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# Parents' Time, Allocated for Child Care?

*An Estimation System on Parents' Caring Activities*

**PAPERS**

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*Abstract (E):*

*This paper investigates the structural dependency of child care intensity of parents. Therefore a simultaneous equation system has been developed. Furthermore, the respective levels of daily market labour intensity, educational activities, home production duties, child care intensity, and leisure are compared internationally.*

*Abstract (D):*

*Diese Arbeit untersucht die strukturelle Abhängigkeit des Ausmaßes an persönlicher Kinderbetreuung durch die Eltern vom Ausmaß der jeweils eigenen Erwerbsarbeit, der Erwerbsarbeit und zeitlicher Kinderbetreuungsintensität des Partners, dem Alter der Kinder und anderer gezielt eingesetzter empirischer Größen. Zur Analyse wurde ein ökonometrisches Mehrgleichungssystem entwickelt, anhand dessen die Abtausch- und Ergänzungseffekte veranschaulicht und weiter analysiert werden. Darüber hinaus werden Lage- und Streuungsmaße von marktarbeits- und ausbildungsbezogenen Aktivitäten, haushaltsrelevanten Tätigkeiten, Kinderbetreuung und Freizeitgestaltung mit den Werten ausgewählter Länder international verglichen.*

# Content

# 1 Introduction

In many scientific studies and political discussions the trade-off between parent's (especially mother's) market working time and time for childcare have been discussed. In several economic studies within the field of 'new home economics' the activity space does not only consist of market work and consumption (time), also home production, human capital investment, childcare and leisure have to be considered. At least due to a standard time restriction for each individual (say 168 hours a week), these activities are highly interrelated. As some activities can be substituted by market services and/or respective activities of the partner or other persons while other activities happen to be executed jointly, these dimensions are also highly interrelated within and across households.

Especially parents with small children are considered to be under higher time pressure. Is this statement empirically provable or does it 'just' reflect the transformation process following the critical event 'birth of (another) child' all young parents have to pass? Within this transformation process the usual day course, individuals have become used to and/or partners have agreed on, has to be broken up in favour of the young child. As individuals are often not prepared to reduce obligations – market work, social engagement, home production, human capital formation, as well as recreation activities – sleep, personal care, leisure activities – to the adequate level, time conflicts have to arise. Within last decades these obligations have risen more sharply for women. The catch-up process of women in the field of labour market participation and the required equalization in education (meanwhile in most OECD-countries a considerably higher proportion of women with high school diploma have enrolled in universities than young men do) was not compensated by higher engagement of men within home production activities. Also, changes in female labour market participation have to be considered within the context of higher separation rates (hence increased risks) and the increased frequency of single parenthood phases. Single parents are more vulnerable to both, time and budget restrictions.

This article focuses on the substitutionability of main time use categories for both genders via econometric methods. At this stage,  the analysis concentrates on the substitutionability of the activity ''child care''. Further research will broaden the spectrum to all five categories of main activities (market labour participation, education, home production, child care, and leisure activities).

## 2 Economic model on child care intensity

Typically, economic models of home production do not consider child care, neither as an item to optimize nor as an element of the restrictions. The activities considered are (market) labour supply, home production and leisure. Although this approach is far more convincing than the standard trade-off models, where just market labour and leisure are considered as dichotomies, it falls short in analyzing the trade-off of concrete activities. So economic theory is not too conclusive about child care and its implications depend strongly on what it is assumed with. Some approaches subsume child care as a form of household production, others consider it as "preferred leisure". Within the traditional Becker-Gronau models[1] comparative advantages are determining the allocation of time. Like in Riccardo's seminal work on comparative cost advantages of nations, the Becker-Gronau approach discovers specialisation in activities (labour market participation vs. home production) as the driving factor in household productivity. Households in which members have specialized entirely will gain most.

Within cooperative bargaining models[2] the outcomes are quite comparable: As partners seek to achieve Pareto-efficient allocations, specialisation that utilizes economies of scale seems inevitable. Contrary to the classical home production models, bargaining aproaches define rationales for leaving a partnership when a partner does not achieve at least his/her reservation utility level.

Most models following one of these approaches consider (amounts of) goods and leisure time as the sole input to the utility function. This approach[3] considers all activities as – more or less – preferred inputs. In order to stress out parents' preference on child quality [C], following Becker's definition[4], child quality is set explicit within the utility function and a production function of child quality (1.1)(a) is added to the standard home production model.

$$
\begin{aligned}
&\max\ U(X, C, t_n, t_l, t_c, t_h) \\
&\text{s.t.}\quad (a)\ \ C = c(t_c) \\
&\qquad\quad (b)\ \ X = x(t_h, (wt_n + Y)) \\
&\qquad\quad (c)\ \ T = t_n + t_h + t_c + t_l
\end{aligned}
\tag{1.1}
$$

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[1] A detailed treatise of this topic can be found in Becker (1993). A wider version of these seminal models that extends the classical dichotomy – market labour & leisure – as well as Becker's dichotomy – market labour & home production – to the optimisation of all three categories home production, labour supply and leisure can be found in Gronau (1977,1986)

[22] Manser/Brown (1980) and McElroy/Horney (1981) found this new way of analysing intra-household resource allocation. In contrast to the Becker-Gronau approach these bargaining models emphasize the fact that resource allocation (the most important resource is time; time invested in labour supply, leisure, or home production) has to be negotiated between partners and is not decided by a – more or less – "benevolent dictator".

[3] like Juster's (1995)

[4] Becker (1993)

Goods and services [X] can be bought on markets or produced at home[5]. Therefore the "production function" for goods and services is limited by wealth and by time for home production [$t_h$]. The four activities considered sum up to total time available. While activities for market work [$t_n$], household production[$t_h$], and child care [$t_c$] are defined taxatively, leisure [$t_l$] – like in most models of home production – serves as rest category.

$$\frac{\partial U}{\partial t_n} + \frac{\partial U}{\partial X}\frac{\partial X}{w\partial t_n} = \frac{\partial U}{\partial t_c} + \frac{\partial U}{\partial C}\frac{\partial c}{\partial t_c} = \frac{\partial U}{\partial t_h} + \frac{\partial U}{\partial X}\frac{\partial X}{\partial t_h} = \frac{\partial U}{\partial t_l} \tag{1.2}$$

First order conditions for an optimal solution state that marginal utilities for market work, home production, child care and leisure have to be equal. Utility form market work comes in two ways: first, directly as a process benefit and second, indirectly as consumption benefit of market goods. Analogously the utility gain from home production separates in the direct process benefit and the consumption benefit. The utility of child care also has two sources: first the direct process benefit and second the effect of child quality on the agent's utility. Just leisure – pure leisure, where no consumption is done – consists solely of the process benefit. Like in standard home production approaches all these marginal utilities are positive but decreasing. This implies that the higher the marginal utility of an activity is, the more time will be used for it. The result of a change in the wage rate or an exogenous variation in the marginal product of home production or child care will also depend on accompanying changes in marginal utilities (second-order derivatives of the utility function). If the income effect of a change in the wage rate dominates the substitution effect, an increase in the wage rate [w] will increase market consumption and/or decrease market labour. A decrease in market labour can increase leisure and/or home production and/or child care. Due to second order properties the marginal utility of every activity increased will strictly decline. If the marginal utility for child care decreases less than marginal utilities of leisure and home production respectively, more time will be allocated to children.

Given the marginal product of child care [$\partial c/\partial t_c$] increases exogenously (some kind of "productivity shock" in child care) and the marginal process benefit for child care [$\partial U/\partial t_c$] is sufficiently high, more time will be allocated to children while at least one of the other activities has to be reduced. If the productivity raising children is related to parents' education, then well-educated parents are likely to produce more child quality than less educated ones. Whether well-educated parents will therefore invest more time to their children depends on how quickly the marginal utilities decline with increasing quality. Differences in marginal utility of child quality may compensate differences in productivity. As high education levels of the parents typically go along with higher wages and higher intrinsic motivation, the overall effect of schooling on child care intensity[6] stays obvious[7].

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[5] For simplicity, no joint production is assumed, so either a good is purchased or produced at home. Of course, most commodities bought on markets have to be prepared for consumption first, so some home production is necessary anyway.

[6] Throughout this text "intensity" has just quantitative meaning!

[7] Another stylized fact shows that high educated parents tend to have less children. Following Becker's approach, high educated parents prefer high child quality on cost of children's quantity.

In addition the substitution of activities between the partners become important to analyse. While the traditional Becker-Gronau home production approach does not emphasize this issue at all – as the home production models just have one deciding dictator, resource reallocations depend entirely on the marginal values of his/her utility function, regardless the degree of altruism within the dictator's preferences.

Clearly institutional child care can reduce the parents' child care intensity. As long as (1.3) holds, additional institutional child care will be demanded[8].

$$\frac{\partial U}{\partial X} - \frac{\partial U}{\partial C}\frac{\partial icc}{\partial t_{icc}} \leq \left( \frac{\partial U}{\partial t_h} + \frac{\partial U}{\partial X}\frac{\partial X}{\partial t_h} + \frac{\partial U}{\partial t_l} + \frac{\partial U}{\partial t_n} + \frac{\partial U}{\partial X}\frac{\partial X}{w\partial t_n} \right) - \left( \frac{\partial U}{\partial t_c} + \frac{\partial U}{\partial C}\frac{\partial c}{\partial t_c} \right) \qquad (1.3)$$

To sum up, this analysis suggests the following:

- Activities are highly interdependent. This fact also has to be mentioned in empirical studies that do not observe all kinds of activities.
- An activity will be emphasized, when its marginal process benefits have become comparably high.
- There is no clear prediction on the effect of education.
- The signs of the interdependency of child care intensity of the partners depends on whether child care is a gross substitute or a gross complement to the agents. When there are strong preferences for joint activities (children and both partners), child care will turn out to be a gross substitute.
- The substitutionablity of child care between partners does not primarily depend on any relations of marginal utilities but on the partners' bargaining power.
- Availability and affordability of institutional child care will increase the other activities proportionally to their relations in (changed) marginal utilities.

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[8] The fist term in (1.3) – left hand side – reflects the market price of institutional child care, the second the productivity of the institution, both valued by the agent's preferences. On right hand side the direct process benefits and marginal utilities of marginal products of all alternative activities MINUS the substituted at-home child care – if any – (again: marginal process benefits plus marginal product of child quality production) are depicted.

# 3   Data

The dataset consists of the Austrian Time-Use-Survey 1992 (AutTUS) designed and executed by the national statistic institute ÖSTAT (now: Statistics Austria; ST.AT), some additional comparisons were made with harmonized data from Italian, Norwegian and German time-use surveys, implemented in the Multinational Time Use Surveys database (MTUS) constructed and maintained by the ISER institute, University of Essex, Colchester, GB.

The AutTUS is conducted as special programme to the Austrian microcensus surveyed in March and September 1992[9]. The microcensus' sample design is a random household sample drawn from the general census 1981. A random sample of households in new dwellings built from 1981 to 1991, drawn from register data, is added. The sample size of each wave of the Austrian microcensus is about 42,000 households, 58,000 persons, or 1% of the total household population. An eight of the sample is replaced for each wave, so every household should be investigated for eight waves or two years. Therefore it is possible to link information of different successive waves on the individual or household level.

Within the first wave 1992 (March) all persons within the sample older than 10 years and with a head of household born from January to June were asked to answer the time use survey. Respective persons with head of household born in the second semester were targeted in the third wave (September 1992). 25,233 individuals submitted a valid questionnaire and diary to be implemented to the dataset. This design enabled the researchers to link the information of the two subsamples with the questionnaire of the second wave (standard microcensus programme with an additional labour force survey) that gave additional insight on household structure and its short termed dynamics, labour participation etc. As neither of the three surveys has items on income levels included, this information has to be linked from surveys executed in 1991 and 1993 respectively. Regretfully, although all households should have been interviewed in one of these two waves, data linkage over larger time spans are generally less efficient, because too many additional households and/or individuals occur to drop out for several reasons. Some can't be found, because they have moved to other locations, some are living in their second domicile, some left the targeted household, others joined the household during the interviewing period so that no information about all items asked in previous waves are available etc. Beside the lack on continuity, the income questionnaire aims on the net income of employees, so no information on the net income levels of self-employed is available.

The time use survey has following design: the survey period begins at 4:00 a.m. of the day chosen by the respondent. The day is separated to 84 time slices, 15:00 minutes slices from 4:00 a.m. to 11:00 p.m. and 30:00 minutes slices from 11:00 p.m. to 4:00 a.m. next day. The respondent writes his/her activities to a diary. For every time-slot he/she has to note his/her primary and secondary activity (e.g. primary activity level: cooking, secondary activity level: watching TV). The respondent has to assign the level of activities his/herself. For each time-slot additional information is available:

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[9] A Time Use Survey executed twice within a year reduces seasonality considerably. Nevertheless, some activities – like gardening – are quite intensive in these two periods, so we have some minor seasonality left.

- with whom was the primary activity done[10]
- was the primary activity done in favour for another household[11]
- where the activities were executed – at home or outside

Only a small section of the rich time use information will be used within this study. The activities[12] reported are aggregated to six main categories:

- market labour supply (and associated activities)
- education
- home production
- child care
- leisure
- personal duties[13]

These aggregated categories are compared among selected European countries by standard descriptive statistics. As child care and its interrelation to the other aggregates is investigated, the comparison focuses on the age group [20-49]. In order to compensate for dissimilarities in legal working hours – especially on the weekend – the comparison is restricted to weekdays. Just primary activities were compared[14].

The analytical part of the paper will focus on the interrelation of child care activities to labour market participation. As most important items of the analytical models have not been transmitted to the MTUS database[15], the analytical model restricts itself to the Austrian survey. In the appendix these results are compared to a quite similar model for Sweden. Different to the descriptive part, the analytical part relaxes the adults' age boundaries, but is restricted to couples with children aged up to 15 with no additional adult in the household. This very restrictive sub-sample design enables us to model the substitution of child care between partners[16].

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[10] As all household members wrote their diary for the same day, individual as well as collective activities can be observed.

[11] This item is an innovative new element to TUS studies. Studies on altruism in favour of persons outside the actual household became more evident.

[12] 202 categories

[13] sleeping and personal care,

[14] The implementation of secondary activities would already cause serious problems regarding weights: how intensive is the secondary activity?

[15] as the surveys included in the MTUS were not harmonized in advance, the ex-post harmonisation done by the MTUS-developers just can aim on items surveyed in all countries

[16] households with more than two adults (perhaps even children over 15) would bias the results considerably

# 4 Child care intensity at a glance

Within this section average levels and distributions of the five main categories of activities will be compared in three dimensions:

1. Austrian women and men by age cohort[17],
2. gender differences, and
3. differences to Germany, Italy and Norway[18]



| | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 |
|---|---|---|---|---|---|---|
| ☐ Leisure | 3,7 | 3,4 | 3,2 | 3,1 | 3,1 | 3,3 |
| ■ Child Care | 0,8 | 1,7 | 1,7 | 0,9 | 0,4 | 0,3 |
| ☐ Home Production | 2,8 | 4,2 | 5,0 | 5,0 | 5,3 | 5,6 |
| ☐ Education | 0,7 | 0,2 | 0,1 | 0,1 | 0,1 | 0,0 |
| ■ Market Labour | 5,7 | 4,4 | 3,8 | 4,7 | 4,7 | 4,6 |
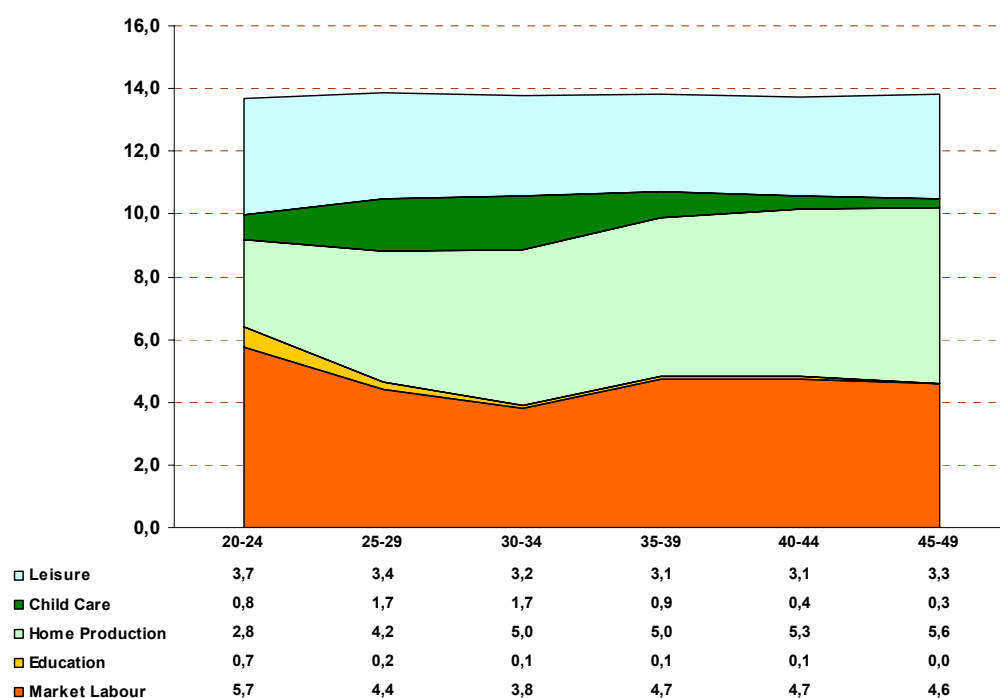
**Figure 1:** Females' activities on weekdays (AUSTRIA)

Austrian women tend to substitute their need for child care by reducing labour market participation. For elder cohorts average labour participation returns to - on average - more than 4.5 hours per weekday. The higher labour market participation of the youngest cohort observed [age 20-24] perceives a different behaviour in the pre-family phase and/or a cohort effect, as younger cohorts generally seem to be prepared to participate more strongly. Compared to the other three European countries, significant differences become evidable: While in Austria the participation stays quite constant for elder cohorts, it still declines in Germany and even in Italy, where overall labour market participation of women starts at

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[17] as the surveys are cross-sectionals, the age effect (= age specific time allocation behaviour) can not be distinguished from the cohort effect. So, the values of an elder cohort can not be interpreted as expected values for the following cohorts in respective future

[18] Figures for these three countries are depicted in the appendix (A.1). As the sample size of Norwegians is quite compact, the variations shown can be partly be ascribed to this fact

considerably lower levels. In Norway labour participation rises continuously from cohort [25-29] on. Nevertheless, regarding the extent of labour participation, Austria and Norway show comparable results.

The labour intensity distribution for female age cohorts [25-39] underline these obersations (Figure 3). The median of asignable hours in paid work (3.0) lies clearly above the value of Italien women within this age cohort (1.25) and even exceeds the Norways' median (2.75) slightly. German women whithin this age cohort show different behaviour (4.5). The distribution of hours in paid work for German women seems to be more symetric than in all other countries observed.

Men's labour participation is, as expected, generally high, according to full employment. More than 10% of men of the enlarged age cohort [25-39] are not working, while on the other side more than 10% invest more than 12 hours in work and work-related duties. The median at (9.75) lies clearly above the mean values for all three subcohorts, indicating a significantly right-skewed distribution. Comparing men's age cohorts a stability of work ( + education) can be seen that seems to stabilize the other activities too. Just the outer cohorts seem to be less time demanding in respect to market labour. The greater unemployment risk of the elderly and – connected – high chances of early retirement, which was quite common in the beginning of the 90ies, as well as the lower requirement for market labour for young people in education, are reflected here. Italian man and especially Norwegians show significantly lower men values per age cohort. Even German men assign continuously less time to market work and related activities.

Education activities are far less executed by Austrian women. Surprisingly Italian women in the youngest cohort observed exhibit far most educational attainment (1.5) followed by Norwegian females (1.3) within corresponding age bounds.

| | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 |
|---|---|---|---|---|---|---|
| ☐ Leisure | 4,7 | 3,8 | 3,7 | 3,5 | 3,5 | 3,8 |
| ◼ Child Care | 0,0 | 0,2 | 0,4 | 0,3 | 0,1 | 0,1 |
| ☐ Home Production | 1,1 | 1,3 | 1,3 | 1,6 | 1,3 | 1,5 |
| ☐ Education | 1,1 | 0,4 | 0,1 | 0,1 | 0,1 | 0,0 |
| ◼ Market Labour | 7,0 | 8,6 | 8,8 | 8,8 | 9,2 | 8,7 |
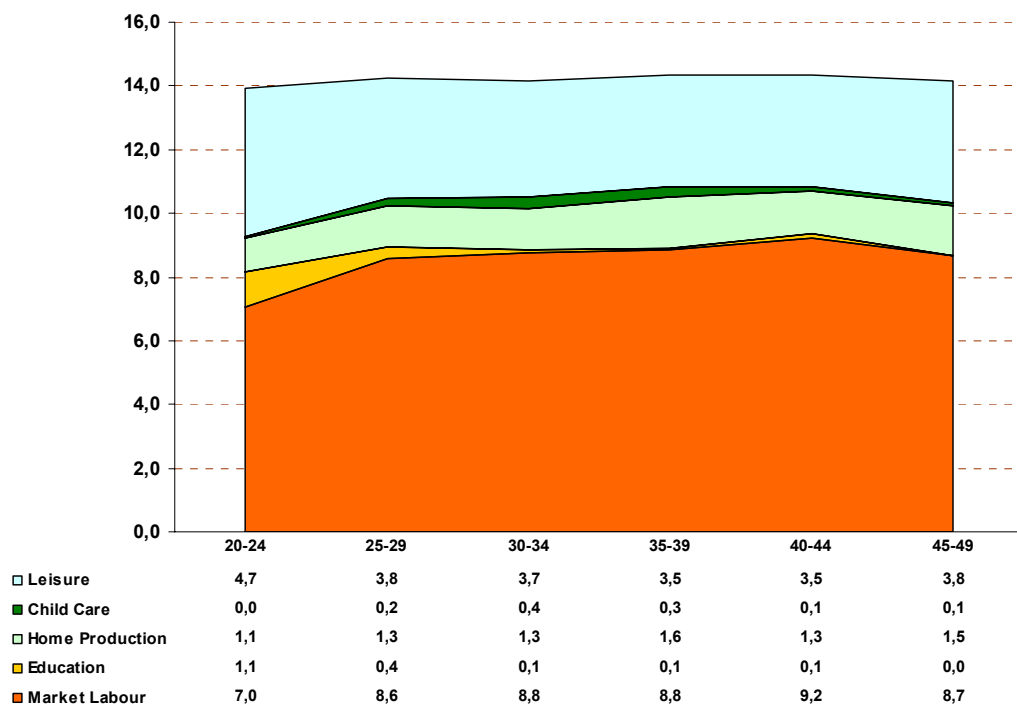
**Figure 2:** Males' activities on weekdays (AUSTRIA)

Looking at Figure 1 at a glance, Austrian women obviously substitute their increased time demand for child care by substituting market labour. Leisure is also reduced by a small fraction in favour of child care. Time for home production rises continuously with age. In case of women in Germany the reduction of labour participation also recognizable, the return to the "standard" labour intensity when children have grown up, is clearly missing. This is quite surprising, as a high share of women in the new provinces (former GDR) had still worked full-time in 1991. Although labour is reduced with rising child-care-demand, German woman seem to reduce leisure more, but remain at considerable higher levels. The effect of reducing primarily leisure as child-care-demand rises can be seen most striking in case of Italian women. Household production enlarges monotonously at highest increase rates, while leisure expels rather low average values. Norway's women show definitely highest values in age-specitic leisure levels and in addition leading position in child care intensity. Home production is much more shared by genders, market work intensity is clearly below Germans' and Austrians' level (at cohort [30-34] Austrian women have their downward peak in labour participation, where Norwegians' levels are undercut.)
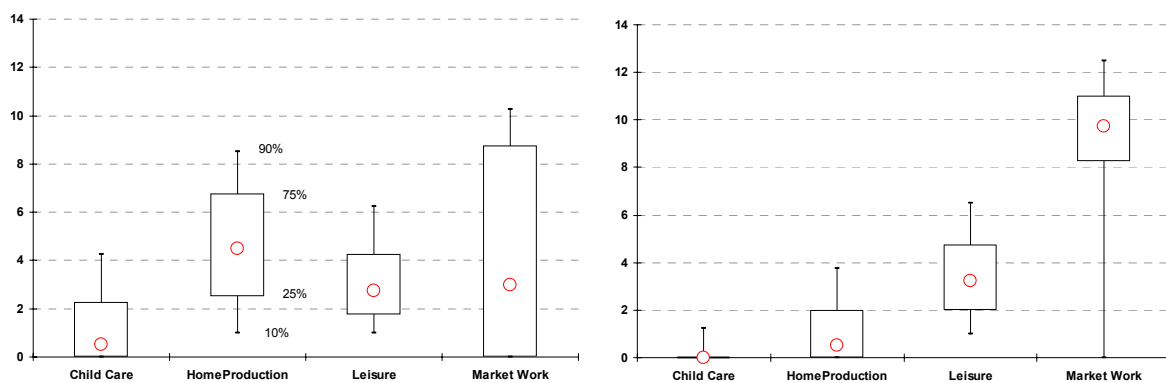


**Figure 3:** Distribution of females' (left) and males' activities on weekdays (AUSTRIA)

Child care participation seems to be similarly unpopular to Austrian and German males, even Italian levels are beneath. In case of home production German males participate comparable to Norwegian men, Austria's man are clearly defeated, Italian's men show maximum minimum.

This comparisons were subjected to all adults in the respective age cohorts in order to get an impression on the position of Austria's parent generation in respect to the activities investigated. In the following chapters a representative, stratified sample of Austria's parents with at least one child below age 15 will be investigated.

# 5  Econometric approach

The analytical part in section 2 gives some idea  about the direction of changes in child care intensity due to  variations in wages, availability of institutional child care, process benefits, and productivities, but, empirical analysis is  still needed, first, to verify results and, second, to specify magnitudes. The strategy here is not to estimate a full structural model that requires a set of additional specific assumptions about functional forms of the respective utility functions and the bargaining rules between the spouses, but still to engage a model that recognizes the joint dependence of time allocated  to different activities  and the interdependence  of the partners' time investments.

Considering the general debate on reducing hours of work for parents in order to free time for their children, it is interesting  to get a direct measure  of the effect of variations  in market  time  on time with children. This is the leading motive for including total market labour time as an explanatory variable. A similar argument stands for the implementation of institutional child care. As a matter of fact the Austrian TUS does not provide information about the time the child has spent in the day care  centre. Instead a dummy variable is given for "in general, the household uses institutional child care", that can only be slightly improved with a rudimentary full-time vs. half-time distinction. No information is given whether the respective child has been in institutional child care on the day surveyed. For this reason the OLS parameter estimates for institutional child care were insignificant[19].

$$t_c^{*f} = \alpha_0 + \alpha_1 t_c^m + \alpha_2 t_n^f + \alpha_3 t_n^m + \alpha_4 X^f + \alpha_5 X + \varepsilon^f$$
$$t_c^{*m} = \beta_0 + \beta_1 t_c^f + \beta_2 t_n^m + \beta_3 t_n^f + \beta_4 X^m + \beta_5 X + \varepsilon^m$$

(5.1)

As all final models showed insignificant  $\alpha_0$ and $\beta_0$ values, constants were excluded. The child care intensity $[\, t_c^{*i} \; ; i = f, m \,]$ therefore is estimated as a linear function of the partner's child care intensity $[\, t_c^{j} \; ; \; j \neq i \,]$, the time allocation in market labour of both spouses $[\, t_n^{i} \,]$ $[\, t_n^{j} \,]$, individual characteristics $[\, X^i \,]$ (education level) and household characteristics $[\, X \,]$ (size of dwelling[20], more than one child, age categories of youngest child).

There are two econometric problems to be solved: The first concerns employment status. With non-employed women typically corner solutions arise. However, using employed women only may introduce significant sample selection biases in the estimates, especially in the estimation of child care intensities. The second problem concerns the possibility that the child care equations are still correlated with other activities. If the residuals of the time allocation equations are correlated, OLS estimates will not be efficient. Both problems should be handled by introduction of an instrumental variable (IV) estimator for

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[19] Nevertheless, this item improved  the 2SLS  estimator.
[20] An indicator for household wealth

all exogenous activities of the model. Therefore a 2SLS procedure was developed[21]. Within this version an "algebraic" form of the 2SLS procedure was used. Comparable models[22] use a functional form instead.

$$\mathbf{y}^* = \mathbf{X\beta} + \mathbf{\varepsilon} \tag{5.2}$$

$$\mathbf{X}^* \equiv f(\mathbf{Z}) + \mathbf{\eta} \tag{5.3}$$

$$\mathbf{y}^{**} = f(\mathbf{Z})\mathbf{\beta}' + (\mathbf{\varepsilon}' + \mathbf{\eta\beta}') \tag{5.4}$$

So, given an estimator (5.2) is biased due to some systematic correlation, this estimator can be considerably improved by defining instrumental variables, that estimates the values of the exogenous variables (5.3). this estimator is expected to be less biased than the original data. The estimation for the endogenous variable is then changed to (5.4).

$$t_c^{**f} = a_1 t_c^{*m} + a_2 t_n^{*f} + a_3 t_n^{*m} + a_4 X^f + a_5 X + e^f$$
$$t_c^{**m} = b_1 t_c^{*f} + b_2 t_n^{*m} + b_3 t_n^{*f} + b_4 X^m + b_5 X + e^m \tag{5.5}$$

So, for estimating the endogenous activities instrumental variables have to be defined (5.5). Within the AutTUS dataset following items succeeded as estimators for the activities selected:

Dummies:

- household is living in urban regions
- household gets (costless) help for child care from relatives, neighbours etc.
- household uses some institutional child care facilities
- household gives (costless) help for child care from relatives, neighbours etc.
- HH receives paid assitance on home production and/or child care
- household gives/gets assistance; several home production activities (2*4 categories)
- household owns the dwelling
- household owns second dwelling (for weekends etc.)[23]
- person is non-Austrian citizen
- person has university degree[24]

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[21] In fact the OLS estimators in section 6.3 are quite biased due to this correlation. In the appendix (A.6) the error term distribution is depicted; on left hand side the OLS estimator's error terms, on right hand side the 2SLS residuals

[22] Halberg/Klevmarken (2003) or van den Brink/Groot (1997) use a 3SLS resp. 2SLS procedure, where they try to control for this sample selection bias by including the inverse Mills ratios based on a Probit equation on labour participation within the time allocation equations. As in the Austrian dataset the wage information is insufficient, this approach was not followed.

[23] Additional indicators for household wealth. Improved the 2SLS estimator, but interaction terms with item "homesize" and/or "size of family" did not show any significant outcome.

[24] in addition to education levels – as a steady growth of child care intensity with education is evidable, but with highest level (university degree) this behaviour reverses, re-entering this item improves the estimator

- person is self-employed
- diary was filled in on  weekend
- diary day was extraordinary for respondent (illness, holyday, …)
- partner has university degree
- partner is self-employed

Continuous / ordinal:
- age
- age squared
- partner's  age
- partner's  age sqared
- partner's education level

What can be expected? The mother's and the father's time in child care activities are assumed to be substitutes, so that $\alpha_1 < 0$; $\beta_1 < 0$. In fact in families with high time pressure this can be proved. On the other  hand, if the partners show high marginal benefits for child care and  for joint activities,  the signs can be reversed. Own market work is expected to decrease time with children, so that $\alpha_2 < 0$; $\beta_2 < 0$ can be assumed. If one spouse works long hours, the other is expected to substitute the lack in (expected) child care activity. So, $\alpha_3 > 0$ ; $\beta_3 > 0$ should be expected. The effect of education on child care is generally assumed to be positive. Number of children and age class are expected to be positive. On the other hand these two items generally force higher specialisation, so – in case of men – this particular effect stays arbitrary.

In this paper 2SLS as well as OLS outcomes will be presented. Although OLS estimators are expected to be biased in some respects, they show robust estimates. The 2SLS estimators are expected to trade off some of this initial robustness against reduced biases. The efficiency of the 2SLS estimators can only be evaluated in comparison with the underlying OLS models.

The 2SLS approach is – of course – just a reduced version of an integrated simultaneous equation system of all activities considered.

$$
\begin{aligned}
\mathbf{t^f} &= \boldsymbol{\alpha}_0^f + \mathbf{T^f}\boldsymbol{\alpha}_f^f + \mathbf{T^m}\boldsymbol{\alpha}_m^f + \mathbf{X^f}\boldsymbol{\beta}_f^f + \mathbf{X^m}\boldsymbol{\beta}_m^f + \mathbf{X}\boldsymbol{\gamma}^f + \boldsymbol{\varepsilon}^f \\
\mathbf{t^m} &= \boldsymbol{\alpha}_0^m + \mathbf{T^m}\boldsymbol{\alpha}_m^m + \mathbf{T^f}\boldsymbol{\alpha}_f^m + \mathbf{X^m}\boldsymbol{\beta}_m^m + \mathbf{X^f}\boldsymbol{\beta}_f^m + \mathbf{X}\boldsymbol{\gamma}^m + \boldsymbol{\varepsilon}^m
\end{aligned}
$$

(5.6)

Within this simultaneous equation system (5.6) the interaction effect of every personal activity could be depicted. Activities can even be classified as substitutes or complements on interpersonal level and corresponding elasticities could be calculated. As a matter or fact neither the sample size nor the data quality are sufficient.

The most striking characteristic of time use studies has to be regarded anyway. Every single equation that estimates an activity as linear function of all other activities will come to the same result: $[\alpha_0 = 1440 \; ; \; \alpha_i = -1 \; ; \; R^2 = 1.00 \;]$. The estimator is robust, efficient, unbiased, but totally meaningless, as we know in advance that a day has 24 hours or 1440 minutes and that every activity executed on the surveyed day will reduce the time left for the endogenous activity. The estimator is getting content with the additional items on personal and household characteristics as well as by induction of instrumental variables.

# 6   Results

## 6.1   Descriptives

Descriptive statistics show the well known fact that fathers participate far less in child care activities while mothers' market labour participation is just a fraction of fathers' effective labour supply. While mothers spend on average child care 1:49 hours per day, fathers' daily child care participation amounts 33 minutes, about 30% of the mothers' time investments. More than 60% of fathers but less than 30% of mothers do not invest at least a quarter of an hour on an average day[25].

| | | Mean | (stddev) | min | 5% | 10% | 25% | 40% | 50% | 60% | 75% | 90% | 95% | max |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | percentiles | | | | | | |
| Mothers | CCARE | 01:49 | (116,156) | 00:00 | 00:00 | 00:00 | 00:00 | 00:45 | 01:15 | 01:45 | 02:45 | 04:45 | 05:45 | 10:30 |
| | LABOR | 02:12 | (199,202) | 00:00 | 00:00 | 00:00 | 00:00 | 00:00 | 00:00 | 00:00 | 04:00 | 08:00 | 09:00 | 15:45 |
| | EDUC | 2,39 | (1,553) | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 5 | 6 | 6 |
| Fathers | CCARE | 00:33 | (63,099) | 00:00 | 00:00 | 00:00 | 00:00 | 00:00 | 00:00 | 00:00 | 00:45 | 02:00 | 03:00 | 07:15 |
| | LABOR | 06:15 | (276,606) | 00:00 | 00:00 | 00:00 | 00:00 | 06:15 | 08:15 | 08:45 | 09:45 | 11:30 | 12:15 | 18:15 |
| | EDUC | 2,57 | (1,489) | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 5 | 6 | 6 |

Table 1: Levels of personal child care, market labour supply, and education

Vice versa, mothers participate in market labour activities on average for 132 minutes, about 35% of fathers' time market labour, while education seems more or less equally distributed among genders.

| | Mean (%) | (stddev) | min | 5 % | 10 & | 25 % | 40 % | Median | 60 % | 75 % | 90 % | 95 % | max |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | percentiles | | | | | |
| HOMESIZE | 104,14 | (39,898) | 24 | 50 | 60 | 78 | 90 | 99 | 110 | 128 | 150 | 170 | 300 |
| CHILD2 | 51,4% | (0,500) | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| YCHILD3 | 38,4% | (0,486) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| YCHILD6 | 20,3% | (0,402) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |

Table 2: Statistics for household level covariates

The average size of dwellings is above the overall average - single households are typically living in smaller dwellings – the distribution is located in the known bandwidths. More than 50% of the sampled

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[25] In this analytical part of the paper all days of the week were considered. As Saturdays and especially Sundays were overrepresented, the sample was weighted to equalize this fact. Additional weight criteria: procvince, sex, age, citizenship, and employment status. Although the AutTUS was surveyed within the Austrian microcenssus program, where generally household weights are used for further calculations, this analysis uses personal weights.

population has more than one child, the share of households with youngest children below school age is about 60%[26] [27].

## 6.2  Child care intensity and its relation to covariates

Before interpreting the econometric model, the most important bivariate relations are discussed. Further graphical analysis on focused trivariate relations are shown in the Appendix (A.4)[28].
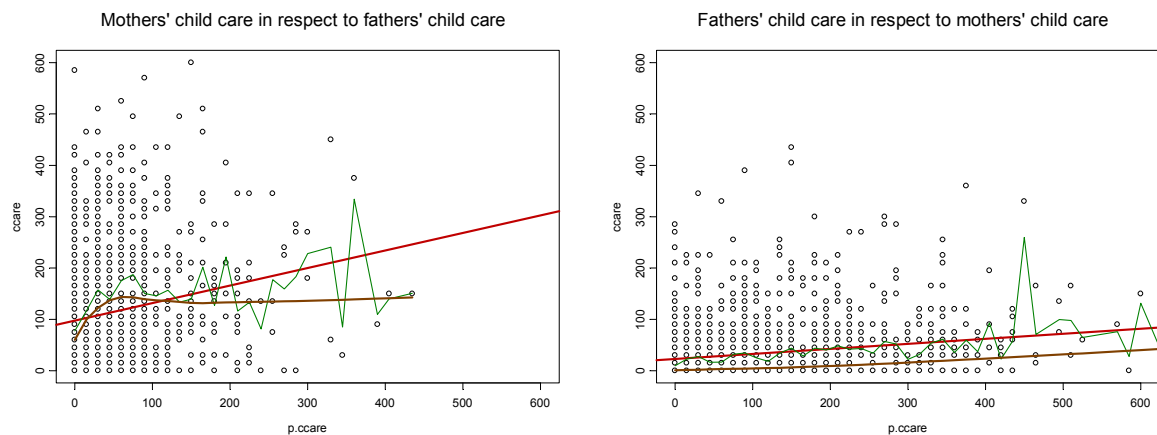


**Figure 4:** Interdependency of the partners' child care intensities

Although child care generally is assumed to be substituted by the partners, the graphical analysis tells the opposite. This reflects the fact that child care is an activity just partly examined "alone", say one partner and the child(ren), but most of child care activities – especially in care-intensive settings – are obviously examined jointly with the spouse. Therefore, we generally see positive correlations[29]. Simple linear fits – like the one illustrated in Figure 4 – suggest an "everlasting" positive relationship[30]. The slope of the linear estimator can generally be supported by the local regression. In case of mothers the region around the origin can clearly be identified as family types with less care demand[31], family types – or situations – with higher care duties are located beyond. The local regression suggests an average care level for these family types around 140 minutes – 30 minutes over average – for mothers, but about average levels for men.

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[26] These last descriptive results are not representative for the Austrian population! As the sample was selected following the criterion [two parents – at least one child<15 – no other adult or adolescent in the household] in order to have comparable households for child care participation estimation, the descriptive results show the levels for this specific subgroup!

[27] Further statistics describing the analyzed sub-sample in the Appendix (A.5)

[28] All bi- and trivariate figures (and gender-specific tables) that depict mothers' in respect to fathers' behaviour, show mothers' behaviour on left hand side.

[29] Correlation tables are in Appendix (A.2)

[30] Clearly, the right scatter plot is the transformed left graph, but as no negative values can occur, the constant of the linear estimator has to be positive (respectively zero). For that reason the linear fit of fathers' child care intensity (as a function of mothers' time with children) on right hand side is – rationally – not the transformation of the mothers' linear fit. Anyway, comparing the regression line to the local regression (LOESS-function) the linear fit – especially the slopes – seems warrantable.

[31] e.g. elder children or children not/short at home on surveyed day…

As generally assumed throughout the literature, child care (like all kinds of home production) are gross substitutes to labour supply (Figure 5) . For both genders an unambiguous negative relationship can be identified (correlation coefficient of -0.29 for men as for women).
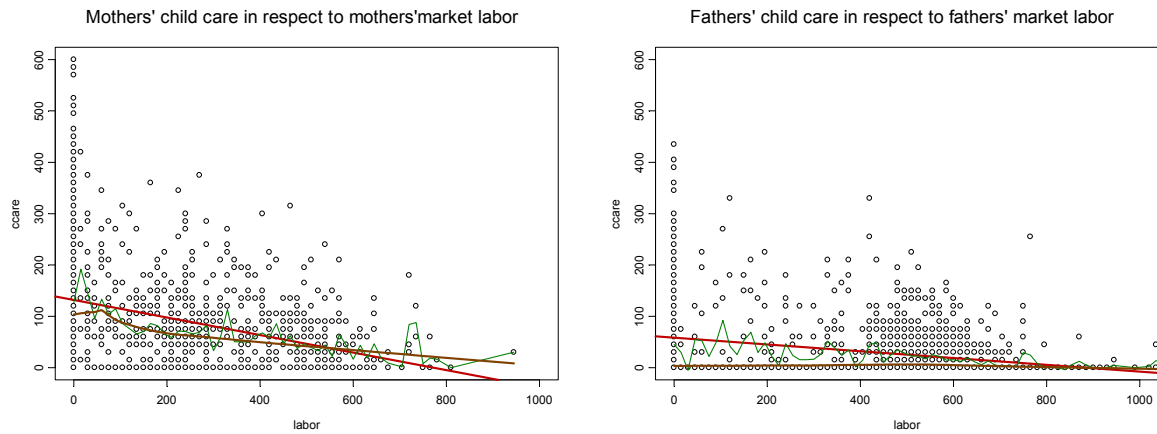


**Figure 5:** Dependency on labour participation

Fathers' child care intensity in respect to market labour participation shows interesting details: Although men typically participate in child care duties about 30 minutes per day and two modal values of market labour participation exist[32] at 0 and around 8.5 hours, the linear trend is not met by the local fit at any level. This corresponds to the fact that at any level of labour intensity – averaged by the neighbouring levels – the share of fathers with exactly zero child care participation clearly dominates. About 30% of fathers participate in child care.
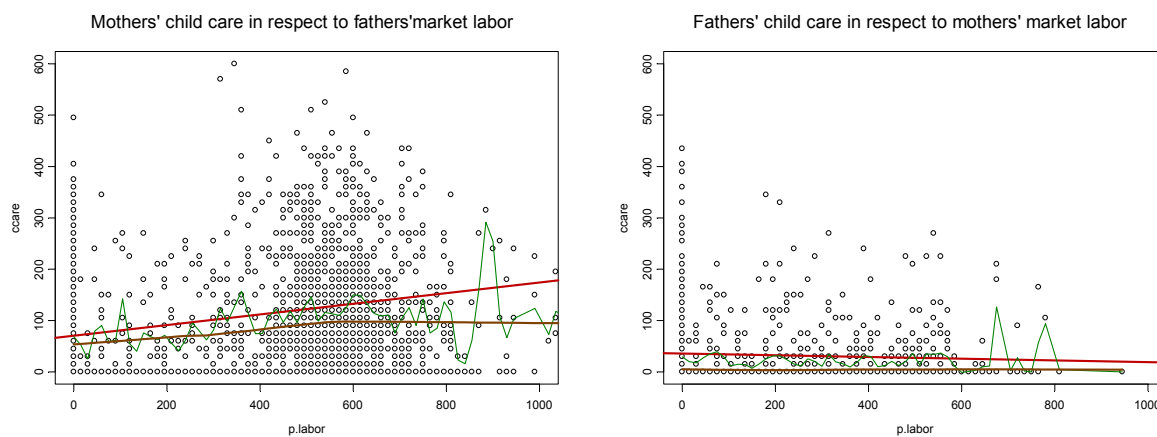


**Figure 6:** Dependency on partners' labour participation

Child care related to the partners' market labour shows adverse effects: While mothers' child care intensity rises with fathers' effective labour supply, fathers' child care intensity falls slightly with mothers'

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[32] As can be seen in Table 1, more than 60% of fathers worked full time (or marginally less). The majority of fathers with no time registered for market work filled out the diary on weekends or holydays. Regarding this fact, a significant higher local value for child care could be expected for $t_n = 0$

labour market participation. This corresponds to the "stylized fact" that men often persistently fall back to the male breadwinner behaviour when young and care-demanding children have come to the household. Figure 6 shows a constant average level of female child care activities when male spouses are working full time.
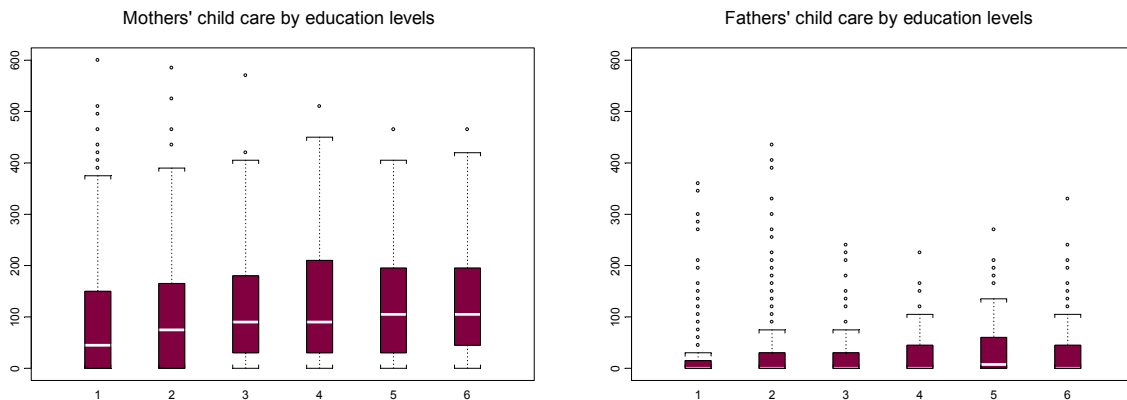


**Figure 7:** Dependency on education

The relation of mothers' child care intensity to the (own) education level seems slightly positive, while fathers behaviour is more ambiguous in this respect[33]. Of course men's levels are definitely under the women's values for every education level. While women with university degree show the slightest increase in child care, men's values clearly decrease on that stage.
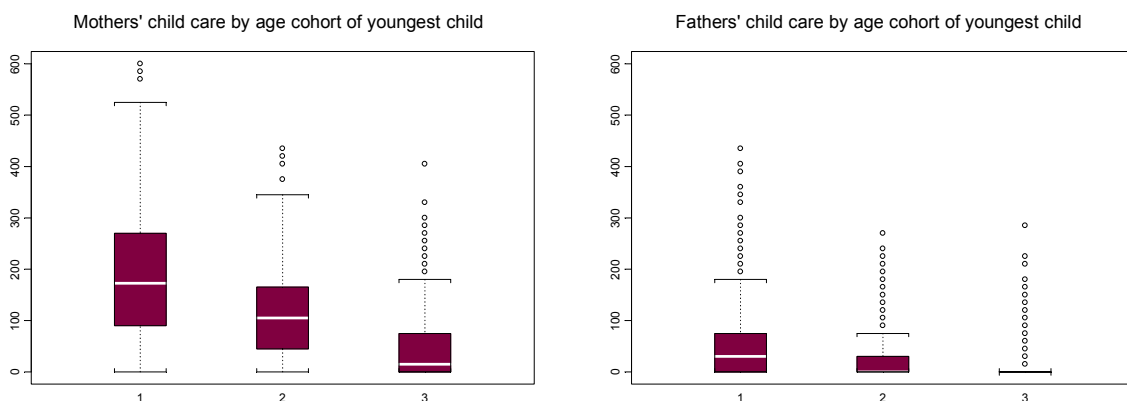


**Figure 8:** Dependency on age of youngest child

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[33] education levels:

| | | |
|---|---|---|
| 1 | compulsory level | ("Pflichschulabschluss") |
| 2 | apprenticeship | ("Lehrabschluss") |
| 3 | technical & vocational school | ("BMS") |
| 4 | academic school | ("AHS") |
| 5 | technical & vocational college | ("BHS" + Colleges) |
| 6 | university degree | ("Universitätsabschluss") |

Child care intensity primarily depends on the age of the (youngest) child. Males show negligible value of child care intensity when youngest children already have reached in school age[34].

Mothers' child care by number of children   Fathers' child care by number of children
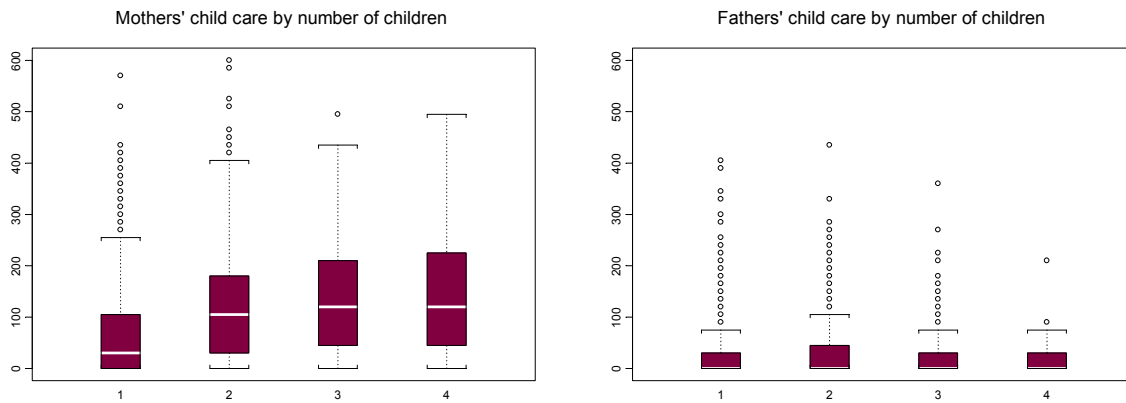


**Figure 9:** Dependency on number of children aged up to 15

Child care intensity has to rise monotonously with the number of children[35]. In some sense of "economies of scale" and due to the fact, that siblings are usually belonging to different age cohorts with decreasing care demand, a concave growth pattern like in case of mothers is assumable. Fathers do not correspond to this pattern. Again the prevalence of the male breadwinner model for families with more than two children can be contributing factor.

Mothers' child care in respect to size of dwelling   Fathers' child care in respect to size of dwelling
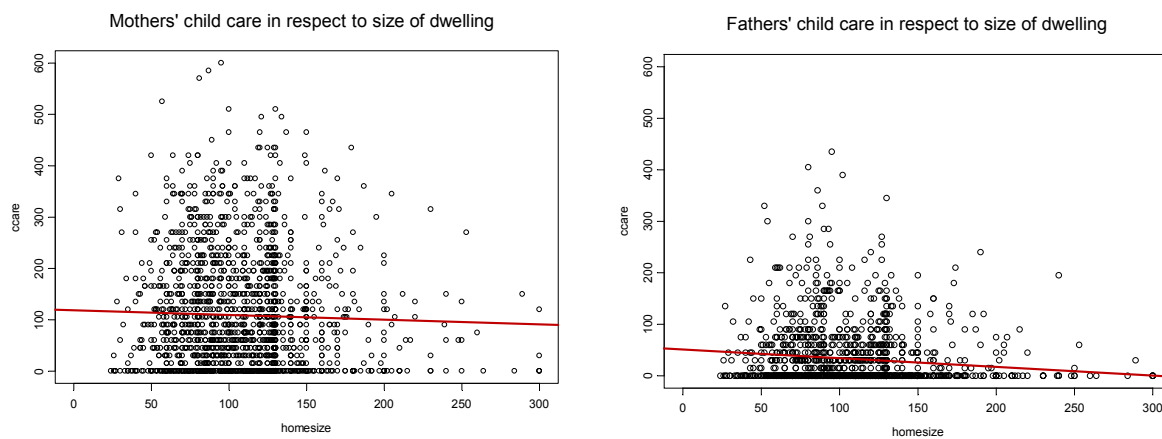


**Figure 10:** Dependency on size of dwelling

No direct information on household's wealth nor on incomes is implemented to the AutTUS. Nevertheless, in order to evaluate the TUS regarding model of home production this information is crucial. The integration of income information of other microcensus waves, where a majority of TUS-

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[34] age cohorts:
        1        age 0 – 3
        2        age 4 – 6        (some institutional child care offered in all provinces)
        3        age 6 – 15     (school age)
[35] values = number of children; 4:= 4 +

respondents were asked about their net income was not successful, as about 60% of the respondents identified did not specify their income. Imputations on these item were rejected for analytical reasons. The only (quasi continuous) proxy for household wealth can be found in the size of the dwelling.

The linear fit show a negligible relation. In case of mothers even the correlation coefficient turns out to be insignificant. In case of fathers the relation is significantly negative, but still weak.  This relation does not mean, that wealthier people care less for their children, but first it is a fact that the wealthier part of the population has less children, and the size of the dwelling is first of all a proxy for the associated costs. Larger families that need larger dwellings first have to refinance these costs by  higher levels of – especially men's – labour supply[36].

## 6.3   OLS and 2SLS estimates

After discussion on bivariate relationships, the outcomes of the whole model of section 5 underline these results. Interpretations of the results are generally straightforward: the coefficients for the exogenous activities (labour, partner's child care, and partner's labour) show direct effects, e.g. parents reducing market labour by one hour raise – ceteris paribus – child care about 7 minutes ($\beta$ = -0,12).[37]

## 6.3.1    OLS

The OLS-estimatior on parental behaviour in general, shows entirely significant results. Separated estimations for mothers and fathers already show some insignificant parameters, but these influences do not harm too much, as the related parameter values are not too high.

Interpretation will focus first on the OLS-outcomes of the unisex model (Table 3) and the gender-separated approach (Table 4). Then the 2SLS estimators for fathers and mothers (Table 5) will be interpreted. The 2SLS unisex model (in Table 3) is just depicted for comparison.

Quasi-constants:
 Parents, whose youngest child is up to three years [YCHILD3]  have an average base level of 80
 minutes child care. Mothers already start with a value of 107 minutes per day, while fathers participate
 in small child care by about three quarters of an hour.

Alternatively, parents with youngest child in age cohort [4-6] [YCHILD6] generally display a reduced base level of 34 minutes. These parents seem to share this base level better: while mothers show up 40 minutes, fathers already come up to 27 minutes. Seemingly specialisation is relaxed with growth of children.

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[36] a detailed study on this issue is reflected in Deutsch/Neuwirth/Yurdakul (2001)
[37] the underlying unit of measurement are minutes. So it would be more correct to interpret: with labour reduction of one minute parents  increase – ceteris paribus – child care by 7 seconds. As this is a linear model, the units can be extended linearly.

These base levels are increased for families with more than one child [CHILD2] by (just) 6 minutes[38]. Here the specialisation mechanism becomes evident again: while mothers have to add 11 minutes per day to the quasi-constant child care level, the corresponding value for fathers is insignificant, possibly around zero.

Within the unisex model mothers [FEMALE] show a child-care base level that is about 27 minutes higher.

| OLS => | CCARE | | 2SLS => | CCARE | |
|---|---|---|---|---|---|
| LABOR | −0,12 | *** | LABOR | −0,20 | *** |
| | (0,005) | | | (0,016) | |
| P_CCARE | 0,09 | *** | P_CCARE | 0,36 | *** |
| | (0,016) | | | (0,066) | |
| P_LABOR | 0,11 | *** | P_LABOR | 0,23 | *** |
| | (0,006) | | | (0,020) | |
| FEMALE | 27,25 | *** | FEMALE | −1,41 | |
| | (3,045) | | | (7,708) | |
| EDUC | 8,08 | *** | EDUC | 7,03 | *** |
| | (0,788) | | | (1,013) | |
| HOMESIZE | −0,05 | * | HOMESIZE | −0,06 | ** |
| | (0,025) | | | (0,031) | |
| CHILD2 | 6,18 | ** | CHILD2 | 3,12 | |
| | (2,562) | | | (2,897) | |
| YCHILD3 | 80,10 | *** | YCHILD3 | 56,60 | *** |
| | (3,137) | | | (6,981) | |
| YCHILD6 | 34,37 | *** | YCHILD6 | 23,72 | *** |
| | (3,455) | | | (4,687) | |
| Observations | 3698 | | Observations | 3698 | |
| R² | 0,618 | | R² | 0,557 | |
| R² (adj) | 0,617 | | R² (adj) | 0,550 | |
| SEE | 76,44 | | SEE | 82,72 | |

*, **, *** significant at 10%, 5% and 1%;
*(Standard errors in parentheses)*

*, **, *** significant at 10%, 5% and 1%;
*(Standard errors in parentheses)*

**Table 3:** OLS and 2SLS estimators for child care intensity

Structural covariates:

The size of dwelling [HOMESIZE] shows just slightly significant effects. In the unisex view the slightly negative effect seems negligible. Surprisingly – at first glance – the significant parameter value for fathers shows adverse sign. Within the bivariate comparison (Figure 10 and Table A8) the relation is clearly negative, but as the OLS model controls for labour participation, the overwhelming fact that for larger dwellings higher rents have to be paid, respectively higher loans have to be payed back by higher instalments or for longer payback periods and – as a consequence – the marginal labour supply is higher for each wage level (income effect dominates in phases of relatively high fixed household costs), the parameter shows the "pure" wealth effect.

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[38] Most of the differences seen in Figure 1 are explained by covariates.

Child care is increased by 8 minutes on daily average by education level [EDUC] [39]. 2 minutes more for mothers, 1.5 less for fathers. This implies that a mother with university degree spends about 50 minutes more child care time, compared to a mother with compulsory education. As the model controls for market labour, the typical explanation of such large differences – low educated have to work longer hours to make their living – falls short. In beginning of the 90ies, when the survey was carried out, some segregation in respect of institutional child care facilities prevailed: The deficiency of sufficient numbers of kindergartens forced parts of the population to seek for (more expensive) alternatives. Low income households – correlated with low education – were widely crowded out. This effect can not be controlled for within the OLS estimator.

Activities in covariates:

The correlation to partner's child care activities [P_CCARE] is evidable: Although the general bivariate correlation coefficient in Table 6 shows up a highly insignificant value, the unisex OLS estimator tells that an one hour increase of the partner's child care activities goes significantly[40] along with a 5-minutes-increase in own care intensity. This positive and significant relationship continues to hold in the gender-specific estimators, although these OLS estimators also control for differences in caring demands (via age cohorts of youngest child and number of children). These models state that – ceteris paribus – 22% of the fathers' time for child care is on average spent jointly with the mother. In vice versa, 9% of the mothers' time dedicated jointly with the husband to child care activities.

An hour additional labour participation of the partner [P_LABOUR] is associated with an increase in child care intensity by 6 minutes. Mothers have to dedicate additional 8 minutes per her spouses additional working hour, while fathers got it cheaper: In case their wife works an additional hour outside, they have to "pay" about 3 additional minutes child care.

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[39] As we have no level valued „0", another 8 minutes should be added to the quasi-constant ; splitting up education to five dummy variables induced a lost in significance

[40] generally, within OLS estimators all parameter values for exogenous activities are significant at 99% level (!)

| OLS    => | CCARE (mothers) |     | OLS    => | CCARE (fathers) |     |
|-----------|-----------------|-----|-----------|-----------------|-----|
| LABOR     | −0,16           | *** | LABOR     | −0,08           | *** |
|           | *(0,011)*       |     |           | *(0,005)*       |     |
| P_CCARE   | 0,22            | *** | P_CCARE   | 0,09            | *** |
|           | *(0,036)*       |     |           | *(0,015)*       |     |
| P_LABOR   | 0,13            | *** | P_LABOR   | 0,05            | *** |
|           | *(0,008)*       |     |           | *(0,007)*       |     |
| EDUC      | 10,36           | *** | EDUC      | 6,50            | *** |
|           | *(1,251)*       |     |           | *(0,826)*       |     |
| HOMESIZE  | −0,05           |     | HOMESIZE  | 0,06            | **  |
|           | *(0,038)*       |     |           | *(0,025)*       |     |
| CHILD2    | 11,06           | *** | CHILD2    | −0,27           |     |
|           | *(4,153)*       |     |           | *(2,680)*       |     |
| YCHILD3   | 106,71          | *** | YCHILD3   | 43,30           | *** |
|           | *(4,903)*       |     |           | *(3,377)*       |     |
| YCHILD6   | 39,93           | *** | YCHILD6   | 27,24           | *** |
|           | *(5,599)*       |     |           | *(3,571)*       |     |
| Observations | 1849         |     | Observations | 1849         |     |
| R²        | 0,700           |     | R²        | 0,386           |     |
| R² (adj)  | 0,699           |     | R² (adj)  | 0,383           |     |
| SEE       | 87,48           |     | SEE       | 56,16           |     |

*, **, *** significant at 10%, 5% and 1%;
*(Standard errors in parentheses)*

**Table 4:** OLS estimators for child care intensity (mothers – fathers)

Variation in own market labour [LABOUR] by one hour less should be generally accompanied by a 7 minute increase of child care. Here the gender differences in Austria become most evident: While lowering fathers' labour participation improves child care by 5 minutes, an hour worked less by mothers results in an 10 minutes invcrease.

### 6.3.2    2SLS

These results, regarding intrapersonal and intra-familiy substitutability or complementarity of activities seem unambiguous statement of the OLS estimator, but , as pointed out in section 5, some sound of caution has to be noted. Looking at the distribution of error terms in the appendix (A.6), biasness of the OLS estimator becomes evident: the residuals' distributions are all skewed to the right, indicating the systematic correlation[41] problem described in  section 5. To point it out differently:  As the models estimate the variations of a share of the day (say 2.5 hours childcare ➔ 2,5/24) by – among structural covariates and state-describing dummies – other shares of the day (say 9.2 hours work related activities ➔ 9.2/24), the outcome is generally limited by [0,24] and as 9.2 hours are dedicated to labour, the boundaries for the endogenous activity are tightened to [0,14.8] in this particular case. Therefore, biased estimators and skewed error term distributions are to be expected.

The respective parameter values of the 2SLS system (partly) controlling for this correlation problem, even top some outcomes of the OLS estimator: controlling for cointegration of child care to labour participation by instrumental variables techniques, a one hour decrease of a mother's effective labour

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[41] in some respect this kind of correlation can be compared to the problem of serial correlation well known from time series analysis

supply improves the mothers child care intensity by 20 minutes (!). Also men's reaction is boosted: following the 2SLS estimator, fathers increase child care by 7 minutes per one working hour less.

| 2SLS => | CCARE (mothers) | | 2SLS => | CCARE (fathers) | |
|---|---|---|---|---|---|
| LABOR | -0,33 | *** | LABOR | -0,11 | *** |
| | (0,036) | | | (0,013) | |
| P_CCARE | 0,18 | | P_CCARE | 0,18 | *** |
| | (0,136) | | | (0,054) | |
| P_LABOR | 0,24 | *** | P_LABOR | 0,13 | *** |
| | (0,019) | | | (0,024) | |
| EDUC | 10,68 | *** | EDUC | 5,31 | *** |
| | (1,525) | | | (0,967) | |
| HOMESIZE | -0,11 | ** | HOMESIZE | 0,05 | * |
| | (0,048) | | | (0,029) | |
| CHILD2 | -0,28 | | CHILD2 | 2,28 | |
| | (4,847) | | | (2,920) | |
| YCHILD3 | 92,25 | *** | YCHILD3 | 36,45 | *** |
| | (9,294) | | | (6,995) | |
| YCHILD6 | 33,52 | *** | YCHILD6 | 25,43 | *** |
| | (7,758) | | | (4,431) | |
| Observations | 1849 | | Observations | 1849 | |
| R² | 0,647 | | R² | 0,336 | |
| R² (adj) | 0,645 | | R² (adj) | 0,332 | |
| SEE | 95,826 | | SEE | 58,344 | |

*, **, *** significant at 10%, 5% and 1%;
*(Standard errors in parentheses)*

*, **, *** significant at 10%, 5% and 1%;
*(Standard errors in parentheses)*

**Table 5:** 2SLS estimators for child care intensity (mothers – fathers)

With these results clear differences arise to the (rather egalitarian) society in Sweden[42]: Halberg/Klevmarken (2003, p.222) state, the fact that fathers' child care intensity is significantly and strongly negative (-0.295, that is about 18 minutes additional child care per reduced hour working time) while mothers' value is (very) insignificant, has strong policy implications: ''A policy increasing the female hours of market work will not markedly change the children's time with their parents, while a policy stimulating fathers to remain more at home will increase the children's time with their father but reduce time with their mother about as much[43]''.

The effect of variation in partners' labour participation [P_LABOUR] is sharpened too: Mothers seemingly react to an increase in fathers' effective labour supply by raising child care intensity by 14 minutes. Vice versa, fathers react to variations in mothers' market work by additional 8 minutes. In case of mothers the instrumentalized value for fathers' child care intensity [P_CCARE] seems to be still ambiguous, as we do not think that fathers' child care activity just have insignificant effects on mothers behaviour. Yet the question arises, whether the ''joint-activities effect'' dominates the child-care substitution effect or not. As the OLS estimator shows significant and positive values – at a much stronger parameter than for fathers – also a strong positive relationship can kept assumed. An improved

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[42] depicted in the Appendix - Table 10
[43] the ,,compensating'' reduction of mothers' care time corresponds to females' value of males' labour participation (+0.287 ***); equivalent to ''P_LABOR'' in the estimator for Austrian parents behaviour

instrumental variable estimator for partner's child care intensity will of course shift all parameter values again.

As the influence of the activity-covariates has risen, the parameter outcomes on structural and state-describing covariates are expected to be below values of the OLS estimates. Except the parameter values for education level [EDUC], this assumption holds true.

# 7   Discussion

The models discussed in this paper show large and persisting gender-driven differences in the coefficient of determination ($R^2$). This indicates that better estimates could have been made with gender-specific designed models, but that would have reduced comparability that is essential to the object of investigation. Interestingly, the estimators within the Halberg/Klevmarken paper show comparable $R^2$ values for all models with improved sample size[44]. As behaviour of fathers and mothers could be explained there at comparable goodness of fit within several models, this could indicate that Swedish couples are much more likely to share the burden of child care – in 'all' accompanying respects. Motivation for take over of additional child care duties by Austria's men  has to be risen by other means as mothers are motivated by, but this issue is topic for further research.

Of course the estimators of this paper should be improved further. In order to separate substitutes and complements in activities, joint activities should be identified in the data to separate "child care jointly with the partner" from "sole partner's child care". This is expected to increase the model considerable, perhaps dissolve the insignificance of the influence of partner's child care on mothers child care intensity (within the 2SLS-estimator).

In addition, a simultaneous equation system  to capture the interdependency of (all) activities more accurately could be designed. Feasibility of such an approach has not turned out yet. The Austrian TUS data lack crucial information, missing information on children's time spent actually in institutional child care centres is just one example. Next, economic analysis of human behaviour stops, when no chance for calculating opportunity costs or (opportunity) wages is given. The implementation of wages from other waves of the Austrian microcensus is technically feasible, but sample size would reduce to an unrepresentative level. Moreover, additional sample selection biases would occur, as monthly wages were only surveyed for employees and response defection on this item – accounting to experience – is unevenly distributed: Low income households typically feel ashamed in quoting their income, high income households tend to refuse answering this item anyway.

The dataset used is definitely not too recent. Austria's officials have withdrawn already two scheduled surveys. The first, the participation in the EU-wide HETUS project, was scheduled for 2000 but shifted –

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[44] to improve their samples, Halberg/Klevmarken had to attach the HUS (1984) to the HUS (1993) (and controlled for the year of survey by an additional dummy) in order to get a sufficient number of couples with characteristics investigated

for budgetary reasons – to 2002. By shifting over the HETUS-deadline, Austria wouldn't have participated in the HETUS project anyway, but, in turn, many well-designed items of the AutTUS 1992 could have been reused and made available for in-depth comparisons of selected items as well as statistical models. From today's view, no new AutTUS is planned.

Nevertheless, the models presented here show structural behaviour of parents and can be used and extended for policy consultancy. Further, in respect of family-related fundamental research, this seems to be a promising starting point for further analysis.

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# A  APPENDIX

## A.1    Comparison to TUS in other European countries

### <u>Germany</u>
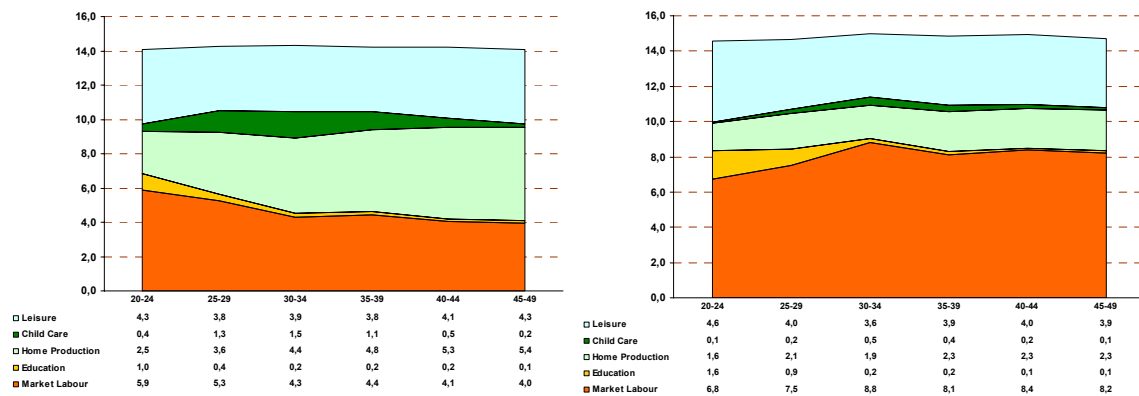


**Figure 11:** Females' and males' activities on weekdays (GERMANY)
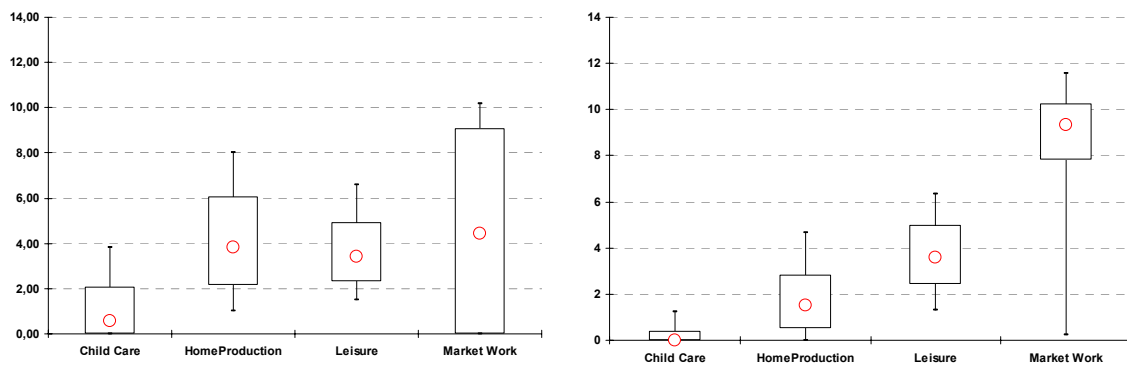


**Figure 12:** Distribution of females' and males' activities on weekdays (GERMANY)

## *Italy*



| | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 |
|---|---|---|---|---|---|---|
| □ Leisure | 5,1 | 4,2 | 3,7 | 3,4 | 3,8 | 3,6 |
| ■ Child Care | 0,4 | 1,0 | 1,2 | 0,9 | 0,5 | 0,2 |
| □ Home Production | 2,9 | 4,2 | 5,4 | 5,9 | 6,2 | 6,7 |
| □ Education | 1,5 | 0,3 | 0,1 | 0,1 | 0,0 | 0,1 |
| ■ Market Labour | 3,0 | 3,5 | 3,2 | 3,1 | 3,0 | 2,8 |

| | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 |
|---|---|---|---|---|---|---|
| □ Leisure | 6,1 | 5,3 | 5,1 | 4,9 | 4,7 | 4,9 |
| ■ Child Care | 0,0 | 0,2 | 0,4 | 0,3 | 0,2 | 0,1 |
| □ Home Production | 0,5 | 0,7 | 0,8 | 0,9 | 0,8 | 1,0 |
| □ Education | 1,3 | 0,4 | 0,2 | 0,1 | 0,1 | 0,1 |
| ■ Market Labour | 5,4 | 6,8 | 7,3 | 7,4 | 7,7 | 7,3 |

**Figure 13:** Females' and males' activities on weekdays (ITALY)
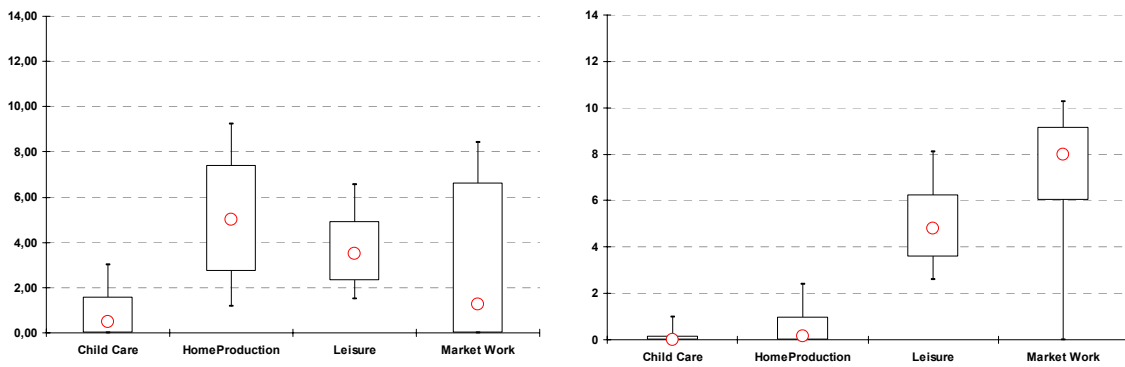


**Figure 14:** Distribution of females' and males' activities on weekdays (ITALY)

## *Norway*



| | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 |
|---|---|---|---|---|---|---|
| □ Leisure | 5,5 | 5,1 | 4,8 | 4,4 | 4,5 | 4,8 |
| ■ Child Care | 0,7 | 1,6 | 1,6 | 1,2 | 0,7 | 0,2 |
| □ Home Production | 2,3 | 3,4 | 3,5 | 4,0 | 4,5 | 4,1 |
| □ Education | 1,3 | 0,3 | 0,4 | 0,4 | 0,1 | 0,3 |
| ■ Market Labour | 4,4 | 3,7 | 4,0 | 4,3 | 4,6 | 4,8 |

| | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 |
|---|---|---|---|---|---|---|
| □ Leisure | 5,9 | 5,0 | 4,8 | 4,5 | 4,8 | 4,7 |
| ■ Child Care | 0,2 | 0,3 | 0,8 | 0,7 | 0,3 | 0,1 |
| □ Home Production | 1,7 | 1,8 | 2,0 | 2,3 | 2,4 | 2,2 |
| □ Education | 1,1 | 0,8 | 0,3 | 0,1 | 0,1 | 0,3 |
| ■ Market Labour | 5,6 | 7,0 | 6,8 | 7,3 | 7,1 | 7,4 |

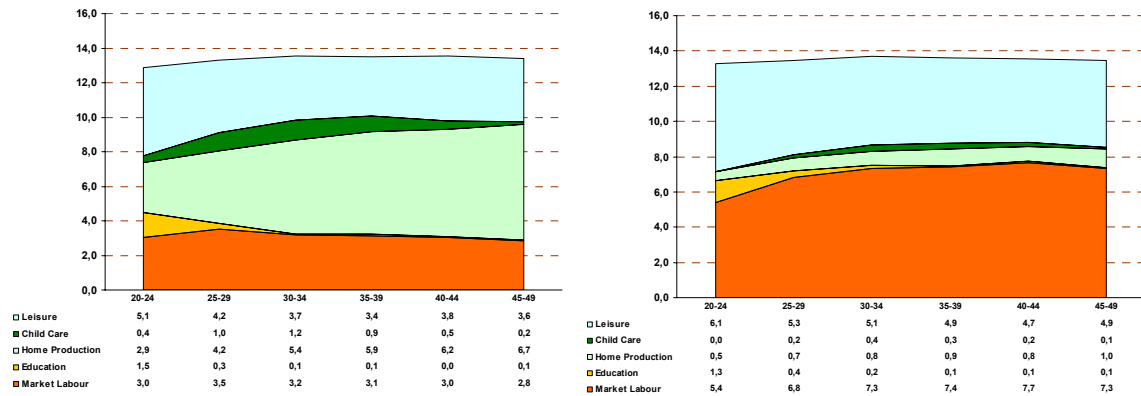**Figure 15:** Females' activities on weekdays (NORWAY)



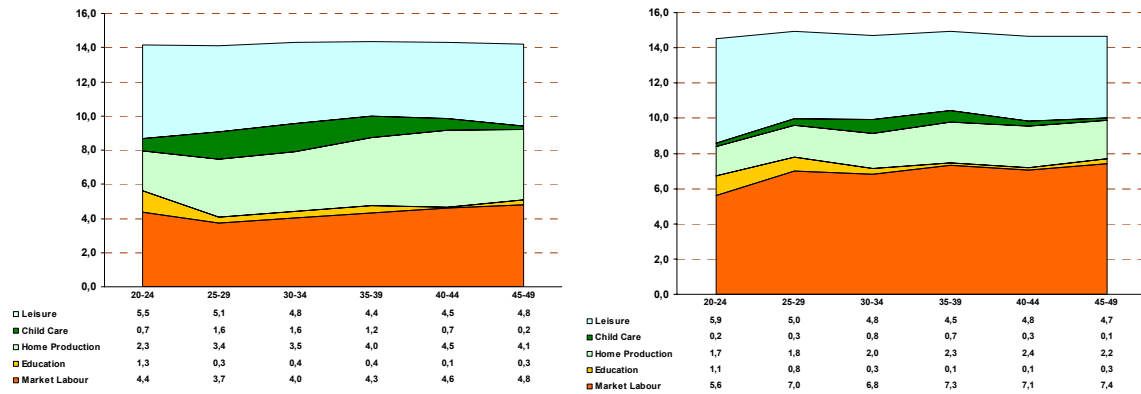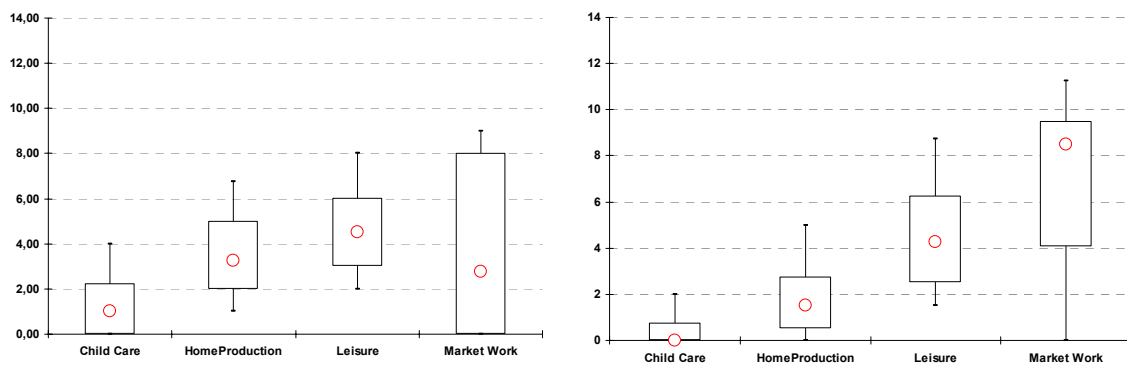**Figure 16:** Distribution of females' and males' activities on weekdays (NORWAY)

## A.2 Correlations

| | CCARE | FEMALE | LABOR | EDUC | P_CCARE | P_LABOR | HOMESIZE | CHILD2 | YCHILD3 | YCHILD6 |
|---|---|---|---|---|---|---|---|---|---|---|
| CCARE | 1,000 | 0,375 | -0,387 | 0,123 | -0,009 | 0,301 | -0,051 | 0,080 | 0,381 | -0,014 |
| | . | (0,000) | (0,000) | (0,000) | (0,583) | (0,000) | (0,002) | (0,000) | (0,000) | (0,386) |
| FEMALE | 0,375 | 1,000 | -0,450 | -0,057 | -0,376 | 0,446 | 0,002 | -0,003 | 0,004 | -0,004 |
| | (0,000) | . | (0,000) | (0,001) | (0,000) | (0,000) | (0,906) | (0,845) | (0,812) | (0,824) |
| LABOR | -0,387 | -0,450 | 1,000 | 0,034 | 0,301 | -0,040 | 0,048 | 0,025 | -0,054 | 0,033 |
| | (0,000) | (0,000) | . | (0,039) | (0,000) | (0,015) | (0,003) | (0,121) | (0,001) | (0,045) |
| EDUC | 0,123 | -0,057 | 0,034 | 1,000 | 0,139 | -0,066 | 0,085 | -0,015 | 0,063 | 0,003 |
| | (0,000) | (0,001) | (0,039) | . | (0,000) | (0,000) | (0,000) | (0,349) | (0,000) | (0,837) |
| P_CCARE | -0,009 | -0,376 | 0,301 | 0,139 | 1,000 | -0,384 | -0,050 | 0,082 | 0,377 | -0,015 |
| | (0,583) | (0,000) | (0,000) | (0,000) | . | (0,000) | (0,003) | (0,000) | (0,000) | (0,372) |
| P_LABOR | 0,301 | 0,446 | -0,040 | -0,066 | -0,384 | 1,000 | 0,047 | 0,024 | -0,047 | 0,029 |
| | (0,000) | (0,000) | (0,015) | (0,000) | (0,000) | . | (0,004) | (0,144) | (0,004) | (0,076) |
| HOMESIZE | -0,051 | 0,002 | 0,048 | 0,085 | -0,050 | 0,047 | 1,000 | 0,094 | -0,112 | -0,005 |
| | (0,002) | (0,906) | (0,003) | (0,000) | (0,003) | (0,004) | . | (0,000) | (0,000) | (0,781) |
| CHILD2 | 0,080 | -0,003 | 0,025 | -0,015 | 0,082 | 0,024 | 0,094 | 1,000 | 0,077 | 0,130 |
| | (0,000) | (0,845) | (0,121) | (0,349) | (0,000) | (0,144) | (0,000) | . | (0,000) | (0,000) |
| YCHILD3 | 0,381 | 0,004 | -0,054 | 0,063 | 0,377 | -0,047 | -0,112 | 0,077 | 1,000 | -0,398 |
| | (0,000) | (0,812) | (0,001) | (0,000) | (0,000) | (0,004) | (0,000) | (0,000) | . | (0,000) |
| YCHILD6 | -0,014 | -0,004 | 0,033 | 0,003 | -0,015 | 0,029 | -0,005 | 0,130 | -0,398 | 1,000 |
| | (0,386) | (0,824) | (0,045) | (0,837) | (0,372) | (0,076) | (0,781) | (0,000) | (0,000) | . |

**Table 6** Correlation table (in general)

| | CCARE | LABOR | EDUC | P_CCARE | P_LABOR | HOMESIZE | CHILD2 | YCHILD3 | YCHILD6 |
|---|---|---|---|---|---|---|---|---|---|
| CCARE | 1,000 | -0,293 | 0,181 | 0,185 | 0,247 | -0,031 | 0,144 | 0,508 | -0,033 |
| | . | (0,000) | (0,000) | (0,000) | (0,000) | (0,178) | (0,000) | (0,000) | (0,154) |
| LABOR | -0,293 | 1,000 | -0,002 | -0,055 | 0,213 | 0,009 | -0,074 | -0,189 | 0,044 |
| | (0,000) | . | (0,938) | (0,018) | (0,000) | (0,703) | (0,001) | (0,000) | (0,058) |
| EDUC | 0,181 | -0,002 | 1,000 | 0,083 | -0,006 | 0,080 | -0,049 | 0,074 | -0,010 |
| | (0,000) | (0,938) | . | (0,000) | (0,789) | (0,001) | (0,034) | (0,001) | (0,654) |
| P_CCARE | 0,185 | -0,055 | 0,083 | 1,000 | -0,286 | -0,107 | -0,013 | 0,280 | 0,016 |
| | (0,000) | (0,018) | (0,000) | . | (0,000) | (0,000) | (0,572) | (0,000) | (0,502) |
| P_LABOR | 0,247 | 0,213 | -0,006 | -0,286 | 1,000 | 0,081 | 0,100 | 0,041 | 0,031 |
| | (0,000) | (0,000) | (0,789) | (0,000) | . | (0,001) | (0,000) | (0,074) | (0,180) |
| HOMESIZE | -0,031 | 0,009 | 0,080 | -0,107 | 0,081 | 1,000 | 0,092 | -0,111 | -0,006 |
| | (0,178) | (0,703) | (0,001) | (0,000) | (0,001) | . | (0,000) | (0,000) | (0,798) |
| CHILD2 | 0,144 | -0,074 | -0,049 | -0,013 | 0,100 | 0,092 | 1,000 | 0,074 | 0,127 |
| | (0,000) | (0,001) | (0,034) | (0,572) | (0,000) | (0,000) | . | (0,001) | (0,000) |
| YCHILD3 | 0,508 | -0,189 | 0,074 | 0,280 | 0,041 | -0,111 | 0,074 | 1,000 | -0,398 |
| | (0,000) | (0,000) | (0,001) | (0,000) | (0,074) | (0,000) | (0,001) | . | (0,000) |
| YCHILD6 | -0,033 | 0,044 | -0,010 | 0,016 | 0,031 | -0,006 | 0,127 | -0,398 | 1,000 |
| | (0,154) | (0,058) | (0,654) | (0,502) | (0,180) | (0,798) | (0,000) | (0,000) | . |

**Table 7:** Females' correlation table

| | CCARE | LABOR | EDUC | P_CCARE | P_LABOR | HOMESIZE | CHILD2 | YCHILD3 | YCHILD6 |
|---|---|---|---|---|---|---|---|---|---|
| CCARE | 1,000 | -0,290 | 0,125 | 0,181 | -0,053 | -0,106 | -0,004 | 0,277 | 0,020 |
| | . | (0,000) | (0,000) | (0,000) | (0,022) | (0,000) | (0,859) | (0,000) | (0,398) |
| LABOR | -0,290 | 1,000 | 0,018 | 0,244 | 0,213 | 0,089 | 0,100 | 0,034 | 0,029 |
| | (0,000) | . | (0,441) | (0,000) | (0,000) | (0,000) | (0,000) | (0,145) | (0,207) |
| EDUC | 0,125 | 0,018 | 1,000 | 0,162 | -0,105 | 0,092 | 0,019 | 0,053 | 0,017 |
| | (0,000) | (0,441) | . | (0,000) | (0,000) | (0,000) | (0,402) | (0,023) | (0,457) |
| P_CCARE | 0,181 | 0,244 | 0,162 | 1,000 | -0,292 | -0,027 | 0,148 | 0,505 | -0,036 |
| | (0,000) | (0,000) | (0,000) | . | (0,000) | (0,252) | (0,000) | (0,000) | (0,120) |
| P_LABOR | -0,053 | 0,213 | -0,105 | -0,292 | 1,000 | 0,013 | -0,070 | -0,190 | 0,040 |
| | (0,022) | (0,000) | (0,000) | (0,000) | . | (0,571) | (0,002) | (0,000) | (0,085) |
| HOMESIZE | -0,106 | 0,089 | 0,092 | -0,027 | 0,013 | 1,000 | 0,096 | -0,114 | -0,003 |
| | (0,000) | (0,000) | (0,000) | (0,252) | (0,571) | . | (0,000) | (0,000) | (0,892) |
| CHILD2 | -0,004 | 0,100 | 0,019 | 0,148 | -0,070 | 0,096 | 1,000 | 0,080 | 0,132 |
| | (0,859) | (0,000) | (0,402) | (0,000) | (0,002) | (0,000) | . | (0,001) | (0,000) |
| YCHILD3 | 0,277 | 0,034 | 0,053 | 0,505 | -0,190 | -0,114 | 0,080 | 1,000 | -0,398 |
| | (0,000) | (0,145) | (0,023) | (0,000) | (0,000) | (0,000) | (0,001) | . | (0,000) |
| YCHILD6 | 0,020 | 0,029 | 0,017 | -0,036 | 0,040 | -0,003 | 0,132 | -0,398 | 1,000 |
| | (0,398) | (0,207) | (0,457) | (0,120) | (0,085) | (0,892) | (0,000) | (0,000) | . |

**Table 8:** Males' correlation table

## A.3 Estimation results for Sweden (HUS 1984 and 1993)

| AUSTRIA; TUS 1992 | | | | SWEDEN; HUS1984 & 1993 pooled | | | | |
|---|---|---|---|---|---|---|---|---|
| | Males | | Females | | | Males | | Females |
| ccare (f) | 0,09 | | | | ccare (f) | 0.737 | | |
| | (0,015) | *** | | | | (0.029) | *** | |
| ccare (m) | | | 0,22 | | ccare (m) | | | 0.778 |
| | | | (0,036) | *** | | | | (0.030) *** |
| | | | | | wage (m) | -0.004 | | |
| | | | | | | (0.009) | | |
| | | | | | wage (f) | | | 0.002 |
| | | | | | | | | (0.009) |
| labor (m) | -0,08 | *** | 0,13 | *** | labor (m) | -0.341 | | 0.257 |
| | (0,005) | | (0,008) | | | (0.026) *** | | (0.029) *** |
| labor (f) | 0,05 | *** | -0,16 | *** | labor (f) | 0.273 | | -0.380 |
| | (0,007) | | (0,011) | | | (0.033) *** | | (0.032) *** |
| | | | | | iccare | -0.497 | | 0.126 |
| | | | | | | (0.322) | | (0.333) |
| educ (m) | 6,50 | | | | educ (m) | 0.040 | | |
| | (0,826) | *** | | | | (0.034) | | |
| educ (f) | | | 10,36 | | educ (f) | | | -0.016 |
| | | | (1,251) | *** | | | | (0.038) |
| | | | | | NLINC/$10^6$ | -3.488 | | 0.053 |
| | | | | | | (3.106) | | (3.206) |
| youngest child 0-3 | 43,30 | | 106,71 | | youngest child 0-2 | -0.675 | | 1.715 |
| | (3,377) | *** | (4,903) | *** | | (0.561) | | (0.577) *** |
| youngest child 4-6 | 27,24 | | 39,93 | | youngest child 3-6 | 0.001 | | 1.098 |
| | (3,571) | *** | (5,599) | *** | | (0.370) | | (0.378) *** |
| | | | | | youngest child 7-12 | 0.550 | | 0.037 |
| | | | | | | (0.335) | | (0.346) |
| two children or more | -0,27 | | 11,06 | | two children or more | -0.056 | | 0.288 |
| | (2,680) | | (4,153) | *** | | (0.292) | | (0.301) |
| | | | | | Adults | -0.125 | | 0.161 |
| | | | | | | (0.312) | | (0.320) |
| home size, m$^2$ | 0,06 | | -0,05 | | home size, m$^2$ | 0.000 | | -0.001 |
| | (0,025) | ** | (0,038) | | | (0.004) | | (0.004) |
| | | | | | λ (male) | 3.842 | | -3.461 |
| | | | | | | (1.713) ** | | (1.696) ** |
| | | | | | λ (female) | 0.698 | | -0.280 |
| | | | | | | (0.748) | | (0.780) |
| | | | | | Dummy for 1993 | 0.011 | | -0.089 |
| | | | | | | (0.278) | | (0.278) |
| | | | | | Constant | 0.184 | | 2.275 |
| | | | | | | (0.834) | | (0.868) *** |
| Observations | | 1849 | | | Observations | | 756 | |
| R² | 0,386 | | 0,700 | | R² | 0.38 | | 0.38 |

Standard errors in parentheses. *, **, *** significant at 10%, 5% and 1%.
λ is the inverse Mill's ratio in the bivariate case.

**Table 9:** OLS estimates for child care intensity: Austria and Sweden[45]

Austria (TUS1992) and Sweden (HUS 1984, 1993)

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[45] Swedish results from Halberg/Klevmarken (2003)

| | AUSTRIA; TUS 1992 | | | SWEDEN; HUS1984 & 1993 pooled | | |
|---|---|---|---|---|---|---|
| | Males | Females | | Males | Females | |
| ccare (f) | 0,18 | | ccare (f) | 0.951 | | |
| | (0,054) *** | | | (0.086) *** | | |
| ccare (m) | | 0,18 | ccare (m) | | 0.989 | |
| | | (0,136) | | | (0.091) *** | |
| | | | wage (m) | -0.003 | | |
| | | | | (0.011) | | |
| | | | wage (f) | | -0.004 | |
| | | | | | (0.008) | |
| labor (m) | -0,11 | 0,24 | labor (m) | -0.295 | 0.287 | |
| | (0,013) *** | (0,019) *** | | (0.107) *** | (0.108) *** | |
| labor (f) | 0,13 | -0,33 | labor (f) | 0.119 | -0.137 | |
| | (0,024) *** | (0,036) *** | | (0.150) | (0.146) | |
| | | | iccare | -0.422 | 0.473 | |
| | | | | (0.705) | (0.711) | |
| educ (m) | 5,31 | | educ (m) | 0.013 | | |
| | (0,967) *** | | | (0.025) | | |
| educ (f) | | 10,68 | educ (f) | | -0.001 | |
| | | (1,525) *** | | | (0.026) | |
| | | | NLINC/10$^6$ | | | |
| youngest child 0-3 | 36,45 | 92,25 | youngest child 0-2 | -1.375 | 1.464 | |
| | (6,995) *** | (9,294) *** | | (0.574) ** | (0.559) *** | |
| youngest child 4-6 | 25,43 | 33,52 | youngest child 3-6 | -0.830 | 0.923 | |
| | (4,431) *** | (7,758) *** | | (0.388) ** | (0.366) ** | |
| | | | youngest child 7-12 | | | |
| two children or more | 2,28 | -0,28 | two children or more | | | |
| | (2,920) | (4,847) | | | | |
| | | | Adults | | | |
| home size, m$^2$ | 0,05 * | -0,11 | home size, m$^2$ | | | |
| | (0,029) | (0,048) ** | | | | |
| | | | λ (male) | 4.102 | -4.177 | |
| | | | | (1.550) *** | (1.470) *** | |
| | | | λ (female) | 0.096 | -0.048 | |
| | | | | (0.795) | (0.808) | |
| | | | Dummy for 1993 | 0.052 | 0.029 | |
| | | | | (0.320) | (0.279) | |
| | | | Constant | 0.061 | 0.479 | |
| | | | | (0.850) | (0.828) | |
| Observations | 1849 | | Observations | 756 | | |
| R² | 0,336 | 0,647 | R² | 0.21 | 0.22 | |

Standard errors in parentheses. *, **, *** significant at 10%, 5% and 1%.
λ is the inverse Mill's ratio in the bivariate case.

**Table 10:** 2SLS estimates for child care intensity: Austria and Sweden[46]

Austria (TUS1992) and Sweden (HUS 1984, 1993)

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[46] Swedish results from Halberg/Klevmarken (2003)

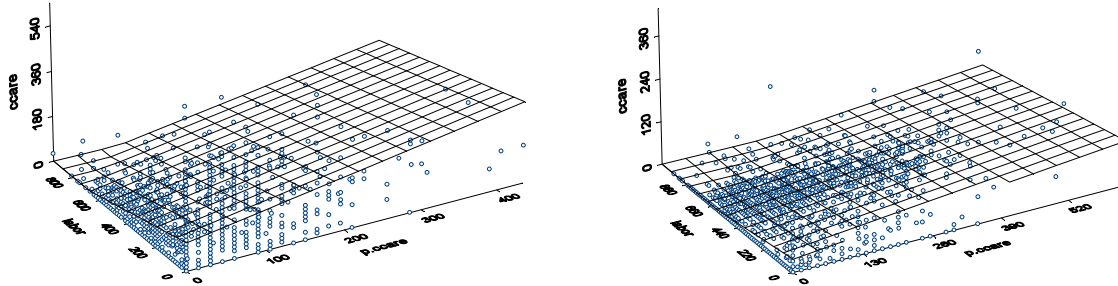## A.4    Additional graphical analysis



**Figure 17:** Child care intensity in respect to own labour intensity and partner's child care intensity; 2nd ORDER FIT
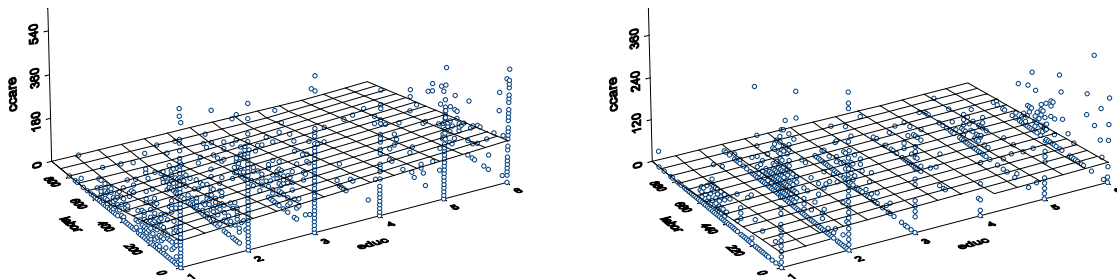


**Figure 18:** Child care intensity in respect to labour intensity and education level; 2nd ODER FIT
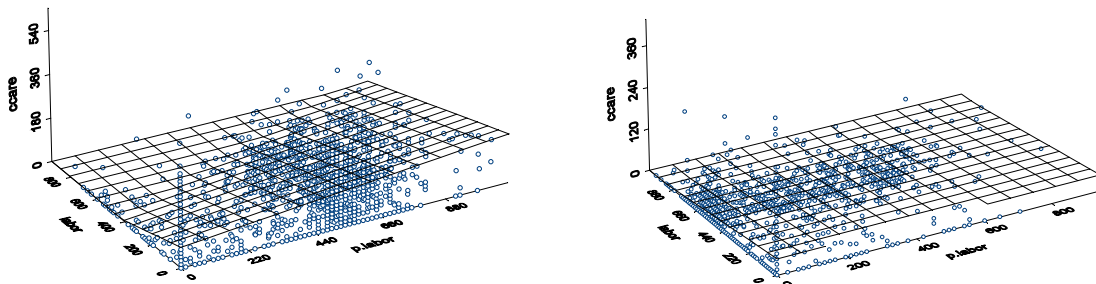


**Figure 19:** Child care intensity in respect to own and partner's labour intensity; 2nd ODER FIT

## A.5 Instruments of the 2SLS estimator

| | | | | | | | | | | percentiles | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | (stddev) | min | 5 % | 10 % | 25 % | 40 % | 50 % | 60 % | 75 % | 90 % | 95 % | max |
| **Mothers** | age | 35 | (8,078) | 19 | 24 | 26 | 29 | 31 | 33 | 35 | 39 | 45 | 50 | 54 |
| | citizenship | 7,8% | (0,269) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| | self-employed | 12,6% | (0,332) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| | extraordinary day? | 8,3% | (0,276) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| | university degree | 8,3% | (0,275) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| **Fathers** | age | 38 | (8,600) | 20 | 26 | 28 | 32 | 34 | 36 | 38 | 43 | 49 | 54 | 68 |
| | citizenship | 7,1% | (0,257) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| | self-employed | 13,0% | (0,337) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| | extraordinary day? | 18,7% | (0,390) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| | university degree | 8,4% | (0,278) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |

**Table 11:** Statistics of individual level instruments

| Instruments for the 2SLS estimator | Mean (%) | (stddev) | Skewness | Kurtosis |
|---|---|---|---|---|
| *indicators of wealth:* | | | | |
| does HH own the dwelling? | 66,1% | (0,473) | -0,682 | -1,535 |
| does HH have second dwelling? | 5,2% | (0,223) | 4,021 | 14,169 |
| costs of rental (main) dwelling | 3624 | (3624) | 1,179 | 2,227 |
| *caring requirement* | | | | |
| disabled persons in HH? | 11,1% | (0,471) | 4,572 | 20,914 |
| child aged <=3 in HH? | 38,4% | (0,486) | 0,477 | -1,773 |
| child aged 4-6 in HH? | 29,9% | (0,458) | 0,880 | -1,226 |
| child under school age in HH? | 58,1% | (0,493) | -0,330 | -1,891 |
| child in school age in HH? | 61,8% | (0,486) | -0,486 | -1,764 |
| youngest child in school age? | 41,9% | (0,493) | 0,330 | -1,891 |
| *assistance from/to surveyed household (for free)* | | | | |
| HH gives costless assitance on household duties | 17,5% | (0,408) | 2,182 | 3,979 |
| HH gives costless assitance on child care | 14,5% | (0,379) | 2,562 | 6,027 |
| HH gives costless assitance on adultcare | 13,4% | (0,365) | 2,671 | 6,624 |
| HH gives costless assitance on gardening | 10,9% | (0,330) | 2,981 | 8,459 |
| HH gives costless assitance on workmanship | 21,5% | (0,421) | 1,561 | 0,943 |
| HH receives costless assitance on household duties | 11,2% | (0,352) | 3,281 | 10,801 |
| HH receives costless assitance on child care | 28,4% | (0,569) | 1,886 | 2,455 |
| HH receives costless assitance on adultcare | 4,4% | (0,207) | 4,623 | 20,439 |
| HH receives costless assitance on gardening | 5,7% | (0,264) | 5,039 | 27,065 |
| HH receives costless assitance on workmanship | 10,8% | (0,317) | 2,719 | 6,168 |
| *paid assistance* | | | | |
| HH receives paid assitance on home production & child care | 6,0% | (0,304) | 5,362 | 28,880 |
| HH takes institutional child care? | 20,0% | (0,400) | 1,501 | 0,253 |
| *additional items* | | | | |
| living in urban region? | 38,7% | (0,487) | 0,465 | -1,784 |
| diary on weekend? | 31,3% | (0,464) | 0,807 | -1,349 |

**Table 12:** Statistics of household level instruments
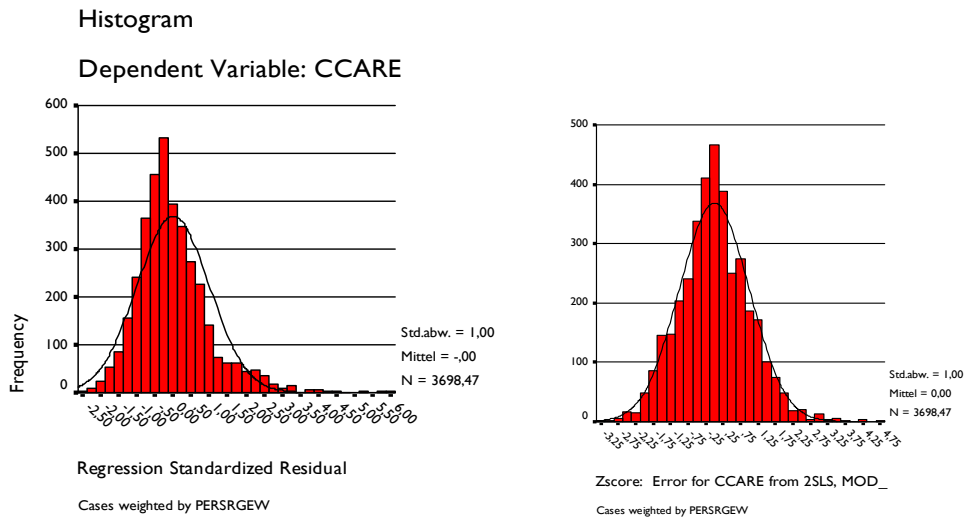
## A.6 Error term distribution of estimation models

Histogram

Dependent Variable: CCARE



**Figure 20:** Improvement of fit: Distribution of residuals for OLS (left) and 2SLS (right) => ALL PARENTS

Histogram

Dependent Variable: CCARE
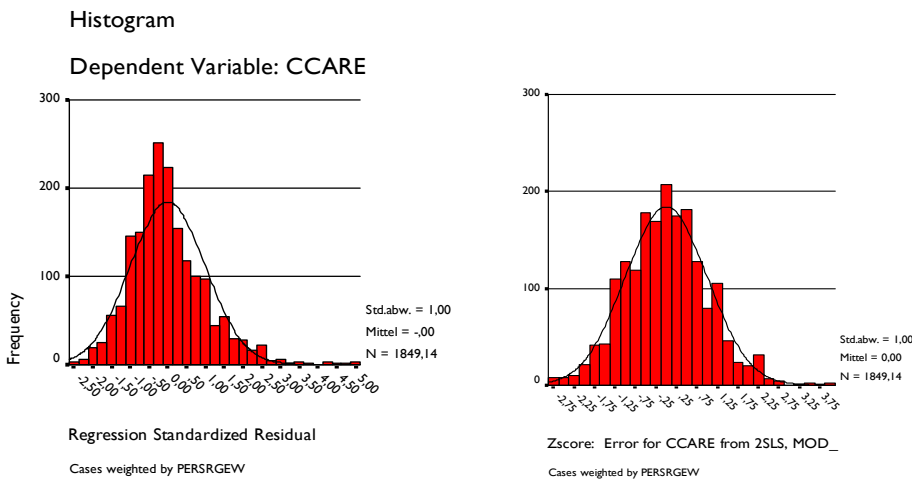


**Figure 21:** Improvement of fit: Distribution of residuals for OLS (left) and 2SLS (right) => MOTHERS

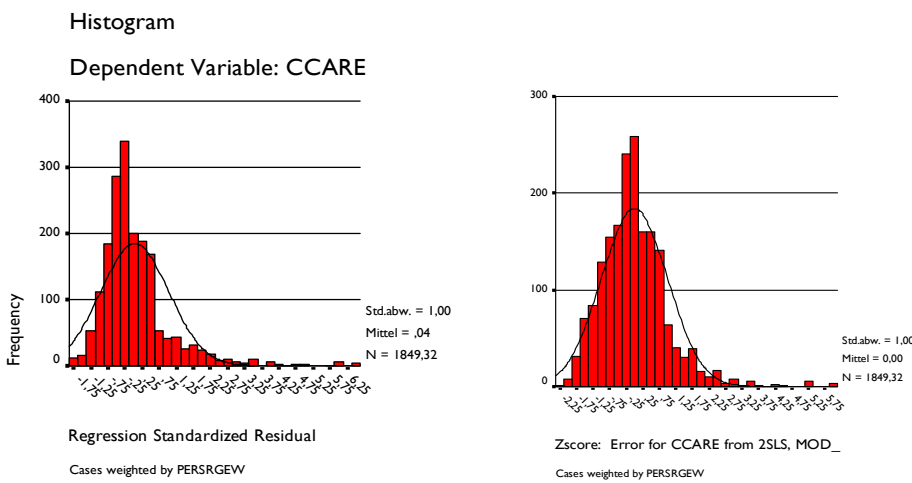Histogram

Dependent Variable: CCARE



**Figure 22:** Improvement of fit: Distribution of residuals for OLS (left) and 2SLS (right) => FATHERS

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