IARIW, 28th General Conference, Cork Ireland, 22-28 August 2004

Topic: Time Use and Inequality (Parallel Session 7a)

Carsten Stahmer, Federal Office of Statistics, Wiesbaden, Germany

Axel Schaffer, Institute for Economic Policy Research, University Karlsruhe, Germany

Time Pattern in a Social Accounting Framework

Abstract

Among various concepts to measure the economic performance, SNA plays a leading role. Particularly the comparability of the GDP confirms its relevance. Problems occur, if the analysis focuses on social welfare, which in turn requires the application of alternative concepts. While conventional approaches are often based on consumer- and producer-surplus, other concepts abstract from the economic corset and centre the individuals' activities.

The paper at hand introduces a methodology, which sets a priority on the individuals' yearly routines and that allows an integrated analysis of time, monetary and physical dimension. In doing so, two main goals are pursued.

First the yearly time use of different cohorts is described. Therefore daily (yearly) routines are subdivided into various activities. Besides personal activities, time used for household production, qualification, social engagement and employment is considered. Since the categories cover all activities of daily life, individual yearly time use must equal 8760h (=24h/d*365d). Simultaneously the presented concept considers time receipts absorbed by the cohorts. Sometimes, e.g. for personal activities, used and received time is equivalent. However, considering e.g. child or elderly care, care provider and beneficiary are often assigned to different cohorts. Similarly only employed persons spend time to produce goods, while all individuals act as consumers. Consequently the time used need not equal the cohorts' received time. This yields negative account balances, if more time is received than used and vice versa. Due to care requirements, young and old age groups show negative account balances. Furthermore both groups do not participate in working life, what additionally increases the negative balances. Since total time use of the population must equal total time receipts, cohorts in the middle age equalise these negative balances.

The consistency of time use and time receipts is not only given for the total population, but is true for each activity. Thus the presented concept shows the characteristics of a social accounting matrix (SAM) in time units. However, driven by the time use a monetary matrix can be generated as well. Therefore activities appropriate for monetary evaluation are transferred into monetary terms. Based on time and monetary flows, finally a physical matrix is elaborated.

Currently societies face, among others, three main challenges: a continuous pressure at the labour market, often accompanied by high unemployment, the ageing of the population, which will require additional efforts for elderly care by laymen and still increasing environmental problems. Hence, the second main aim of this paper is to analyse whether these problems could partly be solved by a radical decrease of the average working time from 1600h to 1000h per year that comes along with an (obligatory) increase of social engagement. Despite the problems such a 'part-time-society' would have to solve, namely small (or even negative) economic growth rates, diverse benefits caused by the radical change could occur.

The application of the presented concept will give first insights into the effects on activity patterns, labour markets, production levels and CO_2-emissions.

Social Accounting Framework – The concept of socio-economic input-output tables

Time balances 1998

In contrast to traditional accounting schemes, socio-economic input-output tables centre human rather than economic activities. While conventional input-output tables provide a detailed picture of the sectoral structure, socio-economic tables widely abandon economic sectors and establish socio-demographic groups as intermediate driving force. The paper at hand uses a very simple disaggregation of the population. Persons are only subdivided into three age groups: young people (0 to 17 years old), adults except seniors (18 to 64 years old) and aged persons (65 years and older). Obviously more disaggregated cohorts could be defined. Particularly further differentiation of age groups and classification by types of household, educational level and gender could be taken into account.

While annual monetary output levels generally increase over time, still accompanied by growing material throughput, the charm of time balances can be seen in the permanence of a 24-hour-day. Subsequently young and old persons possess a time budget of (365 day * 24 h/day =) 8760 hours per (non-leap) year. With regard to a population around 82 Million in Germany, the total time budget of all age groups equals 554 billion hours in 1998. Table 1 shows the available time budget for each considered cohort in row 15, columns 1 to 3.

The concept of socio-economic input-output tables (SIOT) allows the analysis of time pattern from two points of view.

First, the SIOT distinguishes the time use of the cohorts' time budget by three main types of activities:

- Personal activities, which are undertaken for own purposes only and that enclose regeneration, eating and leisure activities.
- Unpaid activities carried out for own purposes and / or for members of the same or of other households. Activities include qualification, household and do-it-yourself production as well as social engagement. With the exception of qualification, the activities could be accomplished by third persons.

- Paid employment activities that aim at producing marketed goods and services, including investments and exports, or non-marketed products.

While data for the first two categories can be derived by the time budget surveys 1991/92 and 2001/02, accomplished by the Federal Office of Statistics, the surveys record the totals of the employment figures only. In order to provide employment data in an appropriate disaggregated way, a separate (rather traditional) input-output model has been applied (Eurostat, 2002). Thus directly and indirectly necessary labour hours could have been estimated by categories of final uses and age groups.

Second, the social input-output tables allow for an analysis of the received time, again differentiated by activities and age groups. In line with the concept of social accounting matrices, activities equal the distinction of the cohorts' time use. However, while time use figures (row 1 to 3) attribute time to the producing party of activities, the figures of column 1 to 3 give an insight into the consumption pattern by activity and age group.

Personal activities and qualification are per definition performed for own purposes only. Thus producers are beneficiaries at the same time and consequently used time equals received time. With regard to unpaid activities besides qualification, producers may also be beneficiaries, but it is likely that other members of the same or of other households benefit as well (e.g. cooking and cleaning). This holds for the majority of household production in non-single households and is particularly true for social activities. No matter, whether additional beneficiaries belong to the same or to other households, producer and beneficiary will often belong to different socio-demographic groups (e.g. child and elderly care).[1]

Considering time accounts, the received hours of socio-demographic groups could be interpreted as an important factor of the cohorts' welfare function. In 1998 young people received from all socio-demographic groups (including personal activities) approx. 162 billion hours, adults (except seniors) benefited from 423 billion hours and aged people from 126 billion hours. While all persons dispose of a time budget of 8760 h per year, which is per definition fully used, young persons received on average 10440 h per year, adults (except seniors) 7920 h per year and aged persons 9450 h per year.

Table 1 balances used and received time for the socio-demographic groups, the foreign trade and the production of capital goods in row 14. Considering the cohorts, positive account balances occur, if the groups' time use or time deliveries are bigger than time receipts. Due to the paid employment work and the unpaid household production, where other groups clearly benefit from, adults younger than 65 years show positive account balances. Vice versa the younger and the older group, which hardly participate in working life but consume goods and services anyway, show negative account balances. While elderly care is often carried out by other elderly people (which does affect the individual but not the cohorts' accumulated balance) generally adults (also seniors) care for children, which in turn increases the negative balance for the younger group.

[1] Stahmer et al. (2003) and Stahmer et al. (2004) give a detailed description of the allocation of received time.

Table 1: Socio-economic input-output table in million hours, Germany, 1998

Nr	Time Use / Received time	Personal activities			Unpaid work					
		Young persons <18 years	Adults between 18 and 65 years	Aged persons >65 years	Qualification		Household production		Children care	
					Schooling	Perm. education	Within private hh.	Among private hh.	Within private hh.	Among private hh.
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	Young persons < 18 years	116 614			14 602	82	3 233	0	204	0
2	Adults aged 18 to 65 years		319 791		4 378	827	67 075	0	7 545	793
3	Aged persons > 65 years			88 730	0	180	22 399	0	0	460
	Qualification									
4	Schooling	14 602	4 378	0						
5	Permanent education	82	827	180						
	Household production									
6	Within priv. households	11 672	58 636	22 399						
7	Among priv. households									
	Children care									
8	Within priv. households	7 749								
9	Among priv. households	1 253								
	Elderly care									
10	Within priv. households			512						
11	Among priv. households			1 727						
	Voluntary work									
12	Among priv. households	754	2 591	635						
13	Private consumption	3 152	18 017	3 932						
14	Services of NPISH	213	731	179						
	Education services									
15	Schooling	2 435	1 139	0						
16	Permanent education	37	298	81						
17	Health services	525	2 847	1 886						
18	Other public services	1 496	5 129	1 256						
19	Net fixed capital formation									
20	Imports of products	1 651	8 721	2 003						
21	Balances	- 26 113	44 801	- 9 027						
22	Total supply	136 122	467 906	114 493	18 980	1 089	92 707		7 749	1 253

NPISH: Non-profit institutions serving households

Source: Stahmer et al., 2004, Table 2

Table 1 (continued): Socio-economic input-output table in million hours, Germany, 1998

Unpaid work			Employment								Total uses
Elderly care		Voluntary work	Private consump-tion	Services of NPISH	Education services		Health services	Other public services	Net fixed capital for-mation	Export of pro-ducts	
Within private hh.	Among private hh.	Among private hh.			School-ing	Perm. edu-cation					
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
0	59	94	980	0	0	0	0	133	0	121	136 122
0	1 668	3 036	23 038	1 123	3 574	416	5 091	7 636	5 874	16 041	467 906
512	0	850	1 083	0	0	0	167	112	0	0	114 493
											18 980
											1 089
											92 707
											7 749
											1 253
											512
											1 727
											3 980
											25 101
											1 123
											3 574
											416
											5 258
											7 881
											0
									2 132	5 530	20 037
									- 8 006	- 1 655	0
512	1 727	3 980	25 101	1 123	3 574	416	5 258	7 881	0	20 037	

NPISH: Non-profit institutions serving households

Source: Stahmer et al., 2004, Table 2

Results for these highly aggregated socio-demographic groups are hardly surprising. However, planned further disaggregation of age groups and by gender will probably add important information.

From the social point of view, time spent from society for children and teenagers can be seen as an investment into future generations. Economically investments into the future are characterised by the extension of production facilities. Net-investments approximately came up to 8 billion working-hours in 1998. Thus the negative account balance (of -8 billion hours) shows the balance of current employees (that invest time in order to increase production potential) with future workforces (that may realise the potential).

The balance of -1.7 billion hours in row 14, column 13 refers to the surplus of German exports versus imports in 1998. Based on the assumption of similar labour productivity, the negative balance shows that the German workforce spent more time producing goods and services for foreign countries than the other way round.

While the strength of the traditional input-output technique can be seen in the description and the analysis of inter-industrial linkages, the presented concept focuses on the linkages between different socio-demographic groups. In doing so, the approach confronts time deliveries with time receipts. Table 2 presents time use and received time, differentiated by activity, for each age group as a whole in million hours and for the (average) individual member of each socio-demographic group (in hours per year). Finally, the third part of table 2 shows the individual activity pattern in percent.

The time pattern of the younger generation is characterised by relatively high time input for qualification activities, and rather low time inputs for household production and paid work. Subsequently young persons dispose of the highest time budget for personal activities. In addition to this desirable structure of time use, which is generally not recognised by the members of this group, young persons benefit significantly from time inputs of other socio-demographic groups. Besides childcare and general household production (e.g. cooking), the young generation specifically absorbs educational services of public schools and consumption goods.

Alongside the young generation, the senior age group can be identified as ‘net-time-receiver’. Due to the significant demand of private consumption goods and of public services (e.g. health services) on the one hand, and the marginal participation at working life on the other hand, aged persons receive more time than they deliver. Elderly care partly strengthens this trend. However, in many cases child and particularly elderly care is carried out by already senior people, which in turn lessens the inter-generation transfers. While time intensive qualification activities of the younger generation do not apply for the older generation, time inputs for household production even exceed time inputs of adults younger than 65 for this activity. Eventually the time budget for personal activities equals pretty much the average of the younger generation’s higher budget and the working generation’s lower budget.

Table 2: Time use and received time of socio-demographic groups

Activities	Time use			Received time		
	Young persons <18 years	Adults between 18 and 65 years	Aged persons >65 years	Young persons <18 years	Adults between 18 and 65 years	Aged persons >65 years
	Million hours					
Personal activities	116614	319791	88730	116614	319791	88730
Unpaid work	18274	85322	24401	36112	66432	25453
Qualification	14684	5205	180	14684	5205	180
Household production	3233	67075	22399	11672	58636	22399
Social engagement	357	13042	1822	9756	2591	2874
Employment	1234	62793	1362	9509	36882	9337
Private consumption	980	23038	1083	3152	18017	3932
Services of NPISH		1123		213	731	179
Education services		3990		2472	1437	81
Health services		5091	167	525	2847	1886
Other public services	133	7636	112	1496	5129	1256
Net fixed capital formation		5874				
Rest of the world (Ex- Import)	121	16041		1651	8721	2003
Total	**136122**	**467906**	**114493**	**162235**	**423105**	**123520**
	Hours per year and capita					
Personal activities	7505	5989	6789	7505	5987	6789
Unpaid work	1176	1597	1867	2324	1244	1948
Qualification	945	97	14	945	97	14
Household production	208	1256	1714	751	1098	1714
Social engagement	23	244	139	628	49	220
Employment	80	1175	105	612	690	714
Private consumption	63	431	83	203	337	301
Services of NPISH		21		14	14	14
Education services		75		159	27	6
Health services		95	13	34	53	144
Other public services	9	143	9	96	96	96
Net fixed capital formation		110				
Rest of the world (Ex- Import)	8	300		106	163	153
Total	**8761**	**8761**	**8761**	**10441**	**7921**	**9451**
	Percent					
Personal activities	85.6	68.4	77.5	72.0	75.5	72.0
Unpaid work	13.5	18.2	21.4	22.3	15.7	20.5
Qualification	10.8	1.1	0.2	9.1	1.2	0.1
Household production	2.4	14.3	19.6	7.2	13.9	18.1
Social engagement	0.3	2.8	1.6	6.0	0.6	2.3
Employment	0.9	13.4	1.1	5.7	8.8	7.5
Private consumption	0.7	4.9	0.9	1.9	4.3	3.2
Services of NPISH		0.2		0.1	0.2	0.1
Education services		0.9		1.5	0.3	0.1
Health services		1.1	0.1	0.3	0.7	1.5
Other public services	0.1	1.6	0.1	0.9	1.2	1
Net fixed capital formation		1.3				
Rest of the world (Ex- Import)	0.1	3.4		1.0	2.1	1.6
Total	**100**	**100**	**100**	**100**	**100**	**100**
Persons (in 1000)	15539	53414	13070	15539	53414	13070

Source: Stahmer et al., 2004, table 3

Finally the group of adults except seniors stands vis-à-vis the two groups of ‘net-time-receivers’. Again personal activities dominate the activity pattern. However, as a result of the time invested for unpaid household production, social services and paid work, the time budget for personal activities is significantly smaller than for the other age groups. In addition to the time transfers to other generations, the average member of this group spends roundabout 400 hours per year for the production of exports (time transfers to foreign economies) and investments (time transfers to future working generations).

Monetary balances in 1998

A strong point of the presented concept can be seen in the integrated analysis of time, monetary and physical dimension. Based on the input-output scheme in time units and starting from the time use data, a socio-economic table in monetary units can be generated.

With regard to personal and qualification activities, the concept does not attribute monetary values to the activities, but only to the consumption of goods and services that come along with the activities. Values of household production can be derived by applying appropriate wage rates. For the study at hand, the wage rate of a domestic servant (the so-called ‘generalist’) has been chosen but the concept allows for other types of valuation as well (e.g. wages of specialists).

In order to attribute values to the various employment activities, the concept foresees, in line with the procedure for time units, the application of a separate input-output model including the sectoral net value added (Eurostat, 2002).

While the first three rows of table 3 show the underlying monetary values of the cohorts’ activities, rows 4 to 13 provide an overview on received values. According to the generalist-approach monetary values (per hour) are assumed to be equal for cooking, child and elderly care as well as for any household production. Thus received values follow the structure of received time units. Received values of employment activities must be estimated according to the cohorts’ consumption pattern.

Table 3: Socio-economic input-output table in million DM, Germany, 1998

Nr	Time Use / Received time	Personal activities			Unpaid work					
					Qualification		Household production		Children care	
		Young persons <18 years	Adults between 18 and 65 years	Aged persons >65 years	Sch-ooling	Perm. edu-cation	Within private hh.	Am. priv. hh.	Within private hh.	Among private hh.
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	Young persons < 18 years						41 848		2 723	
2	Adults aged 18 to 65 years						868 226		100 749	10 588
3	Aged persons > 65 years						289 935			6 140
	Qualification									
4	Schooling									
5	Permanent education									
	Household production									
6	Within priv. households	151 919	758 155	289 935						
7	Among priv. households									
	Children care									
8	Within priv. households	103 472								
9	Among priv. households	16 728								
	Elderly care									
10	Within priv. households			6 834						
11	Among priv. households			23 050						
	Voluntary work									
12	Among priv. households	10 906	37 455	9 169						
13	Private consumption	170 187	1 100 383	226 402						
14	Services of NPISH	6 914	23 716	5 816						
	Education services									
15	Schooling	105 156	46 656							
16	Permanent education	1 219	11 300	2 410						
17	Health services	21 211	114 709	76 097						
18	Other public services	55 895	191 769	47 025						
19	Net fixed capital form.									
20	Imports of products	78 731	426 029	97 456						
21	Balances	- 607 850	1 403 879	- 392 491						
22	Total supply	114 488	4 114 051	391 703			1 200 009		103 472	16 728

NPISH: Non-profit institutions serving households

Source: Stahmer et al., 2004, Table 5

Table 3 (continued): Socio-economic input-output table in million DM, Germany, 1998

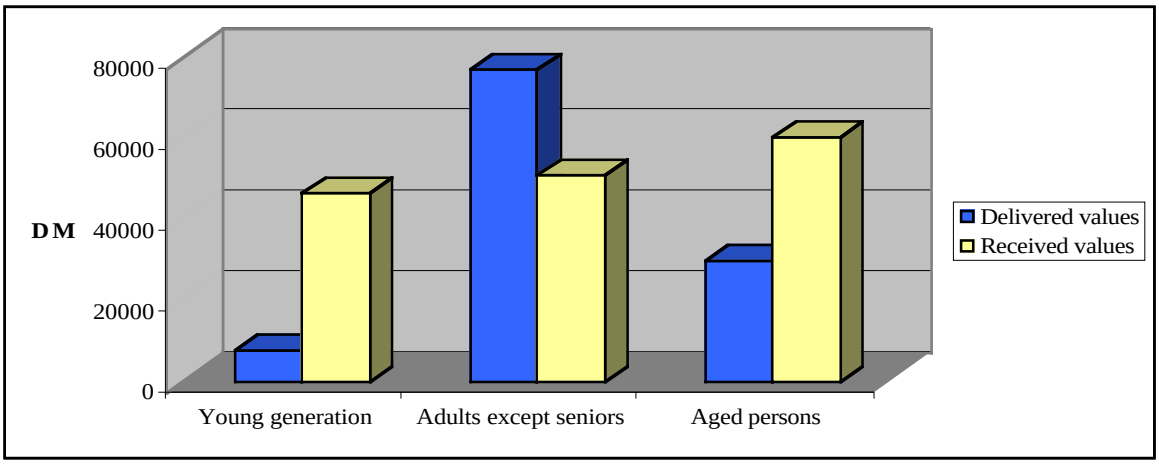
Unpaid work			Employment								
Elderly care		Volunt. work	Private consump-tion	Services of NPISH	Education services		Health services	Other public services	Net fixed capital for-mation	Export of products	Total uses
Within private hh.	Among private hh.	Among private hh.			School-ing	Perm. edu-cation					
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
	787	1359	56922					5130		5719	114488
	22263	43885	1375129	36446	151812	14929	204843	285146	257669	742366	4114051
6834		12286	64921				7174	4413			391703
											1200009
											103472
											16728
											6834
											23050
											57530
											1496972
											36446
											151812
											14929
											212017
											294689
									102120	264374	968710
									-359789	-43749	0
6834	23050	57530	1496972	36446	151812	14929	212017	294689	0	968710	

NPISH: Non-profit institutions serving households

Source: Stahmer et al., 2004, Table 5

Figure 1 shows delivered and received per-capita-values in dependence on socio-demographic groups. Since the model does not monetarise qualification activities, the members of the younger generation show a clear mismatch of delivered and received values. Due to the large time input for household production, which has been evaluated, monetary deliveries of an average member of the older generation are significantly higher. But since valued receipts per person are relatively high for seniors, the imbalance is significant for this group as well. Deliveries exceed receipts for the adults except aged persons only. While the difference per person could not compensate for the imbalances of a young and an aged person, the large size of the middle-aged group (53.4 million persons) outbalances the significant mismatches of the smaller younger (15.5 million persons) and older (13.1 million persons) group.

Figure 1: Receipts and deliveries in monetary units (DM / capita and year) by age groups



Source: Stahmer et al., 2004, table 4

Physical balances in 1998

Main goal of the presented concept is to offer an instrument that allows for an integrated analysis of different paths of sustainable development. Though the SIOT focuses on (changing) time pattern and thus on the social dimension of sustainability, the monetary valuation enables users to analyse economic effects as well. The implementation of physical balances finally highlights ecological issues. Based on the physical input-output table complete material balances have been generated for personal, qualification and employment activities. The coupling of material balances with traditional monetary analysis allows for the consideration of direct and indirect effects for the employment activities. Emissions that come along with the production of goods and services, have been attributed to the employment activities. However, emissions caused by the usage of these products have been allocated to the respective activity. While a former study includes several natural resources and residuals (Eurostat, 2002), the paper at hand focuses on carbon dioxide as a single indicator for ecological effects of human activities.

In contrast to the monetary evaluation, emissions can be attributed to all kinds of activities. Particularly not monetarised personal activities account for significant shares of carbon dioxide for all age groups.

Table 4: Socio-economic input-output table in 1000 t CO_2, Germany, 1998

Nr	Time Use / Received time	Personal activities			Unpaid work					
		Young persons <18 years	Adults between 18 and 65 years	Aged persons >65 years	Qualification		Household production		Children care	
					Schooling	Perm. education	Within private hh.	Among private hh.	Within private hh.	Among private hh.
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	Young persons < 18 years	9 419			2 759	16	2 354		109	
2	Adults aged 18 to 65 years		83 440		1 198	130	53 501		4 452	450
3	Aged persons > 65 years			18 325		59	10 432			254
	Qualification									
4	Schooling	2 759	1 198							
5	Permanent education	16	130	59						
	Household production									
6	Within priv. households	9 507	46 348	10 432						
7	Among priv. households									
	Children care									
8	Within priv. households	4 561								
9	Among priv. households	704								
	Elderly care									
10	Within priv. households			689						
11	Among priv. households			2 149						
	Voluntary work									
12	Among priv. households	416	1 466	352						
13	Private consumption	41 489	256 378	53 010						
14	Services of NPISH	752	2 587	636						
	Education services									
15	Schooling	9 516	4 238							
16	Permanent education	112	1 008	223						
17	Health services	2 292	12 399	8 224						
18	Other public services	7 161	24 582	6 026						
19	Net fixed capital formation									
20	Imports of products	28 193	150 278	34 281						
21	Balances	- 86 530	220 423	- 87 682						
22	Total supply	30 367	804 476	46 724	3 957	205	66 287		4 561	704

NPISH: Non-profit institutions serving households

Source: Stahmer et al., 2004, Table 8

Table 4 (continued): Socio-economic input-output table in 1000 t CO_2, Germany, 1998

Unpaid work			Employment								Total uses
Elderly care		Volunt. work	Private consump-tion	Services of NPISH	Education services		Health services	Other public services	Net fixed capital for-mation	Export of pro-ducts	
Within private hh.	Among private hh.	Among private hh.			School-ing	Perm. edu-cation					
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
	34	45	13 344					656		1 631	30 367
	2 115	1 779	322 317	3 975	13 754	1 343	22 140	36 548	45 228	212 106	804 476
689		410	15 216				775	564			46 724
											3 957
											205
											66 287
											4 561
											704
											689
											2 149
											2 234
											350 877
											3 975
											13 754
											1 343
											22 915
											37 769
											0
									33 627	104 754	351 133
									- 78 855	32 642	0
689	2 149	2 234	350 877	3 975	13 754	1 343	22 915	37 768	0	351 133	

NPISH: Non-profit institutions serving households

Source: Stahmer et al., 2004, Table 8

As mentioned already, the SIOT enables the user to analyse the socio-demographic interweavement in further detail. Table 5 summarises the cohorts' deliveries and receipts for the above-analysed time, monetary and physical units.

Table 5: Deliveries among age groups, Germany, 1998

to from	Young persons	Adults (except seniors)	Seniors	Invest-ments	Rest of the world	Total
Million hours						
Young persons	134245	1514	242	0	121	136122
Adults (except seniors)	25584	411454	8953	5874	16041	467906
Seniors	755	1416	112322	0	0	114493
Investments	0	0	0	0	0	0
Rest of the world	1651	8721	2003	2132	5530	20037
Balance	-26113	44801	-9027	-8006	-1655	0
Total	136122	467906	114493	0	20037	738558
Million DM						
Young persons	43852	54586	10331	0	5719	114488
Adults (except seniors)	582930	2168203	362883	257669	742366	4114051
Seniors	16825	61354	313524	0	0	391703
Investments	0	0	0	0	0	0
Rest of the world	78731	426029	97456	102120	264374	968710
Balance	-607850	1403879	-392491	-359789	-43749	0
Total	114488	4114051	391703	0	968710	5588952
1000 t Carbon dioxide						
Young persons	15894	10683	2159	0	1631	30367
Adults (except seniors)	70515	410954	65673	45228	212106	804476
Seniors	2295	12136	32293	0	0	46724
Investments	0	0	0	0	0	0
Rest of the world	28193	150278	34281	33627	104754	351133
Balance	-86530	220425	-87682	-78855	32642	0
Total	30367	804476	46724	0	351133	1232700

Source: Stahmer et al., 2004, table 10

Part time society

At the beginning of the 21st century, many highly developed economies face the challenge to ensure today's quality of life for an ageing society, by simultaneously following the path of sustainability.

Doubtless future work patterns play a key role in this context. Indeed work patterns include paid employment, but they also refer to unpaid household production and to voluntary activities. While further implementation of artificial intelligence may continue to decrease the demand for human labour in industry and business related service sectors, the demographic development will require additional elderly care in the future.

It could be argued that growing demand for elderly care would result in an appropriate adaptation of the labour market. However, based on recent experiences, where market adaptation has by far not been sufficient from the elderly people's point of view, it could also be concluded that neither market adaptations nor state interventions would be sufficient in the future without being supported by significant increases of voluntary work.

Having in mind the key role of changing work pattern, the paper at hand introduces the concept of the so-called 'part time society'. In doing so the above-described social accounting framework provides the tool to analyse how a significant reduction of paid employment could affect economic, social and ecological spheres.

Central assumption of the concept is the reduction from currently circa 1600 working hours (net working time) to 1000 hours per employee and year. The reduction of working time is accompanied by a higher flexibility of work pattern, such that periods with high workload could be followed by longer periods of recreation. Reduced working time and higher flexibility would in principle enable the companies to react on business cycles and may eventually result in additional employment of currently not employed members of the workforce (registered unemployed and other persons capable to work) at 1000-hour-basis. Their additional participation at (paid) working life could be seen as a chance to release the pressure on the labour market significantly. But it could also as be seen as commitment vis-à-vis the part time society, since the production and provision of goods and services would drop too strong otherwise.

Without the additional working time of not employed persons, aged between 18 and 65 years and capable to work (roundabout 14 million persons in 1998), total working hours would have been fallen by 18.7 billion hours or 37 percent in 1998. The active participation of not yet employed persons limits the drop to 4.7 billion hours or 9 percent. Clearly increasing productivity could not outbalance this still significant decline in the short run, but the cut of production, may turn out to be acceptable. A minimisation of excess supply that may come along with a more efficient allocation of resources in some production fields, could further soften production losses.

In addition, the benefit of newly gained 'free time' (just the 4.7 billion hours) could (partly) outbalance possible income losses that accompany decreasing production levels. Furthermore the reduction of production results in a decrease of emissions as well. This is particularly true,

if people work in blocks and thus reduce the number of trips to the workplace. Though trips related to other activities will partly replace these trips, it can be assumed that in the end transport volumes can be reduced (Schaffer, 2004).

In order to minimise losses of gross value added, it would be helpful to strengthen the most productive sectors, which in turn would require a higher qualification level of the employees. However, currently not employed members of the work force show significant lower levels of qualification compared to already employed persons. Thus the aim to realise higher productivity levels by consciously initiating structural change seems to be too ambitious. Consequently the aim of the modelled part time society is to improve the general qualification level, which at first should allow for the prevailing of the status quo and this would secondly prepare the part time society for further productivity increases in the future.

The refinement of the qualification level is achieved by a two-pillar qualification-offence. First the personal qualification activities rise by 2.1 billion hours. According to the concept of life-long learning the major part, 1.8 billion hours, is allocated to permanent education of workforce members, which equals an increase of qualification activities of 34 hours or 26 percent per person and year. Seniors get 0.2 billion hours (plus 15 hours or 56 percent per person and year) and the young generation increases its already high engagement by 0.1 billion hours or 6 hours per person and year (1 percent).

Second pillar of the concept is the strengthening of the relevant employment sector. While all other sectors will be affected by the general decrease of working time, educational services increase by 0.7 billion hours.

While the general reduction of working time and the additional time for qualification activities have been defined to -4.7 billion hours and +2.1 billion hours respectively, various options arise to attribute the remaining time potentials of 2.6 billion hours. In order to analyse possible time pattern changes in further depth, four scenarios, which range from a very egoistic to a rather altruistic alternative, have been developed.

Scenario **Ego-Plus**, the first, rather egoistic scenario presumes that employees will invest their free time for own purposes only. Besides the predetermined increasing qualification, additional leisure activities compensate for lost income.

Theoretically the egoistic variant seems to be the most probable scenario within the capitalistic market frame. However, in practice altruistic voluntary work has become an important fundament in many Western market oriented societies. In ‘The End of Work’ Rifkin (1995) points to the fact that more than 50 percent of America’s adults accomplished voluntary work in the late nineties and in doing so invested more than 20 billion hours of their personal time budget year by year. In Germany clubs and societies heavily rely on voluntary services and all over the world not only Christian churches strongly depend on unpaid work.

Consequently a less egoistic behaviour can be assumed as well. Scenario **Ego** is based on the assumption that personal activities remain unchanged and social engagement increases just by the net free time of 2.6 billion hours. According to table 1, social activities are further subdivided into child and elderly care as well as other social services. 50 percent of the

additional time for social activities is allocated to other social services. Child and elderly care each receive 25 percent.

Within the first scenarios time for additional qualification activities derive from the reduction of working time. But under certain conditions individuals may be willing to invest in their qualification at the cost of their budget for personal activities, which in turn allows for further extension of social activities (Scenario **Human**).

While the willingness to invest into higher qualification, at the cost of personal activities, may come along with the manifestation of life-long learning, the relatively strong increase of social engagement must be initiated by exogenous incentives. The introduction of a complementary time currency could establish an appropriate tool (Sikora, Hoffman, 2001). Unpaid hours worked in the social field could be credited to the account vice versa received time is debited (for more detailed information see Stahmer et al., 2004). Particularly time spent and received for elderly care could be arranged this way. At first glance the concept reminds of a social contract, which (not only) due to the demographic development recently failed for the German pension fund. However, the concept differs in one significant point. Considering care services that can be done by laymen are to a large extent performed by people of the same or of neighbouring age groups – old people care for older people and young people for younger. Thus the time span between spending and receiving time is generally smaller than for the traditional generation contracts.

Since the free time results from the reduction of working time, young and old generations change their activity pattern only marginally. However, in order to distribute social services to all shoulders, a fourth scenario - **Human-Plus50** – with increased social activities of young and old generations has been developed. Aim of this scenario is to increase the social activities by 50 percent from the original level. According to scenario Human additional social services of adults (except seniors) result in an increase of 36 percent already, i.e. young and old generations must bear the remaining 14 percent within scenario Human-Plus50. Thereby the cohorts extent social services at the cost of their time budget for personal activities. Consequently the time spent by the young generation for social activities raises from slightly more than 20 hours to almost 100 hours per person and year. Seniors increase their annual engagement from 140 hours to 230 hours per person and adults show an extension of almost 100 hours what results in slightly more than 340 hours spent for social activities per person.

The annex provides the detailed time pattern changes and the subsequent changes in monetary and physical units (A1, A2, A3) according to the structure of tables 1,3 and 4, when scenario Human is implemented. Table 6 gives an overview on the most important changes in time, monetary and physical units, referring to changes of time use.

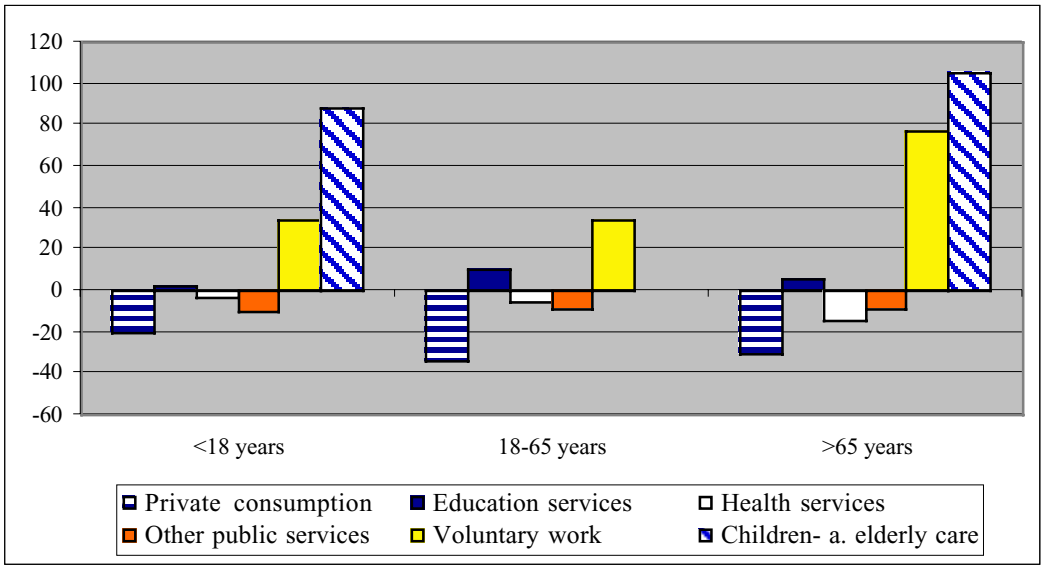
Table 6: Activity changes according to scenarios in time, monetary and ecological units, 1998

Activities according to scenarios in time, monetary and ecological units		Initial situation	Scenario Ego-Plus	Changes vis-à-vis initial situation	Scenario Ego	Changes vis-à-vis initial situation	Scenario Human	Changes vis-à-vis initial situation	Scenario Human-Plus50	Changes vis-à-vis initial situation
Personal activities	Mill. hours	525135	528563	3428	525135	0	523026	-2109	520902	-4233
	Mill. DM	0	0	0	0	0	0	0	0	0
	1000 t CO_2	111184	112077	893	111184	0	110664	-520	110358	-826
Qualification	Mill. hours	20069	22177	2108	22177	2108	22177	2108	22177	2108
	Mill. DM	0	0	0	0	0	0	0	0	0
	1000 t CO_2	4162	4644	482	4644	482	4644	482	4644	482
Houshold production	Mill. hours	92707	92707	0	92707	0	92707	0	92707	0
	Mill. DM	1200009	1200009	0	1200009	0	1200009	0	1200009	0
	1000 t CO_2	66287	66287	0	66287	0	66287	0	66287	0
Social activities	Mill. hours	15221	15171	-50	18598	3377	20708	5487	22832	7611
	Mill. DM	207614	206895	-719	254546	46932	283889	76275	313416	105802
	1000 t CO_2	10337	10309	-28	12838	2501	14384	4047	15947	5610
Employment	Mill. hours	65389	59903	-5486	59903	-5486	59903	-5486	59903	-5486
	Mill. DM	3212619	2933897	-278722	2933897	-278722	2933897	-278722	2933897	-278722
	1000 t CO_2	689596	624065	-65531	624065	-65531	624065	-65531	624065	-65531

Source: Stahmer et al., 2004, table 14

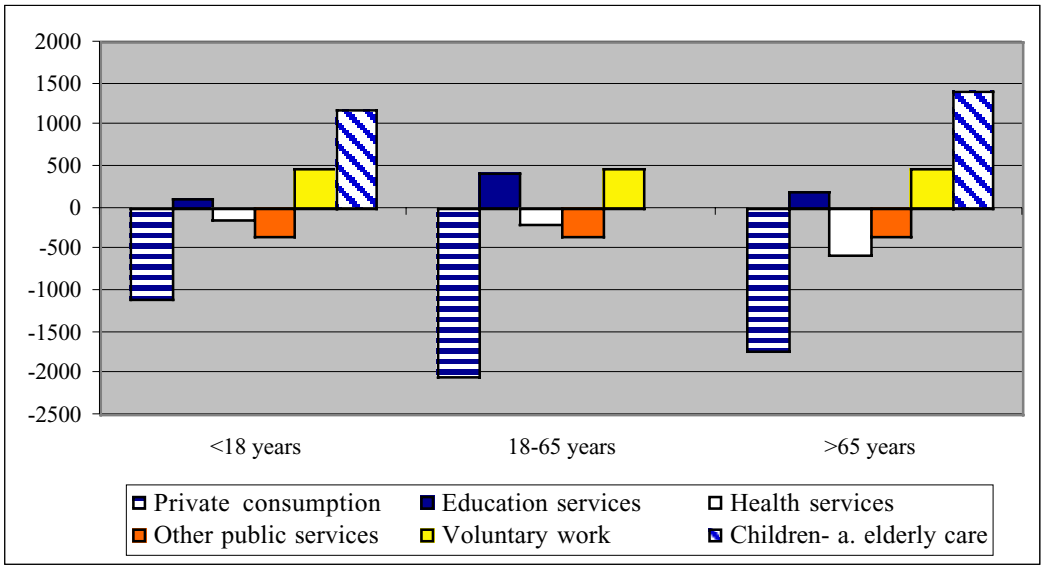
Clearly the strength of the concept is the possibility to analyse time use (=production of activities) and received time (=consumption of activities) simultaneously. Since household production (and the relevant consumption) remains constant, most interesting changes concerning the consumption side occur for the absorption of social services and the consumption of goods and services produced under market conditions. Exemplary for scenario Human figure 2 to 4 show the respective changes of the consumption pattern in time monetary and physical units.

Figure 2: Changes of consumption pattern in h/capita, (received time), Scenario Human, 1998



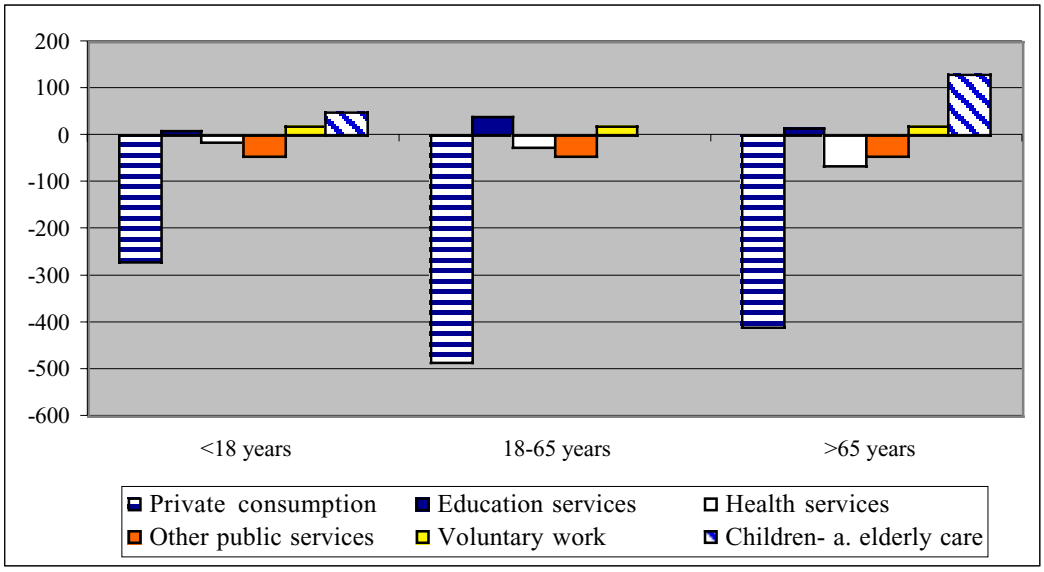
Source: Table 1 and table A1 in annex

Figure 3: Changes of consumption pattern in DM/capita, (received values), Sc. Human, 1998



Source: Table 3 and table A2 in annex

Figure 4: Changes of consumption pattern in kg CO_2 / capita, Scenario Human, 1998



Source: Table 4 and table A3 in annex

Outlook

Especially the idea to decrease working time in such a significant manner contradicts, at first glance, to the momentary political discussion of increasing working time. However, going into further detail, some parallels show up. The concept at hand indeed suggests a reduction of the average yearly working time, but it clearly favours a high flexibility of work schedules. A 42-hour-week, as now postulated by political decision-makers, is consistent with the concept at hand – with the exception of longer breaks (including income cuts) for the employees. The reduction of annual work time could very well come along with the extension of the working life, all the more since professional stresses and strains have not been as intensive over

working life in a part time society. Besides the chance to reduce the number of currently not employed members of the workforce, free time could be invested into the strengthening of unpaid social activities.

Obviously the concept can not be realised instantly. It is of utmost interest to go one step further and to analyse the situation for future years. Based on rather simple assumptions, the paper at hand concludes with a first answer of the arising question:

“Could the modified time use of the part-time-society fulfil the needs of the ageing society?”

If it is assumed that the members of the three age groups stick to the consumption pattern of the hypothetical part time society in 1998, the answer is: Yes and no.

According to the population projection (medium migration variant) of the Federal Office of Statistics, the number of young persons (younger than 18 years) decreases from 16 to 13 and adults except aged persons from 53 to 52 million persons. Contrary the number of old persons increases from 13 million in 1998 to 18 million persons in 2020.

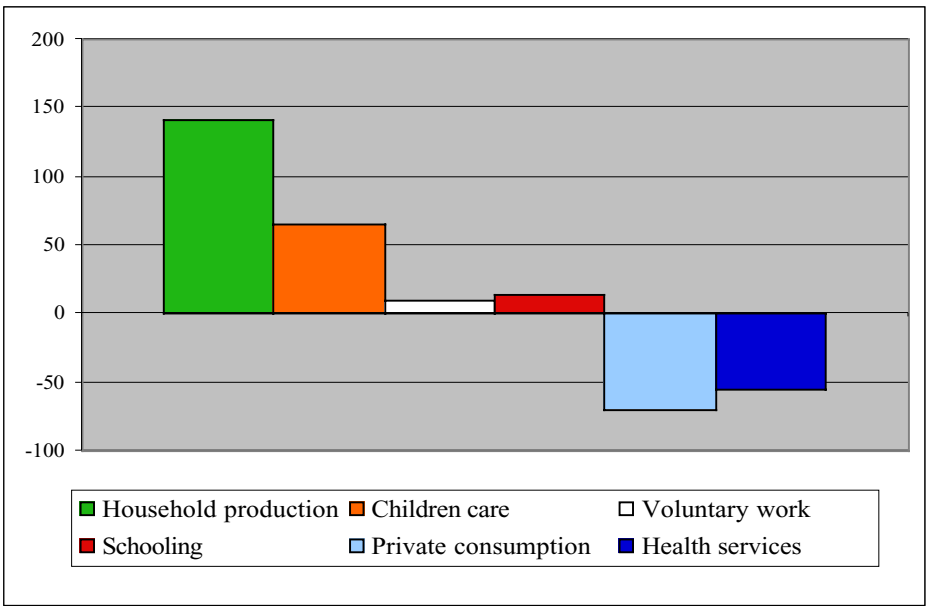
Clearly the changing demographic structure requires a flexibility of time use pattern. According to the momentary time use pattern

- 400 million hours of potential childcare among households are not needed anymore and could be shifted to elderly care.
- 1300 million hours of potential childcare within households are not needed anymore. Half of the time could be shifted to elderly care.
- Teachers that have less classes should be appointed to permanent educational services and if possible to other public services.
- Increased voluntary work may come up for decreases of (paid) services by non-market oriented private organisation.

Taking into account the shifts of time use, figure 5 shows activities where time is missing and where, besides shifts, available time still exceeds needed time.

Time that would, according to the time use pattern of 1998, be available for household production clearly exceeds needed time. On the other hand the demand for private consumption goods can not be satisfied. This can be explained with the growing number of elderly people who, on one hand, were used to do household work for other age groups and who, on the other hand, show higher private consumption than the younger generation. Since the production of unpaid social services will exceed the needs in 2020 as well, it could be argued that working time could slightly be increased again. Thus the increased demand for consumption goods could be satisfied. In addition incentives should be set in order to close the gap of health services.

Figure 5: Missing time and time potentials in 1000 man-years



Source: Own calculations, based on population projection of the Federal Office of Statistics (medium migration variant)

The study at hand introduced a social accounting framework that allows for the simultaneous consideration of time use and received time, differentiated by age (and generally also by gender) groups. The accounting framework is based on an integrated system of socio-economic input-output tables that includes tables in time, monetary and ecological units. Driving force of the tables are changes of time use pattern. Exemplary the introduction of the part time society has been described. The accompanying reduction of the working time results in a significant employment of currently not employed persons and allows for the strengthening of the (unpaid) social activities. From the ecological point of view the strong reduction of the working time that can not be outbalanced by additionally employed persons will most probably reduce the generation of emissions. However, declining production levels would also cut household income – for 1998 by approximately 9 percent.

Clearly the concept of the part time society should not be regarded as prophetic eye, but it may extent the scope for an ageing society on the path of sustainability.

References

Becker, G., S. (1965): A Theory of the Allocation of Time in Economic Journal, Vol. 75, pp. 493-517

Eurostat (2002): Input-Output-Manual, Chapter 13: Extended input-output tables as part of satellite systems, Luxembourg

Keuning, S., J. (2000): Accounting for Welfare with SESAME in: United Nations, Handbook of National Accounting, Household Accounting: Experience in Concepts and Compilation, Volume 2, Series F, No.75, New York, pp. 273-307

Pyatt, G. (1999): Some Relationships between T-Accounts, Input-Output Tables and Social Accounting Matrices, In Economic Systems Research, Vol. 11, No. 4, December, pp. 365-389

Rifkin, J. (1995): The End of Work, G.P.Putnam's Sons, New York

Schaffer, A (2004): Zeitprismen nach Hägerstrand und ihre Verknüpfung mit sozio-ökonomischen Input-Output Tabellen, in Stahmer, C., Hatard, S.: Weimarer Kolloquien 2003, Schriftenreihe Sozio-ökonomisches Berichtssystem für eine nachhaltige Gesellschaft, Band 5, Herausgeber: Statistischen Bundesamt, Metzler-Poeschel, Stuttgart

Sikora, J., Hoffman, G., 2001: Version einer Gemeinwohl-Ökonomie auf der Grundlage einer komplementären Zeit-Währung, Katholisch-Soziales Institut: Bad Honnef

Stahmer, C. (2003a): Halbtagsgesellschaft, Anregungen für ein sozial nachhaltiges Deutschland, in ‚ZUKÜNFTE', Heft 44, Juli 2003, S. 34-39

Stahmer, C. (2003b): Sozio-ökonomische Input-Output-Rechnung, in IWH, Neuere Anwendungsfelder der Input-Output-Analyse in Deutschland, Sonderheft 4/2003, S. 11-36, Halle

Stahmer, C., Ewerhart, G., Herrchen, I. (2003): Monetäre, Physische und Zeit-Input-Output-Tabellen, Teil1: Konzepte und Beispiel, Schriftenreihe Sozio-ökonomisches Berichtssystem für eine nachhaltige Gesellschaft, Band 1, Herausgeber: Statistischen Bundesamt, Metzler-Poeschel, Stuttgart

Stahmer, C., Schaffer A., Herrchen, I. (2004): Sozio-Ökonomische Berichterstattung, 1998, Schriftenreihe Sozio-ökonomisches Berichtssystem für eine nachhaltige Gesellschaft, Band 4, Herausgeber: Statistischen Bundesamt, Metzler-Poeschel, Stuttgart

Stone, R (1981): aspects of Economic and Social Modelling, Librairie Droz, Genève

Annex

Table A1: Time pattern changes in million hours after implementation of part time society, Scenario Human, 1998

Nr	Time Use / Received time	Personal activities			Unpaid work					
		Young persons <18 years	Adults between 18 and 65 years	Aged persons >65 years	Qualification		Household production		Children care	
					Schooling	Perm. education	Within private hh.	Among private hh.	Within private hh.	Among private hh.
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	Young persons < 18 years	- 111	0	0	29	82	0	0	30	0
2	Adults aged 18 to 65 years	0.00	- 1 817	0	990	827	0	0	1 091	218
3	Aged persons > 65 years	0	0	- 180	0	180	0	0	0	33
	Qualification									
4	Schooling	29	990	0						
5	Permanent education	82	827	180						
	Household production									
6	Within priv. households	0	0	0						
7	Among priv. households									
	Children care									
8	Within priv. households	1 121								
9	Among priv. households	251								
	Elderly care									
10	Within priv. households			0						
11	Among priv. households			1 372						
	Voluntary work									
12	Among priv. households	520	1 786	438						
13	Private consumption	- 317	- 1 813	- 396						
14	Services of NPISH	- 22	- 74	- 18						
	Education services									
15	Schooling	7	287	0						
16	Permanent education	35	286	78						
17	Health services	- 53	- 286	- 189						
18	Other public services	- 150	- 513	- 126						
19	Net fixed capital formation									
20	Imports of products	- 151	- 836	- 189						
21	Balances	- 1 241	1 163	- 970						
22	Total supply				1 019	1 089			1 121	251

NPISH: Non-profit institutions serving households

Source: Stahmer et al., 2004, Annex

Table A1 (continue): Time pattern changes in million hours after implementation of part time society, Scenario Human, 1998

Unpaid work			Employment								Total uses
Elderly care		Voluntary work	Private consumption	Services of NPISH	Education services		Health services	Other public services	Net fixed capital formation	Export of products	
Within private hh.	Among private hh.	Among private hh.			Schooling	Perm. education					
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
0	30	60	- 94	0	0	0	0	- 13	0	- 12	0
0	1 309	2 618	- 2 328	- 113	294	399	- 513	- 766	- 592	- 1 618	0
0	33	65	- 104	0	0	0	- 16	- 11	0	0	0
											1 019
											1 089
											0
											0
											1 121
											251
											0
											1 372
											0
											2 743
											- 2 526
											- 113
											294
											399
											- 529
											- 789
									- 215	- 558	- 1 948
									807	240	0
	1 372	2 743	- 2 526	- 113	294	399	- 529	- 789	0	- 1 948	

NPISH: Non-profit institutions serving households

Source: Stahmer et al., 2004, Annex

Table A2: Subsequent changes in million DM after implementation of part time society, Scenario Human, 1998

Nr	Time Use / Received time	Personal activities			Unpaid work					
		Young persons <18 years	Adults between 18 and 65 years	Aged persons >65 years	Qualification		Household production		Children care	
					Sch-ooling	Perm. edu-cation	Within private hh.	Am. priv. hh.	Within private hh.	Among private hh.
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	Young persons < 18 years						0	0	399	0
2	Adults aged 18 to 65 years						0	0	14 568	2 913
3	Aged persons > 65 years						0	0	0	435
	Qualification									
4	Schooling									
5	Permanent education									
	Household production									
6	Within priv. households	0	0	0						
7	Among priv. households									
	Children care									
8	Within priv. households	14 967								
9	Among priv. households	3 348								
	Elderly care									
10	Within priv. households			0						
11	Among priv. households			18 307						
	Voluntary work									
12	Among priv. households	7 517	25 816	6 320						
13	Private consumption	- 17 138	- 109 229	- 22 796						
14	Services of NPISH	- 700	- 2 388	- 589						
	Education services									
15	Schooling	292	11 765							
16	Permanent education	1 162	10 827	2 327						
17	Health services	- 2 133	- 11 533	- 7 645						
18	Other public services	- 5 603	- 19 196	- 4 706						
19	Net fixed capital form.									
20	Imports of products	- 7 195	- 40 012	- 9 505						
21	Balances	618	- 58 195	12 850						
22	Total supply	- 4 864	- 192 145	- 5 436					14 967	3 348

NPISH: Non-profit institutions serving households

Source: Stahmer et al., 2004, Annex

Table A2 (continue): Subsequent changes in million DM after implementation of part time society, Scenario Human, 1998

Unpaid work			Employment								
Elderly care		Volunt. work	Private consump-tion	Services of NPISH	Education services		Health services	Other public services	Net fixed capital for-mation	Export of products	Total uses
Within private hh.	Among private hh.	Among private hh.			School-ing	Perm. edu-cation					
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
0	399	864	-5455	0	0	0	0	-489	0	-582	-4864
0	17474	37848	-137551	-3677	12057	14316	-20636	-28602	-25987	-74870	-192145
0	435	941	-6157	0	0	0	-676	-414	0	0	-5436
											0
											14967
											3348
											0
											18307
											39654
											-149162
											-3677
											12057
											14316
											-21311
											-29505
									-10299	-26665	-93675
									36286	8442	0
0	18307	39654	-149162	-3677	12057	14316	-21311	-29505	0	-93675	

NPISH: Non-profit institutions serving households

Source: Stahmer et al., 2004, Annex

Table A3: Subsequent changes in 1000 t CO_2 after implementation of part time society, Scenario Human, 1998

Nr	Time Use / Received time	Personal activities			Unpaid work					
		Young persons <18 years	Adults between 18 and 65 years	Aged persons >65 years	Qualification		Household production		Children care	
					School-ing	Perm. edu-cation	Within private hh.	Among private hh.	Within private hh.	Among private hh.
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	Young persons < 18 years	- 9			6	16			16	
2	Adults aged 18 to 65 years		- 474		271	130			644	123
3	Aged persons > 65 years			- 37		59				18
	Qualification									
4	Schooling	6	271							
5	Permanent education	16	130	59						
	Household production									
6	Within priv. households									
7	Among priv. households									
	Children care									
8	Within priv. households	660								
9	Among priv. households	141								
	Elderly care									
10	Within priv. households									
11	Among priv. households			1 707						
	Voluntary work									
12	Among priv. households	287	1 010	243						
13	Private consumption	- 4 178	- 25 796	- 5 337						
14	Services of NPISH	- 76	- 261	- 64						
	Education services									
15	Schooling	26	1 070							
16	Permanent education	107	966	215						
17	Health services	- 231	- 1 247	- 826						
18	Other public services	- 718	- 2 460	- 603						
19	Net fixed capital formation									
20	Imports of products	- 2 592	- 14 423	- 3 368						
21	Balances	5 127	- 17 401	6 537						
22	Total supply	- 1 434	- 58 614	- 1 475	276	205			660	141

NPISH: Non-profit institutions serving households

Source: Stahmer et al., 2004, Annex

Table A3 (continue): Subsequent changes in 1000 t CO_2 after implementation of part time society, Scenario Human, 1998

Unpaid work			Employment								
Elderly care		Volunt. work	Private consump-tion	Services of NPISH	Education services		Health services	Other public services	Net fixed capital for-mation	Export of pro-ducts	Total uses
Within private hh.	Among private hh.	Among private hh.			School-ing	Perm. edu-cation					
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
	17	28	- 1 279					- 63		- 166	- 1 434
	1 660	1 487	- 32 590	- 401	1 096	1 288	- 2 230	- 3 665	- 4 561	- 21 392	- 58 614
	30	25	- 1 443				- 73	- 53			- 1 475
											276
											205
											660
											141
											1 707
											1 540
											- 35 312
											- 401
											1 096
											1 288
											- 2 303
											- 3 781
									- 3 391	- 10 566	- 34 340
									7 953	- 2 216	0
	1 707	1 540	- 35 312	- 401	1 096	1 288	- 2 303	- 3 781	0	- 34 340	

NPISH: Non-profit institutions serving households

Source: Stahmer et al., 2004, Annex