Time Use Dynamics in Paid Work and Household Activities of Married Women - A Panel Analysis with Household Information and Regional Labour Demand

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Summary

The dynamics of multiple time use in paid work and in household activities with house-work, child rearing and DIY of married women are analyzed with a two step procedure: the estimation of the participation decision in intertemporal labor force participation strategies (entering, leaving the labor market, permanently employed and not employed) by a multinomial logit approach is followed by a selectivity bias corrected simultaneous hours equations systems (C3SLS) estimation of the determinants of hours supplied in multiple time use activities. Microdata base is the German Socio-Economic Panel with four waves (1984-1987), where information of the household - including the husband's employment situation - is merged with regional economic and local labour demand indicators.

JEL: D13, J16, J20, J22, J23

Keywords: Dynamics of multiple time use, market and non-market activities, female labour supply, multiple longitudinal labor and activity supply of married women, panel analysis with regional information, selectivity bias corrected simultaneous equations system estimation of multiple time use.

Zusammenfassung

Die Dynamik multipler Zeitverwendung in Beruf und Haushalt mit Hausarbeit, Kinder-erziehung und 'Do-it-yourself'-Aktivitäten wird in einer zweistufigen Prozedur analysiert: Der Schätzung der Partizipationsentscheidung in intertemporalen Erwerbsstrategien (Ein- und Austritt aus und in den Arbeitsmarkt, längerfristige Erwerbs- und Nichterwerbstätigkeit) durch einen multinomialen Logit-Ansatz folgt eine selektivitätskorrigierte simultane Schätzung multipler Zeitverwendung (C3SLS). Mikrodatenbasis ist das Sozio-Ökonomische Panel mit vier Wellen (1984-1987), wobei Haushaltsinformationen - inclusive der Beschäftigungssituation des Ehemannes - verknüpft wurden mit regionalen Indikatoren zur ökonomischen Situation und der lokalen Arbeitsnachfrage.

JEL: D13, J16, J20, J22, J23

Schlagworte: Dynamik multipler Zeitverwendung, Markt- und nichtmarktmäßige Aktivi-täten, Arbeitsangebot von Frauen, Multiples Arbeits- und Aktivitätsangebot im Längsschnitt verheirateter Frauen, Panelanalyse mit regionalen Informationen, selektivitätskorrigierte simultane Schätzung multipler Zeitverwendung.

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1   Introduction

Market- and non-market activities include paid market work and activities not financially honored within and for the household. The focus of every analysis of labour market and work availability broadens, therefore, to an analysis of manifold individual activities which, only when taken as a whole, depict the broader pattern of individual ways of life and lifestyles. Increased public as well as scientific interest look up this complex under topics like formal and informal economy, market and non-market activities, household production and new home economics, shadow economy or dual economy[1]. The compatibility of professional activities with household activities has, before the background of enhanced provision activities and increasing female employment, become a special issue within the actual ecomomic and social political debate.

The aim of this paper is an empirically founded contribution to the assessment of time-use determinants for market and non-market activities and for the way in which these various activities affect each other. In our analysis of married women's multiple time-use we concentrate especially on two dimenions: first, multiple time spending at paid work and with household activities; second, the dynamic aspect rendered by a microanalysis

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1)   Gronau 1986, Glatzer and Berger-Schmitt 1986, Niessen and Ollmann 1987, Gross/Friedrich 1988, Schäfer 1988, Merz and Wolff 1988, 1989, 1990b, Merz 1989a, 1990c, 1991, von Schweitzer et al 1990, Kössler 1990. For contributions on household science and research on women's household activities, cf. eg. Rapin 1988, Kettschau 1990, von Schweitzer 1990.

with panel data. Doing so, we pay special attention to intertemporal labour force participation strategies in relation to married women entering the labour market, staying and leaving employment and for those who are not employed.

All hitherto microeconometrically based analyses of women's labour force participation-behaviour published at least in Germany (Hübler 1983, Franz 1985, Dagsvil et al. 1988, Kaiser, v. Essen and Spahn 1989, Merz 1987b, 1989b, 1990a for international studies see e.g. Killingsworth and Heckmann 1986) are mainly based on the static economic model (see, however, eg. Franz and König 1984, Zimmermann 1985, and Hujer and Schnabel 1990). Furthermore, they do not take into account the combined activities connected to paid work <u>and</u> household activities which are here micro-econometrically analysed, based on panel data.

Multiple market- and non-market activities of private households were the objects of a research project headed by the author within the Sonderforschungsbereich 3 'Micoanalytic Foundations of Social Policy' at the Universities of Frankfurt and Mannheim (Merz 1987a). Merz and Wolff 1990a, 1991b provide a survey of the project results, mainly based on a cross-section, the Secondary Occupation Survey of the Sfb 3. The first descriptive dynamic analyses of multiple time allocation carried out with the German Socio-Economic Panel can be found in Merz and Rauberger 1990 and in Merz and Wolff 1991a. See Merz 1990b on the necessity and use of time budget data, and Merz 1989a on the microeconomic as well as microeconometric treatment of multiple market- and non-market activities. Juster and Stafford 1991 provide a recent survey article in the allocation of time in general.

The following study is structured as follows: after the microeconomic modelling of intertemporal decisions within a broader interpretation of Becker's approach, the description of the concept of our quantitative analysis and of the longitudinal microdata base of the first four waves (1984-1987) of the German Socio-Economic Panel follows which was extended to include regional information on the economy and the labour market. The microeconometric specification takes various intertemporal labour force participation strategies via a multinomial logit-approach into account. We specify individual time-use at paid work and in the household with the help of simultaneous, selectivity bias corrected equation systems, explicitly taking into account the specific selectivity from intertemporal labour force participation strategies.

We apply here and for the first time, German results on the dynamics of individual time-allocation dated in the 2nd half of the eighties. We discuss the determinants of the participation in intertemporal labour force participation strategies for women entering or leaving the labour market, in unstable occupations, and in steady wage employment. The

multiple job and other activities available by our data base comprises occupation activities, doing housework, child-rearing, and 'Do-it-Yourself' (DIY) activities.

2 A microeconomic intertemporal model of market - and non-market time allocation

The new home-economics approach of Becker (1965), Lancaster (1966), Muth (1966), Gronau (1973a,b, 1977, 1980, 1986) as well as the Ghez and Becker's (1975) life-cycle extension, provide the theoretical frame for our intertemporal analysis of market and non-market time allocation. According to and in extension to this approach an individual making activity decisions maximizes its utility

(1) $$u = u(\mathbf{Z}; \mathbf{Q}) = u(z_0,...,z_T; q_0,...,q_T)$$

over the life-cycle from time-period t=0,...,T, given its socioeconomic characteristics $\mathbf{Q}=q_0,...,q_T$ which are likewise changing with the passing of time, and with regards to home-produced outputs $\mathbf{Z}=z_0,...,z_T$ with

(2) $$z_t = f_t(X_t, h_{nt}).$$

Home production z_t, a vector of m goods produced at the time period t is a function of market input-goods X_t and of individual non-market time h_{nt} of a given period t. Household commodities are defined comprehensively and include, for example, homework, child rearing, do-it-yourself, watching television, sleeping, etc.

Individual activities are limited by the time budget within a given period and by financial budget considerations. The time restriction

(3) $$h = h_{mt} + h_{nt} = h_{mt} + \Sigma_r h_{ntr} \qquad (r=1,...,m)$$

divides the available time h (as a whole) within one period t into market working time h_{mt} and non-market activity times h_{ntr} (r=1,...,m). With the budget restriction, - a starting equipment A_0 and a discounted (by the market rate of interest i) sum of periodical earnings $w_t h_{mt}$ (w_t is the wage in t) and non-earned income V_t (for example from wealth, transfers etc.) - a financial frame for the discounted consumption expenditures $P_t X_t$ (P_t is the price of the composite consumer good X_t) is given by

(4) $$\Sigma_t P_t X_t (1+i)^{-t} \leq A_0 + \Sigma_t (w_t h_{mt} + V_t)(1+i)^{-t}.$$

The maximization of utility with respect to the input factors (X_t and h_{nt}) of the household commodities z_{tr} under the time- and budget-restriction

(5) $\qquad \max_{xt,hnt} \{u(\mathbf{z}_0,...,\mathbf{z}_T; \mathbf{Q}) \mid \mathbf{z}_t = f_t(X_t, h_{nt}),$

$\qquad h = h_{mt} + \Sigma_r h_{ntr}, \Sigma_t P_t X_t (1+i)^{-t} \leq A_0 + \Sigma_t (w_t h_{mt} + V_t)(1+i)^{-t}\}$

leads to first and second order optimum-conditions and finally to optimal intertemporal allocation equations.

If one supposes, for example like MaCurdy 1981, an additive and separable utility function

(6) $\qquad u = \Sigma_t u_t(\mathbf{z}_t; \mathbf{q}_t)(1+s)^{-t}$

where s describes the time preference rate, then the optimal allocation is given by

$\qquad X_t = X_t(\gamma\delta_t w_t, \gamma\delta_t P_t, V_t, A_0; \mathbf{q}_t)$

(7a) $\qquad h_{nt} = h_{nt}(\gamma\delta_t w_t, \gamma\delta_t P_t, V_t, A_0; \mathbf{q}_t)$

$\qquad h_{mt} = h - h_{nt} = h_{mt}(\gamma\delta_t w_t, \gamma\delta_t P_t, V_t, A_0; \mathbf{q}_t)$

with consumption and the intertemporal time allocation equations of market- (h_{mt}) and non-market (h_{nt}) activities.

The single non-market activities h_{ntr} (r=1,...,m) are the result of the marginal household productivities of time (f_{rt}) and of the goods' input (f_{xt}') with $f_{rxt}' = f_{rt}'/f_{xt}'$ [2]

(7b) $\qquad h_{ntr} = h_{ntr}(\gamma\delta_t w_t, \gamma\delta_t P_t, V_t, A_0, f_{rxt}'; \mathbf{q}_t),$ $\qquad\qquad$ (r=1,...,m),

where $\delta_t = (1+s)^t/(1+i)^t$ is the ratio of the time preference rate to the market interest rate. They are so called γ-constant or corresponding Frisch labour supply or activity supply functions.

With the optimal intertemporal time allocation functions of the microeconomic life cycle model (7) time-use in paid work and in the household is specified via a specific utility function, by the time preference rate s, market interest rate i, wage rates w_t, prices P_t, unearned income V_t, starting capital A_0 as well as the conditions of marginal household productivities f_{rxt}' and the socioeconomic characteristics $\mathbf{q}_t$.

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2)   For details see Merz 1989a, Ch. 2.

3   Microeconometric specification of intertemporal time allocation of market - and non-market activities

Certain labour force participation strategies, its determinants and time-use pattern will be of specific interest in our study. Therefore it is suitable to divide our intertemporal analysis first into the selection of individual intertemporal labour force participation strategies and into estimates of individual market- and non-market activity hours within our various intertemporal labour force participation strategies.

Participation in an intertemporal labour force participation strategy

Intertemporal labour force participation strategy in our terminology is the overall labour force participation pattern as observed during several periods of time, such as steady employment or entering the labour force etc. Since these labour force participation strategies are mutually exclusive - one from altogether J possible alternatives can be chosen - it is advisable here to use a multinomial logit-model to analyse the participation in an intertemporal labour force participation strategy where the IIA-assumption is adequate to our problem. In the multinomial logit-model (McFadden 1973, 1985) a decision maker's i choice is based on a random utility concept with

(8a) $u_{ij} = \alpha_j' x_{ij} + \varepsilon_{ij}$

where u_{ij} is a stochastic utility-index, α_j the parameter vector to be estimated for alternative j, x_{ij} the vector of explanatory variables and ε_{ij} an extreme value distributed error term. Alternative j (j=0,...,J) is selected which provides maximum utility u_{ij}

(8b) $d_{ij} = \begin{cases} 1, & \text{if } u_{ij} = \max(u_{i0},...,u_{ij}) \\ \\ 0 & \text{else.} \end{cases}$

The maximization of the corresponding likelihood function

(8c) $\log L(\alpha) = \sum_i \sum_j d_{ij} \log \Pi_{ij}.$

provides the parameter α_j for the determination of the probability

(8d) $\qquad \Pi_{ij} = \text{Prob} (d_{ij}=1) = \exp(\alpha_j'x_{ij}) / \sum_k \exp(\alpha_k'x_{ik}),$ $\qquad$ (j,k=0,...,J),

to choose alternative j.

Selectivity bias corrected simultaneous estimation of market and non-market time allocation

In order to estimate combined market and non-market time allocation an individually based simultaneous equation system has to be regarded. We take account for the dynamics of individual time allocation using lag-endogeneous time pattern apart from corresponding intertemporal labour force participation strategy. For each and every intertemporal labour force participation strategy as selected through our multinomial model such a simultaneous equations system has to be specified.

Corresponding to Heckman's 1979 two step selectivity bias correction and to Lee's 1983 generalization we explicitly include the selectivity pattern from the multinomial logit approach into the corresponding simultaneous equation system. The multiple time allocation functions specific to one of the intertemporal labour force participation strategy j for an individuum i (d_{ij}=1) then are specified in a linear approximation[2] as follows

(9) $\qquad \mathbf{\Gamma h}_i + \mathbf{B x}_j + \mathbf{c}_i \lambda_{ij} = \mathbf{\varepsilon}_i$ $\qquad\qquad$ (j=0,...,J)

where $\mathbf{h}_i$ is the M vector of endogenous activity hours, $\mathbf{x}_j$ the K vector of the explaining variables, $\lambda_{ij} = \phi(I_{ij})/\Phi(I_{ij})$ the selectivity bias correction variables and $I_{ij} = \Phi^{-1}(\Pi_{ij})$ from the multinominal logit-modell with ϕ and Φ as the standard normal density and distribution function, $\mathbf{\Gamma}$ the (M x M) parameter matrix of the endogenous activitiy hours, $\mathbf{B}$ the (M x K) parameter matrix of the explaining variables, $\mathbf{c}_i$ the M vector of the selectivity bias correction variables λ_{ij}, and $\mathbf{\varepsilon}_i$ the M vector of the structural error terms. For the sake of simplicity, we treat delayed activity hours as exogenous encompassed in $\mathbf{x}_j$.

To identify the structural form besides the norming of the corresponding endogenous parameters zero-restrictions on the parameter matrices $\mathbf{B}$ and $\mathbf{\Gamma}$ have to be regarded. In order to estimate this simultaneous equation system we apply 3-steps least-squares (3SLS). Within 3SLS the parameters of the reduced form activity hours $\mathbf{h}_i$ are estimated, the variances of error terms via 2SLS for each equation then are established and finally the parameters with the corresponding covariance matrix via GLS are estimated.

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2)   See Mroz 1987 for the sensitivity of hours of work specifications.

Under the assumption that the selectivity bias corrected 3SLS approach -with C3SLS further abbreviated - fulfils the conditions of an instrumental estimator, the estimates are consistent. In analogy to the argumentation that 3SLS is asymptotically efficient (Greene 1990, p. 633) among all IV-estimators using the sample information belonging to the system, one can also conclude to C3SLS's asymptotic efficiency.

The two-step microeconometric specification can be summarized as follows:

Step 1:   *Selecting the intertemporal labour force participation strategy*

via a multinomial logit-model. Individual computations of the likelihoods P_{ij} of all labour force participation strategies are based on all observations. For the labour force participation strategy j and the observations of this selection (d_{ij}=1), the selectivity bias correction variable λ_{ij} will be calculated from

$$I_{ij} = \Phi^{-1}(\Pi_{ij})$$
$$\lambda_{ij} = \phi(I_{ij})/\Phi(I_{ij})$$

where I_{ij} is the inverse of the standard-normal distribution function Φ and ϕ the corresponding density function.

Step 2:   *Selectivity bias corrected estimation of a simultaneous equation system of an intertemporal labour force participation strategy from*

$$\Gamma h_i + B x_j + c_i \lambda_{ij} = \epsilon_i$$

from the selected observations (d_{ij} = 1).

Even though we consider the restriction to non-negative hours via the selection of inter-temporal strategies of one endogenous variable, here: paid market working hours by the two step MNL/C3SLS-specification, this approach is only to be understood as a first approximation of the problem of estimating a simultaneous equation system where all dependent variables ($h_i{\geq}0$) are restricted. Such a system estimation, and under a panel design, is a lot more complicated, even for a few equations. A corresponding estimation by simulation estimators (Börsch-Supan et al. 1990), is postponed for a later paper.

Building the bridge to the intertemporal micoreconomic time allocation model (7), we have to note that the relatively few waves of the Socio-Economic Panel cause the necessity to approximate the functional specification of the intertemporal time allocation equations. We must therefore make the assumption that, along with the hypothesis of separability, the implicit time preference ratio as well as the relativ marginal producti-

vities are approximized by our specification and determined by the still to be discussed socioeconomic variables in the specified linear approach.

4 Microdata Base: The Socio-Economic Panel 1984 (Wave 1) to 1987 (Wave 4) extended by regional information on the economic situation and the labour market

Let us now turn our attention to the intertemporal microdata base of our analysis. After a few general remarks concerning the German Socio-Economic Panel, we will characterize the questions on hours in paid work and in the household, the endogenous variables to be explained. In order to be able to take individual data on the regional economic situation and on respective labour market information into account, we link such regional indicators to the individual panel data of each wave.

4.1 General characteristics of the German Socio-Ecnomic Panel

The intertemporal microdata base of our analysis is the German Socio-Economic Panel (GSOEP) of the Sonderforschungsbereich 3 (Sfb 3), 'Microanalytic Foundations of Social Policy' at the Universities of Frankfurt and Mannheim and of the German Institute for Economic Research (DIW) in Berlin. All members of ca. 6,000 households aged 16 and older (around 12,000 individuals) were interviewed once a year since 1984. The sample includes the German resident population, foreigners and people living in institutions of West-Germany and of West Berlin. Our analysis is concerned with the first four waves, the years 1984-1987.

A large number of objective as well as subjective socio-economic variables (more than 1,000 personal and 160 household data for each individual are collected) describing individuals' ways of life and their living conditions. Apart from the preceeding year's panel-information, selected income and transfer variables in addition are also collected monthly. Further individual retrospective information concerning previous employment and living conditions in the past are also included in wave 1 (1984) representing pre-1983 times. Further information on the German Socio-Economic Panel can be drawn from the user manuals (Sfb 3 and DIW 1989a,b) as well as from Hanefeld 1987 discussing its conception, building up, and focal areas. Chapter M.1. of the user manual provides a survey of further publications with data of the German Socio-Economic Panel. Wagner, Schupp and Rendtel 1991 provide for an English version of General GSOEP methodological aspects.

4.2 Questionnaire on hours spent at paid work and in the household

Paid work and other individual activities for and within the household compete for a given time budget and are of interest for the analysis of intertemporal time allocation. Detailed information on wage employment as well as on individual leisure activities - however classified only according to certain time intervals - is found in various personal questions of the German Socio-Economic Panel. Coordinated information of a multiple time-use which includes market and non-market activities are only supplied by question 1 (wave 1) or question 2 (waves 2 to 4) of the personal questionnaire. The present analysis rests upon these coordinated time allocation data.

The persons were asked to give an account of their time allocation in full hours, making the difference between average workable and non workable days; this applies to the follwing activities:

- paid work (including commuting and secondary occupational activities where applicable),
- housework and shopping,
- child care,
- handcrafting / repairs in and around the house, to the car, gardening (hereafter abridged by DIY)
- education/learning
- watching television, videos
- hobbies and other leisure activities.

According this data-recording pattern various time consuming activities may overlap each other ('joint household production'). Yet, they compete with each other for the time available as a whole. The concept of an 'average day' may also include rarer, less regular activities, which, for example, might be cut out by a concept like yesterday's questions. Where time-allocation statements in full hours are concerned, we must admit that more precise information could be gathered. Yet, one argues that especially 'noticable' changes of individual time-allocation patterns are rendered by the chosen way.

4.3 Merging the Socio-Economic Panel to information on the regional economic situation and to regional labour market indicators

In order to be able to take into account the possibilities of paid work and household conditions in a regional context in the quantitative analysis, we have to include regional

information on the household neighbourhoods which include information on the demand for labour as well as on the general economic situation of the region. By proceeding in multi stages, we secured the respondents' anonymity when linking inter-regional information from the 'Bundesforschungsanstalt für Landeskunde und Raumordnung' (BfLR) to each of the four waves of the German Socio-Economic Panel.[3]

The (88) specific regions ('Raumordnungsregionen') of the BfLR were created according to economic considerations and catchment areas. These regions reach beyond geographical limits and can be superimposed onto the 'Higher-Region-Center Locations System' and their catchment areas (for details, see BfLR 1985, p. 1047).

The fact that such regional indicators for market and non-market activities within private households could be important was already demonstrated by microeconometric time-use analyses with an accordingly extended cross-section, the enhanced Sfb 3 - Secondary Occupation Survey (Merz 1989a, 1990c, 1991, Merz and Wolff 1989, Wolff 1990a,b). We will see if such regional indicators are also quantitatively significant in our intertemporal analysis.

5   Participation of married women in intertemporal labour force participation strategies

According to our two step procedure, the first step of selecting an intertemporal labour force participation strategy will now be described according to the available data. Let us first define longitudinal individual occupational pattern along with the concept of intertemporal labour force participation strategies and describe the labour force participation of married women from the longitudinal perspective. Subsequently the microeconometric analysis of the determinants of married women's participation in intertemporal labour force participation strategies follows with a multinomial logit approach in this section.

5.1   Individual longitudinal labour market pattern and intertemporal labour force participation strategies

One focal point of any analysis of married women's time allocation on wage employment and household activities is paid work. Since there are good reasons that different labour force participation patterns will influence non-market time allocation, we overall divided

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3)   I am grateful to Dr. Böltken from the BfLR, the staff of Infratest and the DIW for the immediate provision of data and the opportunity for anonymized regional matching.

the 2^4 generally possible labour force participation patterns of the first 4 waves of the panel (cf. Table 1) into five intertemporal labour force participation strategies of substantial interest:

j =   0   Permanent non-employment
        1   Entering the labour market
        2   Leaving the labour market
        3   Unstable occupation
        4   Permanent employment

Our analysis deals with German married women aged (wave 1) 16 to 63 years in 1984 and being permanently married in each of the four waves (1984-1987). This longitudinal section of the population finally comprises, after regional merging and data editing, 1880 married women.

According to the quoted paid working-days, 44.2% of married women were permanently (4 years) not involved in paid work, in other words, not employed in all time periods. 31.9% were permanently employed. Women entering the labour market (8.6%) or leaving the labour market (7.5%) are women who stepped once into or out of wage employment within the four years. Where a change occured more than once, we will call this an unstable occupation (7.8%), (cf. Table 2).

Before the microeconometric analysis of the determinants of intertemporal labour force participation strategies, we would like to make some remarks on the validity of the data concerned. After comparing the data of the question on time allocation to the available question on 'employment today' from the German Socio-Economic Panel and to labour force participation information from official statistics, we can establish a good equivalency between the Socio-Economic Panel information and the official statistics (Merz and Wolff 1991b).

Since official statistics do not supply information on individual intertemporal labour force participation - a special advantage of our panel - only both corresponding panel questions can be compared to one-another. Table 3 shows a cross-tabulation of the corresponding 5 individual labour force participation strategies. The clustering around the diagonal and the high level of equivalence of the marginal distributions show a great accordance with both independent labour force participation information and thus confirm our longitudinal database with the time use question for further analyses.

Table 1:   Married Women's Market Activities in Wave 1 (1984) - Wave 4 (1987):
            Longitudinal Occupational Pattern of Married Women

Wave				Wave						
1	2	3	4	1	2	3	4	i	n	%
				1	1	1	1	15	600	31,9
				1	1	1	0	14	50	2,7
				1	1	0	1	13	23	1,2
				1	1	0	0	12	43	2,3
				1	0	1	1	11	27	1,4
				1	0	1	0	10	10	0,5
				1	0	0	1	9	20	1,1
				1	0	0	0	8	48	2,6
				0	1	1	1	7	69	3,7
				0	1	1	0	6	13	0,7
				0	1	0	1	5	10	0,5
				0	1	0	0	4	32	1,7
				0	0	1	1	3	44	2,3
				0	0	1	0	2	12	0,6
				0	0	0	1	1	49	2,6
				0	0	0	0	0	830	44,2
All									1880	100,0

1   Employed
0   Not Employed

Source: German Socio-Economic Panel, Wave 1 (1984) to Wave 4 (1987);
            Longitudinal Dataset (n=1880), Own Computations.

Table 2:   Married Women's Activities in Wave 1 (1984)- Wave 4 (1987): Intertemporal Labour Force Participation Strategies of Married Women

j	Intertemporal labour force participation strategy	Occupational pattern Wave i	1 2 3 4	n	%
0	Long-term unemployed	0	0 0 0 0	830	44,2
1	Entering the labour market [1]	1	0 0 0 1	162	8,6
		3	0 0 1 1		
		7	0 1 1 1		
2	Leaving the labour market [2]	8	1 0 0 0	141	7,5
		12	1 1 0 0		
		14	1 1 1 0		
3	Unstable occupation [3]	2	0 0 1 0	147	7,8
		4	0 1 0 0		
		5	0 1 0 1		
		6	0 1 1 0		
		9	1 0 0 1		
		10	1 0 1 0		
		11	1 0 1 1		
		13	1 1 0 1		
4	Permanently employed	15	1 1 1 1	600	31,9
	All			1880	100,0

1)   One single entry into paid work
2)   One single drop-out out of paid work
3)   Repeated changes (at least 2)

Source: German Socio-Economic Panel Wave 1 (1984) to Wave 4 (1987); Longitudinal Dataset (n=1880), Own Computations.

Table 3:   On the Longitudinal Validity of Married Women's Labour Force Participation Strategies (1984-1987) Comparison of Data on Paid Work out of the Question about Time Allocation and the Question on Employment today[1]: Cross-tabulation of Occupational Strategies

		Question on Occupation					
	ET[2]	0	1	2	3	4	Σ %
Time Allocation	0	791 42.1	18 1.0	11 .6	10 .5		830 44.2
	1	14 .7	120 6.4		10 .5	18 1.0	162 8.6
	2	6 .7		120 6.4	3 .2	12 .6	141 7.5
	3	7 .4	10 .5	11 .6	94 5.0	25 1.3	147 7.8
	4		4 .2	1 .1	2 .1	593 31.5	600 31.9
	Σ %	918 43.5	152 8.1	143 7.6	119 6.3	648 34.5	1880 100.0

1)   Panel question AP08, BP16, CP16, DP12 = 1,2,3 oder 4
2)   Occupational Strategies (ET):
      0   Permanent unemployed
      1   Entering the labour market
      2   Leaving the labour market
      3   Unstable occupation
      4   Permanent employed

Source: German Socio-Economic Panel Wave 1 (1984) to Wave 4 (1987); Longitudinal Dataset (n=1880), Own Computations.

5.2 Determinats of the participation in intertemporal labour force participation strategies of married women

The determinants of the participation in intertemporal labour force participation activities by married women, the first step in our model specification, are now investigated. The multinomial logit model explains the probability of belonging to one of the the following groups: entering the labour market, leaving the labour market, permanently employed resp. non-employed and changing unstable occupation. Reference groups are the permanently non-employed married women (j=0).

As explanatory variables for the group 'entering or leaving the labour market', we use the information on the period after the corresponding individual change in one of the 4 waves. With the knowledge of the stable situation after moving from the definition of the intertemporal labour force participation strategies, this time-reference conforms to the following explanation of activity hours in the second step of our model. Furthermore, as much knowledge as possible is drawn from the labour force participation process into the explanation with this procedure. A conceivable reference to the last wave (wave 4) would generally have to process information with different time intervals from various labour force participation patterns according to individual change (cf. Table 1). Here, a clearer delimitation leads to our descision. An unstable occupation (j=3) was defined by several moves in and out of the labour market. For those we draw each of the explanatory variables accordingly out of the wave after the last move. The values of the last panel wave are used as explanatory variables for a permanent employment (j=4) because they contain the latest avaible information of the hitherto labour force participation process.

We subdivide the explanatory variables of the participation in intertemporal labour force participation strategies into personal characteristics, characteristics of the husband, household and regional characteristics.

Personal characteristics: we use previous job-experience as an explanatory variable, which can be deduced from human capital approaches and which has been established to be significant in former studies (eg. Merz 1989a, 1990a). With the help of retrospective information of wave 1 (1984) and the information of the following waves, it is possible to include all individual experiences since leaving school, subdivided into full and part time experience years (any interruption cropping up can be explicitely excluded). Beginning with the first wave out of the yearly calendar monthly labour force participation information was available. Thus, we were able to explicate job experience in months of

employment. Alongside the objective health variable 'officially severely disabled', a subjective health variable is included as a further personal characteristic.

Characteristics of the husband: Apart from the husband's occupational status, his monthly net income might give hints at the economic necessity of a second income.

Household characteristics: The panel design allows more than one family living together in one household. The number of household members with children and consequent burden effects on the women involved, is a information reaching beyond the pure number of children and characterizes the dependency on the women's living conditions.

Regional characteristics: local unemployment rate is taken as an indicator of the labour market in a household's neighbourhood. Tax revenue per inhabitant characterizes the specific economic performance of a region.

Results

One general remark to the interpretation of the following parameter estimates (Table 4)[4] should be done: the parameters estimated by the multinomial logit model generally provide the explanative contribution to the likelihood of married women's intertemporal labour force participation strategies over a 4-period duration. With regard to permanent unemployment (j=0), all coefficients show the corresponding deviation to this group.

Personal characteristics: Of various influence and, apart from women entering the labour market, a long standing previous experience in full or part-time employment increases the participation quota. Long apprenticeships prove to be sure indicators of stable strategies, whether for entering or leaving the labour market (one move) or permanently employed: the corresponding coefficients are highly significant and obviously greater than the ones recorded for many changes, many moves (j=3). Apart from an officially registered disability, a subjective health disability also reduces the participation in the labour market.

Husband's characteristics: The dependence of a husband's job becomes evident for the wife. First the husbands' different occupational status (compared to a non employed husband) effect various positive influences upon the participation in various intertemporal labour force participation strategies. This positive correlation with the

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4)   The computations were performed with LIMDEP/5.1 (Greene 1990)

employment situation of the husband finds its counterweight in the negative correlation of the husband's income. A husband's higher income considerably reduces steady employment. Also the non-significant coefficient found among married women entering the labour market shows the importance of other reasons than the economic necessity to have additional income. This gives a broader basis to similar results by the author (Merz 1990a) based on one cross section (wave 1/1984), and transposes it to intertemporal individual labour force participation behaviour. The significant negative coefficient among women leaving the labour market does not necessarily support the 'additional worker' effect, since a certain persistence regarding an already attained position can fully be drawn into its explanation.

Household characteristics: A large household and, above all, small children reduce the participation to permanent employment and are indicators to women's traditional role appreciation. Also the positive coefficient of small children among women leaving the labour market reinforces this picture. It becomes obvious that older children do not have any significant influence on different labour force participation strategies. The non-significant influence of household size and children from all age-groups among women entering the labour market points to labour force participation motives different from those described by the indicators.

Regional characteristics: The hypothesis according to which the regional labour market and the local economic situation are of relevance for women leaving or entering the labour market finds no supporting evidence in our analysis. A poor local labour market (measured at the local unemployment rate) admittedly reduces the probability of an steady employment. The economic performing capacity of a given region (measured at per capita income tax) points out to the fact that a prospering region, in this sense, is not necessarily an indicator for a high level of permanent employment among married women.

From a statistical point of view, the Likelihood-Ratio-Test-Statistic reveals an obvious explanative contribution of the specified model. Measured with McFadden's Pseudo R^2 = 0,52 for the whole model as well as the explanatory validity of the single intertemporal labour force participation strategies with McKelvey and Zavoina's[5] strategy-specific Pseudo R^2, a relatively valuable model fit is to be kept in mind.

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5)   I like to thank Hilmar Schneider for his hint to McKelvey and Zavoina's R^2, which showed to be superior to other measures, according to the study of Veall and Zimmermann (1990). I modified the denominator expression for the independent logit alternative to

$$\text{Pseudo } R^2 = SQE \, / \, (SQE + n \, \pi^2/3)$$

where $SQE = \sum_i (\alpha'x_i - y^+)^2$ and $y^+ = n^{-1} \sum_i \alpha'x_i$. For the multinominal logit model it would be possible to calculate for example a (weighted) average of the single Pseudo R^2s.

Table 4:   Participation of Married Women in Intertemporal Labour Force Participation
            Strategies. Discrete Choice Model: Multinomial Logit (5 Alternatives).[1]

	Participation			
	Entering the labour market	Leaving the labour market	Unstable Occupation	Permanently employed
j =	1[2]	2[2]	3[3]	4[4]
PERSONAL CHARACTERISTICS				
Occupational experience				
Full time/100 (months)	0.041	0.783***	0.484***	0.899***
Part time/100 (months)	0.321	1.589***	1.472***	1.705***
Apprenticeship (years)	0.146***	0.106 **	0.087 **	0.144***
Health				
Subjective disabled[5]	-0.891***	-1.057***	-1.054***	-0.776***
Registered disabled[6]	-3.879***	-3.265***	-2.461***	-0.332
HUSBAND'S CHARACTERISTICS				
Occupational status				
Worker	1.458***	1.777***	2.164***	2.161***
Clerk	1.156***	1.796***	1.615***	1.883***
Civil Servant	1.079 **	1.198***	1.973***	2.174***
Self-Employed	2.455***	1.625***	3.173***	3.003***
Monthly Income/1000	-0.142	-0.231 **	-0.249***	-0.209***
HOUSEHOLD CHARACTERISTICS				
Household Size	0.053	-0.235 *	-0.158	-0.241***
Children in age groups:				
0 - 6 years	0.032	0.334 *	0.382 **	-0.513***
7 - 10 years	0.305	0.069	0.137	-0.063
11 - 15 years	0.224	0.267	-0.187	-0.144
REGIONAL CHARACTERISTICS				
Unemployment rate	-0.042	-0.032	-0.046*	-0.125***
Tax revenue/1000 inhabitants	-0.194	-0.540	-0.543*	-1.276***

Log-Likelihood	-1798.4			
Likelihood-Ratio-Teststatistik (d.f.)	3891.47 (1863)			
Pseudo R^2 (McFadden)	0.52			
Pseudo R^2 (McKelvey and Zavoina)	0.49	0.56	0.51	0.54
n	162	141	147	600

1)   Reference (j=0): permantly-not employed (=830)
2)   Explanatory variables from wave after each move
3)   Explanatory variables from wave after each last move
4)   Explanatory variables from last wave (Wave 4/1987)
5)   1 = absolutely not, 2 = a little, 3 = a lot
6)   0 = no, 1 = yes

Level of significance: * (90%), ** (95%), *** (99%)

Source: German Socio-Economic Panel Wave 1 (1984) to Wave 4 (1987);
             Longitudinal Dataset (n=1880), Own Computations.

From the substantial point of view, obvious differences in the determinants of different intertemporal labour force participation strategies - especially also between the entering strategy and other strategies - has be emphasised which, for the first time, could be quantified in this form on the basis of individual longitudinal occupational information.

6   Multiple time allocation of married women in employment and in the household in intertemporal labour force participation strategies
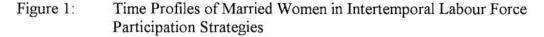
Following our Chapter 3 model specification, labour supply respectively activity supply is determined from the second selectivity bias corrected step of a simultaneous hours equations' system in paid work and in the household. The selectivity correction for each of the five possible intertemporal labour force participation strategies is explicitly taken into account in the 3SLS estimation for every simultaneous system from step 1 (C3SLS)[6]. This two-step procedure has, compared to a possible one-step appropriate TOBIT-specification, the special advantage to be able to consider possible different explanation patterns for the participation and separated for the actual time allocation.
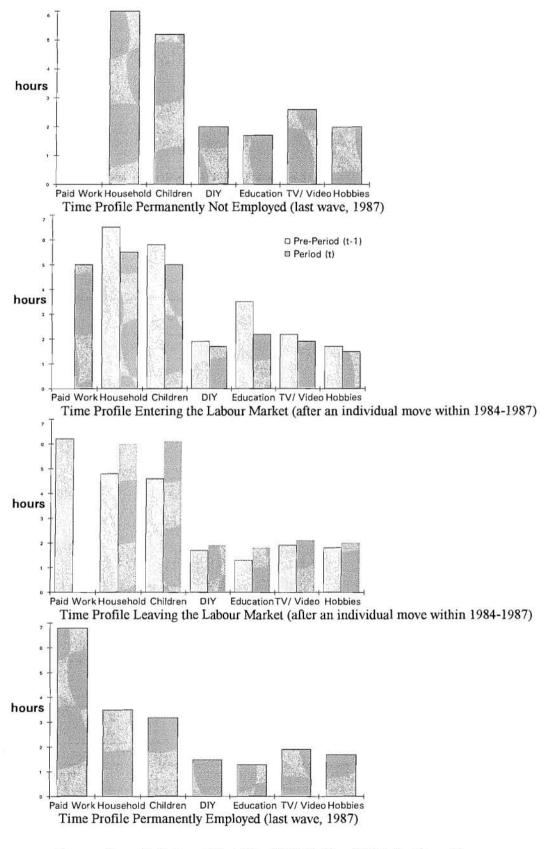
6.1   Married women's time-profiles in intertemporal labour force participation strategies

We want to explain time allocation in paid work, household, child-rearing and in DIY-activities as defined in chapter 2. Figure 1 describes the average time profile of these and of other activities from the correponding years - by analogy to the explaining quantities - after a move for women entering or leaving the labour market (j=1 and 2) as well as permanently not employed or employed from wave 4 (1987) (j=0 and 4).

Four descriptive results out of Figure 1 should be stressed: First an occupational activity mainly curbs housework and child-rearing; second, after leaving the labour market, more time is spent especially for children, housework and education; third, women mainly enter the labour market in part time jobs with a 5 hours' average working day, so that they can dedicate more time, amongst others, to child-rearing, housework and education; and fourth, different intertemporal labour force participation strategies lead to different time-profiles also with relative different time allocation patterns, supporting our choice selection and analysis of time allocation, which essentially is dependent on those intertemporal labour force participation strategies.

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6)   The respective simultaneous estimations were carried out with LIMDEP/5.1.

Figure 1:   Time Profiles of Married Women in Intertemporal Labour Force
             Participation Strategies

Time Profile Permanently Not Employed (last wave, 1987)

☐ Pre-Period (t-1)
☑ Period (t)

Time Profile Entering the Labour Market (after an individual move within 1984-1987)

Time Profile Leaving the Labour Market (after an individual move within 1984-1987)

Time Profile Permanently Employed (last wave, 1987)

Source: German Socio-Economic Panel, Wave 1 (1984) to Wave 4 (1987); Own Computations.

6.2   Determinants of multiple time allocation by married women in paid work and in the household

By approximating the theoretical life-cycle model of multiple market and non-market activities, we use the linear specification from chapter 3. As an approach to specify the individual time preference ratio, as well as marginal household productivities, the corresponding vector of socioeconomic characteristics (reduced form) is taken. An explicit model-endogenous specification remains for a later study.

Possible dependencies on the husband's labour force participation and income as well as the household situation, are taken into account by an extended vector V. The equivalent remaining-household net income - not least determined by model endogenous working time - in the following is calculated out of the entire household net income, including the husband's income plus possible transfers and non-earned income of all members of the household minus the woman's income of paid work.

Alongside a certain amount of the above mentioned explanatory variables - subdivided according to personal characteristics, husband's characteristics, household characteristics and regional characteristics -, individual hourly wage rate, the woman's occupational status, and the already mentioned remaining-household net income are taken into account in the corresponding specifications.

Furthermore, as a simultaneous system we included all other endogenous activity hours from paid work, housework, children and DIY as well as their corresponding pre-period values into each equation of every intertemporal labour force participation strategy.

Each of the various system specifications in the subsequent Tables fulfils the identification requirements of a simultaneous system. The values of the explanatory variables are those after each move (j=1 and 2) or rather to the end of the observed period of time (wave 4, 1987) (j=0 and 4) analogically to the process and substanciated by the participation analysis. We concentrate on four intertemporal labour force participation strategies and analyse with Tables 5.1, 5.2, 5.3 and 5.4 the corresponding multiple time allocation of married women who are permanently not employed (j=0), entering (j=1) and leaving (j=2) the labour market and those in a permanent employment (j=4)[7]. We will not discuss the results of these four estimated simultaneous equations systems

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7)   Since in the first wave (1984) the time for housework and child rearing was collected as one variable, it only was possible to include 93 instead of 141 (resp. 147) observations for the consideration of the lag-endogeneous size for women entering and leaving the labour market.

Table 5.1: Married Women's Multiple Time Allocation in Paid Work and Housework in Intertemporal Labour Force Participation Strategies: Simultaneous Estimations with C3SLS for Women Permanently not Employed

Last wave (1987)	Hours/usual working day: Permanently not employed			
j=0	Paid Work	Housework	Child rearing	DIY
ENDOGENOUS VARIABLES[1]				
Hours				
Paid Work				
Housework			0.741**	0.192
Child rearing		0.672*		-0.134
DIY		0.885	-0.550	
HOURS IN THE PREVIOUS PERIOD[2]				
Paid Work (t-1)				
Housework (t-1)		0.264	-0.304	0.246
Child rearing (t-1)		-0.709**	0.974***	0.135
DIY (t-1)		0.480	-0.633	0.364
PERSONAL CHARACTERISTICS[3]				
Education/10 (years)		0.520	-0.905	-0.424
Apprenticeship/100 (years)				3.590
Occupational experience				
Full time/1000 (months)		0.376		-0.476
Part time/1000 (months)		0.494		-0.948
Health				
Subjective disabled[4]		0.087	-0.052	-0.082
Registered disabled[5]		0.038	0.284	-0.259
HUSBAND'S CHARACTERISTICS				
Occupational Status				
Employed		0.040	0.204	-0.207
Self-Employed		-0.768	1.100	0.396
HOUSEHOLD CHARACTERISTICS				
Household Size		0.417	-0.288	-0.279
Children in age groups:				
0 - 6 years		-0.121	0.277	0.008
7 - 10 years		0.372	-0.294	
11 - 15 years			0.054	
Remaining-household net income/1000		-0.177	0.227	-0.041
REGIONAL CHARACTERISTICS				
Unemployment rate		0.031	-0.029	-0.031
Tax revenue/1000 inhabitants		0.360	-0.733	0.003
Constant		0.518	0.806	-0.100
Lambda		-0.439	0.308	0.109

1) Endogenous variable from last wave (wave 4/1987)
2) Pre-period and explanatory variables from wave 3 (1986)
3) Explanatory variables from last wave (wave 4/1987)
4) 1 = absolutely not, 2 = a little, 3 = a lot
5) 0 = no, 1 = yes

Level of significance: * (90%), ** (95%), *** (99%)

Source: German Socio-Economic Panel Wave 1 (1984) to Wave 4 (1987); Longitudinal Dataset (n=1880), Own Computations.

Table 5.2: Married Women's Multiple Time Allocation in Paid Work and Housework in Intertemporal Labour Force Participation Strategies: Simultaneous Estimations with C3SLS for Women Leaving the Labour Market.

Time period after leaving j=2	Hours/usual working day: Leaving the labour market			
	Paid Work	Housework	Child rearing	DIY
ENDOGENOUS VARIABLE				
Hours				
Paid Work				
Housework			0.135	-0.411***
Child rearing		0.092		0.038
DIY		-1.882***	-0.054	
Hours IN THE PREVIOUS PERIOD[2]				
Paid Work (t-1)		-0.084	-0.048	-0.017
Housework (t-1)		0.698	-0.159	0.290
Child rearing (t-1)		-0.042	-0.543*	0.009
DIY (t-1)		0.674	0.354	0.285
PERSONAL CHARACTERISTICS[3]				
Education/10 (Jahre)		-3.553	1.504	-1.818
Apprenticeship/100 (years)				3.490
Previous experience				
Full time/1000 (month)		-0.680		-0.063
Part time/1000 (month)		-7.578		-2.902
Health				
Subjective disabled[4]		-0.180	-0.513	-0.144
Registered disabled[5]		0.188	0.549	0.029
HUSBAND'S CHARACTERISTICS				
occupational status				
Employed		-1.597	1.977	-0.720
Self-Employed		-0.036	0.535	-0.038
HOUSEHOLD CHARACTERISTICS				
Household Size		-0.122	-0.239	-0.060
Children in age groups:				
0 - 6 years		0.150	6.924***	-0.150
7 - 10 years		0.120	2.686**	
11 - 15 years			1.774*	
Remaining-household net income/1000		-0.141	0.296	-0.059
REGIONAL CHARACTERISTICS				
Unemployment rate		-0.136	-0.139	-0.074
Tax revnue/1000 inhabitants		-1.630	-0.586	-0.870
Constant		13.573	2.065	6.265*
Lambda		-0.344	-0.665	-0.157

1)   Endogenous variable from wave after each move
2)   Lag-endogenous variable from wave before each move
3)   Explanatory variable from wave after each move
4)   1 = absolutely not, 2 = a little, 3 = a lot
5)   0 = no, 1 = yes

Level of significance: * (90%), ** (95%), *** (99%)

Source: German Socio-Economic Panel Wave 1 (1984) to Wave 4 (1987); Longitudinal Dataset (n=1880), Own Computations.

in detail, but emphasize each important explanative pattern. The reader interested in further results will turn to the Tables.

If we consider the explanatory power of the endogenous variables, the lagged variables, the personal characteristics, and the husband's characteristics as a whole, we are more successful in explaining the individual time allocation for women entering the labour market and being permanently employed than for the permanently non employed and those leaving the labour market. Let us, therefore, observe both respective groups together.

Women leaving the labour market and being permanently not employed

Children prove significant for the time allocation of women leaving the labour market as well as for the permanently not employed (Tables 5.2, 5.1): For the former, younger children in the period withdrawal from the labour market, for the latter, time spent in child rearing in the pre-period (is significant). Among permanently not employed women, the hours for housework and child-rearing are significantly correlated. This correlation is not found among those leaving the labour market. In that group, housework and DIY compete with one another for higher hours after paid work has been given up: however, more hours spent on housework is only partly diminishing (- 41%) DIY time. Yet, this mutual dependence is asymmetrical: for those dedicating themselves more to DIY, time spent on housework decreases over-proportionally (-1.882); here, time movements also takes place into other activities.

Altogether, it becomes obvious for both of these labour force participation strategies (j=0,2 and Tables 5.1, 5.2), that personal characteristics such as education, apprenticeship or previous experience, health, husband's characteristics or regional characteristics provide no significant explanative power for the final individual hours spent in market- and non-market activities; an interesting result.

Women entering the labour market and women in permanent employment

Now, let us turn our attention to the time allocation of the permanent employed and those entering wage employment (Tables 5.4, 5.3), to whom the indicators we just mentioned make a particularily significant explanatory contribution. For both these intertemporal labour force participation strategies, job, housework, child-rearing, DIY and the remaining activities compete for the available time.

Table 5.3: Married Women's Multiple Time Allocation in Paid Work and in Housework in Intertemporal Labour Force Paticipation Strategies: Simultaneous Estimations with C3SLS for Women Entering the Labour Market.

Time Period after Entry	Hours / Usual Working Day: Entering the Labour Market			
j=1	Paid Work	Housework	Child Rearing	DIY
ENDOGENOUS VARIABLES[1]				
Hours				
Paid Work	-	0.785***	-0.576**	-0.216*
Housework	1.114***	-	0.656**	0.214**
Child Rearing	-0.954***	0.621***	-	-0.206**
DIY	-1.612	1.076	-1.203	-
HOURS IN THE PREVIOUS PERIOD[2]				
Paid Work (t-1)	-	-	-	-
Housework (t-1)	-0.200	0.171	-0.130	-0.024
Child Rearing (t-1)	0.345***	-0.194	0.433***	0.082
DIY (t-1)	0.827*	-0.514	0.639	0.431***
PERSONAL CHARACTERISTICS[3]				
Wage Rate/10	0.085	0.153	0.026	0.247*
Education/10 (years)	5.435	-3.696**	2.659	3.012**
Apprenticeship/100 (years)	-7.059	-	-	-15.594*
Occupational Status				
Worker	-0.033	-0.069	-0.429	-0.270
Clerk	0.244	-0.347	-0.343	-0.337
Civil Servant	3.888**	-3.187**	2.091	0.796
Self-Employed	2.138*	-1.923*	0.799	0.215
Previous Experience				
Full Time/1000 (months)	-5.381	5.083	-	-1.350
Part Time/1000 (months)	-	-	-	-1.185
Health				
Registered Disabled[4]	0.185	0.229	1.510	-
HUSBAND'S CHARACTERISTICS				
Occupational Status				
Employed	-0.364	0.421	-0.400	0.129
Self Employed	-1.586	1.127	-1.966	-0.183
HOUSEHOLD CHARACTERISTICS				
Household Size	-1.295***	1.134***	-0.638	-0.243
Children in Age Groups				
0 - 6 years	1.430*	-1.019*	1.439**	0.291
7 - 10 years	-	-	0.065	-
Remaining Household Net Inome/1000	-0.189*	0.164**	-0.107	-0.039
REGIONAL CHARACTERISTICS				
Unemployment Rate	-0.180*	0.150*	-0.119	-0.041
Tax Revenue/1000 Inhabitants	-	0.136	-0.264	-
Constant	5.923	-4.768	4.855	1.034
Lambda	-0.476	0.260	-1.201	0.037

1) Endogenous variable from wave after entry
2) Lag-endogenous variable from wave before each entry
3) Explanatory variable from wave after each entry
4) 0 = no, 1 = yes

Level of significance: * (90%), ** (95%), *** (99%)

Source: German Socio-Economic Panel Wave 1 (1984) to Wave 4 (1987)
Longitudinal Dataset (n=93), Own Computations (8/95).

Table 5.4: Married Women's Multiple Time Allocation in Paid Work and Housework in Intertemporal Labour Force Participation Strategies: Simultaneous Estimations with C3SLS for Women Permanently Employed.

Last Wave (1987)	Hours / Usual Working Day: Permanently Employed			
j=4	Paid Work	Housework	Child Rearing	DIY
ENDOGENOUS VARIABLES[1]				
Hours				
Paid Work	-	0.267	-0.999***	-0.282***
Housework	0.592	-	1.220***	0.261*
Child Rearing	-0.697***	0.469***	-	-0.237***
DIY	-3.223***	1.694*	-3.959***	-
HOURS IN THE PREVIOUS PERIOD[2]				
Paid Work (t-1)	0.934***	-0.311	0.976***	0.272***
Housework (t-1)	-0.252	0.370***	-0.475***	-0.105*
Child Rearing (t-1)	0.434***	-0.260***	0.587***	0.144***
DIY (t-1)	0.823***	-0.323	0.929***	0.242***
PERSONAL CHARACTERISTICS[3]				
Wage rate/10	0.142	-0.704	0.730	0.115
Education/10 (years)	-1.014	0.559	-1.132	-0.266
Apprenticeship/100 (years)	1.714	-	-	-
Occupational Status				
Worker	-3.244(*)	1.887	-4.148*	-1.034*
Clerk	-2.644	1.519	-3.382	-0.841
Civil Servant	-2.873	1.735	-3.773(*)	-0.918
Self-Employed	-3.746*	1.900	-4.576**	-1.162*
Occupatinal Experience				
Full Time/1000 (month)	-0.321	-0.565	-	-0.083
Part Time/1000 (month)	-	-	-	-0.000
Health				
Registered Disabled[4]	-0.816	0.503	-1.052*	-0.270*
HUSBAND'S CHARACTERISTICS				
Occupational Status				
Employed	-0.424	0.300	-0.584	-0.147
Self-Employed	-0.386	0.260	-0.501	-0.132
HOUSEHOLD CHARACTERISTICS				
Houshold Size	0.179	-0.009	0.166	0.048
Children in Age Groups:				
0 - 6 years	0.662	-0.529*	1.057**	0.242*
7 - 10 years	-	-	0.092	-
Remaining Household Net Income/1000	-0.006	0.009	-0.014	-0.003
REGIONAL CHARACTERISTICS				
Unemployment Rate	0.019	0.192	0.000	-0.004
Tax revenue/1000 Inhabitants	-	0.124	-0.120	-
Constant	5.653**	-1.107	5.641*	1.550*
Lambda	-0.625	-0.016	-0.522	-0.172

1) Endogenous variable from last wave (Wave 4/1987)
2) Pre-period and explanatory variable 3 (1986)
3) Explanatory variable out of last wave (Wave 4/1987)
4) 0 = no, 1 = yes

Level of significance: * (90%), ** (95%), *** (99%)

Source: German Socio-Economic Panel Wave 1 (1984) to Wave 4 (1987); Longitudinal Dataset (n=600). Own Computations (8/95).

Let us first observe *married women in a permanent employment* (j=4). The mutual dependency of time-allocation in paid work and in the household is emphasized by the highly significant coefficient of the endogenous variables. Child-rearing and housework are positively correlated to one another. Housework and DIY activities are likewise complementary. Hours dedicated to paid work obviously decreases hours spent on child rearing as well as on DIY. It is worth noting that paid work and housework are not significantly dependent on each other. It could be reasoned, that in the case of a permanent employment, long-term arrangements are also met for time spent on housework and that time profile changes rather affect other fields of activities. Persistent time allocation behaviour is expressed also by the high significant time coefficient of the pre-period.

Differences in wages have no significant influence on labour supply nor on hours in household activities in consideration of opportunities costs. This is noteworthy, since the microeconomic approach causes us to expect a sensitiveness. We will come back to this interesting point.

Formal education and apprenticeship, likewise, did not prove significant in this case. In addition to the husband's profession, a few household as well as regional characterictics - the steadiness of a relatively balanced time profile moulded by a permanent job - might explain this attitude.

We find different explanatory pattern of multiple time allocation of women entering the labour market. Here, hours in paid work and hours in housework are significantly correlated positively, which invokes the specific time burden of married women after reentering the labour market. Taking up paid work is to the burden of time spent on child rearing. DIY-activities, however are reduced in favour of the children.

Going into paid work does not radically alter time spent on DIY, only its pre-period value is highly significant. More hours spent on child rearing in the period before starting to work (t-1) increases, after the move, hours in paid work: a particular involvement in child rearing is shifted to paid work when the children have grown older.

It should be stressed that time-use in paid work and household activities of married women entering the labour market is relatively independent of their wages. An interesting result, which, nevertheless, is in so far supported by the determinants of participation, as reasons different from economic necessity, e.g. stronger social integration, are important for the labour force participation of married women.

Yet, where time spent on DIY is concerned, the wage rate is highly significant and has positive influence. This documents that DIY is rather linked to a better income situation:

a result which matches that of another study based on the Secondary Occupation Survey 1984 of the Sfb 3 (Merz and Wolff 1988, Merz 1989a). Linked to this, prolonged education increases hours spent on DIY. However, a prolonged apprenticeship reduces this part of self-reliance in favour of paid supplies.

Previous occupational experience is not, whether from a full- or a part-time occupation, decisive for multiple time allocation of women entering the labour market or permanently being unemployed. This holds for all activities, paid work, housework, child rearing and DIY with one exeption: DIY for those entering the labour market. Specific skills from former occupations no longer determine their future applications. Thus, the human capital approach widely suffers for married women's time allocation entering the labour market or being permanently employed.

Although the husband's occupation still excerted a significant influence on the wife's taking part in intertemporal paid work, this is no longer a decisive factor for the actual time allocation. Other reasons, such as household size and the resulting burden for the woman, prove more important for the time allocation profile.

Finally, regional circumstances are important for time allocation between paid work and household activities. A high local unemployment rate as an indicator for job possibilities (labour demand) in the individual's local area altogether decreases the amount of jobs on offer, i.e. paid work availability. This is of influence, on the other hand, on unpaid work in the home, with more time on housework.

7   Final remarks

We analyzed the dynamics of market and non-market time allocation of married woman with a two step procedure: Via the participation in intertemporal labor force participation strategies with a multinomial logit model (first step), then the selectivity bias corrected simultaneous activity hours equation system (C3SLS) estimates in the second step the determinants of multiple time-use in paid work and in the household with housework, child rearing and DIY.

It has to be emphasized that the different intertemporal labor force participation strategies: entering and leaving the labor market, permanently employed and not employed, causes the need of different explanation of the interdependent multiple time-use. Thus our model specification is strongly supported by the results: In addition, other explana-

tory factors are important for the participation decision and for the final amount of hours spent on the alternatives.

The determinants have been be classified into personal characteristics, characteristics of the husband and of the household as well as especially for this analysis - merged regional economic and labour market indicators with the German Socio-Economic Panel 1984-1987 (waves 1-4).

Altogether, the rather expensive dynamic analysis has shown interesting significant as well as insignificant explanatory pattern, which - also for an international context - are now quantified for the first time extending the traditional focus of labour supply studies mainly focussing on paid work and in a static framework.

Naturally, with respect to the panel design, further progress is to be made regarding the system estimation of limited dependent variables in a dynamic specification. Our study is a reference for this and encouraging for further research.

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