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# WHAT TO DO WITH MARX?

Propositions on his Patrimony

The implosion of “real socialism” in Eastern Europe and Russia, the insufficient problem solution capacity of this type of society (concerning innovation, productivity of labour, democratic processes, empowering of the individual in liberty and peace) as well as the current military, environmental and social self-destructive tendencies within the capitalistic world suggest a re-thinking of Marxist positions with respect to societal and economic theory, political orientation and practical action. Based on selected issues of Marx’ theory, in particular his work on labour value, I would like to get rid of the perspective of the past century, but I maintain his method and use it against the new wave of neo-liberal globalization. On this basis, I try to formulate some guidelines, which should govern analyses of contemporary socio-economic processes.

## 1. Accept history as an open process!

One has to accept that history is not a predetermined, but a relatively open evolutionary process. Evidently, the obsolete deterministic view of history as a gradual process towards always-higher levels of development has to be suspended. This is also in line with the dialectics of chance and necessity in biological systems or in quantum theory, both representing unstable and chaotic structures. Among other things, one important task of social sciences is to measure the content and the scope of the possibility field of future development whereby it is clear that a strictly deterministic attempt to forecast the future must certainly fail. The past development determines the future only to a certain extent (which can be investigated by natural and social sciences), but not completely. In describing the historical process, one has to take individual and collective freedom of action and decision into account. Therefore one can recommend e.g. scenario techniques or combined stochastic-deterministic models of Nelson and Winter’s evolutionary approaches as appropriate methodologies.

## 2. Take into account new contradictions arising in society!

The so far dominant classical main contradiction between capital and labour as the root of all evil has to be qualified. In modern societies new frontiers (see for instance Ulrich Beck’s Risk Society) develop, which we cannot fully understand based on the traditional scheme of class struggle. However, material interests (which we should not reduce only to profit) as driving forces of the historical process remain in place. We have to work out their characteristics in detail; and we should study their interactions. If we investigate the historical development under the perspectives of two key indicators, "effectiveness"[1] and "humanization"[2], we can observe progress, but regression is also there. The virtuosity of humankind in transforming nature increased strongly (and is still increasing) during the capitalistic phase. During long

1 Effectiveness is the general term for measuring the virtuosity of humankind with respect to nature in transforming it into use values. The measurement has to take into account productivity of labour and the ability to innovate.

2 Humanization is the general term for measuring the inclusiveness of the analysed societies or groups with respect to their participation and integration, the level of development of democracy, their human and civil rights, their social sustainability and peace keeping abilities. The concern on environment has to be added here, because otherwise nature will fire back to people.

historical periods, one can also find improvements in the degree of humanization (there are certain tendencies of increased emancipation of the working people within and between the individual society formations). However, capitalistic society suffers from the problem that effectiveness increases at the expense of human beings and nature. The socialist countries emerged under the need for humanization, but over time, they lost their potential for increasing effectiveness, which led towards inhumane policies, by which they finally broke down (humanization without effectiveness). Any future society worth living should be able to use increased effectiveness for the purpose of humanization, in order to make possible a flexible development of the personality in peace and liberty on a mass basis, which might serve among other things – maybe supported by technological or organisational innovations - for an increase in effectiveness.

## 3. Do not give up the labour theory of value, but modify it!

In my opinion, after a few modifications of the term “labour value” we will undertake below, we can maintain the labour theory of value as one of the principles of understanding the historical and contemporary political-economic development.[3] Using the central categories of "work" and “labour” still allows an integrated ontological interpretation of the role of societal human beings (although one has to adapt them to the present conditions) and their perspectives, who reach from philosophical aspects over the political and economic fields to natural sciences and technology. It lays hereby the joint corner stone for inter- and trans-disciplinary work, which goes beyond the bare “side by side” or the “one after the other” approach of separated disciplines of research.

Adam Smith and David Ricardo developed the labour theory of value during a certain phase of history (early capitalism). At that time, they linked it to a certain mental model of production, distribution and appropriation of material wealth and its value. In history, one can identify substantial changes on how the sources of wealth were seen, which were reflected in modifications of the meaning of “value”: Under feudalism, we see wealth as an accumulation of treasures, under mercantilism wealth consists in the transfer of treasures, the Physiocrats saw wealth as the fruits of agriculture, then, in early capitalism, wealth was made up of manual labour (Adam Smith). With Marx we find a new emancipatory turn: While in the first chapter of "Das Kapital"[4] he perceived the wealth of society in capitalism as an immense collection of commodities, in "Grundrisse", where he dealt with the end of capitalism, he defined wealth differently: no longer work and its products represent wealth, but freedom from necessary work, disposable time, is the wealth of the next stage after capitalism. In his view, “disposable time” will enable the all-round development of the personalities of the people and the real emancipation of humankind.[5]

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3 This is directed against the replacement of the notions „labour“ and “work“ by scientifically reduced alternatives, like energy, entropy or information.

4 “The wealth of those societies in which the capitalist mode of production prevails, presents itself as "an immense accumulation of commodities, its unit being a single commodity”. (see http://marx.eserver.org/1867-capital/1-commodities.and.money /1.1.two.factors.commodity.txt)

5 Karl Marx commented approvingly in his Economic Manuscripts of 1861-63 on the "fine statement" by an anonymous author of the 1821 pamphlet: “After all their idle sophistry, there is, thank God! no means of adding to the wealth of a nation but by adding to the facilities of living: so that wealth is liberty -- liberty to seek recreation -- liberty to enjoy life -- liberty to improve the mind: it is disposable time, and nothing more.' (Anonymous, 1821, The Source and Remedy of the National Difficulties). Marx wrote: “The measure of wealth is then not any longer, in any way, labour time, but rather disposable time. Labour time as the measure of value posits wealth itself as founded on poverty, and disposable time as existing in and because of the antithesis to surplus labour time” (see http://marx.org/archive/marx/works/1857/grundrisse/ch14.htm)

Marx's version of the labour theory of value, rooted in "simple commodity production", but targeted at capitalism, contains already the germ of its own abolition: "*But to the degree that large industry develops, the creation of real wealth comes to depend less on labour time and on the amount of labour employed than on the power of the agencies set in motion during labour time, whose 'powerful effectiveness' is itself in turn out of all proportion to the direct labour time spent on their production, but depends rather on the general state of science and on the progress of technology, or the application of this science to production… With that, production based on exchange value breaks down, and the direct, material production process is stripped of the form of penury and antithesis.*"[6]

The question arises if one can already today find some empirical evidence on the tendency towards the end of the realm of the labour value, although in capitalist disguise. Maybe, on the micro level this development is related to the trend towards blurring the rigid separation of "working time" and "leisure time", which can be seen already today in many intellectual and/or self-employed occupations. But, more important, there exists an interesting macro-phenomenon in all developed capitalist economies: the high and still increasing share of services.

To end up with an improved understanding of the role of services in the labour theory of value, I propose to undertake an excursion into an ideal type era of the past where we can apply the labour theory of value in a pure way. Let us move into a phase where capitalism was not yet invented. Only small commodity production of material goods was done on an individual basis, commodity markets were already there. We could group the activities into branches of production and could determine the labour values of the commodities. So far so good. But what if service providers come into this idyllic economy?

I showed in other place[7] that by adding service providers to a society of producers of exclusively material output (an ideal type society regarded as simple commodity production) the commodity producers can only regain the full labour value over the market can, if the service providers ("immaterial production" in traditional terms of the former socialist countries) are compensated to their reproduction costs. Even if the service providers would get a portion of "value added" (I used quotation marks, because a pre-capitalistic form of a part of created value is meant), for the simple commodity producers would regain less than the amount of value they have produced - a contradiction to the labour theory of value for small commodity production.

In my opinion therefore value added is bound to the existence of a surplus product, which in principle can be accumulated, stored or resold in the market (which is impossible for services). But without a surplus product it is not possible to add an increase to the overall labour value, from this it follows for service providers, who cannot produce a surplus product, that they do not produce value added, and therefore they do not produce any labour value; however, they produce use value.

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6 http://marx.org/archive/marx/works/1857/grundrisse/ch14.htm

7 Fleissner, P., Werte und Preise, in: J. Baum, P. Fleissner, G. Hanappi et al, Wirtschaftswachstum und Strukturwandel, Endbericht zum Jubiläumsfondsprojekt Nr. 2702, Wien 1988, Band I, S. 18-21.

For the ability of an ideal type closed economy in equilibrium (consisting of simple commodity producers and service providers) to accumulate follows that exclusively producers of material goods can accumulate (they regain the entire amount of directly and indirectly spent labour via the market). The service providers however cannot, since they receive for their services only their own reproduction costs and the cost of their service providing activity.

This ideal world of simple commodity and service producers can be used for a Gedankenexperiment (experiment in the mind). In this ideal world each producer should be compensated fully for her/his efforts via the market. But the question arises what do the service providers offer? They offer their activities (use values) at the value of their own costs, i.e. their reproduction costs as a production unit. If we assume a situation of equilibrium (clearing all markets) the result would be that the goods will be sold at a price proportional to direct and indirect labour spent, and the services at a price proportional to their total costs of reproduction. I call any deviation from this classical form of labour values “modified value”. A few of particular modifications are described and discussed below.

The mathematical representation can be stated with the following notation:

$$\begin{Bmatrix} \mathbf{A}_{11} & \mathbf{A}_{12} \\ \mathbf{A}_{21} & \mathbf{A}_{22} \end{Bmatrix} \begin{Bmatrix} \mathbf{x}_1 \\ \mathbf{x}_2 \end{Bmatrix} + \begin{Bmatrix} \mathbf{y}_1 \\ \mathbf{y}_2 \end{Bmatrix} = \begin{Bmatrix} \mathbf{x}_1 \\ \mathbf{x}_2 \end{Bmatrix}$$

$$\begin{Bmatrix} \mathbf{L}_1 & \mathbf{L}_2 \end{Bmatrix} \quad \text{Live labor}$$

$$\cdots\cdots\cdots\cdots$$

$$\begin{Bmatrix} \mathbf{x}_1'' & \mathbf{x}_2' \end{Bmatrix} \quad \text{Gross production}$$

whereby **A** is the partitioned matrix of technical coefficients. Partition 1 represents the classical sectors of material production, partition 2 consists of service industries, which do not contribute to value added. Also gross production **x**, final demand **y** and live labour **L** (measured in working hours per year or any other time unit) are partitioned vectors.

To determine unit (labour) values in an economy with sectors, which do not create labour value, but exclusively produce use values, the partitioned vector **w** of labour values obeys the following formula:

$$\begin{Bmatrix} \mathbf{w}_1 & \mathbf{w}_2 \end{Bmatrix} \begin{Bmatrix} \mathbf{A}_{11} & \mathbf{A}_{12} \\ \mathbf{A}_{21} & \mathbf{A}_{22} \end{Bmatrix} + \begin{Bmatrix} \mathbf{l}_1 & \mathbf{0} \end{Bmatrix} + \begin{Bmatrix} \mathbf{w}_1 & \mathbf{w}_2 \end{Bmatrix} \begin{Bmatrix} \mathbf{0} & \mathbf{C}_{12} \\ \mathbf{0} & \mathbf{C}_{22} \end{Bmatrix} = \begin{Bmatrix} \mathbf{w}_1 & \mathbf{w}_2 \end{Bmatrix},$$

whereby $\mathbf{l}_1$ represents the sector unit labour values of life labour, $\mathbf{C}_{12}$ is the consumption matrix of material goods per unit of services, $\mathbf{C}_{22}$ is the consumption matrix of services per unit of services. The solution for **w** is:

$$\{\mathbf{w}_1 \quad \mathbf{w}_2\} = \{\mathbf{l}_1 \quad \mathbf{0}\} \left\{\mathbf{I} - \begin{Bmatrix} \mathbf{A}_{11} & \mathbf{A}_{12} \\ \mathbf{A}_{21} & \mathbf{A}_{22} \end{Bmatrix} - \begin{Bmatrix} \mathbf{0} & \mathbf{C}_{12} \\ \mathbf{0} & \mathbf{C}_{22} \end{Bmatrix}\right\}^{-1} .$$

where $\mathbf{w}_1$ represents the row vector of labour values for one unit of material goods, $\mathbf{w}_2$ the reproduction costs of one unit of services. One could easily create a system of relative prices which is proportional to the values defined in the described way. Such an economy would not allow service providers to grow. On the market they only would gain their total costs of reproduction, while the producers of material goods could accumulate the full amount of value added they had created on their own. Evidently, this is not in agreement with the empirical findings of contemporary capitalist economies, where evidently service providers make profits. How can this discrepancy be explained?

Here we approach a former battlefield of political economy, called “transformation problem”.[8] How is it possible that commodities are sold at prices different from labour values?

Once again we start from an ideal type of a capitalist economy. We assume that the unit prices of this economy allow all the producers (irrespective if they produce material goods or services) to gain equal profit rates in all sectors. Marx called such prices “production prices”. They imply that for each unit of capital advanced there is the same gain in profits (equal mark-up). The velocity of accumulation (the growth rate of capital) will therefore be equal in all sectors. In such a situation the individual capitalist will not try to reallocate her/his capital to other sectors, because she will not gain more profits anywhere else. It represents therefore a relative stable, (but of course ideal type) system of relative prices (proportionate to the “production prices” which are measured in labour time). This situation implies a modification of the labour values by reallocation of the (material) surplus product among the sectors in a way that in terms of production prices each sector can accumulate at equal growth rates (which are also equal to the overall average profit rate).

One can show[9] that the iterative application of Marx' method described in volume two of “Das Kapital” converges to Bortkiewicz’ solution (which is identical to the solution of an eigenvalue problem of matrix calculus). This interpretation of the transformation problem contains however a difference to Marx' solution: In general, it is impossible to keep all three, the surplus product, the total sum of value and the total surplus value, invariant over the transformation. My procedure leaves the material surplus product and one aggregated value variable (total sum of value, or total surplus value) invariant, but not two of them. In my view the transformation problem is located on a very abstract level, since it leaves the ratios of the physical quantities invariant, although value and price changes are made.

The following equation permits the computation of production prices **p** in presence of service sectors in an economy without fixed capital with the average profit rate r and the partitioned consumer goods matrix for each to output unit, **C**:

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8 For a recent review of the transformation problem see Kepa M. Ormazabal, The Transformation of Value into Competitive Price: rescuing Marx’ Value Theory from Historical Misinterpretation, 3rd version: 13 February 2004, www.daskapital.org/files/04Ormanazabal.doc

9 P. Fleissner, Werte und Preise, in: J. Baum, P. Fleissner, G. Hanappi et al, Wirtschaftswachstum und Strukturwandel, Final Report, Jubiläumsfondsprojekt Nr. 2702, Wien 1988, Vol I, S. 18-21.

$$\left( \left\{ \mathbf{p}_1 \;\; \mathbf{p}_2 \right\} \begin{Bmatrix} \mathbf{A}_{11} & \mathbf{A}_{12} \\ \mathbf{A}_{21} & \mathbf{A}_{22} \end{Bmatrix} + \left\{ \mathbf{p}_1 \;\; \mathbf{p}_2 \right\} \begin{Bmatrix} \mathbf{C}_{11} & \mathbf{C}_{12} \\ \mathbf{C}_{21} & \mathbf{C}_{22} \end{Bmatrix} \right) (1 + \mathrm{r}) = \left\{ \mathbf{p}_1 \;\; \mathbf{p}_2 \right\},$$

where the production unit prices (actually still on the level of values, thus measured in labour time units) are determined as left eigenvector of the matrix of the entire reproduction coefficients **A**+**C**,

$$\begin{Bmatrix} \mathbf{A}_{11} + \mathbf{C}_{11} & \mathbf{A}_{12} + \mathbf{C}_{21} \\ \mathbf{A}_{21} + \mathbf{C}_{21} & \mathbf{A}_{22} + \mathbf{C}_{22} \end{Bmatrix},$$

The average profit rate r is

$$r = 1/\lambda - 1$$

whereby $\lambda$ is the largest eigenvalue of the reproduction matrix **A**+**C**. The production prices are partitioned. The first part of the vector is related to material production, the second one to services. Prices are only determined up to a constant factor. Therefore still a standardisation condition is needed which connects the classical value level with the production price level. If one chooses for instance the total amount of value producing labour as invariant and identifies it on the production price level with its corresponding reproduction costs for material production plus the entire profit mass, the following equation results, from which unique production prices follow:

$$\left( \left\{ \mathbf{p}_1 \;\; \mathbf{p}_2 \right\} \begin{Bmatrix} \mathbf{C}_{11} & \mathbf{0} \\ \mathbf{C}_{21} & \mathbf{0} \end{Bmatrix} + \mathrm{r} \cdot \left\{ \mathbf{p}_1 \;\; \mathbf{p}_2 \right\} \begin{Bmatrix} \mathbf{A}_{11} + \mathbf{C}_{11} & \mathbf{A}_{12} + \mathbf{C}_{12} \\ \mathbf{A}_{21} + \mathbf{C}_{21} & \mathbf{A}_{22} + \mathbf{C}_{22} \end{Bmatrix} \right) \begin{Bmatrix} \mathbf{x}_1 \\ \mathbf{x}_2 \end{Bmatrix} = \mathbf{l}_1 \mathbf{x}_1$$

As already mentioned, the above formulation of the transformation problem (with or without services) is done on a very abstract level. A representation of the problem which permits to change the quantities under the influence of modified prices (proportional to the modified values) would be more realistic. By such a formulation we would approach the domain of general equilibrium theory and could forge bridges between the subjectively oriented marginal utility school and the theories of objective value. My own experiments in this regard with two sectors and an explicit *nonlinear* demand curve, which is dependent on wages and prices, did however not result in a unique solution, but there were two feasible results: high prices associated with low amounts of output either in the first or in the second sector. This is an interesting case of ambiguity. Thus we are in good company, not only with the philosophers of history (openness of the historical process), but also with biologists, chemists or physicists[10], stating the ambiguity of the solution of the mathematical description of many processes in nature.

## 4. Take services into account!

With the transition from simple commodity production to a capitalistic economy based on competition, the processes of value generation and value appropriation are

10 Ilya Prigogine, Isabelle Stengers, Dialog mit der Natur, München 1987; Ilya Prigogine, Vom Sein zum Werden, München 1985; Grégoire Nicolis, Ilya Prigogine, Die Erforschung des Komplexen, München 1987

decoupled. At the same moment sectors of material production and services are set at equal rights, since both present themselves as profit-appropriating activities – as we actually can see at the surface of any empirical investigation. Nevertheless, under the surface, is also true, that in first approximation an increase of service providers will be accompanied by a decrease of the overall average rate of profit. This direct effect might be accompanied also by an indirect effect (or second order) which changes the productivity of labour and/or technological coefficients of the economy. The surplus value (up to evaluation differences by value changes) resp. the invariant surplus product has to be re-allocated to a now higher amount of capital advanced (equal rates of profit assumed).

This effect can be used as an alternative explanation of the tendency of the rate of profit to fall as presented by Karl Marx. He identified the increasing organic composition of capital (together with a constant rate of exploitation) as the cause of the tendency to decline, while in my opinion the increase of the share of services in an economy would have the same result. With respect to accumulation of capital, a relative increase of services will result in a decline of the average rate of profit. In a closed economy (without stocks) this is associated with a reduced maximum speed of accumulation. On the other hand, a relative increase of material production will add directly to surplus and to value added, thus increasing the average rate of profit.

While Marx at his era could neglect services produced under capitalistic rule and focus on material production, it is no longer possible today, where about two thirds of the total labour time is spent for the production of services. On the contrary, one could speak of a tendency to marginalize the share of labour time spent for material production compared to total labour time.

The System of National Accounts (SNA) does not only consider - as did the Material Production System (MPS) of the former socialist countries[11] - material production as wealth creating, but treats services on equal footing. They can be seen as productive from a certain point of view, because they allow a profit for the producers and for the providers of services. For this reason, the perceived source of wealth is more or less automatically extended to the service sectors. The SNA designed by Richard Stone and recommended by the United Nations does no longer measure labour values, but defines - roughly speaking - the Domestic Product of an economy as use values, evaluated at market prices, net, after deducing the costs of intermediate products. By this move the SNA not only recognizes weighted use values instead of labour values, but accepts also all producers as producers of use values, irrespective of their location in the “productive” or “non-productive” sectors (as MPS called them). In my opinion, by weighted use values SNA reflects the needs/consumption structure of the people in a more appropriate way than the labour value concept.

What is the result of our tour through the world of simple commodity production, where we have added services, and then undertook the transformation of labour values into production prices? It should qualify the nature of the SNA system with respect to services. As we can see on the basis of an input-output scheme of simple commodity production, the service sector does not generate value, but is a sector to which values are allocated that were produced elsewhere. One can illustrate that value production is restricted to a shrinking fraction of the labour force. This effect

11 M. W. Solodkow, T. W. Poljakowa, L. N. Owsjannikow, Nichtproduktive Sphäre im Sozialismus, Berlin 1975

could be interpreted as a historic tendency towards the end of value production, illustrating Marx' comments we quoted above.

## 5. Take unpaid work into account!

In my opinion, we are witnessing a transformation in the perception of the sources of wealth: As society is more and more perceived as a complex system in which nearly all activities have become important for maintaining production, including the ones beyond formal labour, we can hear requests for the introduction of a "basic income". Under such a perspective all citizens are seen as contributors of wealth, without difference concerning gender, age, race, occupation etc. Consequently, everyone is to receive her/his fraction of wealth. The first traces of this idea we can find back in history at utopian socialists. Later on, at the beginning of the 20th century, we can identify scientists and politician in Germany and Austria[12] who demanded a more equal distribution of the national wealth, at this time for social reasons. In the process of increasing female participation in the labour market in Europe after World War 2 the meaning of wage labour has changed: While the classical economists understood the wage of manual workers as covering all the costs of reproduction of all the family members, after WW2 wages are seen more and more as compensation for individual work, and no longer for the whole family. Nowadays tendencies can be seen to extend the source of wealth also to informal labour of housewives. One can hear requests for individual compensation for housework, and a "wage" for this type of activity should be paid by society. The concept of "basic income" extends the principle of individual compensation for individual work by a social component and promotes a more even income distribution. The income received should become more and more independent of the particular contribution of the individual. It is sufficient to be a member of a certain society to receive a minimum income. These requests fit well in the Marxian tradition where communism is characterized by the famous quote "from each according to his ability, to each according to his needs" (the origin of this quote goes back to 1840 to Louis Blanc, extending a statement of utopian socialist Henri de Saint Simon, who claimed that each should be rewarded according to how much they work[13]), but I am not sure if the classics really have seen house-work as a contribution to society. Their ideas were rather to transform house-work into the public domain (public kitchens, kindergarten, public laundries etc.) where once again labour is compensated by wages. They expected (or hoped) that in the home there would not be any more work to do – a hope which remains unfulfilled up to now, neither in the West nor in the East. In both parts of Europe technical devices were introduced into the homes, but as one can see from time budget studies, parallel to a higher diffusion rate of technical devices the demands on cleanliness and tidiness increased, too (at the same moment outside their homes people accept higher levels of environmental pollution).

## 6. Reward the effort of nature!

Nature, beside work, is the second source of economic wealth. Since her services were assumed to be free of charge, nature became damaged and hurt, to an extent that the basis of human existence became undermined. For human beings to survive,

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12 See e.g. J. Popper-Lynkeus, Die allgemeine Nährpflicht als Lösung der sozialen Frage, Dresden 1912; Otto Neurath, Wirtschaftsplan und Naturalrechnung - Vollsozialisierung, Verlag Eugen Diederichs, Jena 1920; Atlanticus (pseudonym of Karl Ballod), Der Zukunftsstaat, Produktion und Konsum im Sozialstaat, 1898.

13 http://en.wikipedia.org/wiki/From_each_according_to_his_ability,_to_each_according_to_his_need

a necessary, but not sufficient condition would be to include any damage of nature into the economic accounting schemes to provide for financial repair funds. This extension of economic accounting will not work where the damage has already become irreversible. An extinguished species cannot be revived; non-renewable resources are lost forever. In these cases, one needs political decisions outside the economic sphere that are able to assess the advantages and disadvantages of the interactions with nature, and institutions, which are able to implement the results in the framework of economic activities. It is evident that the actual instruments of democracy are not sufficient to meet the goals.

Nevertheless, fort he economic aspect of the environmental problem it would be an advantage to give nature a value (expressed by the cost of the repair measures), leading to another "modification of value" which has to be expressed in price terms. A share of the net domestic product has to be used for cleaning the environment. On the basis of information about the structure, scope and scale of recycling industries this modification of value, „the value of environmental reproduction"[14], can be determined. Still the allocation of the costs has to be done on some political decision or a principle backed by politicians.

To illustrate the verbal description a simple mathematical formulation is used. We start from the same input-output structure including services we have already used above.[15] The service sectors have now to be interpreted differently: The should use to repair environmental damage. The output $\mathbf{x}_2$ stands for the amount of cleaned substances per time unit (in physical units). The sub-matrices $\mathbf{A}_{11}$ and $\mathbf{A}_{12}$ represent the technical coefficients, the sub-matrices $\mathbf{A}_{21}$ und $\mathbf{A}_{22}$ contain the emission coefficients (pollutant per unit of output of the respective product). They are negative if they absorb pollution, they are positive, if the add to it. The second part of the vector of final demand has now a special meaning: If it is negative, pollutants are transported into the environment. The net effect results from the difference between repair activities $\mathbf{x}_2$ and pollution ( $\mathbf{A}_{21}\ \mathbf{x}_1 + \mathbf{A}_{22}\ \mathbf{x}_2$ ), caused by all production and recycling processes together.

In analogy to the equation of the labour values in the presence of services, vector $\mathbf{w}_u$ of unit labour values can be derived with the only difference that $\mathbf{C}_{21}$ and $\mathbf{C}_{22}$ have only zero elements, because we do not assume, that pollutants are consumed.[16] By setting the labour value of the output of recycling industries equal to the labour time needed for reproduction – like we have done for services– we get the (partitioned) vector of the values for environmental reproduction, wu, from the following equation:

$$\left\{ \mathbf{w}_{u1}\ \mathbf{w}_{u2} \right\} \begin{Bmatrix} \mathbf{A}_{11} & \mathbf{A}_{12} \\ \mathbf{A}_{21} & \mathbf{A}_{22} \end{Bmatrix} + \left\{ \mathbf{l}_1\ \ \mathbf{0} \right\} + \left\{ \mathbf{w}_{u1}\ \mathbf{w}_{u2} \right\} \begin{Bmatrix} \mathbf{0} & \mathbf{C}_{12} \\ \mathbf{0} & \mathbf{0} \end{Bmatrix} = \left\{ \mathbf{w}_{u1}\ \mathbf{w}_{u2} \right\}.$$

With $\mathbf{w}_u$:

14 I owe this term to Prof. Rainer Schwarz, Berlin

15 When I tried to include activities to repair the environment I followed an idea of Wassily Leontief, modified and extended by Faye Duchin (Faye Duchin, Framework for the Evaluation of Scenarios for the Conversion of Biological Materials and Wastes to Useful Products: An Input-Output Approach, FD3018, paper presented at the ASSA meetings, New York 1988; W. Leontief, Environmental Reprcussions and the Economic Structure: An Input-Output Approach, in: Review of Economics and Statistics 52, 3 1970, 262-271).

16 For special investigations (like to analysis of pathogenic effects of toxic substances in the environment on the workers, ort he reverse, the environmental charge by the consumption of the people) one could work with non-zero matrices.

$$\{ \mathbf{w}_{u1}\ \mathbf{w}_{u2} \} = \{ \mathbf{l}_1\ \mathbf{0} \} \begin{Bmatrix} \mathbf{I} - \mathbf{A}_{11} & -\mathbf{A}_{12} - \mathbf{C}_{12} \\ -\mathbf{A}_{21} & \mathbf{I} - \mathbf{A}_{22} \end{Bmatrix}^{-1}.$$

After some transformations, using inverses of partitioned matrices, we arrive explicitly at the vector of values for environmental reproduction

$$\{ \mathbf{w}_{u1}\ \mathbf{w}_{u2} \} = \mathbf{l}_1 \{ \mathbf{T}_{11}\ \mathbf{T}_{12} \},$$

where

$$\mathbf{T}_{11} = [\ \mathbf{I}_n - (\ \mathbf{I}_n - \mathbf{A}_{11}\ )^{-1} (\ \mathbf{A}_{12} + \mathbf{C}_{12}\ ) (\ \mathbf{I}_r - \mathbf{A}_{22}\ )^{-1} \mathbf{A}_{21}]^{-1} (\ \mathbf{I}_n - \mathbf{A}_{11}\ )^{-1}$$

And

$$\mathbf{T}_{12} = \mathbf{T}_{11} (\ \mathbf{A}_{12} + \mathbf{C}_{12}\ ) (\ \mathbf{I}_r - \mathbf{A}_{22}\ )^{-1}.$$

The matrices $\mathbf{I}_n$ and $\mathbf{I}_r$ represent unit matrices of dimension n (number of industries producing traditional commodities) resp. r (number of industries repairing nature).

One can show that the unit values for environmental reproduction will grow with growing labour coefficients and with growing coefficients of all the other matrices. This is the mathematical expression of the verbal statement: the better technology, the less the unit value.

We give an illustrative example on the effects of the various value schemes on the value added. Let us start by defining the amount of the primary input “life labour”. The system needs L laborers

$$L = \mathbf{l}_1 \mathbf{x}_1 + \mathbf{l}_2 \mathbf{x}_2,$$

but only the first term can be seen as value producing

$$\mathbf{l}_1 \mathbf{x}_1$$

The GDP according to the usual SNA-system ist he sum of industrial wages and profits, where the repair activities contribute positively to it

$$\mathbf{l}_1 \mathbf{x}_1 + \mathbf{w}_{u2} \mathbf{C}_{12} \mathbf{x}_2.$$

My proposal for a more appropriate measure would be to determine the net-effect (GDP minus repair cost)

$$\mathbf{l}_1 \mathbf{x}_1 - \mathbf{w}_{u2} \mathbf{C}_{12} \mathbf{x}_2. = \mathbf{l}_1 (\ \mathbf{x}_1 - \mathbf{T}_{12} \mathbf{C}_{12} \mathbf{x}_2\ ).$$

We can do the same computations also for an ideal capitalist economy under perfect competition. We have just to set $\mathbf{C}_{21}$ und $\mathbf{C}_{22}$ to zero. Everything else remains unchanged. We end up with a price for environment reproduction, now under the condition of repairing the environment. Still, the political problem remains unsolved (as in the case of “basic income”): Who should pay for the repairing nature?

## 7. Acknowledge the market, but tame it!

In my opinion, from the paragraphs above follows clearly that the necessity of societal intervention to influence the prices is growing over the decades (even if this is in striking contradiction to the break down of the planning economies of "real socialism"); that instruments to control economic processes is now more important than ever, and one should not trust too much in the free market economy. We tried to show that the market price deviates more and more from labour value.

This does not mean that we should get rid of the market immediately and replace it by a command economy of Soviet type. My intention is that we need societal institutions should tame the anarchy of the capitalist economy. Still the resistance of particular economic or other interests can be considerable high. The free market can only work fair if the agents in the market have more or less the same resources at their disposal. Unfortunately this is neither true inside the national economy nor in global dimensions. Society has to undertake the never ending task to r(e)produce the fair play in the markets, maybe by re-distribution of wealth, by offering infrastructure, or by non-economic measures.

If we would abandon the market, at the same moment we would do without the only empirically tested driving force of innovation and reconstruction of the means of production, which history has brought up. For the coming decades, up to the time where the ability of self-organisation and selflessness has developed at a mass scale, we have to deal with the market. In partial markets, we can already see regulation for the free interplay of market forces. We need to target them towards social goals.

If we include the indirect contributors of wealth into the labour theory of value, we have to solve the question of the appropriate system of relative prices. Many variants are possible, either by associating housewives to the respective industry of their husbands (meaning that the goods of those industries become more expensive) or, better, to decouple completely work and remuneration.

## 8. Apply integrated multi-level analysis!

To bring the labour theory of value in a position of a testable theory of the metabolism of society with nature, I propose the method of „multi-level analysis".[17] This is an analysis based on input-output tables located on top of each other. They should cover structured indicators starting with physical ones, various kinds of work, labour up to economical ones.

The lowest levels refers to the amount of solid, liquid or gaseous matter measured in physical units (e.g. tons or kilograms), which is moved by the society; the second level is related to energy and entropy.

17 Fleissner, P. et al (1993) Input-Output-Analyse - Eine Einführung in Theorie und Anwendungen (Input-output analysis - an introduction into theory and applications) Vienna: Springer Verlag, pp 249-264

The third, but first “human” layer represents the input-output table of abstract living time, structured into working time, leisure and sleep. If we have two separate tables, one for the time spent by females and males, data might be used to get information on the gender division of labour in society, again separated by time spent for the reproduction of the workers, formal labour (by employees, also including co-operatives and petit bourgeoisie) and time for sleep. One can use the tables to construct a measure of exploitation inside the households, beyond class positions.

The fourth layer deals only with labour time spent inside the formal economic system. This is the basis for economic accounting and for the construction of price systems located on the next higher levels. Here we have to make a distinction between material production and services. The labour time spent for the production of material goods is the basis for the calculation of classic labour values, considering services only at their direct reproduction cost.[18] This table informs us on the price structure in an ideal type of society of small commodity producers.

By mathematical transformation (after we have solved the classic transformation problem, where we transform a price system proportional to labour values into another system of relative prices that are associated with industries carrying identical profit rates) we end up with hypothetical relative prices, the „prices of production“, as they were called by Marx. Strictly speaking, to calculate them precisely, we would need estimates of capital invested (fixed capital) and turnover-time, which are empirically difficult to get. This table describes the situation in another ideal type of economy, a capitalistic economy under perfect competition. From there we can go for more modifications of the relative price systems (by supply and demand, market power, financial capital, political intervention etc) until we come finally to the level of observed market prices.

Formally and methodically, one can the labour theory of value apply far beyond the scope of labour values (like surplus value, rate of exploitation and profit rate), to alternative views of economic activities. In the labour theory of value, one uses labour time per time unit as the only primary input, but one could also use the same computation for other possible primary inputs (like energy per time unit or tons of matter). By analogy, the output will always be the sum of all input, measured in the appropriate units.[19] These methods can be used to analyze material or energy losses/waste with respect to the supply provided by nature free of charge (oxygen intake as input, pollutants etc. as output). From there one could analyze specific production processes simultaneously from different perspectives, reducing it to the essentials of the chosen perspective (like an x-ray done by different energy levels).

## 9. Bring each area of society under democratic control!

The tendencies of bureaucracies in private enterprises and in public administration towards an independent existence without controls show that there is a need for processes and institutions being able to regulate them. One of the most important would be a flourishing culture of democracy, tolerance and civil disobedience. Such a culture will usually not emerge neither by itself nor just by soap-box speakers or

18 Of course, in any practical application one needs also input-output data and other statistics of the System of National Accounts (SNA).

19 see Henning Wasmus, Produktion und Arbeit, Immanente Kritik der politischen Ökonomie, VSA-Verlag, Hamburg 1987.

verbal appeal. The opportunities to learn democratic behaviour have to be organised. There is a lack of „go-schools of democracy“ on all levels, in particular in the German speaking countries with their strong authoritarian tradition or big fathers (like the Emperor Franz Josef or the Austrian Prime Minister Bruno Kreisky). One should engage in a broad field of activities: Co-determination in the enterprise by introducing „technology commissions“ (where the advantages and disadvantages of new technologies can be shaped and controlled). “Internal shortening“ of the working day or the working week could be used as time resources for individual or collective activities of the employees to prepare and participate in labour politics. The Italian “workers health care movement”[20] and the British Greater London Enterprise Board[21] represent two interesting examples, but both came under pressure by economic or political crises and were dismantled or disappeared. A very interesting example outside the enterprise is the Scandinavian institution of “study circles”[22] According to my knowledge more than half of the Swedish population has participated in a study circle during their life. Regional “economic and social councils”[23] could help to bring local needs to the fore. They could become a place where the decisions of the council will meet these needs. “External” participation in the region should complement “internal” co-determination inside the enterprise. Democratic institutions should not leave neither the state nor the enterprises alone and allow them to follow only their internal particular interests. They should be made responsible to society and its appropriate institutions. An effective lever would be the modification of the legal status of working people (Arbeitsverfassung) to give them appropriate rights and duties (having been a Shop Stewart of the Austrian Academy of Sciences I know the game played today) influencing the interrelation between the workers and the management.

The model of Soviet cadres will no longer shape the political environment of the future. There is a need for voluntary and democratic cooperation of the various initiatives. Without an „enlargement” of the traditional „left“ towards a platform of decent and reasonable people it will not be possible to bring the necessary political changes into existence.

20 Helmut Wintersberger, Arbeitermedizin in Italien, Berlin 1988.

21 Greater London Enterprise Board (chairperson: Mike Cooley), see: P. Fleissner, W. Hofkirchner, P. Kolm et al, Anwendungskonzepte flexibler Automation in Klein- und Mittelbetrieben, Endbericht eines Forschungsprojekts im Auftrag des Bundesministerium für Wissenschaft und Forschung, Wien 1985, 40-44.

22 Lars und Irmtraut Karlsson, Studienzirkel - ein schwedisches Beispiel macht Schule, Linz 1988.

23 W. Altzinger et al, Wege zur Vollbeschäftigung, Verlag für Gesellschaftskritik, Wien 1985.