Why has a reduction in housework for women not led to an equal division of housework between the sexes?

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ABSTRACT

Why has a reduction in housework for women not led to an equal division of housework between the sexes?

This paper draws on the 2001/02 German Time Use Survey to evaluate couples' time-use behaviour, most especially the equal division of housework. It aims to explain both the time allocation of housework and persisting gender differences in household time-use behaviour. The theoretical foundation for this empirical analysis is Chiappori's (1997) collective model, which allows simultaneous consideration of individual utility and issues of household production. It also incorporates the alternative econometric method of structural equation modelling (SEM) to provide more detailed insight into the factors affecting housework decisions. We find that even if the characteristics measured for the individual are given the same values, the division of housework is still unequal because these variables impact housework differently for each sex. We also find that instead of the wage rate being responsible for the gender gap, it is the presence of children, housing characteristics (e.g. living space), age and paid or unpaid household services that influence the time spent on housework more strongly for women than for men.

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1. Introduction

The widespread discussion on gender equality and laws against discrimination has attracted public attention to family and household behaviour and the compatibility of job and family. The division of housework plays a substantial role in this discussion. According to data from the German Federal Statistical Office's 1991/92 and 2001/02 German Time Use Survey, women living in partnerships (with or without children) reduced the time they spent on housework (i.e. informal work) substantially in the decade between the two surveys, but their partners increased the time spent on housework only marginally. Hence, despite a slight reduction in the disparity of housework division between the sexes, a large inequality still exists (Statistisches Bundesamt 2004).

Researchers have long been interested in time use for housework, especially the division of work within the household. The applied models used by recent studies to examine this issue range from extended Gronau time use models (Connelly, Kimmel 2007) to common Nash bargaining models (El Lahga, Moreau 2007) to bargaining models with integrated consideration of social norms (Burda, Hamermesh, Weil 2007). The primary finding of such studies is that while the spouse's role has less influence on the share of housework over time (Connelly, Kimmel 2007; El Lahga, Moreau 2007), the individual economic situation is important (Breen, Cooke 2005). Most of these authors admit to the limited explanatory power of economic approaches for this phenomenon and fall back instead on sociological constructs like gender ideology (Breen, Cooke 2005; Álvarez, Miles 2003; Burda, Hamermesh, Weil 2007).

By following an alternative approach, this study enhances the explanatory power of the economic approach with regard to differences in time-use behaviour, especially in respect to the division of housework between men and women. Specifically, the use of Chiappori's (1997) collective model allows simultaneous consideration of individual utility and housework issues because it integrates household production. Moreover, the econometric method of structural equation modelling (SEM) provides more detailed insight into the effects of diverse factors on housework decisions. The aims of the present study are twofold: to understand why individual household members – male and female – spend a certain amount of time on housework, and where and why gender differences in household time-use behaviour persist. This latter may help explain the reduced but persistent specialization that still seems to rule household behaviour.

Following a brief review of pertinent literature in section 2, section 3 outlines the applied theoretical approach. Section 4 then provides relevant information about the 2001/02

German Time Use Survey and the empirical implementation of SEM. Section 5 first contextualises and then presents the empirical results of the two path models for men and women in partnerships in 2001/02, including some explanations for the gender gap. The final section summarizes the results and provides suggestions for future research.

2. Previous Research

Several recent studies address the phenomenon of the unequal intra-household division of work. Of these, some international studies find that despite a modest increase, cross-nationally, men only do about a third of the housework that women do (Gershuny 2000; Sousa-Poza, Schmid, Widmer 2001). Nevertheless, most such studies deal with the female labour supply or household behaviour in general; fewer authors directly investigate the sharing of housework between partners. Thus, rather than offering a holistic survey of the extant literature, this review gives an impression of the different theoretical and econometric approaches taken by researchers and the corresponding results.

First, in their cross-sectional analysis of the persistence of the gendered division of housework in 22 countries, Breen and Cooke (2005) apply a game model of marriage to the 1994 International Social Survey Programme (ISSP), which provides a wealth of comparable international data. The results of their ordinary least squares regressions indicate that the unequal share of housework between the sexes will persist as long as women's economic situation does not equal that of men and as long as men do not change their gender ideology.

This gender aspect was earlier studied by Álvarez and Miles (2003), who used data from a 1991 Spanish time-use survey to analyse gender's effect on housework for Spanish two-earner couples. Because they isolate gender-specific factors through an Oaxaca-Blinder decomposition, they explain the unequal division of housework primarily by unobservable factors that are assumedly gender-specific differences rather than by observable spousal characteristics.

The effect of spousal characteristics on domestic work activities for American couples is also addressed by Connelly and Kimmel (2007), who develop an extended Gronau-type model of time use for individual household members and measure non-market time choices by a seemingly unrelated regression (SUR) Tobit model. They conclude that spousal influence on housework is minimal or even nonexistent.

Another recent study by El Lahga and Moreau (2007) uses the 1984 to 2004 German panel data sets (SOEP) to explore the effect of marriage on a couple's allocation of their time between market and domestic work. Basing their approach on a Nash bargaining model and

using a generalized method of moments (GMM) to estimate their empirical specifications, they find that marriage results in increasing specialization of housework and decreasing leisure time for women.

In contrast, the Burda, Hamermesh and Weil (2007) study, based on the 2001/02 German Time Use Survey data, refutes the idea that gender differences arise from marital bargaining power. Rather, in their initial analysis of work behaviour, which ignores gender roles because it is wages that are traditionally assumed to indicate within-household bargaining power, the effect of marklet earnings on gender differences turns out to be very small. This finding may result either from men's altruism towards their partners or from the incorrectness of the economic models (i.e. the men get more utility out of their work than the women). The authors therefore develop a bargaining model that includes social norms through "gender differences in the valuation of marginal changes in time spent in market or housework" (Burda, Hamermesh, Weil 2007; p.24). However, this approach has yet to be tested empirically.

Addressing the issue from a sociological perspective, Bianchi, Milkie, Sayer and Robinson (2000) examine time-use behaviour in American couples from 1965 to 1995 in terms of time availability, relative resources and gender. Although their regressions provide more evidence for the time availability and relative resource perspectives, they are unable to totally reject gender ideology.

Despite their various approaches, most of the above studies recognize the importance of an individual's economic situation. They also show that even though marriage still influences the division of work within households, spousal effects have become less important. Nevertheless, even though economic approaches can explain the division of housework between the sexes to a certain extent, their power is restricted and various questions remain unanswered. Therefore, to address these questions, studies often revert to sociological constructs like gender identities, cultural aspects or social norms (see Breen, Cooke 2005; Álvarez, Miles 2003; Burda, Hamermesh, Weil 2007; Bianchi, Milkie, Sayer, Robinson 2000).

3. Theoretical Framework

To explain the unequal division of housework between both spouses, we use the microeconomic theory of the household. Therefore, the subsequent discussion first outlines the primary theoretical tenets and then introduces the implications of that underlying theory and the resultant hypotheses.

3.1. Theoretical concepts

Conceptually, this approach is a collective model of labour supply with simultaneous consideration of the Beckerian household production approach (Chiappori 1997), both of which have specific advantages for the measurement of housework supply. This methodology is selected because of identified weaknesses in alternative models. For example, the so-called unitary models are criticised for taking the household as one rational agent without considering the interests of individual household members. In contrast, the collective approach assigns each spouse an individual utility function that should be maximized. The outcomes of the decision process are therefore assumed to be Pareto efficient[1], but no assumptions are made about the determinants of both partners' bargaining power. In addition, despite the realization of separate utility, efficient models imply that spouses do care about one another in a non-paternalistic way (Phipps, Burton 1998, p. 600). The Chiappori model is optimal in that it delivers labour supply functions that are empirically testable, as well as recoverable individual preferences and the outcome of the decision process (Donni 2003, p. 2). Moreover, several recent empirical studies (e.g. Fortin, Lacroix 1997, Donni 2003, Browning, Gortz 2006, Oreffice 2007) show this approach to be worthwhile. For instance, to remedy the absence of household production in earlier models (Apps, Rees 1997), Chiappori integrates the household production approach into his collective model.

This household production approach is important because it considers basic commodities and therefore housework time, which alters the results of efficient time allocation. That is, households and their members not only consume, specialize and exchange, they also produce like a small economy (Apps, Rees, 2002, p. 17). Thus, household production, as an alternative perception of consumption, is defined as buying market goods and combining them with time to produce so-called basic commodities that are then consumed (for time use and consumption, see Jalas 2006). Such basic commodities including reading books, enjoying pleasant living conditions, eating self-prepared food or rearing "high-quality" children.

The productivity of these household goods is determined by market goods, housework time, household technology and know-how. In this context, housework is comprised of activities for producing goods and services that could have been provided by a third party (Reid 1934), meaning that individuals can substitute market goods and services with their own housework. In addition, such housework is not market work, and we exclude voluntary service. Hence, housework includes the following activities: meal preparation, clean-up, laundry, shopping,

[1] The Pareto-efficient process can be interpreted as follows: "members agree on some efficient production plan and some intra-household distribution of resources; then each member chooses his or her own leisure-domestic production-consumption bundle subject to the specific budget constraint he or she faces" (Chiappori 1997, p. 193).

maintenance of residence, childcare, gardening, pet care or even bookkeeping related to household management (Bryant, Zick, Srisukhumbowornchai 2006, p. 2).

Because these domestically produced commodities are also assumed to be marketable (the "complete market" case), the market price of domestic goods is exogenous for the household (Chiappori 1997). Such an assumption is reasonable because meals can either be prepared at home or bought in a restaurant while children can either be cared for at home or in public childcare facilities. Accordingly, consumption is more than the purchase of market goods and the enjoyment of leisure time.

From this perspective, each partner's utility function – based on domestic goods, market goods and leisure – is assumed to be maximisable and preferences are assumed to be egoistic. This latter means that the welfare of each spouse does not depend on the partner's consumption (Oreffice 2007, p. 185), as in, for example, the case of a household budget constraint to which both spouses are subjected.

Obviously, even separately, both approaches are very useful, but if combined in one model, they are especially valuable. Specifically, the collective approach opens the door to an analysis of the labour supply of each spouse in a multi-person household, while the household production approach introduces basic commodities, of which housework time is one input.

3.2. Methodological rationale

Combining the two approaches enables measurement of the demand for basic commodities and the demand for housework time, both of which depend on several latent variables. Measuring these variables allows conclusions to be drawn about their dependencies on housework demand.

First, primarily because of ease of estimation, we consider a Stone-Geary utility function that comprises market goods x^i, basic commodities z^i and leisure l^i and also captures substitution between these categories. Preferences are assumed to follow this functional form even though it is restrictive. The individual choice problem may thus be represented more formally as follows:

$$\max u^i(x^i, z^i, l^i) = \alpha \cdot \ln(x^i - x_0^i) + \beta \cdot \ln(z^i - z_0^i) + \gamma \cdot \ln(l^i - l_0^i)$$
$$\text{whereas } \alpha + \beta + \gamma = 1$$

For the sake of simplicity, the model is static: that is, because the data are cross-sectional, incomes and wages vary across households, but all other prices are kept constant over the sample. As a restriction, in the case of household production, we assume a household budget constraint to which both partners are subjected. Housework is therefore introduced through full income, and, as an output, must be distinguished from basic commodities, which

are an output. This distinction means that, depending on individual productivity, the commodities produced individually through a certain amount of housework time must not equal the consumed volume of commodities. In addition, commodities, being defined by third party criteria, are also obtainable by other household members and external persons and from the market.

Hence, the allocation of time – which can be categorised as housework, market labour or leisure – depends on the composition of the respective household and the position in the household that a family member adopts. This dynamic can be seen in the resulting demand for housework, which is determined by several latent variables:

$$t^i = T^i - l_0^i - \frac{x_0^i}{w^i} + \frac{V + (y^j - x^j)}{w^i} + \left(\frac{\alpha + \gamma}{\beta}\right) \cdot \frac{z_0^i}{w^i} + \left(\frac{p \cdot h^{ij}(t^i, t^j, x^i, x^j)}{w^i} - \frac{1}{\beta} \cdot \frac{p \cdot z^i}{w^i} - \frac{p \cdot z^j}{w^i}\right)$$

i:	i^{th} household member	j:	partner of household member i
t:	household work	T:	available time
l_0:	aspiration level of leisure	x_0:	aspiration level market goods
w:	wage	V:	public income
y:	income	x:	market goods
z_0:	aspiration level of commodities	p:	price of z
h(t,x):	production function of z	z:	basic commodity
α, β, γ:	marginal propensity to market goods, basic commodities, leisure		

Thus, the model includes interrelated variables like available time, wage, public income, the consumption of market goods and basic commodities by both spouses, as well as household production issues[2] and the level of consumption and commodities to which the spouses aspire.

Such aspiration levels are not defined here as a margin of subsistence that must be fulfilled for survival but rather as a satisfaction of psychological needs. That is, an individual is content if the aspiration level is achieved (Simon 1978). In principle, these levels permit model differences in individual and household characteristics, beliefs and satisfaction (Deaton, Muellbauer 1980, p. 95).

The resulting demand function permits the following hypotheses about the effect of the variables on the amount of housework:

- The more time available (*T)*, the more time can be allocated, meaning a person can do more housework.
- Public income *(V),* as well as partner's income *(y^j),* increases the amount of housework done, and both variables are equivalent to an individual's non-labour

[2] We make no assumptions about the household production function.

income. That is, theory posits that a higher non-labour income will reduce the probability of participation in the labour market (Seel 1991, p. 204), which in turn allows allocation of more time to housework and leisure time. This dynamic reflects the coherences between the incomes of each partner and public incomes.

- A high aspiration level of consumption (x_0) demands more market goods than a lower level, meaning that more income is needed and less time is available for housework.
- A high aspiration level of commodities (z_0) leads to more housework because of a higher demand for basic commodities. However, the strength of the effect of the aspiration level of commodities on housework depends on the time intensity of commodity production.

Other relations between variables are not as clear cut. Thus the relation between wage and housework is unpredictable. If individuals follow a normal labour supply, the relationship should be negative, but other reactions may be empirically observed. Additionally, the relations between the variables themselves cannot be predicted in advance because more than one effect direction is feasible (e.g. that between the aspiration level of commodities and wage could be positive or negative). Thus, this study aims to gain more information about these relations between the variables and housework, and among the variables themselves.

4. Data and Methodology

The link between theory and evidence is assessed using SEM; most particularly, by the partial least square procedure (PLS[3]), which allows the theoretical foundation to be combined with the empirical analysis. The Federal Statistical Office's 2001/02 German Time Use Survey[4], the second of its kind, covered a representative sample of 5,400 households that included over 12,000 individuals. Every person over the age of 10 completed a diary during two weekdays and one weekend day that recorded both individual and household details. Thus, this data source not only provides information about the everyday life of diverse population groups but also demographic data like age, sex, employment status, level of education, engagement in volunteer work and economic status (Gwozdz 2007, p. 37). Nevertheless, even though this dataset provides uniquely rich data on time-use behaviour, some variables of the demand function are not directly observable. We therefore address these non-observable variables by path modelling a set of observable factors that are linked to each of the corresponding latent variables.

[3] The PLS analysis is a covariance-based technique of SEM, which simply converts "theoretical and derived concepts into unobservable (latent) variables, and empirical concepts into indicators, which are linked by a set of hypothesis" (Haenlein, Kaplan 2004, p. 286).
[4] After the data are cleansed, 2,497 couples remain in the analysis.

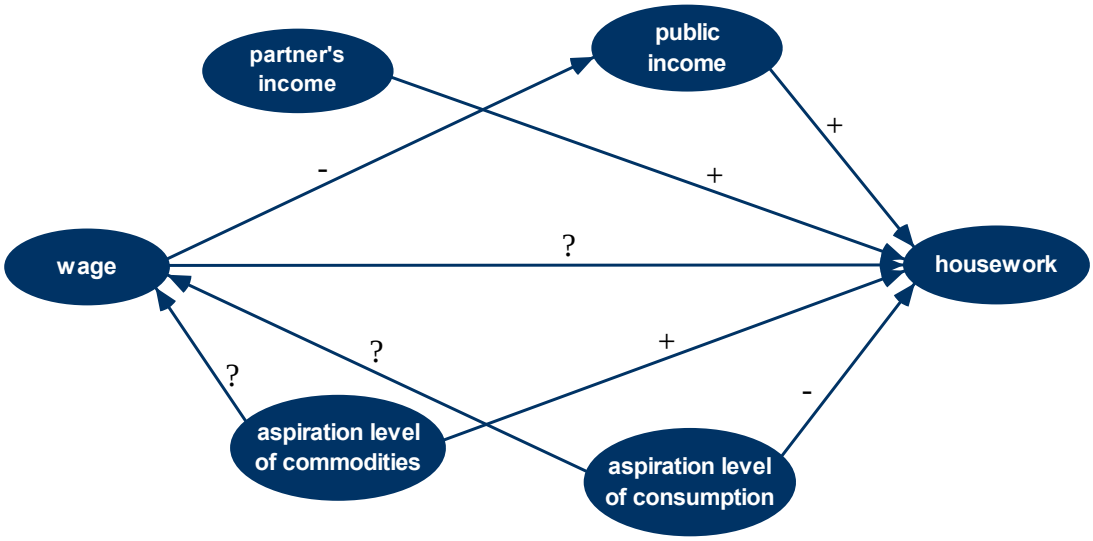
One major advantage of SEM is that, by maintaining the theoretical structure of the housework supply, it allows us to gain more information on the relations between the latent variables, assess these variables' impact on the housework supplied and extract the significant factors that determine them. Thus, the path model has two parts: an inner model that forms the theoretical structure and an outer measurement model that obtains the latent variables through the observed variables. The PLS procedure takes both the inner structure and the measurement model into account simultaneously (Cassel et al. 2000, p. 902).

4.1. Structural model

The structure of the housework supply can best be illustrated by a graphic translation of the theoretical dependencies between the latent variables (the inner model of the SEM approach). Thus, we extend our earlier premises by trying to predict the effect of the latent variable wage on housework.

However, because of restrictions inherent in the underlying theoretical assumptions and the dataset, we cannot measure all latent variables of the demand for housework. Rather, Figure 1 shows the latent variables included in the model and their connective paths, whose algebraic signs are derived directly from the hypotheses presented in section 3. Because we cannot predict the effects of the other paths, this structural model is a partial demand function for housework.

Figure 1: Structural model of the analysed demand for housework



It is reasonable to assume that aspiration levels influence an individual's realized wage. Thus, because the aspiration levels are assumedly exogenous, the arrows of the paths considered point towards wage and not vice versa. Moreover, we can argue that wage has a negative effect on public income in that government does not pay public benefits to those earning high wages.

Because SEM can provide knowledge about these paths, we must find reasonable factors for measuring the latent variables.

4.2. Measurement procedure

Such measurement is conducted in the outer model, using exactly the same measurement models for both spouses to allow the comparison that enables a closer look at gender differences. However, because showing all the measurement factors for the latent variables would go beyond the scope of this paper, we report only the paths for the variables of most interest – housework, wage and aspiration level of commodities.

The latent variable housework, which is the only latent variable whose level can be scaled (in minutes per day), is measured directly as the housework time entered in the diary. The mean is then weighted by weekdays and weekend based on an assumption of different behaviour in each.

The variable wage is directly measured by net income, weekly hours of work and type of job. The latter is important because part-time work is precarious and so pays less hourly than does full-time employment (Keller, Seifert 2006; Brinkmann et al. 2006). Additionally, even though the dataset does not record job experience, we can measure human capital – which plays a major role in earned wage – in terms of school graduation, vocational training and on-the-job training. Other variables, like working status, turn out not to be significant. In addition, because the different scales produce a large number of factors, the wage level becomes uninterpretable, although it is possible to compare the wage levels of different groups (e.g. men and women).

The aspiration level of basic commodities, although quite abstract, can be approximated by several factors. First, based on the definition given earlier, consumption of commodities arises from the aspiration level of commodities, which depends on individual and household characteristics. In addition, children, which are assumed to be commodities, imply a certain aspiration level (Säntti, Otva, Kilpio 1981, p. 4ff) and have a major impact on the division of housework between the sexes. Specifically, different investments must be made in housework according to the number and age of children, so children are divided into several subgroups: those aged 0–1, those aged 2–6 and those aged 7–15.

Because housework is a basic commodities input, housework done by others (paid or unpaid) could also be important. Thus, the claim on commodities can be satisfied in two ways – self-producing more basic commodities or obtaining or buying commodities elsewhere (i.e. social networks or the market). Our earlier research finds that the more housework done by one spouse, the more done by the other. Therefore, the relationship is more complementary than substitutional, and partners seemingly match each other in their appreciation for commodities and preferences for commodities. In addition, housework may

be done by non-household members, although instances in this dataset are so few that we cannot identify differences between paid and unpaid external housework. Nevertheless, where this factor is measured in minutes a day, the support received is also measured by the use of external childcare, meaning that the higher the aspiration level of commodities, the higher the level of housework done by others. Thus, a high aspiration level may lead to a higher use of non-self-produced commodities.

Another very important factor for aspiration levels is individual age because demands and perceptions change over the lifecycle (Säntti, Otva, Kilpio 1981). Indeed, we find age to be a better performance factor for the aspiration level of commodities than wage. Nevertheless, aspiration level still affects wage, which is also influenced indirectly by age.

The final important indicator of aspiration level is housing characteristics. Specifically, a large living space implies a high aspiration of commodities that is likely to lead to commodities such as a large domicile or the housing of several children. Likewise, we expect home occupants (who inhabit houses and not appartments) to attach importance to commodities, because domestic appliances can also be seen as an indicator of aspiration level.

Overall, aspiration level is measured by the number and age of the children, the housework being done by others, the person’s age and the housing characteristics.

The table below gives an overview of the composition of the latent variables:

Table 1: Composition of the latent variables[5]

Latent variable	Factors
Housework	Housework
Wage	Net income Weekly hours of work Type of employment
Aspiration level of commodities	*Human capital* Graduation Vocational training On-the-job training Children (aged 0–1) Children (aged 2–6) Children (aged 7–15) *Work other* Housework (partner) Childcare Housework (paid or unpaid) *Age* Age, Age squared *Housing characteristics* Living space House occupants Dishwasher Dryer

All the factors presented above have a significant impact on the latent variables of housework, wage and aspiration level of commodities for at least one of the groups studied (men or women).

5. Empirical results

This study's goal was two-fold: to understand why individual household members – male and female – spend a certain amount of time on housework, and where and why gender differences in household time-use behaviour persist. To assess whether the latent variables selected for study play a major role in the gender-specific allocation of housework and evaluate which explanations for inequalities are most reasonable, we first trace both the development of time use in certain areas and the division of housework, and then outline the results of the structural models for men and women. Finally, we identify the differences in time-use behaviour between the sexes.

[5] Further information of the measurement model are presented in the appendix, where descriptive statistics are displayed in table 2, cross correlations between the factors and the latent variables of men and women in table 3 and 4.

5.1. Descriptive analysis

Because understanding the results of the housework path models requires prior knowledge of German couples' time use behaviour, we first assess the shift in time spent in the main activity fields by comparing data from the 2001/02 German Time Use Survey, which polled 2,500 couples, to the 1991/92 survey, which observed nearly 3,900 couples. This comparative analysis, which is restricted to couples only, looks primarily at the division of housework and observes the following time-use changes:

- **Personal sphere and regeneration:** Not surprisingly, most of this time is used for private activities like sleeping, eating and drinking, and body care. Men and women spent about half an hour more for their privacy in 2001/02 than in 1991/92.
- **Leisure:** Similar results were found in the field of leisure, which covers social life, sports or consumption of mass media. In 2001/02, men and women in partnerships reported allotting nearly five hours of their spare time to such activities.
- **Market work and on-the-job training**: Even though men still spend more time on market work than women, there has been a reduction on both sides since 1991/92 that is also recorded in recent studies (e.g. Statistisches Bundesamt 2006, p. 81). Given that the 2005 Gender Report of the German Federal Statistical Office finds that increased unemployment affects more men than women (Cornelissen 2005, p. 42), this development may well have been strongly influenced by increasing unemployment between 1991/92 and 2001/02. Indeed, based on a closer look at time worked in the market, our results seem to support this assumption.
- **Housework:** Not only do women still spend far more time in this activity than men, but the time shift in housework is completely different than that for other activity fields. Specifically, between 1991/92 and 2001/02, men slightly increased the time they spent on housework by 6 minutes a day, but women reduced the amount of time for this activity by an enormous 42 minutes a day.

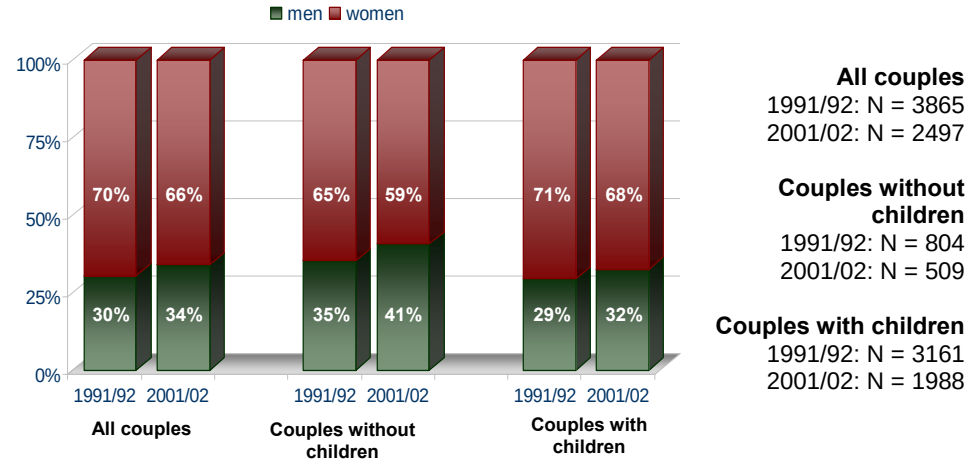
One important aspect of the above shifts in time use is that over this decade, couples reduced their housework by more than 30 minutes a day, which is in line with findings for other countries like the U.S. (see Bianchi et al. 2000, p. 205). Earlier analyses provide some explanations for this phenomenon:

- There has been a structural change in the number and age of children in households. In 2001/02, the number of younger children up to the age of 10 was smaller than in 1991/92, which reflects the reduced birth rate (Statistisches Bundesamt 2006, p. 42). As a result, less housework and less childcare is needed.
- The significantly heightened number of household appliances like laundry dryers, microwaves or dishwashers or the marketization of housework itself may have contributed to the shift.

- Household goods may have become devalued.

Whichever the case, even though women reduced and men increased their time spent for housework, as Figure 2 shows, housework is still not split equally.

Figure 2: Division of housework chronologically per type of couple



Intuitively, it might be argued that children have a great impact on the division of housework. Indeed, the Figure 2 breakdown of housework share by couples with and without children supports this assumption. Thus, women in partnerships with children contributed a 68% share of the collective housework in 2001, compared to a 59% share for women without children. Among all couples, in 2001/02, 66% of all housework was done by women, which equates to about 5 hours and 20 minutes a day, relinquishing approximately 2 hours and 45 minutes a day to partners. For both sexes, total work hours – for market work and housework – are about the same, meaning no difference between genders in total work hours. Nevertheless, irrespective of household type, despite the convergence in the amount of time men and women spend on housework, there is still a gender gap.

5.2. Results of the path models for men and women

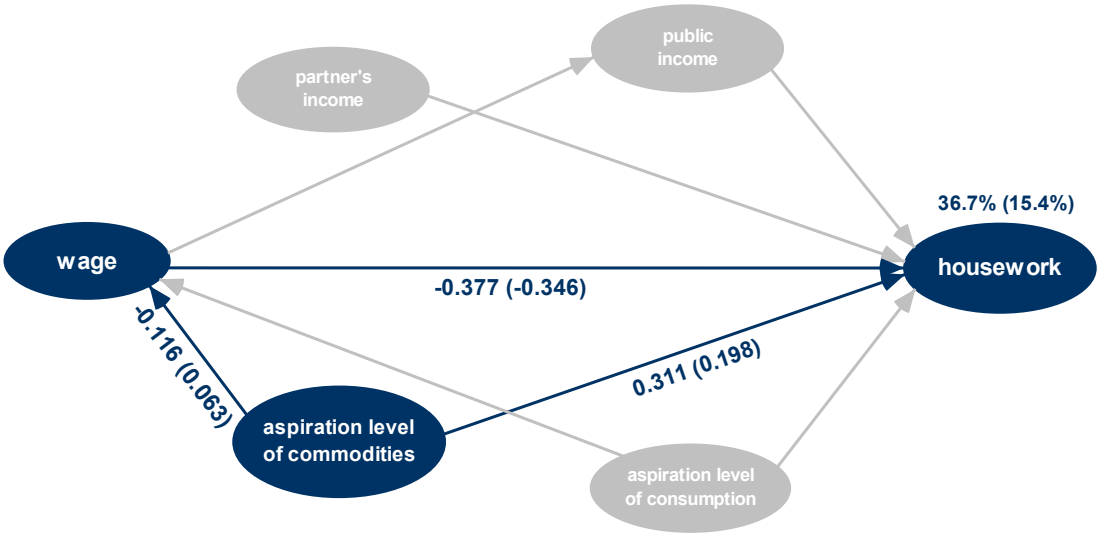
The results for housework are dependent on the tendency of each latent variable and the strength it exerts. Because these tendencies and strengths differ somewhat between the sexes, we carry out separate path analyses for men and women. Given our current focus, we specifically extract the paths of the latent variables of most interest – wage, aspiration level of commodities and housework.

In Figure 3, which shows the relevant path coefficients for the structural model, latent variables measured in the model but not currently of particular interest are coloured light grey (For more detailed results see table 5 and 6 in the appendix). The first coefficients on each path are for women; those in brackets are for men. These path coefficients can be interpreted as standardized regression coefficients, and the R^2s given for each latent variable

selected equal the coefficients of determination in regression analyses[6] (Chin, Newsted 1999, p. 316). A quality criterion summary for the path models of men and women is given in the appendix, to be more precisely in table 7 and 8 (see appendix).

The latent variables considered are measured by the factors introduced above. For women, we can identify 55% of the aspiration level of commodities and about 46% of the latent variable wage. The explained variance of aspiration level of commodities and wage for men is about 60% and 35%, respectively. This structural model also explains about 37% of women's housework in partnerships, but only about 15% of the variance in men's housework, meaning it has less than half the explanatory power of the women's model. According to accepted practice, a predicted R^2 of about 60% is substantial, about 30% is good and about 15% is weak (Chin 1998, p. 232). Thus, as discussed below, our values are quite reasonable for this model.

Figure 3: Path coefficients of the structural model of housework for women (men) [extracts]



Results for the path coefficients help explain the amount of housework done by spouses. Specifically, we address the following three aspects: (a) the relation between the aspiration level of commodities and wage, (b) the relation between the aspiration level of commodities and housework, and (c) the path between wage and housework.

For women, there is a significantly negative association between the aspiration level of commodities and wage, meaning that women with higher aspiration levels of commodities realize a lower wage than women with lower aspiration levels. Nevertheless, aspiration level of commodities has a somewhat strong positive effect on housework, which means that either women have a more time- than goods-intensive household production technology or

[6] The authors justify this equality based on the fact that "the case values of latent variables are determined by the weight relations" (Chin, Newsted 1999, p. 316).

women's aspiration levels tend to be defined by time-intensive commodities. Indeed, in their analysis of the time and goods intensity of certain commodity groups (e.g. lodging, eating or childcare), Hamermesh and Gronau (2006) find that goods and time expenditures differ within groups of commodities and with a country's prevalent standard of living.

The results for men are quite different: the association between the aspiration level of commodities and wage is significantly positive but small. As in the results for women, a higher aspiration level leads to more housework. Thus, men's production of basic commodities seems more goods than time intensive. As theoretically predicted, a higher aspiration level of commodities generally leads to more housework for both men and women. Presumably, the individual can offset the high demand by consuming commodities produced by the partner or by others whether paid or not.

For the impact of wage on housework, which is not directly predictable theoretically, several possibilities appear reasonable. In the structural model, as measured in Figure 3, wage has a negative effect on housework for both spouses, which mirrors Gronau and Hamermesh's (2006) statement that the goods intensity of produced commodities generally rises with education and therefore with income and wage. As the effect is negative, the substitution effect and the normal income effect (due to the more expensive housework) assumedly surmount the total income effect that arises from the re-evaluation of available time. This dynamic also means that women and men earning higher wages do less housework than women and men with lower wages, which, as here, reduces time intensity.

In sum, these results show the importance of the interdependencies between latent variables in explaining the amount of housework. Specifically, even though a high aspiration level of commodities increases the housework for both sexes, there still seem to be differences in strength. Moreover, even though wage has a stronger effect than any other path for both partners, the relation between aspiration level and wage points in different directions for men and women. The significance of such differences is discussed below.

5.3. Gender differences

Perhaps one of the most interesting aspects of this analysis is the inter-sex comparison of latent variables and their effect on housework. In terms of the descriptive differences in the levels of latent variables between partners, it has already been shown that the women studied did significantly more housework than their partners, spending an average of 5 hours 20 minutes a day on domestic work to men's 2 hours 45 minutes. How, then, can such differences be explained?

To begin answering this question, we first compare the wage levels of men, who at 4.9 (unscaled) realize a higher wage than women (at 2.4). Given that, except for education (for which no significant discrepancy is found in 2001/02), all wage factors for German couples are significantly lower for women than for their partners, the discrepancy in housework allocation is not surprising. That is, because men in partnerships achieve a higher grade job, are more likely to be employed full time and work more hours a week, it seems reasonable that they also spend less time in housework than women. All found levels of the latent variables are displayed in table 9 (see appendix).

However, not only can path modelling distinguish between latent variables (e.g. men's wage levels versus women's), it also enables interpretation of the different effects that an equal level of a latent variable has on the two sexes. For example, aspiration level of commodities, being measured primarily by household characteristics, is, not surprisingly, the same for both spouses. Only age and the partner's housework times differ for the individual aspiration level; on average, men are 2.7 years older than their partners.

Yet, even though the latent variable levels are about the same for both sexes, the effect of the aspiration level, which is assumed to be exogenous, on wage is positive for men and negative for women (see Figure 3). This difference[7] is highly significant, with a t-value of -8.592[8]. Moreover, the same level of aspiration increases domestic work time for women more than for men. Taken together, these results imply that men realize a more goods-oriented commodity production than women. In addition, because the aspiration level of commodities influences housework directly and indirectly through wage, its total effect on women is even higher – and that for men even lower – than the path coefficients presented above[9]. This finding supports the assumption that women follow a rather time-intensive household production, whereas men prefer a goods-intensive household production.

Wage has a negative effect on housework for both men and women. The roughly equivalent path coefficients indicate no significant difference. That is, in contrast to the theoretical prediction of different reactions for men and women, if both sexes realize the same wage, both react in the same way and hence reduce their time spent on housework by an equal amount. According to theory, women should react more strongly because the amount of time for good housework in their portfolio share (i.e. time available for allocation to market work,

[7] The significance of all differences between the path models of men and women are demonstrated in table 10, which appears in the appendix.

[8] Structural differences across gender groupings, which are not automated in PSL, can be examined by taking the standard errors for the path coefficients provided by bootstrapping output and hand-calculating them. Until non-parametrical methods are developed, Chin (2000) advises that the estimates be treated in a parametric sense via t-tests. It is this method, available on Chin's homepage, that we use here.

[9] The total effect of the aspiration level of commodities on housework for women is 0.355; that for men is 0.176. All relevant total effects for the path models of men and women are presented in table 11 and 12 (see appendix).

housework and leisure) is much greater than men's. In addition, theory assumes that women's wage has a greater impact than men's wage on individual domestic work because of a stronger income effect on women than on men (Seel 1991, p. 199). Given that, in this study, several latent variables could not be measured because of data unavailability, the reaction might have been even stronger if all variables had been included in the model. Blau and Kahn (2000) offered several explanations for their finding that women's wage labour supply elasticities adapt with men's; for example, women's increased participation in the labour market or the rising divorce rate may make the labour supply of women less sensitive to their own wages. In such cases, they do not completely allocate their time anew, which makes their housework supply less sensitive to wage.

Overall, our model explains 37% of the amount of housework done by women in partnerships. We attribute the undefined part to the unmeasured latent variables of the demand function and other non-observable influences. One interesting finding is that the explained variance of housework found for men is much smaller than that observed for women, less than half the R^2 for men (about 15%) compared to the structural model for women (about 37%). Either the unobserved latent variables can explain more of the housework done or the underlying model is not as suitable for men as for women.

In addition, this analysis identifies several behavioural differences between men and women. Specifically, it finds discrepancies in the values for the latent variables and also in effects that wage and aspiration levels of commodities have on housework. Clearly, some variables that might alter results are missing, but in all we would expect the tendencies identified to remain the same.

Where the influence was predictable, our empirical results support economic theory in that, for both men and women, the aspiration level of commodities increases the amount of housework, whereas wage reduces it. Nevertheless, we find differences in the strength of the aspiration level's relationships to wage and housework that we attribute to the different household production behaviours of time versus goods intensities.

6. Discussion

The most important finding of this paper on shifts in couples' time use between 1991/92 and 2001/02 is that even though over this decade women reduced and men increased the amount of housework they engage in, the difference between partners' domestic work hours – while converging – is still large.

To explain this phenomenon, we propose a collective model of labour supply that incorporates a household production approach and allows analysis of the behaviour of individual household members as well as consumption not only of market goods but also basic, individually produced commodities. At the same time, our exploration of time use in housework allows simultaneous consideration of theory and data, while at least partly preserving the structure of the demand function in the empirical model (i.e. it measures the latent variables themselves before calculating their impact on housework). In addition, our approach not only provides valuable information about the relations between the latent variables and housework but also about the relations among the latent variables themselves.

We identify aspiration level of commodities and wage as latent variables that help explain why individual household members spend a certain amount of time on housework. Specifically, we find that

- The higher the aspiration level of commodities, the more housework is done.
- The higher a person's wage, the less housework is done.

Additional influences on housework, not discussed in this paper, are partners' income and the aspiration level of consumption.

Even if men and women realize the same levels for the latent variables, division of housework will be unequal because these variables have different impacts on housework for both sexes. This gender differences in household time use may occur for several reasons:

- As widely acknowledged, women earn lower wages than men.
- Women's aspiration levels have a negative impact on wage, whereas men's have a positive one.
- The effect of the aspiration level of commodities on housework is significantly higher for women than for men.
- The total effect of aspiration level on domestic work differs significantly between men and women.

These last three results are interconnected and can be explained by men's rather goods-intensive household production versus the rather time-intensive production technology of women.

Finally, because of the gender-specific effects that latent variables have on housework, even if all the individual and household-specific characteristics of men and women measured were equal, there would still be differences in the time each sex spends on housework. Therefore, this study's most important contribution to the research stream is its distinction between the goods- versus time-insensitive production of basic commodities by men and women, respectively, in household production. This findings extends the work of Gronau and Hamermesh (2006), whose U.S./Israel comparison not only shows that goods intensity varies

over cultures and categories of commodities but identifies coherences between a rather goods-intensive household production and education and wage. In terms of culture and realized wage, we find a gender difference that may also relate to women's higher preference for time-intensive commodities and men's rather higher preference for goods-intensive commodities.

By doing so, this study raises the explanation of gender differences in time allocated for housework to another level. By isolating latent variables and their indicators (e.g. wage), we identify differences in the levels and effects of these variables; most particularly, men and women's different modes of household production. These latter are partly explainable by economic factors like wage: a higher wage leads to an increased shadow price of housework time, which results in rather goods-intensive production behaviour. Such gendered wage differences and different investments in human capital may be explainable by sociological constructs like gender identities (see e.g. Bianchi, Milkie, Sayer, Robinson 2000; Burda, Hamermesh, Weil 2007; Breen, Cooke 2005). That is, "people's economic and social circumstances shape how they live their family lives." (Woolley 2000, p. 21)

In sum, the still persistent division of housework between men and women can be attributed to the idiosyncratic gender-effects of latent variables that determine its amount. Gender-specific household production technologies could be a solution to such inequity.

Nevertheless, several questions remain unanswered that further research on the 1991/92 path models might address. For example, has reduced housework for women resulted in different effects and levels of latent variables on housework since 1991/92? If so, to what amount and in which direction? In addition, future research might longitudinally compare structural models to test the finding of other scholars (e.g. Kahn, Blau 2005; Connelly, Kimmel 2007) that the influence of wages and spousal characteristics on housework activities reduces over time. This present study has laid the foundation for such research by proposing an alternative, and more explanatory, methodology.

References

Alvarez, B.; Miles, D. (2003): Gender effect on housework allocation: Evidence from Spanish two-earner couples,in: *Journal of Population Economics*, 16, 227-242.

Apps, P./ Rees, R. (1997): Collective labor supply and household production, in: *Journal of Political Economy*, 105(1), 178-190.

Bianchi, S.M./ Milkie, M.A./ Sayer, L.C./ Robinson, J.P. (2000): Is anyone doing the housework? U.S. trends and gender differentials in domestic labor, in: *Social Forces,* 79(1), 191-228.

Blau, F./ Kahn, L. (2005): *Changes in the labor supply behavior of married women: 1980-2000*, in: NBER Working Paper No. 11230.

Breen, R./ Cooke, L.P. (2005): The persistence of gender division of domestic labour, in: *European Sociological Review,* 21(1), 43-57.

Brinkmann, U./ Dörre, K./ Röbenack, S./ Kraemer, K./ Speidel, F. (2006): Prekäre Arbeit - Ursachen, Ausmaß, soziale Folgen und subjektive Verarbeitungsformen unsicherer Beschäftigungsverhältnisse, in *Wirtschafts- und sozialpolitischen Beratungszentrum der Friedrich-Ebert-Stiftung* (Eds.), Bonn.

Browning, M./ Gortz, M. (2006): Spending time and money within the household, in: *Economics Series Working Papers* 288, University of Oxford, Department of Economics.

Burda, M./ Hamermesh, D.S./ Weil, P. (2007): *Total work, gender and social norms*, in: NBER Working Paper No. W13000, http://ssrn.com/abstract=977411.

Cassel, C.M./ Hackl, P./ Westlund, A.H. (2000): On measurement of intangible assets : a study of robustness of partial least squares, in: *Total Quality Management*, 11(7), 897-907.

Chiappori, P.-A. (1997): Introducing household production in collective models of labor supply, in: *The Journal of Political Economy*, 105(1), 191-209.

Chin, W. W. (2000): *Frequently asked questions – Partial least squares & PLS-Graph*, Home Page [On-line] Available at: http://disc-nt.cba.uh.edu/chin/plsfaq.htm.

Chin, W. W. (1998): The partial least squares approach to structural equation modeling, in: Marcoulides, G. A. (Eds.): *Modern methods for business research*, Mahwah, 295-336.

Chin, W.W./ Marcolin, B.L./ Newsted, P.R. (1996): A partial least squares latent variable modeling approach for measuring interaction effects : results from a Monte Carlo simulation study and voice mail emotion/adoption study, in: DeGross, J. I. et al. (Eds.): *Proceedings of the Seventeenth International Conference on Information Systems*, Cleveland, 21-41.

Chin, W. W./ Newsted, P. R. (1999): Structural equation modeling analysis with small samples using partial least squares, in: Hoyle, R. H. (Eds.): *Statistical strategies for small sample research*, Thousand Oaks et al., 307-341.

Connelly, R./ Kimmel, J. (2007): *Spousal influences on parents' non-market time choices,* in: IZA Discussion Papers 2894, Institute for the Study of Labor (IZA).

Cornelissen, W. (Eds.) (2005): *Gender-Datenreport - 1. Datenreport zur Gleichstellung von Frauen und Männern in der Bundesrepublik Deutschland im Auftrag des Bundesministeriums für Familie, Senioren, Frauen und Jugend,* München. URL: http://www.bmfsfj.de/Publikationen/genderreport/root.html.

Donni, O. (2003): *Collective models of the household*, Université de Cergy-Pontoise

El Lahga, A./ Moreau, N. (2007): *The effects of marriage on couples' allocation of time between market and non-market hours,* in: IZA Discussion Papers 2619, Institute for the Study of Labor (IZA).

Gershuny, J. (2000): *Changing times: Work and leisure in postindustrial society*, Oxford, UK.

Gronau, R./ Hamermesh, D. (2006): Time vs. goods: The value of measuring household production technologies, in: *Review of Income and Wealth*, 52(1), 1-16.

Gwozdz, W (2007): Zwischen "Familienernährer" und "Ernährungsproduzent" – Eine Untersuchung der geschlechtspezifischen Arbeitsteilung im Haushalt anhand der Zeitbudgeterhebungen 1991/92 und 2001/02, in: *Hohenheimer Beiträge zu Gender und Ernährung*, 2.

Jalas, M. (2006): *Busy, wise and idle time: a study of the temporalities of consumption in the environmental debate*, Helsinki School of Economics.
Keller, B./ Seifert, H. (2006): Atypische Beschäftigungsverhältnisse: Flexibilität, soziale Sicherheit und Prekarität, in: *WSI Mitteilungen 5/2006*, 235-240.
Oreffice, S. (2007): Legalization of abortion, intra-household bargaining power, and labor supply, in: *Review of Economics of the Household*, 5(2), 181-208.
Phipps, S.A./ Burton, P.S. (1998): What's mine is yours? The influence of male and female incomes on patterns of household expenditure, in: *Economica*, 65, 599-613.
Reid, M.G. (1934): *Economics of Household Production*, New York.
Säntti, R./ Otva, R.-A./ Kilpiö, E. (1982): *Housework study. Part VIII – Unpaid housework: Time use and value*, Official Statistics of Finland, Special Social Studies.
Seel, B. (1991): *Ökonomik des privaten Haushalts,* Stuttgart.
Sousa-Poza, A./ Schmid, H./ Widmer, R. (2001): The allocation and value of time assigned to housework and child-care: An analysis for Switzerland, in: J*ournal of Population Economics*, 14, 599-618, Reprinted in Vogler, M./Zimmermann, K.F. (Eds.) (2003): Family, Household and Work, Berlin.
Statistisches Bundesamt (Eds.) (2006): *Statistisches Jahrbuch für die Bundesrepublik Deutschland und das Ausland*, Wiesbaden: Statistisches Bundesamt.
Statistisches Bundesamt (Eds.) (2004): *Alltag in Deutschland. Analysen zur Zeitverwendung. Forum der Bundesstatistik*, Band 43, Reutlingen: SFG.
Statistisches Bundesamt (Eds.) (2003): *Ergebnisse der neuen Hochrechnung der Zeitbudgeterhebung*, (Neue_Hochrechnung_okt03_ZBE01-02.pdf).
Tenenhaus, M; Vinci, V. E.; Chatelin, Y.-M.; Lauro, C. (2005): PLS path modeling, in: *Computational Statistics & Data Analysis*, 48, 159-205.
Zick, C.D./ Bryant W.K./ Srisukhumbowornchai, S. (2006): *Does housework matter anymore? The shifting impact of housework on economic inequality,* Working paper.

Appendix

Table 2: Description of the measurement models and descriptive statistics of men and women in partnerships in 2001/02

Latent variable	Measurement model	scale	Women in 2001/02			Men in 2001/02		
			Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Housework	Housework	Minutes per day	2,497	319.26	139.54	2,497	164.16	115.84
Wage	Net income	13 classes	2,487	2.64	2.98	2,489	7.44	3.64
	Weekly hours	Hours per week	2,486	16.08	16.98	2,483	37.23	16.55
	Type of employment	0 'not employed' 4 'full time'	2,497	1.50	1.12	2,497	3.63	0.94
Human capital	Graduation	0 'no graduation' 4 'baccalaureate'	2,474	2.34	1.09	2,484	2.29	1.20
	Vocational training	0 'no degree' 7 'university degree'	2,481	3.76	1.73	2,489	4.40	1.77
	On the job training	Index	2,497	1.33	2.67	2,497	2.16	3.25
Aspiration level of commodities	Children (aged 0-1)	No. of children this age	2,497	0.06	0.25	2,497	0.06	0.25
	Children (aged 2-6)	No. of children this age	2,497	0.27	0.55	2,497	0.27	0.55
	Children (aged 7-15)	No. of children this age	2,497	0.71	0.86	2,497	0.71	0.86
Work other	Housework partner	Minutes per day	2,497	164.16	115.84	2,497	319.26	139.54
	Child care	Dummy	2,466	0.20	0.40	2,466	0.20	0.40
	Housework (paid or unpaid)	Hours per week	2,497	3.96	8.98	2,497	3.96	8.98
Age	Age	In years	2,497	42.23	7.77	2,497	44.93	8.07
	Age squared	$Years^2$	2,497	1,843.31	665.54	2,497	2,084.41	729.095
Housing characteristics	Living space	10 square metres	2,469	11.89	4.09	2,469	11.89	4.09
	House occupants	Dummy	2,490	0.60	0.49	2,490	0.60	0.49
	Dishwasher	No. in household	2,497	0.84	0.39	2,497	0.84	0.39
	Dryer	No. in household	2,497	0.56	0.50	2,497	0.56	0.50

Summary statistics for the manifest variables, which are presented in this study, are based on the observations of path models for men and women in 2001/02.

Table 3: cross-loadings between the factors and considered latent variables of men (measurement model)

	Housework	Wage	Human capital	Aspiration level of commodities	Work other	Age	Housing
Housework							
Housework	1.0000	-0.3420	-0.0669	0.1263	0.1291	-0.0308	-0.0567
Wage							
Net income	-0.2635	0.8795	0.3517	0.1248	0.1370	-0.1243	0.3243
Weekly hours of work	-0.3550	0.9129	0.2449	0.1255	0.1370	-0.1987	0.1954
Type of employment	-0.3185	0.9500	0.1604	0.1208	0.1290	-0.2487	0.1793
Graduation	-0.0062	0.1788	0.7835	0.1034	0.1156	-0.1109	0.0969
Vocational training	-0.0305	0.1948	0.7979	0.0307	0.0462	0.0705	0.1542
On-the-job training	-0.1021	0.2397	0.7335	0.0116	0.0262	-0.0191	0.1125
Aspiration level of commodity							
Children (aged 0-1)	0.1139	0.0440	0.0360	0.4454	0.3056	-0.2882	-0.0128
Children (aged 2-6)	0.1191	0.0824	0.0173	0.8924	0.6934	-0.4087	0.1021
Children (aged 7-15)	-0.0475	0.1551	0.0949	0.2699	0.1361	-0.2270	0.1796
Housework partner	0.1416	0.1200	0.0288	0.4266	0.6076	-0.1657	0.1253
Childcare	0.0827	0.0923	0.0397	0.6888	0.8637	-0.4064	0.0785
Housework (paid or unpaid)	0.0436	0.1103	0.1242	0.3013	0.5206	-0.2529	0.0934
Age	-0.0349	-0.1988	-0.0178	-0.5215	-0.4224	0.9987	0.0651
Age squared	-0.0265	-0.2235	-0.0275	-0.5194	-0.4208	0.9987	0.0485
Living space	-0.0214	0.1838	0.1877	0.1126	0.1143	0.0767	0.7642
House occupants	-0.0096	0.1114	0.0546	0.0487	0.0556	0.1055	0.5438
Dishwasher	-0.0623	0.2013	0.1010	0.1015	0.0930	-0.0408	0.6767
Dryer	-0.0457	0.1233	0.0131	0.0742	0.0645	0.0404	0.5508

Manifest variables are supposed to produce the highest cross-loadings with the correspondent latent variables than to other latent variables. To make this table easier to read, correlations below 0.25 are not shown.

Table 4: cross-loadings between the factors and considered latent variables of women (measurement model)

	Housework	Wage	Human capital	Aspiration level of commodities	Work other	Age	Housing
Housework							
Housework	1.0000	-0.5086	-0.1218	0.4379	0.2425	-0.1724	0.1252
Wage							
Net income	-0.4560	0.9326	0.4444	-0.2262	-0.0353	0.0352	0.0210
Weekly hours of work	-0.4915	0.9604	0.3646	-0.2496	-0.0593	-0.0114	-0.0510
Type of employment	-0.4984	0.9544	0.3412	-0.2392	-0.0517	-0.0124	-0.0180
Graduation	0.0551	0.1341	0.5545	0.1872	0.2021	-0.2211	0.1076
Vocational training	-0.0354	0.2511	0.7171	0.0529	0.1287	-0.0302	0.0628
On-the-job training	-0.1763	0.3810	0.8114	-0.0849	-0.0088	-0.0087	0.0180
Aspiration level of commodity							
Children (aged 0-1)	0.2739	-0.1768	0.0150	0.4853	0.2447	-0.2991	-0.0127
Children (aged 2-6)	0.3072	-0.1700	-0.0114	0.8552	0.6912	-0.4168	0.1021
Children (aged 7-15)	0.2157	-0.1152	0.0377	0.3145	0.0467	-0.2492	0.1802
Housework partner	0.1416	0.0307	0.0326	0.1246	0.2337	-0.0407	-0.0567
Childcare	0.2371	-0.0920	0.0447	0.6705	0.9237	-0.4145	0.0787
Housework (paid or unpaid)	0.0796	0.0505	0.1608	0.3002	0.5945	-0.2566	0.0938
Age	-0.1692	0.0070	-0.0673	-0.5484	-0.4384	0.9985	0.0748
Age squared	-0.1751	-0.0009	-0.0768	-0.5467	-0.4310	0.9984	0.0539
Living space	0.1342	-0.0194	0.0972	0.1164	0.0660	0.0768	0.7661
House occupants	0.1061	-0.0543	0.0128	0.0490	0.0116	0.1151	0.5409
Dishwasher	0.0390	0.0247	0.0446	0.1053	0.0824	-0.0335	0.6809
Dryer	0.0484	-0.0212	-0.0222	0.0743	0.0458	0.0490	0.5439

Manifest variables are supposed to produce the highest cross-loadings with the correspondent latent variables than to other latent variables. To make this table easier to read, correlations below 0.25 are not shown.

Table 5: Structural model: path coefficients of men's path model in 2001/02 (Bootstrapping with 1,000 resamples)

	Original Sample (O)	Sample Mean (M)	Standard Error (STERR)	T Statistics (|O/STERR|)
Aspiration level of commodities → housework	**0.1981**	**0.1974**	**0.0204**	**9.7025**
Aspiration level of commodities → wage	**0.063**	**0.0625**	**0.0146**	**4.3149**
Work other → aspiration level of commodities	0.6179	0.6182	0.0151	40.8662
Age → aspiration level of commodities	-0.2641	-0.2639	0.0149	17.7103
Housing → aspiration level of commodities	0.071	0.0703	0.0133	5.3265
Wage → housework	**-0.3461**	**-0.3458**	**0.0276**	**12.5327**
Human capital → wage	0.1826	0.1835	0.0147	12.4307
Aspiration level of consumption → housework	**-0.0372**	**-0.0377**	**0.0247**	**1.5092**
Aspiration level of consumption → wage	**0.5177**	**0.5174**	**0.0181**	**28.5846**
Social infrastructure → aspiration level of consumption	0.2009	0.2015	0.0187	10.7313
Communication →aspiration level of consumption	0.1233	0.1251	0.0186	6.6362
Perception of time use for work → aspiration level of consumption	0.4194	0.4187	0.0209	20.0466
Partner's income → housework	**0.094**	**0.0941**	**0.0214**	**4.3984**
Time (partner) → partner's income	0.8044	0.8047	0.0088	90.9092
Human capital (partner) → partner's income	0.1579	0.1575	0.0137	11.5018
Public transfer → housework	**0.0004**	**0.0005**	**0.0265**	**0.0154**
Wage → public transfer	**-0.559**	**-0.5583**	**0.02**	**27.9131**

Through bootstrapping, reasonable standard errors are provided, which allow the calculation of t-values for each path. 1,000 bootstrapping resamples are specified that produces samples consisting of 2,497 cases each as in the original sample. The significance level at the 95% confidence interval is at t=1.96 (99%: t=2.57).

Table 6: Structural model: path coefficients of women's path model in 2001/02 (Bootstrapping with 1,000 resamples)

	Original Sample (O)	Sample Mean (M)	Standard Error (STERR)	T Statistics (|O/STERR|)
Aspiration level of commodities → housework	**0.3114**	**0.3113**	**0.0186**	**16.7672**
Aspiration level of commodities → wage	**-0.1162**	**-0.1156**	**0.0149**	**7.7957**
Work other → aspiration level of commodities	0.5164	0.5165	0.0201	25.7269
Age → aspiration level of commodities	-0.3309	-0.3302	0.0177	18.7259
Housing → aspiration level of commodities	0.1181	0.1197	0.0143	8.2669
Wage → housework	**-0.3774**	**-0.376**	**0.0219**	**17.2135**
Human capital → wage	0.2901	0.2916	0.0159	18.1937
Aspiration level of consumption → housework	**-0.0783**	**-0.0783**	**0.0266**	**2.9485**
Aspiration level of consumption → wage	**0.5145**	**0.5145**	**0.0132**	**38.9586**
Social infrastructure → aspiration level of consumption	0.0827	0.0894	0.0218	3.7836
Communication →aspiration level of consumption	0.0208	0.0287	0.0185	1.119
Perception of time use for work → aspiration level of consumption	0.5690	0.5673	0.0146	39.095
Partner's income → housework	**0.0861**	**0.0871**	**0.0198**	**4.3551**
Time (partner) → partner's income	0.707	0.7072	0.0115	61.6126
Human capital (partner) → partner's income	0.2067	0.2061	0.0145	14.2497
Public transfer → housework	**-0.0096**	**-0.0075**	**0.0209**	**0.4573**
Wage → public transfer	**-0.3072**	**-0.3079**	**0.0122**	**25.2249**

Through bootstrapping, reasonable standard errors are provided, which allow the calculation of t-values for each path. 1,000 bootstrapping resamples are specified that produces samples consisting of 2,497 cases each as in the original sample. The significance level at the 95% confidence interval is at t=1.96 (99%: t=2.57).

Table 7: Structural Model: overview over the quality criteria of men's path model in 2001/02

Latent variable	AVE	Composite reliability	R square	Cronbach's alpha	Communality	Redundancy	No. of manifest variables	Goodness-of-fit index (GoF)
Housework	**0**	**0**	**0.154**	**0**	**1**	**0.0006**	**1**	
Wage	**0.8364**	**0.9387**	**0.345**	**0.9018**	**0.8364**	**0.0555**	**3**	
Human capital	0.596	0.8155	0	0.666	0.596	0	3	
Aspiration level of commodities	**0**	**0**	**0.604**	**0**	**0.3558**	**0.0727**	**3**	
Work other	0.4617	0.7106	0	0.4248	0.4617	0	3	
Age	0.9974	0.9987	0	0.9974	0.9974	0	2	
Housing	0.4102	0.7315	0	0.5311	0.4102	0	4	
Aspiration level of consumption	**0.3843**	**0.6244**	**0.2593**	**0.2171**	**0.3843**	**0.0236**	**3**	
Social infrastrucutre	0.4297	0.6514	0	0.2335	0.4297	0	3	
Communication (equipment)	0.4802	0.7785	0	0.6417	0.4802	0	4	
Perception of on-the-job time use	0.694	0.8181	0	0.5753	0.694	0	2	
Partner's income	**0**	**0**	**0.7601**	**0**	**1**	**0.113**	**1**	
Time (partner)	0.9406	0.9694	0	0.9369	0.9406	0	2	
Human capital (partner)	0.5103	0.7561	0	0.548	0.5103	0	3	
Public transfer	**0.4253**	**0.666**	**0.3124**	**0.3819**	**0.4253**	**0.1256**	**3**	
Average			**0.348**		**0.5480**	**0.0676**	**38**	**0.437**

AVE is the average variance examined, which should be above 0.5 (Chin 1998, p.321).
The composite reliability is measurement of the internal consistency and describes the reliability of latent variables like Cronbach's Alpha. Both are supposed to take a value of 0.7 and higher (Tenenhaus 2005, p164).
The R^2 is the explained variability as is known in regression analyses. Its values should be as high as possible.
The communality index measures the quality of the measurement model for each latent variable. It is defined as:

$$communality_j = \frac{1}{p_j}\sum_{h=1}^{p_j} cor^2(x_{jh}, y_j)$$ (Tenenhaus 2005, p.173).

By consideration of the measurement model, the redundancy index measures the quality of the structural model for each endogenous latent variable. Redundancy is defined as: $redundancy_j = communality_j \cdot R^2(y_j, \{y_{j'}\text{'s explaining } y_j\})$ (Tenenhaus 2005, p.173).

Redundancy and R^2 are obviously not computable for exogenous latent variables.
GoF is calculated by the square root of the average communality multiplied with the average R^2. The average communality is computed as a weighted average of the different communalities with the weights being the number of manifest variables per latent variable. GoF is a way of comparing model validity like a goodness of fit, which is defined by $GoF = \sqrt{\overline{communality} \cdot \overline{R^2}}$ (Tenenhaus 2005, p.180).

Table 8: Structural Model: overview over the quality criteria of women's path model in 2001/02

Latent variable	AVE	Composite Reliability	R Square	Cronbach's Alpha	Communality	Redundancy	No. of manifest variables	Goodness of Fit-index (GoF)
Housework	**0**	**0**	**0.3672**	**0**	**1**	**0.0168**	**1**	
Wage	**0.901**	**0.9647**	**0.459**	**0.9452**	**0.901**	**0.1351**	**3**	
Human capital	0.4933	0.7405	0	0.548	0.4933	0	3	
Aspiration level of commodities	**0**	**0**	**0.5449**	**0**	**0.3552**	**0.089**	**3**	
Work other	0.4202	0.6381	0	0.3174	0.4202	0	3	
Age	0.9969	0.9985	0	0.9969	0.9969	0	2	
Housing	0.4096	0.7307	0	0.5311	0.4096	0	4	
Aspiration level of consumption	**0.3558**	**0.3147**	**0.3446**	**0.2171**	**0.3558**	**0.0071**	**3**	
Social infrastrucutre	0.2879	0.3778	0	0.2335	0.2879	0	3	
Communication (equipment)	0.4543	0.754	0	0.6417	0.4543	0	4	
Perception of on-the-job time use	0.8556	0.9222	0	0.8321	0.8556	0	2	
Partner's income	**0**	**0**	**0.6025**	**0**	**1**	**0.1027**	**1**	
Time (partner)	0.9137	0.9549	0	0.906	0.9137	0	2	
Human capital (partner)	0	0	0	0	0.5994	0	3	
Public transfer	**0.4106**	**0.6531**	**0.0944**	**0.3819**	**0.4106**	**0.0363**	**3**	
Average			**0.326**		**0.5384**	**0.0658**	**38**	**0.419**

AVE is the average variance examined, which should be above 0.5 (Chin 1998, p.321).
The composite reliability is measurement of the internal consistency and describes the reliability of latent variables like Cronbach's Alpha. Both are supposed to take a value of 0.7 and higher (Tenenhaus 2005, p164).
The R^2 is the explained variability as is known in regression analyses. Its values should be as high as possible.
The communality index measures the quality of the measurement model for each latent variable. It is defined as:

$communality_j = \frac{1}{p_j}\sum_{h=1}^{p_j} cor^2(x_{jh}, y_j)$ (Tenenhaus 2005, p.173).

By consideration of the measurement model, the redundancy index measures the quality of the structural model for each endogenous latent variable. Redundancy is defined as: $redundancy_j = communality_j \cdot R^2(y_j, \{y_{j'}\text{'s explaining } y_j\})$ (Tenenhaus 2005, p.173).

Redundancy and R^2 are obviously not computable for exogenous latent variables.
GoF is calculated by the square root of the average communality multiplied with the average R^2. The average communality is computed as a weighted average of the different communalities with the weights being the number of manifest variables per latent variable. GoF is a way of comparing model validity like a goodness of fit, which is defined by $GoF = \sqrt{\overline{communality} \cdot \overline{R^2}}$ (Tenenhaus 2005, p.180).

Table 9: Structural model: Index values for latent variables of women and men

	Women	Men
Housework	319.2616	164.1647
Wage	2.459	4.9363
Human capital	2.5422	2.9701
Aspiration level of commodities	0.225	0.2279
Work other	0.4301	0.8621
Age	62.9994	67.2488
Housing	1.1698	1.1666
Aspiration level of consumption	1.5893	2.2994
Adolescent	1.8251	1.1374
Communication (equipment)	0.7614	0.8517
Perception of time use for work	1.9739	2.607
Partner's income	7.4113	2.6292
Time (partner)	4.4207	2.3916
Human capital (partner)	2.9953	2.5803
Public transfer	0.0618	0.0549

All index values are without scale except for the variable “household work”.

Table 10: Significance of differences in path models of men and women in 2001/02

Path coefficients			Men		Women		Comparison	
Impacting variable		Variable impacted	Path effect	Standard error (STERR)	Path effect	Standard error (STERR)	Difference of path effects	t-value
Aspiration level of commodities	⇒	**Housework**	**0,3114**	**0,00035**	**0,1981**	**0,00042**	**0,113**	**4,105**
Wage			**-0,3774**	**0,00048**	**-0,3461**	**0,00076**	**-0,031**	**-0,889**
Aspiration level of consumption			**-0,0783**	**0,00071**	**-0,0372**	**0,00061**	**-0,041**	**-1,132**
Partner's income			**0,0861**	**0,00039**	**0,094**	**0,00046**	**-0,008**	**-0,271**
Public transfer			**-0,0096**	**0,00044**	**0,0004**	**0,00070**	**-0,010**	**-0,296**
Work other	⇒	**Aspiration level of commodities**	0,5164	0,00040	0,6179	0,00023	-0,102	-4,038
Age			-0,3309	0,00031	-0,2641	0,00022	-0,067	-2,888
Housing			0,1181	0,00020	0,071	0,00018	0,047	2,412
Aspiration level of commodities	⇒	**Wage**	**-0,1162**	**0,00022**	**0,063**	**0,00021**	**-0,179**	**-8,592**
Aspiration level of consumption			**0,5145**	**0,00017**	**0,5177**	**0,00033**	**-0,003**	**-0,143**
Human capital			0,2901	0,00025	0,1826	0,00022	0,108	4,965
Social infrastructure	⇒	**Aspiration level of consumption**	0,0827	0,00048	0,2009	0,00035	-0,118	-4,116
Communication (equipment)			0,0208	0,00034	0,1233	0,00035	-0,103	-3,908
Perception of on-the-job time use			0,569	0,00021	0,4194	0,00044	0,150	5,869
Time (partner)	⇒	**Partner's income**	0,707	0,00013	0,8044	0,00008	-0,097	-6,728
Human capital (partner)			0,2067	0,00021	0,1579	0,00019	0,049	2,447
Wage	⇒	**Public transfer**	**-0,3072**	**0,00015**	**-0,559**	**0,00040**	**0,252**	**10,750**

The bootstrapping results of the path coefficients (see table 5 and 6) are used for the calculation of the differences between the paths of the structural models of men and women in 2001/02. The equation to compute the t-values for the differences are given by Chin 2000.
The significance level at the 95% confidence interval is at t=1.96 (99%: t=2.57).

Table 11: Structural model: total effects of men's path model in 2001/02 (Bootstrapping with 1,000 resamples)

Impacting variable		Variable impacted	Original sample (O)	Sample mean (M)	Standard error (STERR)	T statistics (|O/STERR|)
Aspiration level of commodities	⇒	**Housework** (direct)	**0.1763**	**0.1758**	**0.021**	**8.4026**
Wage			**-0.3463**	**-0.346**	**0.0253**	**13.6732**
Aspiration level of consumption			**-0.2165**	**-0.2168**	**0.0217**	**9.9829**
Partner's income			**0.094**	**0.0941**	**0.0214**	**4.3984**
Public transfer			**0.0004**	**0.0005**	**0.0265**	**0.0154**
Work other	⇒	**Housework** (indirect)	0.1089	0.1087	0.0133	8.2036
Age			-0.0465	-0.0464	0.0063	7.4024
Housing			0.0125	0.0123	0.0026	4.7235
Human capital			-0.0632	-0.0635	0.007	9.0644
Social infrastructure			-0.0435	-0.0437	0.0059	7.3681
Communication (equipment)			-0.0267	-0.0271	0.005	5.3614
Perception of on-the-job time use			-0.0908	-0.0909	0.0112	8.1198
Human capital (partner)			0.0148	0.0149	0.0038	3.9396
Time (partner)			0.0756	0.0757	0.0172	4.3989
Work other	⇒	**Aspiration level of commodities** (direct)	0.6179	0.6182	0.0151	40.8662
Age			-0.2641	-0.2639	0.0149	17.7103
Housing			0.071	0.0703	0.0133	5.3265
Aspiration level of commodities	⇒	**Wage** (direct)	**0.5177**	**0.5174**	**0.0181**	**28.5846**
Aspiration level of consumption			**0.063**	**0.0625**	**0.0146**	**4.3149**
Human capital			0.1826	0.1835	0.0147	12.4307
Work other	⇒	**Wage** (indirect)	0.0389	0.0387	0.0091	4.2582
Age			-0.0166	-0.0165	0.004	4.1853
Housing			0.0045	0.0044	0.0014	3.2331
Social infrastructure			0.104	0.1042	0.0099	10.4933
Communication (equipment)			0.0638	0.0647	0.0096	6.674

Perception of on-the-job time use			0.2171	0.2168	0.0164	13.2721
Social infrastructure	⇒	**Aspiration level of consumption** (direct)	0.2009	0.2015	0.0187	10.7313
Communication (equipment)			0.1233	0.1251	0.0186	6.6362
Perception of on-the-job time use			0.4194	0.4187	0.0209	20.0466
Time (partner)	⇒	**Partner's income** (direct)	0.8044	0.8047	0.0088	90.9092
Human capital (partner)			0.1579	0.1575	0.0137	11.5018
Wage	⇒	**Public transfer** (direct)	**-0.559**	**-0.5583**	**0.02**	**27.9131**
Aspiration level of commodities	⇒	**Public transfer** (indirect)	**-0.0352**	**-0.0349**	**0.0082**	**4.2803**
Aspiration level of consumption			**-0.2894**	**-0.289**	**0.0165**	**17.5687**
Work other			-0.0218	-0.0216	0.0052	4.2247
Age			0.0093	0.0092	0.0022	4.156
Housing			-0.0025	-0.0025	0.0008	3.2265
Human capital			-0.1021	-0.1024	0.0087	11.6996
Social infrastructure			-0.0581	-0.0582	0.0061	9.605
Communication (equipment)			-0.0357	-0.0361	0.0055	6.4561
Perception of time use for the job			-0.1214	-0.1211	0.011	11.0668

Through bootstrapping, reasonable standard errors are provided, which allow the calculation of t-values for each path. 1,000 bootstrapping resamples are specified that produces samples consisting of 2,497 cases each as in the original sample.
The total effects describe the overall impact a latent variable takes on another one.
The significance level at the 95% confidence interval is at t=1.96 (99%: t=2.57)

Table 12: Structural model: total effects of women's path model in 2001/02 (Bootstrapping with 1,000 resamples)

Impacting variable		Variable impacted	Original sample (O)	Sample mean (M)	Standard error (STERR)	T statistics (|O/STERR|)
Aspiration level of commodities	⇒	**Housework** (direct)	**0.3549**	**0.3545**	**0.0196**	**18.0841**
Wage			**-0.3744**	**-0.3736**	**0.0222**	**16.8668**
Aspiration level of consumption			**-0.2709**	**-0.2705**	**0.022**	**12.3419**
Partner's income			**0.0861**	**0.0871**	**0.0198**	**4.3551**
Public transfer			**-0.0096**	**-0.0075**	**0.0209**	**0.4573**
Work other	⇒	**Housework** (indirect)	0.1833	0.1831	0.0115	15.9709
Age			-0.1174	-0.1171	0.0096	12.1859
Housing			0.0419	0.0424	0.0055	7.5845
Human capital			-0.1086	-0.109	0.0089	12.226
Social infrastructure			-0.0224	-0.0243	0.0067	3.3659
Communication (equipment)			-0.0056	-0.008	0.0047	1.2027
Perception of on-the-job time use			-0.1542	-0.1535	0.0133	11.5563
Human capital (partner)			0.0178	0.018	0.0043	4.107
Time (partner)			0.0608	0.0616	0.0141	4.3128
Work other	⇒	**Aspiration level of commodities** (direct)	0.5164	0.5165	0.0201	25.7269
Age			-0.3309	-0.3302	0.0177	18.7259
Housing			0.1181	0.1197	0.0143	8.2669
Aspiration level of commodities	⇒	**Wage** (direct)	**-0.1162**	**-0.1156**	**0.0149**	**7.7957**
Aspiration level of consumption			**0.5145**	**0.5145**	**0.0132**	**38.9586**
Human capital			0.2901	0.2916	0.0159	18.1937
Work other	⇒	**Wage** (indirect)	-0.06	-0.0597	0.0079	7.6362
Age			0.0385	0.0382	0.0056	6.8883
Housing			-0.0137	-0.0138	0.0024	5.8288
Social infrastructure			0.104	0.1042	0.0099	10.4933
Communication (equipment)			0.0107	0.0153	0.0087	1.2244

Perception of on-the-job time use			0.2927	0.2919	0.0121	24.1842
Social infrastructure	⇒	**Aspiration level of consumption** (direct)	0.0827	0.0894	0.0218	3.7836
Communication (equipment)			0.0208	0.0297	0.0169	1.2269
Perception of on-the-job time use			0.569	0.5673	0.0146	39.095
Time (partner)	⇒	**Partner's income** (direct)	0.707	0.7072	0.0115	61.6126
Human capital (partner)			0.2067	0.2061	0.0145	14.2497
Wage	⇒	**Public transfer** (direct)	**-0.3072**	**-0.3079**	**0.0122**	**25.2249**
Aspiration level of commodities	⇒	**Public transfer** (indirect)	**0.0357**	**0.0356**	**0.005**	**7.2052**
Aspiration level of consumption			**-0.158**	**-0.1584**	**0.0076**	**20.8729**
Work other			0.0184	0.0184	0.0026	7.0617
Age			-0.0118	-0.0118	0.0018	6.496
Housing			0.0042	0.0043	0.0008	5.5601
Human capital			-0.0891	-0.0898	0.006	14.7437
Social infrastructure			-0.0131	-0.0142	0.0036	3.6601
Communication (equipment)			-0.0033	-0.0047	0.0027	1.2266
Perception of time use for the job			-0.0899	-0.0899	0.0053	17.0988

Through bootstrapping, reasonable standard errors are provided, which allow the calculation of t-values for each path. 1,000 bootstrapping resamples are specified that produces samples consisting of 2,497 cases each as in the original sample.
The total effects describe the overall impact a latent variable takes on another one.
The significance level at the 95% confidence interval is at t=1.96 (99%: t=2.57)