

Dynamic Modelling towards a Society of Solidarity

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„*La solidaridad es la ternura de los pueblos*“

(*Solidarity is the tenderness of the peoples*

團結是各族人民的柔情)

Che Guevara

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1. Introduction

Aiming at a society of *solidarity*, its main manifestations need to be spelled out. Implementing the principle of solidarity would mean in practice:

- Solidarity between the *recipients of income*. Differences of net income should only reflect qualification requirements (educational achievement

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and experience) and risks associated with an occupation, such as impacts on physical and mental health.

- Solidarity on the *paid labour market*. The disposable amount of paid labour should be shared among employable persons. This requirement implies that the average hours of paid work per person have to be substantially reduced and that all persons able to work should get free access to the necessary basic and advanced education.
- Solidarity between *men and women*. Men and women should equitably share paid and unpaid work. In most societies, this aim implies that women's participation in the market for paid labour increases whereas that of men decreases. Concurrently, men would have to considerably notch up their share of hours spent on domestic tasks and caring for children, the ill and the elderly. Of course, the principle of equal pay for equal work has to apply.
- Solidarity between the *generations*. Children and elderly people should be supported by the mid-aged employed persons. Furthermore, to the extent feasible, young people should support the elderly just as the later might take care of children and adolescents. Above and beyond fostering solidarity among current generations, caring for future generations requires us to pass on a sustainable society and (live-supporting) environment.
- Solidarity between *rich and poor countries*. The above principles also apply beyond national borders and imply working towards fairly sharing economic, ecological and social space and requisite resources among current generations both at global and local level, Rich countries should support sustainable development of poor countries and should not continue to misuse them as source of cheap labour and low priced natural resources. Resources within poor countries need to be deployed with the aim of building solidary and resilient societies.
- Solidarity between *human beings and the natural environment*. Instead of exploiting and destroying the natural environment, human beings should exercise stewardship for nature in all its facets by respecting and sustaining it and restoring it if damage has been inflicted.

A solidary society can only evolve on the basis of viable and interconnected social units. It is not enough to call for social responsibility and feelings like empathy or compassion without creating concrete social networks for learning

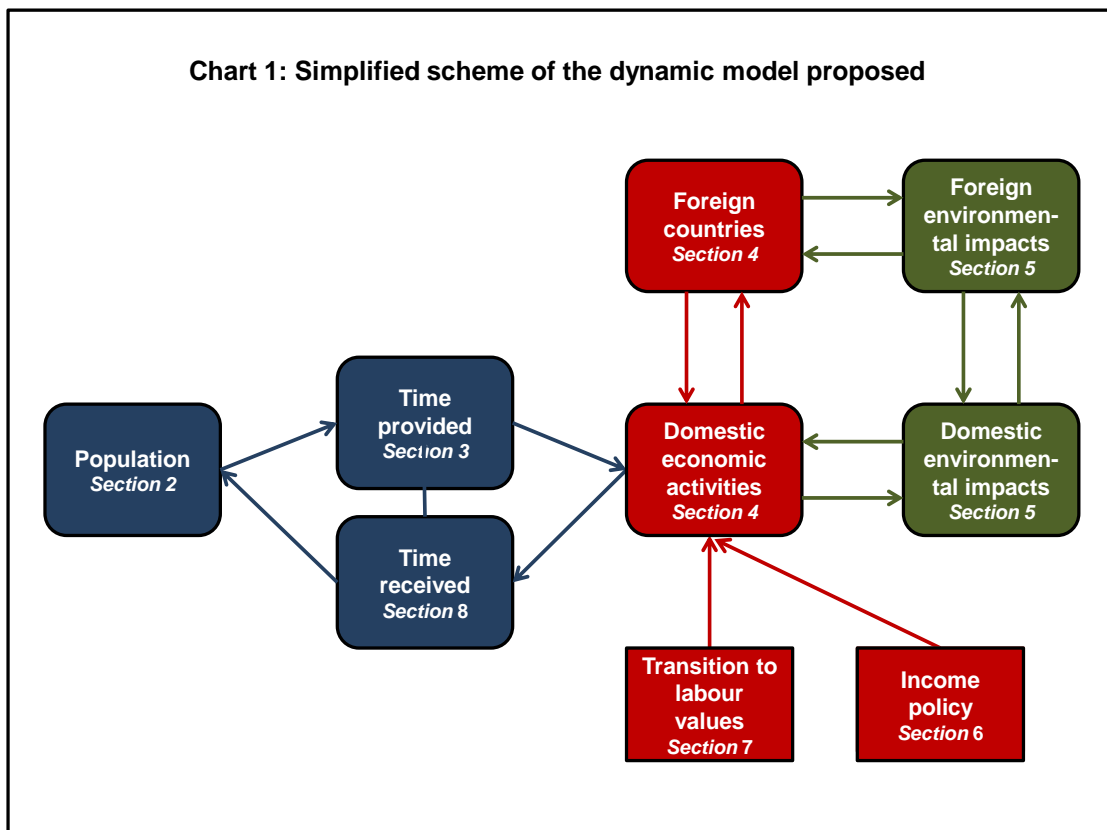
and practicing them. This exercise is only possible between people who know and trust each other through interacting in relatively small and manageable units. Therefore, the principle of *subsidiarity* seems to be an indispensable pre-condition for a society of solidarity. This principle postulates that all what we can manage in a small social unit should not be delegated to a bigger one. Thus the activities of families, partnerships with and without children, of neighborhoods, of communities like urban quarters and of small and mid-size enterprises should constitute the basis of a solidary society. Public and private non-profit organizations should not compete with them but should support them in the sense of “help to self-help” - while of course providing sometimes core, sometimes back-up and complementary services depending on the quantity and quality of needs.

Obviously, the transformation to a solidary society takes time. Most building blocks could be in place within 20-25 years, so that good progress is possible within one generation. Some aspects will require longer transition and adaptation periods of, say, 50-60 years, such as influencing age distribution of the population and ensuring an environmentally compatible economy. In this case, dynamic models could be very helpful to get a quantitative impression of possibilities, transition paths and limits of the aspired changes. At the start, such models would of course work with rough simplifications as the interrelationships between social, economic and environmental aspects of the society seem to be endless. Nevertheless, main variables of the development of our society can be identified in a first step and a process can be started of refining the structure of the chosen model according to practical experience within the transition process itself.

It is impossible to present an elaborated dynamic model in this paper. The scientific discussion on the necessary transformation processes to a solidary society and on suitable models has just begun. In autumn 2011, I presented a static-comparative input-output model showing some characteristics of a solidary society in comparison to the present situation (Stahmer 2011c). In the following, I present a more complex analysis of the necessary transition period. Different modules of a dynamic model are discussed which might play an important role in developing a comprehensive model of the society. Furthermore, some interdependencies of social, economic and ecological variables are described. Nevertheless, the following analysis will be restricted. Topics which are not discussed include, for example, the necessary changes

of the financial sector, the question of a sustainable future level of economic activities and the impact of migration of labour and capital.

Chart 1 shows a very simplified version of the proposed dynamic model. The order of the following sections reflects the order of the different modules of the model: Starting point is a population model linked with an education model (section 2) which delivers the necessary key data for estimating the time budgets of the population (section 3). The time use data are main inputs into the model of domestic economic activities (section 4) which are interrelated with the domestic natural environment (section 5). Linkages are discussed between domestic activities and activities abroad which are also interrelated with their natural environment (also sections 4 and 5). In the context of the model of economic activities, special emphasis is placed on questions of a suitable income policy (section 6) and the proposed transition process to labour values (section 7). Finally, flows of time will return to the population. This can happen directly in the context of time provided for personal activities or social engagement or indirectly in the context of labour time being embodied in goods and services which are consumed by the population (section 8).



2. Population model

It is obviously useful to start the dynamic model of the society by presenting a model of the population. Differentiated by age and sex, it has to explain the future development of the population (see e.g. Federal Statistical Office of Germany 2009). As is known from experience, most demographic change tends to occur at a slow pace and development can only be influenced in the long run.

In most developed countries, relatively low birth rates and increasing life expectancy can be observed. This implies a decreasing fraction of children and an increasing fraction of elderly people with respect to total population (see Poetzsch 2009). In the long run, fewer children imply less middle-aged employable persons who have to ensure the subsistence of both young and elderly people. At present, the financial burden on middle-aged people inevitably continues to increase. Thus, a substantial increase of birth rates is needed to re-establish balanced proportions between the generations. One of the main points of a political agenda should be a substantial increase of the child benefits. Society should take over the costs of children to avoid a financial burden having a baby. Furthermore, changing the division of labour between men and women is essential. It should be no disadvantage for women (or men) to have children. Thus, men and women should care for children in a comparable manner and equally participate in the labour market. Paid and unpaid labour should get the same high recognition from society. The population model should be able to show the impacts of such a family policy.

The average number of persons living and acting together in a private household has substantially decreased in many developed countries in the past decades (see Pöttsch 2011). In a solidary society, this trend has to be reversed: Related and unrelated people living and acting together in a small unit can be considered as a centerpiece of a society of solidarity. Such households should be supported by policy measures, especially by tax splitting among all employable members of the household (see below). Children and elderly people getting an old-age pension should be excluded from this measure as they are financially supported by sufficient children's supplement and by the social security system, respectively.

Such an approach could support various types of labour division between the members of the household. Some members might have a full-time job whereas others could spend time on unpaid social activities (e.g. care for

children, elderly and ill persons). Of course, such a division of labour has to be periodically changed to avoid new dependencies among members of the household. Single parents could live together and can alternate between caring for the children belonging to the household and working on a full-time basis. Elderly people can align with others to care for each other in case of illness. The population model should analyse the corresponding changes of the size and social composition of private households.

Closely linked to the population model, an educational model should be developed (see Reinberg, Hummel 2006, Ewerhart 2001, Stahmer et al. 2003a). Such a model has to show the cohorts of the population passing through stages of education from pre-schooling through general and advanced education to professional training. As adults, periods of further education will alternate with stages of full employment and unpaid social activities. As a result of the educational model, the population data can be disaggregated in a combined classification by age, sex and educational level. It should be noted that required changes to the educational system would need to be added in a separate analysis (see section 4).

The educational model plays a key role in modelling the transition to a society of solidarity. All available calculations have shown that a general reduction of the average working hours of employees and an equal distribution of available labour among all employable persons create a substantial additional need for qualification and skills (see e. g. Stahmer et al. 2004). Currently, persons with high-level education work considerably longer than the average of employees. If they are to substantially reduce their working hours, other persons have to upgrade their educational and skills levels in order to fill the post competently. This implies a major effort by the society to strengthen the education system and ensure a general high level of education of the population. Incentives have to be given to employees to undertake further professional training. The educational model has to describe these processes and indicate the time needed for implementing necessary changes in the educational system. Quick results cannot be expected, but the transition period should also not exceed 20-25 years with benchmarks to be achieved at 5-year intervals.

3. Time provided

Information on the population disaggregated by age, sex and educational level provides key data for estimating the annual time use of the population in a

classification by activities. These activities comprise of employment, basic and further education, homework and handicraft, care for children and for elderly people, voluntary work and all other personal activities like recreating, eating, sleeping, etc. In Germany, representative time budget studies collect such data once in a decade.

The time uses of the population can be considered as the essential variable for changing the activity patterns of the population. Through a dynamic model, the direct and indirect impacts of such changes could be analysed. The hours of paid work are one of these variables. It has already been mentioned that the employment of women should be strengthened whereas the male participation in the labour market should decrease. For Germany, an annual average of 1000 hours of professional work for both men and women was proposed (see Stahmer 2009 and 2011d). This would amount to a weekly average of about 25 hours. This proposal does, however, not imply that all employees should work part-time (e.g. half-a-day). Instead, phases of full-time work could alternate with phases of unpaid social engagement or further education. Moreover, from an ecological point of view, it is desirable to organize work in a manner that reduces the need for frequent physical commuting.

If every employable person would work on an annual average of 1000 hours, total working hours of employees in Germany would decrease by about a sixth. The freed-up time should be used for strengthening social activities and improving educational and skill levels. The time of social engagement should be recognized through the issuance of time credits which can be used in times of need. Within the scope of a dynamic model, the impacts of such a shift from paid to unpaid work could be analysed, inter alia for its economic, ecological and social consequences.

4. Input-output model of economic activities

The impacts of the transition processes on the production and uses of commodities should be calculated by a disaggregated input-output model (see Fleissner 2011, Frohn 2007, Minx 2007). The data base of such models should be extended input-output tables which not only comprise the traditional producing branches but also explicitly show all private activities as

production activities.² For socio-economic analysis, the conventional view on economic production does not suffice. According to the extended approach, private consumption goods are intermediate inputs of the branches of private activities. Expenses for consumer durables become private investment goods which are depreciated according to their expected useful life. The data on time spent become the time inputs of all paid and unpaid activities. An immediate link could thus be established between data of the time budget studies and economic production.

Differing from the concepts of traditional national accounts, the outputs of institutional and private educational activities should be not treated as consumption goods but as investment goods augmenting the education capital of society (see Ewerhart 2001, Stahmer et al. 2003a and Stahmer 2011a). According to the working lifetime, educational investment is depreciated and provides additional inputs for all conventional and private activities. Following this concept, close linkages could be established between the economic activity accounts and the education model outlined in section 2.

The other parts of the input-output model follow the usual concepts of national accounts. Gross fixed capital investment (buildings and equipment) is an input to the conventional capital stock of the economy. Such capital stock calculations need long investment series and estimates of expected service lives of the different investment goods (perpetual inventory method). They allow the calculation of data on consumption of fixed capital which are inputs to the different economic activities.

Input-output tables also comprise data on foreign trade of the respective country (exports and imports of goods and services). In the case of imports, they are shown as inputs to the different economic activities. For dynamic modelling, additional data are needed on economic structures and trends of those countries which play an important role as origin or destination of foreign trade flows. International input-output tables are available which allow linkages between foreign trade flows of important countries. They not

² In the field of national accounting, this approach of a general activity analysis was firstly proposed in Chapter V of the *System for Environmental and Economic Accounting* (see United Nations 1993). A numerical example for Germany is given in Stahmer et al. 2003a (see also an aggregated version in Stahmer 2011a).

only allow analysing the domestic market but also reveal international interdependencies.

Regarding the necessary modelling work in Germany, the “family of models” of the Institute of Economic Structures Research (GWS) in Osnabruck seems to be especially suitable for constructing the needed extended input-output models. INFORGE is the basis model which is a multi-sectoral macroeconomic forecasting model for Germany. Detailed information on the different branches of the economy is given and the behavioural patterns of enterprises, households and government are econometrically estimated. PANTA RHEI (Everything flows) is the extended version used for economic-environmental analysis. Its configuration allows for complex and simultaneous modelling of industrial interdependencies, the origin and distribution of income, the consumption of energy and the emission of pollutants, the redistribution of income by the government and the consumption activities of private households (see Meyer 2005). For international economic and environmental problems, the model GINFORS can be used. It allows linking the world's largest economies and even permits the analysis of the global economy (see Meyer et al. 2007b).

In summer 2004, a cooperation group was established at the Center for Interdisciplinary Research in Bielefeld. Conducted by Bernd Meyer (GWS Osnabruck), Joachim Frohn (University of Bielefeld) and Carsten Stahmer (Federal Statistical Office of Germany), the research group studied the possibilities and limits of linking economic-environmental models with socio-economic models (see Frohn 2007, Meyer, Wolter 2007 and Schaffer 2007). The population model of the German Federal Statistical Office - in combination with additional data on educational levels of the employees - was linked with the model PANTA RHEI of the GWS. During the following years, further extensions of the socio-economic modules could be calculated and combined with the GWS models (see Drosdowski, Wolter 2008 and Drosdowski et al. 2011).

If it were possible to get sufficient financial resources to establish a comprehensive dynamic model of the transition of the present German society to a society of solidarity, the available models of the GWS seem to be a suitable starting point. Of course, for specific modelling purposes extensions would be necessary. Examples for such necessary extensions are a general

activity analysis, the treatment of education services as investment and comprehensive linkages of the activity analysis with the results of the time budget studies.

5. Environmental impacts and policy measures

All economic activities have environmental impacts. The extraction of natural resources diminishes the natural stocks, the land use for economic purposes affects the ecosystems and the disposal of residuals of economic activities reduces the quality of the natural environment. Through policy measures, such as eco-taxes as subsequently described, such negative impacts could be prevented, mitigated or at least compensated for.

The introduction of a comprehensive eco tax system would require detailed information on the physical flows connected with economic activities. Material balances should show the use of natural resources, the stages of conversion into tradable goods and their transformation into recyclable residuals or non-recyclable waste of potential harm to the environment. For estimating eco taxes to be paid at the border, information would also be necessary on non-domestic, trans-boundary environmental impacts connected with the production of imported goods.

The suitable macro-economic data base for such material balances are physical input-output tables showing the material flows in a consistent framework (see United Nations 1993, Strassert 1993, van Dieren 1995, Stahmer et al. 2003a and Stahmer 2011a). Of course, additional information is needed on the degree of damages caused by different pollutants. The material balances should be calculated for all economic activities including private ones. Thus, the activity classification applied in physical material balances and physical input-output tables should use the same general concept of economic activities as described in the preceding section.

One of the main purposes of eco taxes would be the compensation for losses of materials at each stage of production. The payment of eco taxes should activate economic agents to redesign and re-engineer products with the aim of longevity, efficiency and recyclability of materials in mind. Taxing the extraction of natural resources should lead to a more efficient use of such

materials. Thus, ecologically-friendly activities should be forcefully encouraged. Several studies have already analyzed the possible impacts of a system of eco taxes (see e.g. Bach et al. 2002, Meyer et al. 2007a and Barker et al. 2011, Enell 2012).

A system of eco taxes could gradually substitute the value-added taxes and other production taxes (see the static-comparative input-output model in Stahmer 2011c). Taxes which are raised on products posing a risk for human health e.g. alcohol and tobacco might be excluded from the process of substitution.

Eco tax revenues should partly be used for promoting the transition process to environmentally-friendly products. For example, eco subsidies could support research on and the introduction of renewable energies. Furthermore, stewardship of the natural environment should be supported, e.g. by financing conservation areas.

One of the main reasons for introducing a system of eco taxes is its potential to drastically reduce energy consumption. Transportation costs that fully reflect external costs would warrant against long-range transporting of goods that are also available within the consuming region. The massive support of regional environmentally-friendly products could not only have ecological but also social effects by securing the economic basis for small- or medium-sized regional enterprises and weakening the market power of large multinational companies with unsustainable production and distribution practices.

Of course, the change from the value-added tax system to a comprehensive eco tax system cannot be abruptly implemented. A transition period of about ten years seems to be realistic. As already mentioned, eco taxes can only be assessed once detailed material balances are available for all enterprises, private households and non-profit institutions. The establishment of such a comprehensive information system takes time.

A number of countries are already gathering experience with taxing the emission of selected pollutants for which data are relatively easily available and which are particularly dangerous for the natural environment, e.g. carbon dioxide. As further pollutants are captured under the tax, the value added tax

could correspondingly be reduced. It would be the task of dynamic modelling to describe the necessary transition process and to analyze the fiscal as well as ecological, economic and social impacts of the proposed conversion of the production tax system.

6. Income policy

The transition to a solidary society necessarily requires a more equal distribution of the disposable income of the private households and the elimination of poverty. Even in a rich country like Germany, a seventh of the population is at the risk of poverty. The quintile of highest income recipients earns nearly five times more than the quintile of lowest income recipients (see Deckl, Rebeggiani 2012).

One of the most important aims of wage policy should be to reach an agreement of labour unions and employers' associations to introduce minimum wages which allow all employees a decent standard of living. The income of a full-time worker should at least be sufficient for the subsistence of two persons living together; the income generated by a half-day job should be sufficient for a single person.

The tax burden of employees should depend on the number of persons living in a household. If some members of the household have taken over other tasks like social engagement (e.g. child care or care for elderly or ill persons), the level of the tax rate of the employed persons in the household should be appropriately reduced. Such household splitting of taxes should facilitate the decision of people for interrupting their employment and to take over unpaid tasks. As already mentioned, another incentive should be time credits for unpaid social engagement which can be accumulated and can be spent in times of own need.

According to the concept of a half-day society, a yearly average of 1000 hours of employment is aimed at. If a person living alone in a household decides to work full time, she/he should pay higher income taxes. These income taxes would partially be reimbursed if she/he decided to interrupt the paid job for undertaking unpaid social tasks.

It has already been mentioned that a sufficient subsistence of children should be guaranteed by child allowances. This implies that adults directly have to care for their own subsistence only. Of course, the collectivity of all employees has to pay taxes and social contributions which permit the payment of sufficient pensions to older people, benefits for the disabled and appropriate allowances for children. Thus, the employed medium-aged generation has to bear the entire financial burden for all generations.

A basic income should be paid to those persons who are, in spite of educational and training efforts, not employable. This group of persons comprises children, older people and ill/disabled people of medium age. It should be one of the main tasks of the economic policy that all employable persons have access to a job sufficient for their maintenance. The proposed decrease of the average working hours should contribute to a substantial reduction of unemployment and should strengthen the bargaining position of the employees on the labour market.

In a society with increasing rates of older persons, a higher retirement age will inevitably be necessary to increase the rate of medium aged employees. Under the present social conditions, such measure would overcharge many senior persons. Thus, jobs which are tailored to elderly persons are necessary. Furthermore, the medium aged persons should already have a richer variety of activities like employment, unpaid social engagement and further education. Such vita would avoid a premature burn-out and would allow an extension of their period of employment.

The tax rates of high income should be substantially increased. The progression of the income tax rates could be constructed in such a way that the maximum of the disposable income of an average family would not exceed the average income by about four or five times. This implies that the tax rate will come up to nearly one hundred percent if the taxable income is extremely high.

Of course, a strongly progressive tax system cannot be introduced in the short term. A transition period of ten to fifteen years seems to be realistic. In parallel, the minimum wages have to be increased. The dynamic modelling work has to show the economic and social impacts of such an income policy.

7. Transition to labour values

The above described income and tax policies can, however, only address in part – and, in case of tax avoidance, not at all – the fundamental income inequalities across the population. A move towards equity is much likelier successful if labour valuation – the substitution of monetary wages and salaries by time-based compensations - is introduced. While such an approach would stand in sharp contrast to prevailing paradigms in a capitalist society it would open the door wide for realizing a society of solidarity.³

No doubt however, this revaluation can only be implemented in a final stage of the transition process. The same is true for the substitution of the prices for goods and services by labour values which were directly and indirectly necessary to produce these commodities. In a preceding phase, the social, ecological and economic conditions have to be changed in such a way that the introduction of labour values is not considered as an arbitrary measure but a logical extension of a path chosen by society for the tangible benefits it yields.

The compensation of employees should not only reflect the immediate amount of work hours provided but also the hours indirectly necessary to be qualified for a specific job. Such indirect labour hours are especially the hours of education that have to be brought in relation to the hours provided by an employee during an occupational lifetime. The hours of education comprise not only learning but also teaching hours and other hours directly or indirectly necessary to produce the educational services, e.g. teaching materials or heating costs of school buildings (see the education model in Ewerhart 2001 and Stahmer et al. 2003a). If an occupation poses a risk to the physical or mental health of an employee, the total working hours expected to be performed during an occupational lifetime should be reduced and therefore the extra amount to the immediate hours of working should be raised.

Even if governmental institutions would subsidize education costs, the labour values should reflect all hours directly and indirectly necessary to enable a specific type of work to be competently undertaken. This demand points again to the urgent need for raising educational qualifications and skills of the

³ The concepts of the labour value calculations and their importance for a solidary society cannot be presented in this paper in the details, see the comprehensive discussion in Cockshott, Cottrell 1993 and Dieterich 2006. See also Resnick, Wolff 2006, Fleissner 2010 and Stahmer 1998, 2011b.

population. Apart from immaterial benefits material incentives might help in achieving the required level of basic and professional qualifications. Studies have shown that the additional payment for the educational level achieved will raise the basic payment for one working hour by a third or a half only (see e.g. Schaffer, Stahmer 2006). Even if it would double the spread in income would be much smaller than in the scenario presented in the preceding section.

The introduction of labour values instead of commodity prices requires a fundamental change of social and economic structures. It poses a challenge especially to large private companies as a drastic reduction of profits and a fundamental change in the prices of their commodities is implied. Thus, the governmental influence on key industries like banking and insurance, transportation and telecommunications has to be strengthened. On the other hand, it would open greater economic space for small and medium-sized enterprises and thus support regional economic infrastructures. In any case, private enterprises should be owned and managed in a co-operative way which allows workers' participation.

Governmental institutions should not top-down administer or "dictate" the new labour values of the commodities. They should rather give initial assistance to enterprises based on input-output modelling for commodity groups. Each enterprise should calculate its commodity values based on its specific production conditions. The iterative process of achieving balanced commodity values can be simulated by a dynamic input-output model (see Cockshott, Cottrell 1993 and Stahmer 2011b).

The compilation of labour values by enterprises cannot be exactly determined ex ante but will need to be accompanied by modelling work:

- Key factors are necessary to break down the fixed costs of an enterprise (e.g. administration) and allocate them to the different commodities produced by an enterprise.
- The depreciation of fixed capital (buildings, equipment) can only be determined once the expected life time of the specific types of fixed capital has been estimated.

The introduction of labour values should not influence the eco-tax system. The eventual transition to environmentally-friendly production should not be

affected. Regional ecological products should have the lowest values to give adequate buying incentives to the consumers. For transforming the monetary amount of the eco taxes into labour values, the direct and indirect labour contents of the monetary aggregate of public consumption might be used.

Even though the introduction of labour values would come at the ultimate stage of the transition process to a solidary society, the acceptability for such change should be built and continually strengthened long before through various measures. Especially, *complementary currencies* for local exchange trading systems should be supported (see Kennedy, Lietaer 2004). Furthermore, time banks have to be set up which collect and administer time credits earned by unpaid social engagement. Such time credits can be easily calculated if someone is supporting persons outside of the own household. In the case of child care or care for ill or elderly persons within the household, a yearly lump-sum credit should be calculated based on time budget studies. This system of time credits for social engagement should not be abandoned after introducing labour values for employment. Social time credits earned should only be used for receiving social support by other persons.

A dynamic model should already map these first steps into the direction of a general labour valuation scenario. Furthermore, it would be helpful if input-output tables in time units were calculated in each phase of the transition period to analyse the remaining gaps between prevailing monetary relations and envisaged time accounting (see the “magic triangle” of input-output tables in Stahmer 2011a). The convergence of the two data sets during the transition period would be an important measure of progress towards a solidary society.

8. Time received

The time provided (see section 3) is used for activities which benefit principally the population of the respective country in a given period of time. In the case of personal activities like leisure, eating and sleeping, this relationship is evident. The same person is providing and receiving time. Other private activities like domestic or maintenance/repair work are useful not only for the person spending his or her time but also for other members of the household. In the cases of child care, care for ill or elderly persons and other social activities, the benefits for other persons are at the very fore. In all

these cases, the link between the providing and receiving person can be unambiguously identified.

This connection is much more difficult to establish in the case of professional work. Commodities are produced which may reach the private household after many stages of transformation only. An increasing part of the commodities are investment goods which are leaving the current production and are used for a more or less long life-span to produce other goods. Another part of the commodities is exported and will be used by the population of other countries. Correspondingly, time spent by employees working in foreign countries will be used for producing commodities which are imported and benefit the population of the importing country.

For modelling social development it seems extremely important to link time provided and time received in a classification by detailed population groups. Such an analysis would reveal the degree to which specific population groups (e.g. children) are benefitting from the time provided by others and which groups are especially engaged in caring for others. A comprehensive mapping of the flows from the time-providing to the time-receiving population groups can only be implemented by using input-output models which allow estimating the labour hours that are directly and indirectly necessary to produce the commodities consumed. Based on input-output modelling, socio-economic input-output tables can show these flows of time between different groups of the population. They have been developed 2002 for the first time (see Stahmer 2004, Eurostat 2008, Chapter 13, Stahmer et al. 2004, Schaffer 2008). In parallel to the time flows, monetary and physical flows can be shown. Thus, the magic triangle of social, economic and environmental aspects can also be accommodated in the scope of this type of input-output tables.

It should be mentioned that the allocation of received time to specific receiving persons is complicated if commodities are bought by a private household with consists of more than one person. Rough estimates might be necessary to distribute the flows among members of the household. In any case, it seems advisable to allocate the time provided not only to persons but also to private households. In the study “Zeit für Kinder (Time for children)”, the German Federal Statistical Office gained experience in this field (see

Stahmer et al. 2003b). Private consumption was disaggregated in a combined classification by type of households and by group of persons.

After introducing labour values as a general measure of the value of commodities, it will no longer be necessary to estimate the time received which is embodied in the value of commodities. The value of the commodities will immediately show this amount of time. Of course, the data cannot reveal the persons directly and indirectly engaged in producing these commodities. Therefore, the modelling task for analysing interdependencies between persons providing time and persons receiving it will still need to be undertaken.

In a dynamic model, one should aim at linking the time received in one period with the behavioural parameters of the population model and with the time provided during the subsequent period. Step-by-step, all modules of the dynamic model should be interrelated. The model family of the GWS Osnabruck is a suitable example for such linkages which is already illustrated by its model name PANTA RHEI.

The existing approaches to explain behavioural parameters of the population (e.g. birth rate, household size, structure of time use) are not very convincing. It seems possible to identify specific influencing factors, e.g. level of education, financial support by government, situation of the environment and level of consumption. Such partial analysis has successfully been undertaken (see e.g. O'Neill et al 2001, Hoem 2005, Lutz, Samir 2011). An integrated approach which combines social, economic and environmental variables will be extremely challenging. The most critical barriers are fundamental deficits in the field of theory and empirical practice of social analysis. The dominating role of economic analysis and its underlying paradigms has prevented the necessary research work for achieving a more comprehensive view of the reality of our society and its potential to change.

9. Outlook

Most countries will not be immediately able to implement dynamic models for explaining the transition processes to a solidary society. The available data base and the modelling resources will often not be sufficient. Yet, where dynamic models of the economy already exist, they could be extended step-

by-step. In other cases, it seems advisable to start with simple models for obtaining the necessary know-how for more complicated analysis.

For improving the data base, it is advisable to establish satellite systems to the national accounts which analyse specific important social fields of the country (see chapter 29 of the System of National Accounts 2008, United Nations 2009, pp. 523 – 544). Examples are satellite systems for education, health care, environmental protection, household production or income redistribution. Linking such data systems to the traditional national accounts would allow for an integrated analysis of the specific social field and the economy as a whole.

Based on the data sets of satellite systems, input-output tables could be compiled which are not only measuring human activities in monetary terms but also in time and physical units. Such a “magic triangle” of input-output tables allows overcoming the narrow economic approach by integrating social, economic and environmental aspects (see Stahmer et al 2003a and Stahmer 2011a). In a next step, socio-economic input-output tables can be calculated which show the interrelationships between groups of population (see Stahmer 2004, Eurostat 2008, Chapter 13, and Stahmer et al. 2004). Such tables allow shifting the focus from the analysis of the economy to an analysis of activities of social groups. All these different types of input-output tables provide the necessary data for relatively simple static-comparative analysis. Nevertheless, such research work can already give interesting hints for developing basic features of a solidary society.

Noble prize winner Richard Stone was not only the “father” of national accounting after the Second World War but also gave inspiring advice for developing socio-economic models (see e.g. Stone 1971 and the System of Social and Demographic Statistics (SSDS) drafted by Richard Stone, United Nations 1975). The dominance of narrowly defined economic policy since the mid-1970s stopped the application and further development of his ideas. Hence, the SSDS remained an “unknown masterpiece” (see Stahmer 2002) hidden in the drawers of the UN.

The work of the German Federal Statistical Office on socio-economic accounting started in 1997 (see Stahmer 2003). The cooperation with Arno Peters (University of Bremen) gave the necessary priming to calculate input-

output tables at labour values (see Stahmer 1998) and to develop the concepts of the “magic triangle” of input-output tables. Linkages to the dynamic model of the GWS Osnabruck were established in the scope of the already mentioned research project on socio-economic modelling in 2004. During the last years, the GWS has made – in cooperation with the Federal Statistical Office and other research institutes - further substantial progress in the field of integrated socio-economic modelling (see Drosdowski, Wolter 2008 and Drosdowski et al. 2011).

Nevertheless, the presently available dynamic models have to be extended to analyse not only occupation-related economic activities but all human activities including private ones. Furthermore, the number of exogenous variables has to be reduced substantially. The development of such a comprehensive dynamic model is a very ambitious task which can only be implemented by an interdisciplinary team of researchers, e.g. statisticians, econometricians and social scientists. Thus, the presented considerations of a statistician can only give some advice from his point of view which has to be complemented by proposals of researchers with other scientific background. The planned center for transition sciences will be an excellent institutional background to achieve rapid progress in this field.

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