Trends in children's gendered housework performance:

Time use evidence from Germany, 1991–2013

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Abstract

Like their parents, children are productive members of their households and may contribute to housework. This study is the first to examine trends in children's housework behavior in Germany. Using data from the German Time Use Study, 12-17-year-old boys' and girls' participation in and time use for housework activities are tracked between 1991 and 2013. The analytical focus is on the relation between the time spent on housework by parents and children and its development over time. It is shown that there is no change in children's overall participation in housework, but that girls and boys spent fewer days on housework in 2012/2013 than 20 years ago. Furthermore, children's average time spent on housework decreased in the observed timeframe, but remained constant on days on which children actually do housework. Moreover, children's time use is positively related to parents' time use, especially for same-sex parent-child-dyads. In conclusion, trends in children's time use resemble developments in parental housework behavior, especially concerning the decline of total housework time and gender convergence.

Keywords: time use; housework; children; gender convergence; Germany, intergenerational transmission

1 Introduction

In the mainstream of housework research, children have been considered as (exogenous) explanatory factors of parental time use and the division of labor between mothers and fathers. However, like their parents, children are productive members of their households and may contribute to home production. In doing so, children influence parental time binds, flexibility in everyday life, and work-life balance. Concurrently, parents influence their children's productivity and readiness to participate in housework by involving them in their everyday routines and by serving as primary role models in the context of home production.

Previous studies have shown that children's input to housework in families is quite significant and that girls tend to do more housework than boys (Bonke 2010; Dotti Sani 2016; Gager et al. 1999; Hofferth 2009). This observation fits well with the general literature on unpaid work times, as current estimates indicate that women continue to do the majority of housework in western societies. Even despite long-term evidence of gender convergence, gender inequality in housework seems to be a remarkable social invariant whose life course dynamics and determinants are, however, still not fully understood. This is particularly true for the early phases of the life course, in which children are socialized within a society's gender relations and develop their own gender stereotypes and identities. Thus, the childhood experiences and impressions of who should be doing the housework may pave the way for future gendered behavior of girls and boys.

Which patterns of housework participation children perceive as 'adequate' behavior largely depends on the family context and on the behavior of mothers and fathers within the family. In this respect, previous studies have shown robust evidence that parents' and children's contributions to housework are highly dependent and positively related (Álvarez and Miles-Touya 2012; Cordero-Coma and Esping-Andersen 2018; Cunningham 2001; Gimenez-Nadal et al. 2017, 2018; Gupta 2006). On the one hand, this finding fuels the major explanatory approach to children's housework behavior, the socialization perspective. On the

other hand, this behavioral interrelation may trigger change in children's time use for housework in accordance with adult women's and men's changing housework patterns.

Bringing the rather descriptive, but theoretically grounded perspective of gendered time use for housework and the more analytical socialization approach together, the present study aims to enlighten the processes of persisting or changing gendered housework patterns across generations (Cordero-Coma and Esping-Andersen 2018). To achieve this, this study contributes a diachronic perspective to the current literature on children's housework, which is still limited and has been largely descriptive. Using repeated cross-sectional data of the German Time Use Study from 1991/1992, 2001/2002, and 2012/2013, the present study examines changes in 12-17-year-old children's contributions to housework in two-parent families over a period of 20 years in Germany, a country which has been underexposed to this kind of research in the past, and which is of particular interest because of its prevailing conservative welfare regime.

First, the study explores trends in girls' and boys' changing participation in and time spent on housework between 1991 and 2013, making use of a repeated cross-sectional design. This extends the current predominantly cross-sectional literature by a trend perspective, which is able to uncover the development of children's housework time over a period of unprecedented scope.

Second, the study examines the association between parents' and children's time use for housework and whether this association has changed over the past 20 years in Germany. In doing so, the study contributes to the explanation of children's gendered housework performance by assessing whether the well-documented positive association between parents' and children's housework times has changed over the years and if this change may contribute to changing gender inequality. In addition, changing children's time budget for housework will be discussed with a more general view to children's well-being.

2 Background

2.1 Context of the study

Studying Germany fits well with the existing literature on children's housework in other western countries such as the United States (Gager et al. 1999; Hofferth and Sandberg 2001; Hofferth 2009), Italy (Dotti Sani 2016), Denmark (Bonke 2010), Sweden (Evertsson 2006), Spain (Álvarez and Miles-Touya 2012; Gimenez-Nadal et al. 2017), or the United Kingdom (Gimenez-Nadal et al. 2018). Germany is at least considered a modified male breadwinner society with prevailing traditional gender ideologies and gendered behavior in the family. Even though Germany has experienced remarkable changes in gendered time use patterns (Altintas and Sullivan 2016; Sullivan et al. 2018) and gender role attitudes (Braun and Scott 2009) over decades, women still take the lion's share of unpaid work and are basically seen responsible for this kind of labor. Scoring 65.5 on the Gender Equality Index, Germany ranks near the European average in gender equality, which ranges from Sweden's top score of 82.6 to Greece's bottom score of 50.0 (European Institute for Gender Equality 2017).

As any other western country, Germany has gone through a process of gender convergence in unpaid work times over the last decades, which was driven by sizable decreases in adult women's housework time paired with slight increases (or at least no further decreases) in adult men's housework and child care time (Sullivan et al. 2018). Wirth (2017) found the same pattern for 10-17-year-old German children: between 2001 and 2013 (she did not include data for 1991 and participation indicators, though), girls' time for housework decreased from 73 to 67 minutes per day, and boys' housework time has remained rather constant at 48 and 47 minutes per day for the respective years (similar in the United States: Hofferth 2009; Hofferth and Sandberg 2001).

2.2 Longitudinal evidence for the association between parents' and children's time allocation for housework

Linking parents' behavior of the past with later behavior of their children, Coma-Cordero and Esping-Andersen (2018) found that the participation of 18-19-year-old German sons in housework was more likely the more their fathers contributed when they were 8-11 years old. German daughters' contribution to housework was found to be generally more likely than that of sons and largely independent of parental behavior. Cunningham (2001) found for the United States that fathers' share of housework in sons' early childhood was positively related to sons' domestic involvement at age 31. Daughters' contribution to housework, on the other hand, was more driven by mothers' labor market participation when they were very young. Gupta (2006) added evidence for the United States that men's housework involvement was influenced by their exposure to maternal employment during childhood as well as their current marital circumstances. Cross-sectional studies from several countries, including Germany, provided largely identical evidence for these kinds of positive "intergenerational correlations" (Gimenez-Nadal et al. 2017: 1147) between parents and children regarding participation in and time use for housework (Álvarez and Miles-Touya 2012; Dotti Sani 2016; Evertsson 2006; Gimenez-Nadal et al. 2017, 2018; Wirth 2017).

In sum, the previous literature clearly advocates the socialization perspective as the major explanatory mechanism of children's housework behavior. This strengthens the argument outlined in the introduction that changes in parental behavior may trigger long-term changes in gender inequality, as these new patterns are adopted and perpetuated by their children.

2.3 Theoretical considerations

The majority of previous research framed the explanation of children's participation in housework along the lines of "need or socialization" (Blair 1992; Cordero-Coma and Esping-

Andersen 2018). The demand perspective argues that children need to contribute to housework because of parental time constraints, i.e., that children need to fill in to relieve their parents from some home production. The socialization perspective argues that children contribute to housework because parents have (more or less successfully) got the importance of helping at home across to their children. Both explanatory approaches have received some notable albeit not entirely conclusive support in the international (cross-sectional) literature (Blair 1992; Bonke 2010; Evertsson 2006; Gager et al. 1999). However, the socialization mechanism clearly dominates the interpretation of the longitudinal studies discussed in section 2.2 (Cordero-Coma and Esping-Andersen 2018; Cunningham 2001; Gupta 2006).

To frame the correlation between parents' and children's housework behavior, which is the main analytical issue of this study, a gendered perspective on the socialization process is needed. When girls and boys grow up, they develop "beliefs about the roles and expectations that are associated with each sex group" (Stockard 1999, p. 215). Parents influence their children to learn gender-appropriate beliefs and behavior by either strategically guiding them or by (more or less passively) acting as role models which children observe and imitate (Coma-Cordero and Esping-Andersen 2018). Because housework and intra-household time allocation between women and men are still crucial references of doing gender in modern societies, this domain of daily life is expected to be a major source through which parents transmit gendered beliefs, identities and behavior to their children.

2.4 Hypotheses

The empirical analyses of the present study are guided by two sets of expectations. The first set is derived from the empirical findings of the previous literature on children's housework and the developments in adults' unpaid work times outlined in sections 2.1 and 2.2, and, thus, does not have the character of hypotheses in the narrower sense.

Given the prevalence of gender convergence and overall decline in total housework time over recent decades, I expect children's participation in housework and their average time use for housework to decline over the course of my observation period from 1991/1992 to 2012/2013. Concerning gender differences, I expect this decline to be stronger for girls than for boys, because women's and mothers' time budgets have decreased substantially over decades while men's and fathers' have been rather stable or slightly increasing. Consequently, this pattern would result in a trend of gender convergence in housework time between teenage girls and boys, just as it has been observed for women/mothers and men/fathers.

The second set of expectations is derived from the theoretical arguments of the socialization perspective outlined in section 2.3, and, thus, could be considered to include hypotheses in the narrower sense.

Drawing on the socialization mechanism, I hypothesize positive correlations between mothers' and fathers' and girls' and boy's time use for housework. Given the developments in parents' housework time, i.e., a decline in women's time spent on housework and rather stable time use of men, these correlations may be interpreted as credible sources of the explanation for children's gender convergence. Concerning gender differences, I hypothesize boys' time use to be more strongly correlated to fathers' than to mothers' time use. Conversely, I hypothesize girls' time spent on housework to be more strongly correlated to mothers' than to fathers' time use. Furthermore, I hypothesize the association between children's and their parents' time use to be stronger for boys than for girls, because gender construction theory would predict a generally higher involvement of female than of male children in housework activities due to the doing-gender-mechanism, irrespective of parental behavior.

2.5 Discussion regarding the scope of the present study

Four aspects need to be acknowledged concerning the scope of the present study. First, the developments in children's housework participation and time use should hold when

controlling for common measures capturing arguments of need and socialization perspectives. Especially parents' housework behavior should be correlated with children's behavior, largely independent from other parental characteristics (Coma-Cordero and Esping-Andersen 2018) and irrespective of the mechanism which triggers parental relative allocation of housework, e.g., bargaining or gender construction (for a brief discussion of the most relevant mechanisms in housework research see Coltrane 2000).

Second, based on the design at hand, I recognize that it is impossible to draw conclusions about causal inferences between parental and child behavior. Having used longitudinal data, Cordero-Coma and Esping-Andersen (2018), Gupta (2006), and Cunningham (2001) have indeed concluded in favor of causality in their respective settings. With the repeated cross-sectional design of the present study, I can only draw conclusions about intergenerational correlations. However, I can assess whether these correlations have remained stable or have developed in a certain direction over the last 20 years in Germany. The only time use evidence for Germany on these issues, thus far, (Gimenez-Nadal et al. 2017; Wirth 2017) is single and separate cross-sectional evidence for 2001/2001 or 2012/2013. In the present study, I use all three surveys of the German Time Use Study to offer a view on longer-term developments and parental dependencies of children's time use for housework.

Third, and in close relation with the aforementioned aspect, endogeneity may be of concern given the design at hand. As discussed by Gimenez-Nadal et al. (2017: 1150-1153), endogeneity, either because of measurement error (discussed below in section 3.1), reverse causality, or unobserved heterogeneity, may bias estimates in cross-sectional studies. Regarding reverse causality, the basic question is if there exists an effect of children's housework on their parents' time for housework. Regarding unobserved heterogeneity, there may indeed be unobserved factors which relate to both parents' and children's decision to devote time to housework. In the present study, both problems cannot be solved, especially

because of the cross-sectional structure of the data. Thus, this needs to be acknowledged by interpreting the results in an unpretentious and cautious way. However, as the longitudinal studies of parents' and children's allocation of time for housework have shown (see section 2.2), the assumption of a one-way influence from parents to their children based on the socialization mechanism is quite plausible, especially for the observed age range of teenage children.

Fourth, as Cordero-Coma and Esping-Andersen (2018) have noted, it is basically impossible to disentangle if boys' and girls' different housework participation is triggered by learning and modeling or whether it reflects gendered parental assignment of chores. Given the age range of children in the present study (12-17), it is plausible to assume that the children are not free in their decisions on doing housework and, thus, will be following their parents' behavior and instructions to a greater extent than adult children. Yet, in both cases, positive dependencies between the behavior of parents and children signal evidence of gender role transmission, either because children tend to follow their same-sex parent's behavior or because the asymmetry between girls and boys cannot be rationalized from an economic perspective of costs and returns (Álvarez and Miles-Touya 2012; Cordero-Coma and Esping-Andersen 2018; Lundberg 2005).

3 Method

3.1 Data

This analysis was based on the scientific use files of the three waves of the German Time Use Study, which were conducted in 1991/1992 (Ehling 1999), 2001/2002 (Ehling et al. 2001), and 2012/2013 (Maier 2014) by the German Federal Statistical Office. The three surveys of the German Time Use Study were based on quota sample of about 7,200, 5,000 and again 5,000 households, respectively, and portray the whole German population for all days of the week and all months of the year. Compared to a (hypothetical) random sample, in particular

households with children were oversampled ensuring sufficient case numbers for the analyses of the present study.

The time use data was collected with the time diary approach, accompanied by separate questionnaires for each respondent and each household. Using time diaries is regarded as superior in capturing time use patterns compared to other methods, such as stylized survey questions on time use (Kan and Pudney 2008), especially when children are the target population (Ben-Arieh and Ofir 2002). For the purpose of the present study, it is of advantage that the German Time Use Study contains first-hand information of all household members, i.e., parents and children, as reporting the time use of others has been found to be prone to errors (Kamo 2000).

In 1991/1992, each member of a household aged 12 years or older kept a diary for two successive days, recording all activities in 5-minute intervals. In 2001/2002 and in 2012/2013, each household member aged 10 years or older kept a diary for two weekdays and one weekend day, recording all activities in 10-minute intervals. The openly recorded activities were subsequently coded according to the 2008 Guidelines for Harmonized European Time Use Surveys (Ehling et al. 2001; Maier 2014).

3.2 Sample

The present study focused on 12-17-year-old children, who are living in two-parent households. Consequently, nothing can be said about single-mother/father families, leaving this important issue for future research. The sample was further restricted by dropping all households with 'third persons', such as grandparents, and with children aged 18+ to reduce heterogeneity. Finally, all diaries of children aged 10 or 11 years were dropped from the two most recent time use surveys to harmonize the age range of the sample for all three observation points (including the 10-11-year-old children would not have affected the conclusions, though).

Altogether, the final sample of the present study comprised 7,733 time use diaries from 1,484 girls and 1,513 boys within 2,216 households (see Table 1 for case numbers and descriptives). The diaries were almost evenly distributed over the three surveys and children's sex.

--- Table 1 ---

3.3 Measures of children's housework participation

Children's contributions to housework were captured with four measures, all of which refer to a broad definition of housework, including activities in the kitchen (e.g., cooking, washing dishes), cleaning, doing the laundry and ironing, doing repairs in and around the home, caring for the car, grocery shopping, doing organizational work for the household, and doing administrative (paper)work. First, a binary variable measured participation in housework if a child recorded any housework activity on a single diary day. Second, another binary variable measured overall participation in housework if a child recorded any housework activity on any of the diary days within one survey. Third, children's time use for total housework was measured as the sum of all housework activities on a given diary day, including days on which the children did not participate in housework and, thus, recorded zero time. Fourth, time use of participating children conditioned children's total time for housework on those children who actually participated in housework, dropping all diaries with zero time for housework. Both housework time budgets were measured in minutes per day (see Table 1 for descriptives).

All variables included time for primary and secondary activities on weekdays (Mondays through Fridays) and on weekends (Saturdays or Sundays). Because it is plausible to assume that housework time is not distributed evenly over the week, all analyses were, in addition, estimated separately for weekdays and weekend days. The results of these

estimations did not affect the conclusions, even though lower case numbers of the weekend analyses produced larger confidence intervals.

Two necessary transformations were applied to the time use variables. First, to avoid statistical outliers, children's time for housework was truncated at 240 minutes per day. Sensitivity analyses showed that the results and the conclusions were not affected by this procedure, whereas the fit of the models slightly increased. Second, because the German Time Use Study has used different time slots for their diaries (5-minute intervals in 1992/1992 and 10-minute-intervals in 2001/2002 and in 2012/2013), each episode of housework activity in 1991/1992 was rounded down to the nearest ten. Thus, absolute time budgets in 1991/1992 are lower and less precise, which, however, did not affect the conclusions of the present study.

3.4 Predictors and stratification variables

The main predictor of children's contributions to housework was parents' housework time. It was measured as mothers' and fathers' mean time for total housework in minutes over all of their respective diaries in each survey, as the parents did not necessarily keep their diaries on the very same days as their children (see Table 1 for descriptives). All analyses were performed separately for girls and boys and each survey year.

3.5 Controls

The multivariate models included four sets of control variables (see Table 1 for descriptives). First, a continuous variable controlled for children's age. Other possible children's characteristics, such as time spent on education or employment, were not included because of endogeneity issues (when included, though, both variables did not affect the outcomes). Second, mothers' characteristics included binary variables capturing education (university degree or no university degree) and employment status (not working, working part-time, or working full-time). Third, fathers' characteristics included binaries for education (university

degree or no university degree) and employment status (working full-time or not working full-time). Fourth, household characteristics included the number of children aged 0–12 years, the number of children aged 12–17 years, and the region in which the household was located (East or West Germany). Another binary was used to control if the diary depicts a day on the weekend.

3.6 Models

To estimate the probability of children to participate in housework, I used logistic regression models. To estimate children's time use and the dependence between children's and parents' time use, I applied OLS regression models. As the children in the German Time Use Study kept one to three diaries in each survey, I accounted for this multilevel structure by estimating cluster robust standard errors on the level of respondents. Yet, I did not account for clustering on the level of households but included several controls for household composition in the models. This was done to, first, keep the modeling procedure as simple as possible, and, second, because sensitivity analyses showed that the results and conclusions would not have been affected. The latter is also true for alternative modeling approaches such as probit or tobit, which have been quite frequently used in recent time use research.

The Figures presented in section 4 show estimated (in a technical sense: "predicted") margins at the means (Williams 2012), adjusted by setting all covariates to the sample means (Figures 1, 2) and additionally to fixed time budgets of mothers and fathers (Figure 3). The models behind the plots are detailed in Tables A1–A4 in the Appendix.

4 Results

The plots in Figure 1 illustrate changes in children's participation in housework activities from 1991/1992 to 2001/2002 and then to 2012/2013 in Germany, separately for girls (marked with triangles) and for boys (marked with bullet points). Figure 2 plots developments

in children's time use and Figure 3 shows the association between parents' and children's time budgets for housework.

4.1 Children's participation in housework

Figure 1 shows how girls' and boys' probabilities of participating in housework have developed between 1991/1992 and 2012/2013. The markers connected with solid lines refer to the classic diary-based concept of participation, treating each diary separately. In 1991/1992, girls participated in any kind of housework activity in 79 %, and boys in 63 % of all collected diaries. Until 2012/2013, this probability has decreased significantly to 63 % and 47 %, respectively, while the main decrease seems to have happened between 1991/1992 and 2001/2002, followed by only a minor further decrease between 2001/2002 and 2012/2013. The decrease is slightly stronger for girls than for boys, as their probability of participation declined by about 19 % compared to 25 %.

--- Figure 1 ---

Looking at overall participation in housework changes the picture completely. The markers connected with dashed lines in Figure 1 show the probabilities of girls and boys to record any kind of housework activity over all of their collected diaries. From this perspective, there has not been any change between 1991/1992, 2001/2002, and 2012/2013. Over the years, slightly more than 90 % of the girls and about 80 % of the boys have been participating in housework. The probabilities varied by only two percentage points for girls and boys.

4.2 Children's time use for housework

Figure 2 illustrates the changes in children's time use over the 20 years of this study's observation window. The markers connected with solid lines include all diaries of the sample,

i.e., they include diaries with zero time for housework. Starting at an average of 55 minutes per day in 1991/1992, girls' time for total housework declined by 13 minutes to about 42 minutes in 2012/2013. The 13-minute decline divides into a non-significant portion of six minutes between 1991/1992 and 2001/2002, and another, this time significant reduction of 7 minutes between 2001/2002 and 2012/2013. Boys' time for total housework has declined from 37 minutes in 1991/1992 to 29 minutes in 2001/2002 and finally to 28 minutes in 2012/2013. In each year of the German Time Use Study, boys' time use is significantly lower than girls', with about two thirds of girls' time budgets. Although girls' and boys' decline in housework time has been about 25 % of the initial time budget in 1991/1992, girls' absolute decrease is higher (average of -13 minutes per day) than boys' (average of -9 minutes per day). Consequently, the difference between girls' and boys' time use declined by about 20 % between 1991/1992 and 2012/2013.

--- Figure 2 ---

Again, the picture changes when looking at a second measure of time use. The markers connected with dashed lines in Figure 2 show the time budgets of those children who participated in housework. In these estimations, all diaries with zero time for housework were dropped. If boys participated in housework, their average time budgets on these occasions remained rather constant at about 60 minutes over the 20 years of the observation window. Girls' average daily time spent on any kind of housework decreased slightly but not significantly between 1991/1992 and 2012/2013 from about 69 to 67 minutes on participation days. In 2012/2013, participating girls' and boys' average time spent on any kind of housework is not significantly different, whereas this was the case in the two preceding survey years.

4.3 Children's and parents' time use for housework

Figure 3 relates to the main analytical issue of the study, pertaining to the relation between parents' and children's time budgets for housework. Time use is averaged on the basis of all diaries, including those with zero time use for housework, as derived from Table A3 in the Appendix. However, conclusions from the models of participants' time use (Table A4 in the Appendix) would basically be identical. To reduce complexity and to focus on the development over the 20-year observation window, I did not include plots for 2001/2002 in Figure 3. The left panel of Figure 3 plots children's time for total housework by mothers' and the right panel by fathers' housework time.

--- Figure 3 ---

Girls' time spent on housework is positively related to mothers' and fathers' time use. However, the correlation with fathers' time use is not significant in 2012/2013. Likewise, boys' time spent on housework is positively related to mothers' and father's time use. However, in 2012/2013, the correlation with mothers fails to be significant on the level of $p<.05$. In both panels, the decline in housework time is visible as the dashed lines for 2012/2013 are below the solid lines of 1991/1992. For boys' time spent on housework in 2012/2013, the slope of the correlation is steeper than for 1991/1992 and almost converges with the pattern of 1991/1992. In this case, it seems as if the sons of less involved fathers might have reduced their time to a greater extent than the sons of highly involved fathers. For the association between girls' and fathers' time use, it is the other way around, as the daughters of highly involved fathers might have reduced their time to a greater extent than the daughters of less involved fathers.

5 Discussion and conclusion

There have been massive changes in patterns of time use for housework in all western societies over the last decades. Previous research has typically focused on adults, accounting for children as (exogeneous) sources of demand for housework. This study looked at children as productive household members who supply housework, fueling a hitherto under-researched niche of housework research. Using data from the German Time Use Study, it provided the first analysis of trends in 12-17-year-old children's housework behavior with more than two points of time. To examine children's contributions to housework, the study analyzed changes in participation in and time use for housework between 1991/1992, 2001/2002 and 2012/2013. Analytically, the focus was on "intergenerational correlations" between children's and parents' time budgets for housework as the main determinant of children's housework behavior.

5.1 Three main findings

Three main findings surfaced in this analysis. First, even though almost every child seems to be involved in at least some housework over the week, the expected daily participation in doing chores declined considerably between 1991/1992 and 2012/2013. Second, whereas girls' and boys' time use for housework was found to be declining over the 20-year observation period, the average time use of children participating in housework has remained constant.

Taken together, these findings illustrate an overall decline of housework involvement of children aged 12-17 years in German households. Both declines in daily participation and time use were similar for girls and boys. On the one hand, the probability of doing daily housework declined around 25 percentage points. On the other hand, daily time use declined about 30 percent. Both developments are in line with previous literature on changing children's housework contributions over time (Hofferth 2009; Hofferth and Sandberg 2001;

Wirth 2017). Given that girls started on a higher level in 1991/1992 regarding both daily participation and time use, similar relative reductions in both indicators resulted in higher absolute decreases trough 2012/2013. Thus, the gender gap in expected daily participation and time use between girls and boys on typical days has narrowed, giving rise to the notion of gender convergence.

Third, the study found positive correlations between parents and children concerning their time use for housework, supporting views of "intergenerational correlations" expressed in earlier studies (Dotti Sani 2016; Evertsson 2006; Gimenez-Nadal et al. 2017; Wirth 2017). Especially same-sex parents' behavior proved to be particularly predictive for girls and boys. These findings support the theoretical perspective of gendered socialization and family learning, as parental behavior seems to be "transmitted" to their children. Declines in girls' housework involvement could have been predicted from women's and mothers' long-term declines in housework in combination with the positive connection to their daughters. Boys' declines, however, did not fit this picture, as men's and fathers' average time budgets for housework have developed rather steadily or might be slightly increasing. Nevertheless, there was some indication that the time use of sons, whose fathers were highly involved in housework, did not decrease as much as the time use of sons of less involved fathers.

5.2 Limitations of the present study

Despite the novel insights of the present study, three limitations require further investigation. First, this study was limited to the German context, which is an interesting case to examine gender differences as it is regarded as a conservative welfare regime with still prevailing traditional gender arrangements. However, similar observations have been made for the United States (Hofferth 2009; Hofferth and Sandberg 2001), albeit not over such a long period within one single data source, and a strong case has been made for gender convergence in housework time in virtually all western countries (Altintas and Sullivan 2016; Sullivan et al.

2018). Therefore, broader conclusions about contextual differences in children's housework behavior require further time use studies from other countries.

Second, even though the German Time Use Study offers data of unprecedented range to study children's time use, a larger sample would have been needed to spell out the analyses in more detail. Most notably, this concerns the distinction between time use on weekdays and weekends, as well as the life-course dependency of doing housework (Leopold et al. 2018; Dotti Sani 2016). Studying age and cohort patterns of children's time use, for housework and in general, will give further insight in the dynamics of change and gender convergence.

Third, more longitudinal research is necessary to disentangle issues of causality. Even though Cordero-Coma and Esping-Andersen (2018), Gupta (2006) and Cunningham (2001) made strong cases in favor of causality, it is still unclear, how the proposed transmission mechanism of housework behavior really works – through parental assignment of tasks to their children or through modeling and imitation. Most likely, it will be a combination of both mechanisms, and in this case, the relation of both mechanisms will be of interest. Further, longitudinal studies of time use, if available, would be able to address issues of endogeneity and reverse causation empirically and to test the assumptions about both problems which are necessarily made in cross-sectional studies.

5.3 Conclusions

The findings of the study have two implications for gender inequality and children's well-being. Regarding the former, the results showed that the changes in housework time that have been observed for adult women and men, tagged with labels of "gender convergence" or "gender revolution", were transmitted to children. Converging housework time between sons and daughters means that children grow up in more equitable, or at least less gendered arrangements of home production than decades ago. This, in turn, may trigger path dependencies which could further decrease the gender gap in housework in the future.

Concurrently, the developments of gender convergence have hardly eliminated the still pervasive inequality between women and men regarding the distribution of unpaid work times. In that sense, the transmission of parental housework behavior to their children can perpetuate traditional gender roles despite an increasing societal climate of equality and overall decreasing housework hours. Taken together, this is an ambivalent situation, in which the positive notion of decreasing gender inequality is somewhat thwarted by the awareness that this kind of traditional patterns is 'tenacious' and needs a long time to be changed.

In closing, decreasing time for housework has implications for children's well-being as well. If today's children spend less time on housework than decades ago, they have more time to spare for other activities. Relieving children from doing housework, on the one hand, frees capacities and resources to invest in other productive, especially educational or social activities, or most simply in leisure or personal recreation. On the other hand, participating in housework may be an educational activity itself, nurture responsibilities and provide guiding structures within the challenge of growing up. This debate about the burdens and benefits of children's housework (see the discussion in Lee et al. 2003) is far from being solved. Yet, it benefits from knowledge of children's actual time use patterns, their determinants and developments to assess the magnitude of children's time binds, flexibility and productivity.

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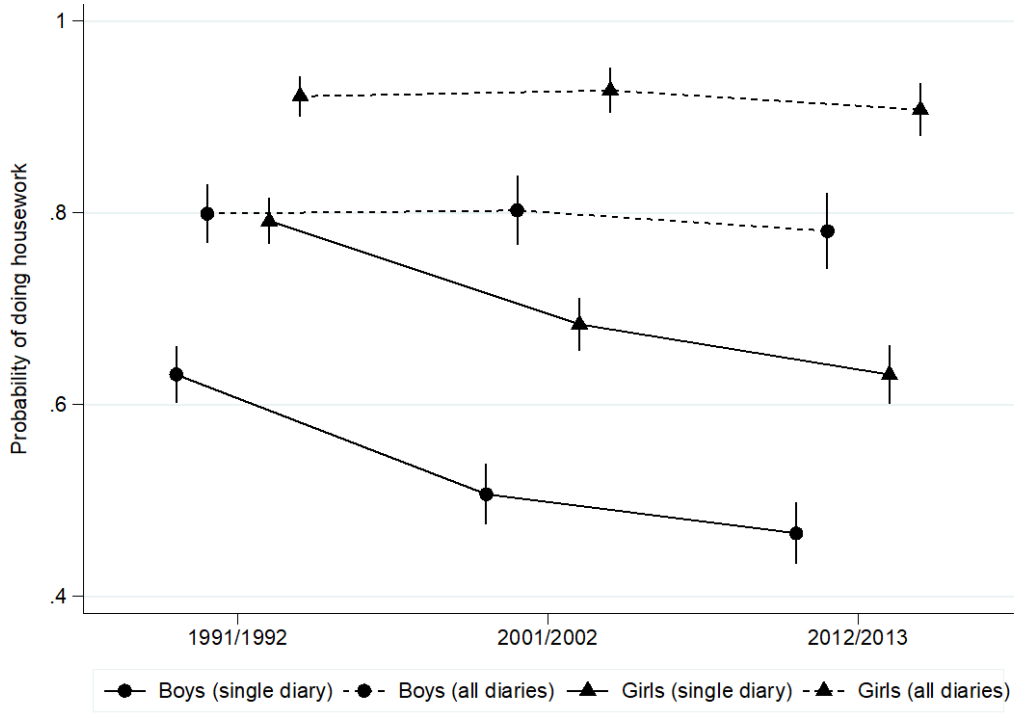
Table 1. Descriptive statistics and case numbers of the sample

	1991/1992		2001/2002		2012/2013		Notes[1]
	Girls	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**	
Children's characteristics							
Number of children	616	633	449	460	419	420	
Age of children	14.2 (.07)	14.2 (.07)	14.1 (.08)	14.1 (.08)	14.1 (.08)	14.2 (.08)	Age range: 12–17
Children's housework participation and time							
Participation in housework (diaries)	.79	.63	.68	.51	.63	.47	Share of children, who did any kind of housework on a given diary day
Participation in housework (overall)	.92	.80	.93	.80	.93	.80	Share of children did any kind of housework on any of their recorded diary days
Time for housework (all)	54.9 (1.7)	36.5 (1.4)	48.7 (1.7)	28.9 (1.3)	41.9 (1,6)	28.0 (1.4)	Minutes of children's total housework on a given diary day
Time for housework (participants)	69.4 (1.9)	57.8 (1.8)	71.5 (2.0)	57.2 (1.0)	66.4 (2.1)	60.0 (2.3)	Minutes of children's total housework on diary days on which they actually did housework
Mother's characteristics							
Time for housework	255.4 (4.4)	253.5 (4.5)	216.1 (4.3)	203.5 (4.2)	199.5 (4.2)	195.2 (4.2)	Minutes of mother's time of total housework over all recorded diaries
University degree	.16	.14	.22	.24	.41	.39	Mother holds university degree
Not working	.32	.31	.25	.21	.27	.27	
Working part-time	.39	.37	.58	.57	.55	.54	
Working full time	.29	.32	.17	.21	.18	.19	
Father's characteristics							
Time for housework	74.5 (2.7)	77.5 (2.9)	76.4 (2.9)	78.0 (2.9)	87.4 (3.4)	82.3 (3.3)	Minutes of father's mean time of total housework over all recorded diaries
University degree	.30	.29	.33	.35	.53	.46	Father holds university degree
Not working full-time	.06	.07	.11	.14	.15	.14	
Working full-time	.94	.93	.89	.86	.85	.86	
Household characteristics							
Number of households	930		667		619		
Children under 12 in the household	0.6 (0.0)	0.6 (0.0)	0.6 (0.0)	0.5 (0.0)	0.5 (0.0)	0.4 (0.0)	Range 0–5
Children 12-17 in the household	1.6 (0.0)	1.6 (0.0)	1.6 (0.0)	1.6 (0.0)	1.6 (0.0)	1.6 (0.0)	Range 1–4
East Germany	.32	.32	.20	.21	.17	.19	Household is located in East Germany
Diary characteristic							
Number of diaries	1232	1266	1344	1375	1256	1260	1–2 diaries per child in 1991/1992, 1–3 diaries per child in 2001/2002 and 2012/2013
Weekend diary	.26	.24	.35	.35	.35	.36	Diary pictures Saturday or Sunday

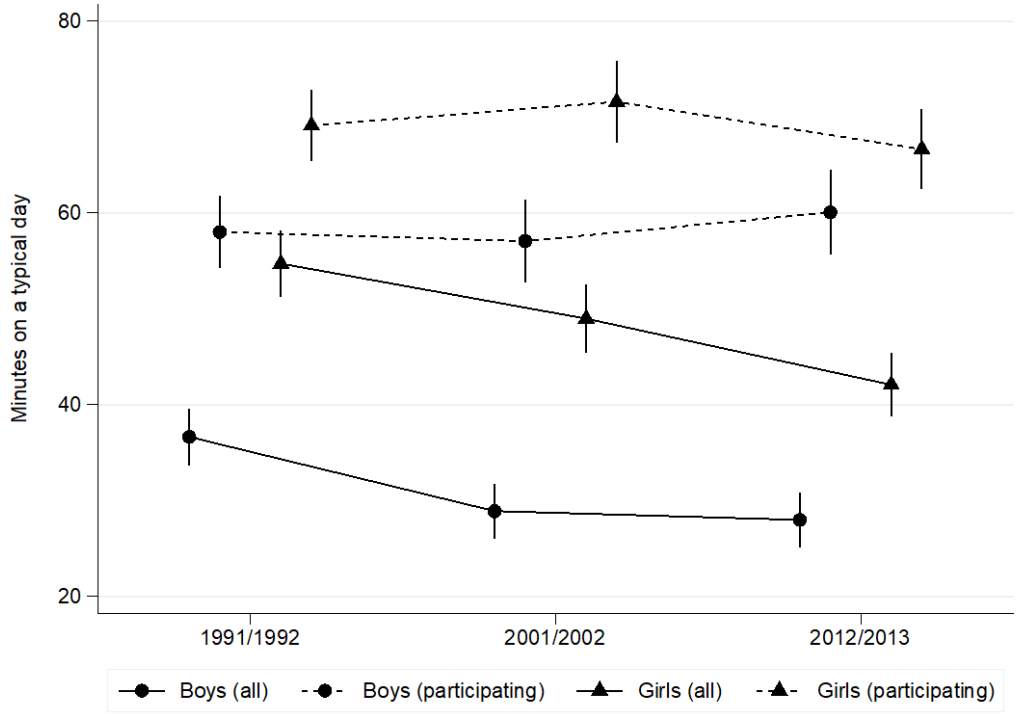
Note. [1] Cf. the explanations in sections 3.3, 3.4, and 3.5. German Time Use Study, 1991/1992, 2001/2002, 2012/2013, own calculations, case numbers, means, standard deviations in parentheses.

Figure 1. Children's participation in housework, 1991/1992–2012/2013



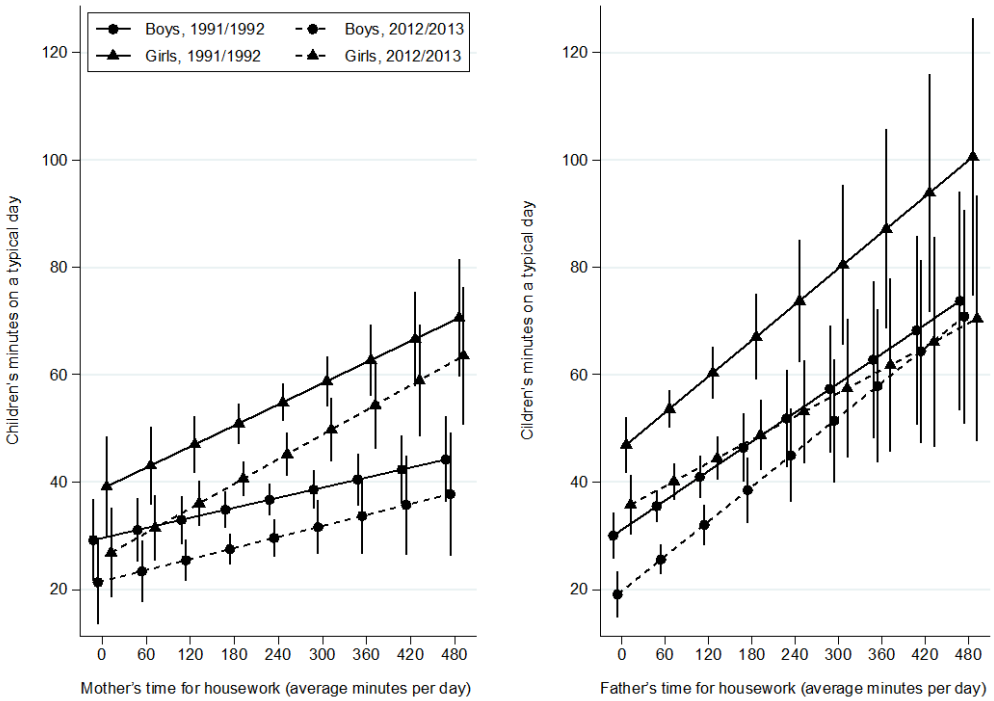
Notes: Probabilities and 95%-confidence intervals, calculated from the models in Tables A1, A2; German Time Use Study, 1991/1992, 2001/2002, 2012/2013, own calculations.

Figure 2. Children's time for housework, 1991/1992–2012/2013



Notes: Minutes per day and 95%-confidence intervals, calculated from the models in Tables A3, A4; German Time Use Study, 1991/1992, 2001/2002, 2012/2013, own calculations.

Figure 3. Association between parents' and children's time for housework, 1991/1992 and 2012/2013



Notes: Minutes per day and 95%-confidence intervals, calculated from the models in Tables A3, A4; German Time Use Study, 1991/1992, 2001/2002, 2012/2013, own calculations.

Appendix

Table A1. Logistic regression models of participation in housework activities on single diary days (solid lines in Figure 1)

	Boys			Girls		
	1991/1992	2001/2002	2012/2013	1991/1992	2001/2002	2012/2013
Mother's housework time	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Father's housework time	0.00*	0.00*	0.00**	-0.00	0.00*	0.00**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age	-0.00	-0.05	-0.03	0.14**	0.14**	0.04
	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)
University degree mother [a]	0.26	0.03	0.18	0.13	-0.03	0.16
	(0.22)	(0.17)	(0.15)	(0.25)	(0.17)	(0.14)
Mother working part-time [b]	0.13	-0.20	0.14	0.31	0.30^{+}	0.06
	(0.17)	(0.18)	(0.17)	(0.19)	(0.17)	(0.18)
Mother working full-time [b]	0.12	-0.10	0.15	0.48^{+}	0.16	0.07
	(0.21)	(0.25)	(0.23)	(0.27)	(0.26)	(0.22)
University degree father [c]	-0.02	-0.17	0.04	-0.03	0.08	-0.28^{+}
	(0.16)	(0.15)	(0.15)	(0.19)	(0.16)	(0.15)
Father working full-time [d]	0.02	0.45*	-0.02	0.23	0.38^{+}	0.40^{+}
	(0.27)	(0.20)	(0.22)	(0.36)	(0.21)	(0.21)
Children under 12 in hh.	0.07	0.06	0.04	0.04	0.08	0.26*
	(0.09)	(0.10)	(0.11)	(0.11)	(0.10)	(0.11)
Children aged 12-17 in hh.	0.14	0.09	0.17	0.01	0.03	0.12
	(0.11)	(0.11)	(0.12)	(0.13)	(0.13)	(0.13)
East Germany [e]	0.80***	0.54**	0.54**	1.04***	0.60**	0.13
	(0.18)	(0.19)	(0.18)	(0.25)	(0.21)	(0.20)
Weekend day [f]	0.23	0.41***	0.33**	0.51**	0.30*	0.47***
	(0.15)	(0.11)	(0.12)	(0.19)	(0.13)	(0.12)
Intercept	-0.37	-0.22	-0.71	-1.59^{+}	-2.45***	-1.22^{+}
	(0.73)	(0.72)	(0.71)	(0.88)	(0.74)	(0.71)
Pseudo-R^2	0.0342	0.0234	0.0207	0.0522	0.0281	0.0246
BIC	1676.61	1918.51	1744.50	1256.24	1701.28	1678.13
AIC	1609.95	1850.83	1678.10	1190.07	1633.82	1611.58
Number of diaries	1246	1348	1221	1200	1326	1235
Number of persons	623	451	407	600	443	412

Notes: German Time Use Study, 1991/1992, 2001/2002, 2012/2013, own calculations, all diaries, standard errors in parentheses, $^{+}$ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$, reference categories: [a] No university degree of mother, [b] Mother not employed, [c] No university degree of father, [d] Father not working full-time, [e] Household is located in West Germany, [f] Diary was recorded for Monday-Friday.

Table A2. Logistic regression models of overall participation in housework (dashed lines in Figure 1)

	Boys			Girls		
	1991/1992	2001/2002	2012/2013	1991/1992	2001/2002	2012/2013
Mother's housework time	0.00	-0.00	-0.00	0.00	0.00	0.01*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Father's housework time	0.01**	0.00	0.00*	0.00	0.01	0.01+
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age	-0.07	-0.12	-0.02	0.25*	0.20+	-0.08
	(0.07)	(0.08)	(0.07)	(0.10)	(0.12)	(0.10)
University degree mother [a]	0.31	0.05	0.39	-0.29	0.90	0.47
	(0.36)	(0.30)	(0.28)	(0.48)	(0.69)	(0.36)
Mother working part-time [b]	0.05	0.01	-0.22	0.53	0.46	0.56
	(0.25)	(0.33)	(0.31)	(0.36)	(0.52)	(0.44)
Mother working full-time [b]	0.11	0.35	0.03	0.62	-0.17	0.71
	(0.32)	(0.50)	(0.43)	(0.55)	(0.62)	(0.50)
University degree father [c]	0.02	-0.24	0.23	0.38	0.34	-0.51
	(0.24)	(0.26)	(0.27)	(0.38)	(0.50)	(0.38)
Father working full-time [d]	-0.40	0.10	0.32	0.68	0.76	0.81
	(0.50)	(0.38)	(0.37)	(0.60)	(0.53)	(0.53)
Children under 12 in hh.	0.09	0.08	0.13	0.22	0.04	0.33
	(0.14)	(0.19)	(0.21)	(0.25)	(0.28)	(0.28)
Children aged 12-17 in hh.	0.11	0.06	0.47*	-0.10	-0.07	0.07
	(0.18)	(0.20)	(0.22)	(0.27)	(0.38)	(0.31)
East Germany [e]	0.72*	0.56	0.97*	1.05*	0.77	0.09
	(0.29)	(0.38)	(0.39)	(0.53)	(0.60)	(0.47)
Weekend day [f]	-0.03	-0.18	-0.03	0.52	0.06	0.30
	(0.24)	(0.25)	(0.27)	(0.40)	(0.39)	(0.38)
Intercept	1.69	2.65*	-0.09	-2.68	-2.54	0.71
	(1.17)	(1.31)	(1.24)	(1.77)	(1.85)	(1.82)
Pseudo-R^2	0.0401	0.0264	0.0467	0.0673	0.0726	0.0627
BIC	681.03	515.82	485.71	391.16	292.06	316.54
AIC	623.28	462.38	433.59	334.00	238.85	264.27
Number of persons	623	451	407	600	443	412

Notes: German Time Use Study, 1991/1992, 2001/2002, 2012/2013, own calculations, persons only, standard errors in parentheses, $^{+}$ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$, reference categories: [a] No university degree of mother, [b] Mother not employed, [c] No university degree of father, [d] Father not working full-time, [e] Household is located in West Germany, [f] Diary was recorded for Monday-Friday..

Table A3. OLS regression models of time use for total housework (solid lines in Figure 2, all lines in Figure 3)

	Boys			Girls		
	1991/1992	2001/2002	2012/2013	1991/1992	2001/2002	2012/2013
Mother's housework time	0.03*	0.03	0.03^{+}	0.07**	0.08**	0.08***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Father's housework time	0.09***	0.10***	0.11***	0.11***	0.08**	0.07*
	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)
Age	0.57	-0.45	-0.66	5.08***	4.58***	1.81^{+}
	(0.92)	(0.96)	(0.88)	(1.07)	(1.17)	(1.04)
University degree mother [a]	6.35	-3.81	0.69	14.45*	-0.39	1.67
	(5.01)	(3.65)	(3.39)	(6.13)	(4.96)	(3.59)
Mother working part-time [b]	4.14	-2.61	-0.89	1.09	8.68^{+}	1.44
	(3.67)	(4.03)	(3.74)	(4.45)	(4.68)	(4.57)
Mother working full-time [b]	3.75	1.50	5.52	0.51	7.82	2.89
	(4.48)	(5.87)	(5.05)	(6.04)	(6.45)	(6.40)
University degree father [c]	-1.13	-0.50	4.10	-5.15	2.13	-7.31^{+}
	(3.58)	(3.45)	(3.46)	(4.39)	(4.46)	(3.74)
Father working full-time [d]	-1.54	7.42	1.77	8.47	12.83*	2.80
	(6.71)	(4.85)	(4.39)	(8.18)	(5.83)	(5.46)
Children under 12 in hh.	1.94	0.38	-1.36	5.39*	1.85	-2.17
	(1.98)	(2.25)	(2.18)	(2.65)	(2.57)	(2.47)
Children aged 12-17 in hh.	4.71^{+}	2.92	3.76	3.25	-0.22	3.39
	(2.67)	(2.48)	(2.63)	(2.76)	(3.62)	(3.35)
East Germany [e]	15.96***	8.13*	4.47	21.59***	15.24**	-0.06
	(4.08)	(3.88)	(4.02)	(4.99)	(5.26)	(5.28)
Weekend day [f]	13.43***	8.95**	14.20***	15.40***	15.15***	18.20***
	(3.86)	(2.73)	(3.10)	(4.09)	(3.58)	(3.66)
Intercept	-4.26	7.24	6.17	-69.31***	-65.38***	-16.08
	(16.18)	(15.23)	(15.28)	(18.70)	(18.57)	(16.79)
R^2	0.065	0.033	0.050	0.095	0.056	0.049
BIC	13261.11	14321.21	12986.76	13136.33	14671.90	13540.02
AIC	13194.45	14253.53	12920.36	13070.16	14604.43	13473.47
Number of diaries	1246	1348	1221	1200	1326	1235
Number of persons	623	451	407	600	443	412

Notes: German Time Use Study, 1991/1992, 2001/2002, 2012/2013, own calculations, all diaries, standard errors in parentheses, $^{+}$ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$, reference categories: [a] No university degree of mother, [b] Mother not employed, [c] No university degree of father, [d] Father not working full-time, [e] Household is located in West Germany, [f] Diary was recorded for Monday-Friday..

Table A4. OLS regression models of participants' time use for total housework (dashed lines in Figure 2)

	Boys			Girls		
	1991/1992	2001/2002	2012/2013	1991/1992	2001/2002	2012/2013
Mother's housework time	0.04*	0.04	0.04	0.07***	0.10**	0.11***
	(0.02)	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)
Father's housework time	0.09**	0.12**	0.11***	0.13***	0.05	0.04
	(0.03)	(0.04)	(0.03)	(0.03)	(0.04)	(0.04)
Age	0.96	0.57	0.06	4.89***	4.01**	1.94
	(1.23)	(1.46)	(1.41)	(1.12)	(1.43)	(1.29)
University degree mother [a]	3.31	-7.44	-3.26	15.91**	0.41	-0.87
	(5.88)	(5.67)	(5.09)	(6.06)	(5.94)	(4.58)
Mother working part-time [b]	4.26	0.47	-5.46	-3.30	7.10	1.98
	(4.92)	(5.99)	(5.81)	(4.83)	(5.94)	(6.03)
Mother working full-time [b]	4.35	5.76	5.46	-4.61	8.85	3.16
	(5.63)	(8.61)	(7.72)	(6.22)	(7.93)	(7.73)
University degree father [c]	-1.00	3.26	7.26	-6.29	1.24	-4.88
	(4.37)	(5.42)	(5.38)	(4.52)	(5.28)	(4.75)
Father working full-time [d]	-2.54	1.46	5.86	7.15	11.53+	-7.66
	(8.14)	(7.28)	(6.49)	(8.79)	(6.92)	(7.81)
Children under 12 in hh.	2.17	-0.30	-3.59	6.28*	1.02	-8.62**
	(2.54)	(3.97)	(3.30)	(2.65)	(2.96)	(3.01)
Children aged 12-17 in hh.	4.85	3.43	1.32	4.29	-1.22	3.63
	(3.55)	(3.57)	(4.49)	(2.97)	(4.35)	(4.29)
East Germany [e]	7.91+	1.62	-6.78	12.92**	9.41	-2.65
	(4.79)	(5.34)	(5.59)	(4.98)	(5.79)	(6.28)
Weekend day [f]	14.68**	6.32	19.13***	12.02**	14.76***	16.16***
	(4.95)	(4.40)	(5.11)	(4.42)	(4.25)	(4.60)
Intercept	12.04	21.28	28.27	-50.10*	-33.29	14.64
	(21.60)	(23.38)	(23.38)	(19.63)	(23.22)	(21.81)
R^2	0.051	0.032	0.067	0.091	0.047	0.064
BIC	8471.78	7463.16	6245.27	10391.96	10089.69	8632.98
AIC	8411.09	7404.32	6188.80	10328.83	10027.16	8572.41
Number of diaries	787	683	569	950	907	780
Number of persons	498	362	318	553	411	374

Notes: German Time Use Study, 1991/1992, 2001/2002, 2012/2013, own calculations, diaries with positive housework time only, standard errors in parentheses, + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$, reference categories: [a] No university degree of mother, [b] Mother not employed, [c] No university degree of father, [d] Father not working full-time, [e] Household is located in West Germany, [f] Diary was recorded for Monday-Friday..