The Determination of Extended Income Equivalence Scales from Income Satisfaction and Time Use Data

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Paper prepared for the 35th IARIW General Conference

Copenhagen, Denmark, August 20-25, 2018

Session PS16: Poster Session

Time: Wednesday, August 22, 2018 [17:30-18:30]

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July 30, 2018

Abstract

In this paper, I estimate extended income equivalence scales from income satisfaction and time-use data contained in the German Socio-Economic Panel. Designed to capture the needs of additional household members, these scales account for both, increases in households' money income and domestic production requirements. The estimation procedure determines equivalence weights in these two components separately. My findings suggest greater monetary equivalence weights for adults than for children. At given levels of monetary well-being, the value of household production increases more strongly in the number of children than in the presence of an adult partner. Differences in relative needs tend to balance out in the extended income equivalence scale, assigning adults and children almost identical weights of about 45 percent. I illustrate the implications of these estimates for measures of income inequality using the same dataset.

JEL Classification Codes: D13, I32, J13, J22

Keywords: equivalence scales, income satisfaction, household production

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1. Introduction

Suppose that you want to compare the standard of living of two different households: a single man and a couple. You probably think that it might be a good idea to compare their respective money incomes. Money incomes are relatively easy to measure, available in many datasets and approximate the household's market consumption quite well. Let us assume both households' monthly income is equal to 2000 euros. Do the two households enjoy the same standard of living? How would your assessment change if you knew that the couple produced goods and services worth 500 euros at home while the single did not?

The first question is at the heart of all welfare analyses carried out at the household level. Almost certainly, two differently structured households will not enjoy the same standard of living when they have the same monetary income, all other things equal. An additional household member requires additional funds, even though probably not as many as a single person does. To account for differences in needs and economies of scale and hence make the economic well-being of differently structured households comparable, empirical economists typically adjust incomes by equivalence scales. These indicate the percentage increase in income necessary to keep a household's living standard constant as additional members join that household. In the past, these scales were often limited to considering money incomes or expenditures. However, monetary measures only provide an incomplete account of a household's total consumption, which is what the second question hints at. Households satisfy their needs not only by market consumption at the expense of money but also by household production at the expense of time. Gronau (1977) formalized this idea assuming individuals' utility to depend on total commodities consumption and leisure when they can either purchase commodities in the market or produce substitutes domestically at the cost of forgone leisure. The benefits from the three components, money income, household production and leisure enjoyed by all family members, add up to form the household's full income (going back to Becker, 1965). A closely related concept is extended household income, which captures total commodities consumption by the sum of monetary incomes and the proceeds from household production. In considering extended instead of monetary incomes of households, one can account for the fact that larger households typically produce more goods and services domestically, which might expand their consumption possibilities. At the same time, their household production requirements may also be larger. This may be because moving into a

bigger place in response to the family size increase might entail the need to clean more rooms or, more obviously, because a young child requires care.

Many recent welfare analyses have realized the importance of household production in generating additional consumption possibilities to households. With simultaneous increases in the availability of time-use data, the distribution of extended incomes has become a matter of growing interest in the literature (see e.g. Jenkins & O'Leary, 1996, Frick et al., 2012, Folbre et al., 2013). Many studies account for the fact that domestic production needs vary across households by applying conventional equivalence scales to extended incomes and thereby assume that differences in needs and economies of scale in household production are the same as in market consumption. With most of the commonly applied equivalence scales lacking an empirical basis in the first place, it is unclear why this should be the case. Researchers in the field, of course, are aware of that. For instance, Jenkins & O'Leary (1996) note that "Arguably the equivalence scale rates for money income and the proceeds of household production should differ (…)" [p.406]. It is the lack of reliable estimates of monetary and household production equivalence scales that has led to the pragmatic approach of applying monetary expert scales to extended incomes. Only recently, Folbre et al. (2017) have proposed an expert scale for extended incomes, whose empirical estimation they leave to further research. The present paper steps in here, proposing a method by which one can determine equivalence scales in the two components of extended income – money incomes and household production. It does so using a well-established method to determine equivalence scales from self-reported income satisfaction together with findings from research on the time cost of additional household members. A combination of the resulting two scales yields the extended income equivalence scale.

An application of the estimation procedure to German survey data containing income satisfaction as well as time-use figures shows that the monetary equivalence weight of an adult is significantly larger than that of a child. At the same time, household production requirements are greater for children than for adults. These differences tend to balance out, leaving the extended income needs of additional adults and children to be virtually identical, unless one accounts for large differences in the home production requirements of children depending on their age.

The remainder of this paper is structured as follows. In section 2, I review the related literature. In section 3, I present assumptions of the econometric model ending in an explanation of the estimation procedure. After that, I introduce the data from the German

Socio-Economic Panel used in the empirical estimation. Section 5 contains the results. Section 6 shows implications of the estimated equivalence scales for the assessment of inequality, whereas section 7 discusses limitations of my results. Section 8 concludes.

2. Literature Review

To date, numerous studies have been devoted to empirically estimating the cost of additional household members. Frequently, these costs are embedded in equivalence scales that provide a relative account of the compensations needed for differently structured households to enjoy the same standard of living. In general, there are three different approaches to determining equivalence scales. In the first approach, experts evaluate the relative needs of households based on arbitrary judgements or indicative evidence regarding desirable baskets of goods and services or based on anticipated economies of scale. The OECD and the square-root scale are two commonly applied examples of these so-called expert scales. Shortcomings in their theoretical and empirical basis have led to the development of more systematic approaches employing either objective or subjective data. The objective approach relies on indirect accounts of welfare based on households' spending behavior. The subjective approach makes use of directly surveyed concepts of household welfare.[1]

Of principal importance to the present paper is the subjective approach, which involves individuals' evaluations of their own or hypothetical living standards or incomes (see Bradbury, 1989). Because of the difficulties that respondents might face when evaluating conditions that they have never actually experienced, recent studies make increasing use of how individuals perceive their actual household income. This concept is part of several social surveys enquiring individuals about their satisfaction with household income or their financial situation. Its use in the estimation of equivalence scales typically involves different variants of a model regressing income/financial satisfaction on equivalent income and other possibly relevant control variables. Definitions of the underlying equivalence scale vary from constant-elasticity (see Buhmann et al., 1988) to fixed-weights scales (see OECD, 2005) to combinations of these two (see Cutler & Katz, 1992).

Like the present paper, a number of studies consider data from the German Socio-Economic Panel to estimate the equivalence weight of adults and children (see e.g., Charlier

[1] Van der Gaag (1982) provides a helpful review of these two approaches.

2002, Schwarze 2003, Van Praag & Ferrer-i-Carbonell 2004, Biewen & Juhasz 2017). Although they focus on different aspects of the equivalence scale, most of these studies find similarly low equivalence weights. The top panel of Table 1 provides an overview of some of the results. Various other studies carry out similar analyses using survey data from other countries (see e.g., Melenberg & van Soest, 1996, for the Netherlands; Van Praag & Ferrer-i-Carbonell, 2004, and Bollinger et al., 2012, for Great Britain; Rojas, 2007, for Mexico; Buetikofer & Gerfin, 2017, for Switzerland). The magnitude of the estimated equivalence parameters differs considerably across studies. Yet, apart from Bollinger et al. (2012), all of them agree in the finding that children receive significantly lower weights than adults.

Table 1: A Selection of Previous Studies' Equivalence Scale Estimates

Authors	Specification / Sample	Equivalence Weight (1st adult = 1)		
		2nd Adult	1st Child to Couple	2nd Child to Couple
Monetary Equivalence Scales derived from Income Satisfaction Data in the SOEP				
Schwarze (2003)	Pooled Sample	0.34	0.17	0.08
Van Praag & Ferrer-i-Carbonell (2004)	Ordered probit, no distinction by employment	0.23	0.16	0.10
Biewen & Juhasz (2017)	OECD-type Scale	0.35	0.13	0.13
Equivalence Scales including Time Costs				
Apps & Rees (2002)	male first adult, equal contribution to child cost	0.57	0.91	0.91
Van Praag & Ferrer-i-Carbonell (2004)	Ordered probit, distinction by employment	0.52	0.26	0.17
Koulovatianos et al. (2009)	German Sample, Reference Income of 2000 €	0.95	0.24	0.23
Gardes & Starzec (2017)	Prais-Houthakker, opportunity cost method	0.31	0.24	0.24

Note: For the sake of easy comparison, results were converted into the given format whenever necessary. When crucial to the equivalence scale, full-time employment of all adults in the household is assumed.

Almost all studies based on income satisfaction data largely ignore the positive well-being effect of household production and thus are limited to identifying monetary equivalence scales, i.e. the extra amount of money income households need to achieve equivalent market consumption. Only Van Praag & Ferrer-i-Carbonell (2004) extend their analysis of income satisfaction data to include the aspect of time. They distinguish between households with one and two breadwinners and find that monetary equivalence weights are higher in the latter

household type. Using hypothetical income responses from an online survey of individuals in Belgium and Germany, Koulovatianos et al. (2009) support this finding. In the most comprehensive specification, the monetary compensation for fully restricting parents' time ranges from 12 to 24 percent of an additional adult's income needs. The bottom panel of Table 1 presents a selection of the resulting equivalence scale estimates that include (parts of) the time cost of additional household members.

A relatively small number of studies estimates equivalence scales in full incomes, including money income, household production and leisure. All of them make use of the objective approach. Apps and Rees (2002) are among the first to provide a formal treatment of the full cost of additional household members. They integrate Australian time-use into an analysis of cross-sectional income data to estimate the costs of children, defined in terms of their full consumption of market and domestically produced goods as well as parental leisure time. Focusing on families with two adults and two children, the authors also find that the money cost of children differs significantly across households with two full-time employed parents and households with only one full-time employed adult. When the allocation of parental time is included into a full-consumption equivalence scale, the difference between household types vanishes and produces considerably higher equivalence weights for children. Depending on the distribution rule, the full-consumption equivalence weight of a child ranges from 79 to 98 percent relative to a male and from 128 to 173 percent relative to a female adult. Bradbury (2008) estimates the full cost of children using the "adult goods" approach proposed by Rothbarth (1943). Assuming adult personal time to be an appropriate indicator of household welfare, he derives the increase in full income necessary to hold parental leisure constant. Depending on a relatively simple household welfare model, he applies earlier empirical findings regarding the time use of differently structured Australian households and the income elasticity of labor supply. Not accounting for price effects, he finds that the full cost of children is much higher than the monetary cost assigned by common equivalence scales and that the full cost declines with children's age. The results suggest that the full costs of the first infant are as large as 50 to 80 percent of a childless couple's monetary income. Gardes and Starzec (2017) develop full cost equivalence scales that they estimate on matched French family budget and time-use data applying a variety of model specifications to a complete system of demands. They find that monetary equivalence scale parameters are generally higher for adults than for children whereas in full cost equivalence scales this difference diminishes. Moreover, full costs of both, additional adults and children, relative to the first adult turn out to be higher than their monetary costs when accounting for price

substitution effects. With price substitution, the full cost equivalence weight of a child (an adult) ranges between 40 and 57 percent (36 and 69 percent). The authors also illustrate that considering full incomes and full income equivalence scales instead of their monetary counterparts considerably reduces measured inequality.

Bittman and Goodin (2000) construct an equivalence scale exclusively for time. Their analysis of time-use data from 28 different surveys demonstrates that engagement in unpaid domestic work crucially depends on household structure, especially so for women. Their results indicate that, given their weekly hours in paid work, men spend on average half an hour more per week in unpaid labor when there is a partner or another adult in the household and about 3.3 hours more when there are children. Time costs are much more remarkable for women, for whom an additional adult implies an increase in unpaid work by almost 7 hours and the presence of children another 11 hours per week when hours in paid work are fixed. Various other studies investigate the time cost of children more generally. Craig and Bittman (2008) and Ekert-Jaffé & Grossbard (2015) estimate the time cost of children in terms of sacrificed leisure. By restricting the analysis to couples with two full-time employed spouses, while accounting for selection and endogenous wages, the latter study limits the scope of substitution effects between home production and labor supply appearing in the first. The results indicate that a child reduces men's leisure by 0.7 hours and women's leisure by 0.8 hours on an average weekday. The loss in leisure is significantly larger for children under the age of three and close to zero for children aged 15 or older. Sousa-Poza et al. (2001) make time costs comparable to monetary costs by reviewing different methods for the evaluation of the proceeds from housework and childcare. Using Swiss time-use data, they compare the resulting monetary value of domestic production across household types. The authors find that the home production cost of children is massive for the first child but does not increase considerably with additional children.

Based on an extensive review of empirical results regarding differences in the expenditure of time and money across households, Folbre et al. (2017) propose scaling and weight parameters to apply to market incomes and the proceeds from household production separately. The resulting expert scale assigns the partner a weight of nearly 70 percent in money income and 40 percent in household work. The first (second) child to a couple increases market income needs by 60 (55) percent and household production requirements by 59 (45) percent. Childcare needs associated with the first child exceed the household production requirements of the first adult by about 30 percent. These costs decline massively in the number of additional children. Moreover, the authors show that deflating non-market

household production by the same equivalence scale as monetary incomes overstates the contribution of household production to households' living standards and hence overstates the well-being of families. Therefore, it is crucial to determine equivalence scale parameters in the separate components of extended incomes empirically. To do that, the present paper merges ideas and findings from the literature on the estimation of money equivalence scales from income satisfaction data on the one hand and the time cost of additional household members on the other.

3. Econometric Model

3.1 Model Assumptions

To estimate extended income equivalence scales, I assume that a household's welfare, defined as its material well-being, positively depends on the consumption of both, marketed and domestically produced goods and services. The separable welfare function summarizes the preferences of all household members. Formally, one can express the welfare of household j at time t by

$$u_{jt} = U(V_m(m_{jt}), V_d(d_{jt}))$$
$$\text{with } \frac{\partial V_m}{\partial m_{jt}} > 0 \text{ and } \frac{\partial V_d}{\partial d_{jt}} > 0 \tag{1}$$

where m_{jt} is the household's equivalent market consumption and d_{jt} is the equivalent consumption of domestic produces. Both components enter the household's welfare via the respective sub-utility functions V_m and V_d with complete income pooling by all household members.

Furthermore, I assume that a household can fulfill its domestic production requirements by purchasing substitute goods and services in the market. Equivalent consumption of household produces therefore depends on a household's monetary well-being as captured by equivalent money income:

$$d_{jt} = f(m_{jt})$$
$$\text{with } \frac{\partial f}{\partial m_{jt}} < 0 \tag{2}$$

If market consumption acts as a substitute for household consumption, m_{jt} will affect d_{jt} negatively. Empirical results by Kornrich and Roberts (2018) support this assumption by showing that household outsourcing, i.e. the purchase of household services that replace household production, increases in household income. Condition (2) together with the exclusion of similar effects of domestic production on monetary incomes imply that households first decide about how much labor they supply in the market before they allocate their remaining time to household production and leisure. Alternatively, working time regulations together with social norms may predetermine market work and hence income.

Based on this set of assumptions, I can consider the two components of extended income separately from each other and estimate equivalence scales in money incomes and household production according to the specifications outlined in the next subsection.

3.2 Estimation Procedure

Step 1: Estimation of the Monetary Equivalence Scale

Under the condition that income satisfaction is a valid proxy for households' monetary wellbeing V_m, one can rely on the same approach that previous studies have used to identify the monetary needs associated with additional household members. This involves the following type of model.

$$S_{ijt} = \alpha_0 + \alpha_1 g\left(\frac{Y_{jt}}{MEQ\left(a_{jt}, k_{jt}\right)}\right) + X'_{ijt}\alpha + \varepsilon_{ijt} \tag{3}$$

The dependent variable S_{ijt} is satisfaction with household income as indicated by individual i in household j at time t. Y_{jt} is the respondent's household's net monetary income, which is deflated by the household's total monetary equivalence weight MEQ that depends on the number of adults a_{jt} and the number of children k_{jt}. The function $g(.)$ allows for nonlinearities in the association between equivalent income and income satisfaction. In the following, I assume the relationship to be logarithmic, which implies that the marginal utility from equivalent money income is diminishing. X'_{ijt} is a vector containing other personal and household characteristics that may be relevant determinants of income satisfaction.

I consider an equivalence scale that assigns fixed weights to additional adults and children irrespective of how many people the household consists of in total. This is the approach followed by the frequently used OECD-scale. Applying this definition to equation (3) yields the following estimation equation, where the coefficients linked to the number of additional adults and children represent their fixed monetary equivalence weights.

$$S_{ijt} = \alpha_0 + \alpha_1 ln\left(\frac{Y_{jt}}{1+\gamma_a\left(a_{jt}-1\right)+\gamma_k k_{jt}}\right) + X'_{ijt}\alpha + \varepsilon_{ijt} \qquad (4)$$

Although the model used to identify the monetary component of the extended income equivalence scale perfectly corresponds to previous studies estimating equivalence scales from income satisfaction data, one must note the differences in its assumptions and implications. Previous studies rely on the assumption that income satisfaction is a valid indicator of households' welfare u. At the same time, they focus exclusively on the market consumption component m by considering only monetary income. If income satisfaction indeed measured a household's material well-being u as defined by (1), one could estimate the extended income equivalence scale directly by including equivalent household production in equation (3). Unfortunately, an investigation of the determinants of income satisfaction carried out before the present analysis revealed that increases in household work are associated with lower levels of income satisfaction.[2] As respondents do not seem to appreciate the positive consumption effect of household production when assessing their income satisfaction, this measure may not be an appropriate account of the household's total material well-being.[3] The finding thus prohibits the direct estimation of extended income equivalence scales from income satisfaction data and supports its treatment as a measure of households' monetary well-being. Consequently, I need to estimate the equivalence scale in household production in a second step.

[2] This is true for a variety of specifications and even after controlling for leisure time and personal income shares. Estimation results are available upon request.

[3] In fact, the small but significant negative effect of household production on income satisfaction could possibly lead to the interpretation that income satisfaction partly captures to what extent one is able to substitute household production by market goods and services.

Step 2: Estimation of the Household Production Equivalence Scale

Naturally, one does not observe the proceeds from household production but only the time devoted to it. To make household production comparable to money incomes and eventually derive an extended income equivalence scale, it is essential to evaluate the time spent in household production in monetary terms. In using median wages to approximate market replacement costs, I apply the most straightforward approach, which I explain in the data section in more detail. As per the assumption of equation (2), the level of equivalent household production depends on equivalized market incomes. The estimation of the equivalence scale in household production thus involves a descriptive analysis of the total value generated by different types of households at given monetary incomes. I regress the value of household production V_{jt} on the number of adults and children according to the following general specification.

$$V_{jt} = (\beta_0 + \beta_1 m^*_{jt} + X'_{jt}\beta)\left(\mathrm{HEQ}(a_{jt}, k_{jt})\right) + \varepsilon_{it} \tag{5}$$

The first sum in brackets measures equivalent home production, i.e. the average value of home production generated by a single adult with the given characteristics. It is a linear function of the household's equivalent income m^*_{jt}, as determined by the parameters estimated in the first step, and a vector of other household characteristics X_{jt} that potentially affect the level of equivalent household production. Most importantly, this includes the total number of nonworking hours of adult household members to account for massive differences in time availability. Subtracting actual working hours from a total time of 24 hours per person per day, this measure accounts for differences in the residual time of households of the same type but also for differences in the initial endowment with time across differently structured households. Standard models of households' time allocation put the validity of this specification into question, as money income, hours of market work and hence non-working time will be endogenous. The present analysis thus strongly relies on the assumption of sequential decision-making about the allocation of time or predefined labor hours due to legal and social norms (see Jenkins & O'Leary, 1995).

The second term in brackets represents the equivalence scale in household production, which I align with the functional form of the monetary equivalence scale. This yields the following specification.

$$V_{jt} = (\beta_0 + \beta_1 m^*_{jt} + X'_{jt}\beta)\left(1 + \delta_a\left(a_{jt} - 1\right) + \delta_k k_{jt}\right) + \varepsilon_{it} \quad (6)$$

It assigns additional adults and children the fixed household production equivalence weights δ_a and δ_k, respectively. These measure the percentage increase in the value of household production associated with the respective household member at the given level of market consumption and other household characteristics. Note that the estimation equation involves several interaction effects between variables that affect equivalent household production and the number of adults or children, respectively. A change in any one variable contained in the first linear function may thus affect the value of household consumption differently in differently structured households. At the same time, the relative difference is constrained to be identical for changes in each household characteristics. One should thus interpret the equivalence weights as the average differential effect of changes in the given characteristics.

Step 3: Estimation of the Extended Income Equivalence Scale

Eventually, I can use the estimated money income and household production equivalence parameters to approximate the extended income equivalence scale. To do this, I determine each household's equivalized money income and household production based on the estimated parameters. Dividing the sum of actual by the sum of equivalized incomes gives me the extended income equivalence weight of that particular household, which depends on the relative share of monetary in the extended income.

$$EEQ_{jt} = \frac{Y_{jt} + V_{jt}}{\frac{Y_{jt}}{\left(MEQ(a_{jt}, k_{jt}\right)} + \frac{V_{jt}}{\left(HEQ(a_{jt}, k_{jt}\right)}} \quad (7)$$

Regressing these weights on the number of adults and children according the respective equivalence scale specification then gives me the average extended income equivalence weight of each household member, which completes my analysis.

Estimation Method

The nonlinear model of equation (4) as well as the constrained linear regression proposed by equation (6) will be fitted by nonlinear least squares (using Stata's `nl` command). The simple averages summarized by equation (7) will be determined via ordinary least squares. Although the employed data is of a panel structure, I will refrain from the application of an individual or household fixed effects model. This is because within changes in household structure, providing the basis for all equivalence scale parameter estimates in the fixed-effects setting, are associated with two problems. First, changes in household size or structure are typically expected. They may affect income satisfaction well before their actual occurrence, which could bias monetary equivalence scale estimates in a fixed-effects setting. Second, when a child enters a household it typically does so as a baby whereas it leaves as an adult. This means that the addition of a child will usually be associated with an exorbitant increase in household production intensified by maternity and paternity leaves. On the other hand, an adult child moving out may reduce household production insignificantly or might as well increase it (if the child contributed to household production before). To identify equivalence scale parameters more accurately, I therefore carry out pooled regression analyses. I cluster standard errors by households in the first step. As monetary equivalent income included in the second step depends on the first-stage estimates of the monetary equivalence scale, I bootstrap standard errors in the regression of the value of household production based on 1000 replications.

4. Data

The data needed to estimate extended income equivalence scales from income satisfaction data is available in the German Socio-Economic Panel. This representative longitudinal dataset provided by the German Institute for Economic Research (DIW) covers annual responses to a wide range of questions regarding the life circumstances of about 20,000 individuals in 11,000 households in Germany.[4] Among the inquired variables are income satisfaction, family composition and household income. Adding to that, the SOEP

[4] For a detailed description of the SOEP, please refer to Wagner et al. (2007).

also contains relatively comprehensive time use data. This makes it a suitable basis for studying the relationship between income satisfaction, home production and extended incomes.

I assume income satisfaction to be an adequate measure of a household's "financial well-being" that is comparable across households. Its assessment within the SOEP relies on asking each individual above the age of 16 to indicate on a zero-to-ten scale how satisfied they are with their current household income. Presumably, individuals evaluate their household's net monthly income as stated by the head of the household to which the individual belongs. To ensure intertemporal comparability of incomes across different years, I calculate household incomes (as well as all other monetary measures) in real terms using consumer price indices from the German statistical office taking 2010 as the base year. In an attempt to handle implausible income records, I exclude the lowest and highest percentile of each year's income distribution. I classify households according to the number of adults and children below the age of eighteen living therein. Furthermore, I restrict the analysis to a sample of adult respondents within "classical households", consisting of either a single or two partnered adults with or without children. Other exogenous variables used to explain variations in income satisfaction are the respondent's age, age squared, sex, state (Bundesland), survey year, education, nationality and dummies for unemployment, home ownership, residence in a rural area and the presence of a person in need of care.

To consider domestic work, I use answers to the following question: *"What is a typical day like for you? How many hours do you spend on the following activities on a typical weekday, Saturday and Sunday?"* Among the listed activities are running errands, housework, childcare, caring and repairing, which I summarize to form my measure of domestic production according to an admittedly broad definition. As per the survey instructions, respondents indicate a value of zero when an activity does not apply to them. The sample is restricted to individuals, whose adult household members give complete information about hours spent on each activity on weekdays, Saturdays and Sundays. This limits the analysis to eight waves of the survey, as the SOEP included such detailed time-use questions only biannually between 2001 and 2015. To obtain the number of hours spent on household production on an average day, I use a weighted average of the sums of activities specified above. Hours spent in home production on an average weekday receive a weight of $5/7$. Hours spent on typical Saturdays and Sundays receive a weight of $1/7$ each. To avoid possibly erroneous measurements, I drop households with any adult member claiming to spend more than 18 hours on household production on an average day and all households

whose total household production is zero. In principle, my measure of household production should only capture activities that benefit the respondent's own household to make sure that household production equals consumption of its proceeds. It is however impossible to distinguish activities dedicated to other households' well-being. Childcare is a notable exception – respondents that live in a household with no children but do spend time on childcare clearly contribute to another household's home production (for instance, to that of their grown-up children). Thus, I replace any positive hours in childcare by zeros when there are no children in the respective respondent's household.

As indicated by equation (6), there are several control variables that might affect the value of household production. Because this regression relates to the household instead of the individual respondent, these mainly consist of the household characteristics that I control for in the first step regression, i.e. home ownership, residence in a rural area, nationality of the household head, presence of a person in need of care as well as state and year dummies. Furthermore, I include the household's total nonworking time, which is all adults' monthly time endowment minus contracted monthly working hours of working adults in the household.

All mentioned sample restrictions together with the requirement of non-missing values on each of the required variables for all adults within the household leave me with a sample of 78,133 individual-level observations from 29,808 respondents living in 18,858 households. Table A.1 in the appendix summarizes sample characteristics by listing means and standard deviations of the most important variables used in the subsequent analysis.

In order to make household production comparable to money income, I multiply average daily hours by thirty and sum these up for all adults in the household to obtain total monthly home production time. I assess its monetary value using the market replacement cost method, which assumes that there is a market substitute for each activity of domestic production. A very simple and comprehensible approach is to value each hour spent in household production by the average hourly wage rate of all full-time employees subject to social insurance contributions. I use median gross monthly wages included in the *Jahresentgeltstatistik* 2016, which the Federal Employment Agency provides (Statistik der Bundesagentur für Arbeit, 2016). To obtain hourly wages, I divide monthly figures by 172 hours.[5] A more commonly applied approach is to value each hour spent in household production by the wage rate of a professional housekeeper (see e.g. Sousa-Poza et al., 2001).

[5] Full-time employment in Germany typically involves 40 hours of work per week. I multiply this by 4.3 weeks per month in order to get monthly hours.

This generalist approach is suitable when time-use data is as aggregated as in my data set. The Federal Employment Agency also offers data on median gross monthly wages by occupational category (Statistik der Bundesagentur für Arbeit, 2018), including professional housekeepers (*Hauswirtschaftsverwalter*). Their wages are considerably lower than overall median earnings, which means that the assigned value of household production is lower when applying this method. Unfortunately, one can consistently compare housekeeper's wages across years only until 2010. Because this limits the number of survey waves that I can consider, I will constrain the use of housekeeper's wages to a robustness test. Table A.2 in the appendix illustrates the implications of both evaluation approaches for mean values of household production by household type.

5. Results

The presentation of results proceeds in the three steps proposed by the estimation procedure. First, I present results on the income increments needed to cover the money costs of additional household members. Second, I quantify percentage increases in household production necessary for additional household members. At last, the two separate equivalence scales unite within the extended income equivalence scale. All my base results refer to a fixed-weight scale that distinguishes only between the number of adults and children. To gain further insights into the market and domestic needs of additional family members, one may also choose to classify household members according to alternative criteria. In addition to the baseline model, I therefore consider the money and home production requirements of children according to their age group. To do so, I differentiate between infants that are between 0 and 5 years old, children aged 6 to 13 and teenagers aged 14 to 17. Due to the stepwise procedure of determining the extended income equivalence weights, I present this extension along with the basic results in each table.

Table 2 presents the results from the individual-level regression of income satisfaction on equivalent income. Column 1 reports the results from the baseline specification that is very close to the model used in previous studies estimating equivalence scales from income satisfaction data. It is reassuring to find similar results as earlier such studies using the German SOEP. Despite the different sample definition and control variables used, the estimated equivalence scale parameters turn out to be of comparable magnitudes while the effect of log equivalent income is significantly positive and relatively large. More

specifically, the analysis suggests that the monetary equivalence scale should assign a weight of 34 percent to additional adults and a weight of about 16 percent to each child.

Table 2: Estimation of Money Equivalence Scales from Income Satisfaction (Step 1)

Dependent Variable:	Satisfaction with Household Income	
	(1) Baseline	(2) Age-dependent
Equivalent income	2.349***	2.354***
	(0.033)	(0.019)
Scale Parameter Adult	0.340***	0.346***
	(0.016)	(0.010)
Scale Parameter Children	0.161***	-
	(0.009)	
Scale Parameter Children 0-5	-	0.142***
		(0.012)
Scale Parameter Children 6-13	-	0.131***
		(0.008)
Scale Parameter Children 14-17	-	0.257***
		(0.014)
Age	-0.107***	-0.103***
	(0.004)	(0.003)
Age Squared	0.001***	0.001***
	(0.000)	(0.000)
Female	0.134***	0.136***
	(0.014)	(0.013)
Years of Education	-0.013***	-0.013***
	(0.005)	(0.003)
Unemployed	-1.076***	-1.070***
	(0.044)	(0.032)
Home Ownership	0.287***	0.283***
	(0.027)	(0.015)
Rural	0.041	0.041**
	(0.032)	(0.018)
Nationality not German	0.034	0.031
	(0.047)	(0.029)
Person in Need of Care	-0.352***	-0.350***
	(0.063)	(0.037)
Constant	-8.483***	-8.592***
	(0.242)	(0.146)
N	78,133	78,133
adj. R^2	0.313	0.313

Note: Standard errors in parentheses, clustered by households. All regressions include year and state fixed effects (not explicitly reported). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The coefficients on each of the various other control variables suggest that they affect income satisfaction in the expected direction. Income satisfaction as a function of the respondent's age follows a U-shape. Female respondents are more satisfied with their household income. Higher levels of education (as measured by years spent in education) decrease satisfaction. Enormously so does a respondent's unemployment. All these effects most certainly stem from relative comparisons, by which an individual's income satisfaction gains or suffers at given equivalent incomes because the income of its reference group changes. For the implications of specifically modelling reference incomes in the estimation of equivalence scales from income satisfaction, see Borah et al. (2016). Some household characteristics probably affect individuals' income satisfaction more directly. Home ownership significantly increases income satisfaction, as it reduces the monetary burden of rent payments. Presence of a person in need of care is associated with significantly lower levels of income satisfaction, most likely because of additional monetary expenditures related to it. Residence in a rural area as well as nationality do not seem to have strong effects on satisfaction.

Column 2 presents estimates of a monetary equivalence scale that considers the number of children in each of three age groups separately. This redefinition of the equivalence scale does neither greatly affect the coefficients on the control variables nor the equivalence weight for an adult partner. However, one does observe differences in the equivalence weight of children of different ages. While the monetary needs of children up to the age of 13 seem to be similarly small (at 14 and 13 percent, respectively), the weight of teenagers is significantly larger at almost 26 percent and thus clearly approaches the weight of an additional adult.

The scale parameters derived in the first step serve to calculate the money equivalent income of each household, which I control for when comparing the value of household production across households. This comparison yields the equivalence scale in household production. Table 3 reports the results of the household-level regressions. Again, column 1 presents the baseline results differentiating households only according to the number of adults and children. As hypothesized before, I find that the value of equivalent household production decreases in money equivalent income. Greater time availability as measured by the total nonworking hours on the other hand translates into greater household production. Equivalent household production furthermore increases significantly with home ownership, residence in a rural area and presence of a person in need of care. Supposedly, home ownership mainly comes at the cost of repairing work and a person in need of care will imply more time spent

on caring activities. Living in a rural area implies several challenges. For instance, it will be associated with overcoming greater geographical distances, such that time spent on running errands might increase. Greater properties will likely be associated with more repairing and gardening work and social norms regarding housework in general may differ, as well. Differences in social norms or cultural differences, more generally, could also explain the significantly negative coefficient I find for households whose head does not have the German nationality.

Table 3: Estimation of Household Production Equivalence Scales based on Monetary Evaluations of Time Use (Step 2)

Dependent Variable:	Value of Household Production	
	(1) Baseline	(2) Age-dependent
Scale Parameter Adult	0.538***	0.684***
	(0.036)	(0.036)
Scale Parameter Children	0.702***	-
	(0.015)	
Scale Parameter Children 0-5	-	1.274***
		(0.029)
Scale Parameter Children 6-13	-	0.730***
		(0.017)
Scale Parameter Children 14-17	-	0.194***
		(0.015)
Money Equivalent Income	-0.141***	-0.127***
	(0.009)	(0.008)
Home Ownership	97.736***	135.623***
	(16.609)	(14.359)
Rural	71.984***	74.422***
	(20.518)	(17.706)
Nationality not German	-153.831***	-144.696***
	(34.242)	(28.872)
Person in Need of Care	107.722**	136.107**
	(43.560)	(39.908)
Total Nonworking Hours	1.381***	0.967***
	(0.080)	(0.067)
Constant	1004.418***	1286.302***
	(73.414)	(59.630)
N	49,975	49,975
Adj. R^2	0.861	0.878

*Note: Standard errors in parentheses, bootstrapped on both stages based on 1000 replications and clustered by households. Regressions also include year and state fixed effects (not explicitly reported). * p < 0.10, ** p < 0.05, *** p < 0.01*

The parameters of interest are presented in the top of Table 3. The equivalence scale parameter for an adult partner in the baseline specification is about 54 percent and is thus

higher than in the monetary scale. The difference between monetary and household production weights is even larger for children, who increase home production requirements by 70 percent. This result certainly reflects huge childcare requirements, which considerably affect the time spent on household production. The second regression accounting for the age of children supports this idea. As can be seen from column 2, household production requirements are massive for infants. With an equivalence weight of 127 percent, a child in the age range of zero to five years needs more household production efforts than the first adult. This result appears plausible keeping in mind how much active and supervisory care an infant requires. Household production needs decline as children grow older. A child aged 6 to 13 receives an equivalence weight of 73 percent in the estimated household production equivalence scale. This is close to an additional adult's requirement of 68 percent, which is a bit higher than the adult's weight in the baseline specification. The scale parameter for teenagers is surprisingly small amounting to only 19 percent. This leaves the oldest group of children with a significantly lower home production weight than adults. A plausible explanation for this finding may be that teenagers themselves contribute to household production and thus substitute for their parents' household work, which is something I cannot account for in my household production measure, unfortunately.

Based on the separately determined equivalence scale parameters for the two components of extended income, I can now calculate each household's extended income equivalence weight according to equation (7). This depends on the relative shares of monetary and household produced income in total extended income. Comparing the extended income equivalence weights across households and calculating differences therein by means of a simple linear regression, I obtain the weights listed in Table 4.

Table 4: Extended Income Equivalence Scales (Step 3)

	Extended Income Equivalence Weight	
	(1) Baseline	(2) Age-dependent
Additional Adult	0.451	0.527
Children	0.454	-
Children 0-5	-	0.763
Children 6-13	-	0.686
Children 14-17	-	0.152

In the baseline specification, both, an additional adult and each child receives an extended income equivalence weight of about 45 percent. Smaller monetary needs of children thus seem to be outweighed by their relatively larger household production needs as compared to an additional adult's. The average percentage increase in extended income necessary for an additional adult and a child is thus virtually identical. Considering average children may cover up some very interesting relations though. The extension of the equivalence scale by the age of children supports this hypothesis. Larger household production requirements associated with young children dominate the effect of their relatively low monetary needs. The extended income equivalence weight of children below the age of 14 is therefore greater than that of an additional adult. On the other hand, the very low weight of teenagers in household production results in a very low extended income equivalence weight, as well. This is much lower than the weight of an additional adult and surprisingly also lower than a teenager's weight in the household production equivalence scale. As mentioned above, these extremely low weights must be interpreted with caution, as they may be ascribable to own home production efforts by teenagers.

6. Implications

In this section, I explore the implications of comparing the standard of living of households according to their extended instead of their monetary income depending on the applied equivalence scales. In order to do this, I calculate three inequality indices for the year 2015 – the Gini coefficient, the Theil index and mean log deviations – based on observations contained in the sample on which I estimated the extended income equivalence scale. Table 5 presents the results.

The first row relates to the comparison of monetary incomes not accounting for differences in household size and structure. Compared to all other definitions of the standard of living, inequality in unadjusted money incomes is the greatest. This is because it fails to take differences in needs and economies of scale into account. The most common practice to include these in the comparison of monetary incomes is to equivalize them according to the OECD-scale. The second row shows that following this approach massively lowers all three measures of inequality. The Gini coefficient, for instance, falls by 3.3 percentage points. The OECD-scale lacks a solid empirical basis, however. Therefore, it may be more appropriate to

assess money income inequality based on an empirical estimate of the monetary equivalence scale. The third row considers monetary incomes deflated according to the equivalence scale parameters derived from the first step of my analysis. This has almost no effect on the inequality measures and hence supports the use of the OECD-scale in approximating the money equivalence scale.

Table 5: Inequality Measures based on Different Definitions of the Standard of Living (2015 Sample)

	Gini Coefficient	Theil Index	Mean Log Deviation
monetary incomes, no equivalence scale	0.282	0.127	0.134
monetary incomes, OECD scale	0.249	0.101	0.100
monetary incomes, est. monetary income equivalence scale	0.251	0.101	0.102
extended incomes, OECD scale	0.196	0.060	0.064
extended incomes, est. monetary income equivalence scales	0.220	0.076	0.082
extended incomes, est. equivalence scales in extended income components	0.185	0.054	0.058

Source: SOEP, Federal Employment Agency, own calculations.

The bottom three rows define the standard of living of households in terms of their extended income. No matter what the equivalence scale applied, measured inequality in extended is always lower than in monetary incomes. Households that are poor in money income thus seem to be able to, at least in parts, compensate for their lack of monetary funds by greater household production. Inequality in extended incomes appears particularly low when applying the two separate equivalence scales estimated in this paper. Accounting for the differential needs of additional household members in household production as compared to market consumption thus may reflect an even greater ability of money-income poor households to generate household welfare by household production. Using the OECD scale produces similar results. In fact, the weight of an adult in the extended income equivalence scale as reported in column 1 of Table 4 is very close to the weight of an adult in the OECD scale, which might

produce this finding. Money and extended income equivalence scales are a bit further apart and produce less similar inequality indices.

7. Limitations

The previous section illustrated that different estimates of the equivalence scale affect implied income inequality measures quite strongly. To be of real relevance to policy and research, equivalence scale estimates therefore need to be quantitatively accurate and reliable. Unfortunately, the present study is subject to several limitations in this respect. First, the results rely on the strong assumption that a household's money income is determined before its members decide about their home production efforts. The identification strategy thus cannot account for the possible endogeneity of market work and income. In the absence of an indicator of domestically produced welfare, I believe this is one possible, but certainly strong simplification needed to estimate equivalence parameters in the two components of extended income. Furthermore, there are a number of technical particularities affecting the size of the equivalence scale estimates.

Naturally, a very important factor determining my results is the choice of the method by which I assign monetary value to household production. In order to check the sensitivity of the household production and extended income equivalence scale to an alternative approximation of this value, I rerun my entire analysis using the generalist method. It values each hour spent in household production by the median gross monthly wage of professional housekeepers. As mentioned in the data section, consistent wage information of this kind is not available in all survey years contained in the original sample. Due to the consequent sample changes, I also need to re-assess the monetary equivalence scale before taking the second and third step. Tables A.3, A.4 and A.5 in the appendix present the equivalence scale parameter estimates obtained from each of the three steps. While the monetary equivalence scale does not change much in response to the sample adjustment (see Table A.3), the scale parameters in household production are considerably lower when using the generalist method as opposed to the average wage method (see Table A.4). In the base specification, the equivalence parameter for adults falls by more than 14 percentage points and by almost 8 percentage points for children. However, the ranking of different household members in terms of their relative needs does not change in either specification. The same holds true for the combined scale (see Table A.5). Extended income equivalence weights are somewhat lower (except for teenagers), but their relations do not change. This confirms that the size of the

parameter estimates is sensitive to the evaluation method chosen, whereas their relations are not greatly affected.

To my belief, another aspect requires some closer consideration. This concerns the strong assumption that income satisfaction measures the market consumption possibilities of households and thus provides a suitable basis for estimating the monetary equivalence scale on which all subsequent estimations rely. A violation of this assumption seems likely and it could severely impair the quality of my results. For instance, Borah et al. (2016) find that income comparisons within a reference group greatly affect income satisfaction and that accounting for reference incomes leads to different equivalence parameters than previously determined. In principle, many other factors that are unrelated to market consumption opportunities of the household may be important for income satisfaction. To be able to estimate a pure money equivalence scale in that case, it is necessary to identify all determinants of income satisfaction that are correlated with family size or structure. The present paper neither can nor intends to achieve a complete understanding of the process that generates income satisfaction. The existing body of literature on the determination of equivalence scales from income satisfaction data will prove helpful in this regard but will need further enhancements. However, at this point, it is important to realize the implications of a misspecification of the model estimated in the first step. Therefore, I rerun the second-step regression under different assumptions about the money equivalence scale to see how this affects equivalence weights in home production. Table 6 presents the results.

Table 6: Estimating Home Production Factors Assuming Different Money Equivalence Scales

Dependent Variable:	Value of Household Production		
	(1)	(2)	(3)
Money Equivalent Income	-0.111***	-0.160***	-0.253***
	(0.003)	(0.007)	(0.010)
Home Production Factor Adults	0.597***	0.506***	0.415***
	(0.025)	(0.024)	(0.023)
Home Production Factor Children	0.782***	0.669***	0.585***
	(0.011)	(0.009)	(0.008)
N	49,975	49,975	49,975
R^2	0.862	0.861	0.861

Note: Standard errors in parentheses. All regressions include a constant term, year and state fixed effects (not explicitly reported). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Column 1 and 3 build upon two extreme assumptions one can make about the money equivalence scale. In column 1, each additional household member receives an equivalence weight of zero. Household equivalent income is thus equal to real household income. This is true only if there are perfect economies of scale in market goods consumption. Comparing the estimated home production factors to the full model results in Table 3, one recognizes that their values are higher, for both, the additional adult and children. Column 3 considers the other extreme of the money equivalence scale, which assumes that there are no economies of scale and hence assigns a weight of one to each additional household member. Thus controlling for per-capita income in the household production equation, I find considerably lower weights for adults and children. Column 2 relies on the OECD-scale, which is a more moderate version of the money equivalence scale and assigns different weights to adults and children. Not very surprisingly, the resulting home production weights lie in between those implied by the two extreme money equivalence scales. A similar finding appears in the coefficient on money equivalent income. Its magnitude is relatively small in column one and grows larger as economies of scale in market consumption decline.

Again, the magnitude of the equivalence weights in domestic production seems to be relatively sensitive to changes in the results obtained in the first step of the model. However, similar changes occur in the weight of both, adults and children, such that the relation of the equivalence parameters is largely unaffected. Nevertheless, the extended income equivalence scale crucially depends on the underlying money equivalence scale, because it directly includes the latter.

The data on household production presents one last limitation to the present study, as it does not account for simultaneity of different activities or the intensity of actions. Large increases in household production associated with additional adults may thus stem from both partners working at home together with only half the individual effort. Household production may also be over- or underestimated, depending on how respondents consider simultaneous activities in their time assessment. Unfortunately, there is no way for me check this. However, these concerns again emphasize the need for a careful interpretation of the obtained parameters.

8. Conclusion

The aim of this paper was to appreciate the role of domestic production in enhancing a household's consumption possibilities and standard of living and to determine equivalence scales that capture the market and domestic consumption requirements of different households. To this end, I have proposed a novel approach that first determines money income and household production equivalence scales separately from each other and subsequently combines them into an extended income equivalence scale. I have pointed out the set of assumptions regarding the determinants of households' standard of living and their time allocation upon which this procedure relies. When these assumptions hold, I am able to link findings from two strands of literature in an application to data from the German SOEP.

I first estimate a model that previous studies have used to determine equivalence scales from income satisfaction data. Contrary to other studies, I do not interpret the resulting equivalence weights as the income increment needed to keep households' standard of living but their members' market consumption and hence monetary wellbeing constant. Quantitatively, the estimated monetary equivalence scale resembles previous studies' results, assigning the additional adult a weight of 34 percent and each child a weight of 16 percent. In the determination of household production equivalence weights, I benefit from concepts, methods and findings from the literature on the value of household production and the time cost of additional household members. I evaluate household production by median hourly wages to approximate market replacement costs. Differences in the total value of household production across differently sized or structured households with otherwise identical characteristics imply the household production equivalence scale. According to this, an additional adult is associated with an increase in the value of household production by 54 percent. With an increase by 70 percent, the weight of each additional child is even larger. Weighing the separate equivalence scales based on each component's share in extended income, I obtain an estimate of the extended income equivalence scale. It assigns adults and children almost identical equivalence weights of 45 percent. Differences in the weights of adults and children in the two components of extended incomes thus seem to balance out. While adults have relatively greater monetary needs and children require relatively more home production, the needs of additional household members in terms of extended income seem to be the same. A further distinction of children according to their age has shown that this is not generally true. Due to their massively greater domestic production requirements, younger children receive

significantly higher extended income equivalence weights than adults or elder children do, even though their monetary needs are smaller.

By the help of an illustrative assessment of inequality indices based on different income concepts and equivalence scales, this study has emphasized the importance of accounting for the proceeds from household production and differences in the relative needs thereof. Considering extended instead of monetary incomes may lead to different conclusions about the degree of inequality just like the adjustment of extended incomes according to a monetary equivalence scale could. Therefore, it is important to develop approaches to the empirical estimation of extended income equivalence scales further.

I have illustrated that the approach suggested by the present paper suffers from a number of limitations. In particular, quantitative results are sensitive to the definition of the monetary equivalence scale and the method by which one evaluates household production. Although an increasing body of literature deals with the latter issue, no method seems to excel. The monetary equivalence scale will best be determined empirically, as I have proposed here. However, uncertainties regarding the informational content of the income satisfaction variable put the appropriateness of my estimation model into question. These limitations provide a guide to further research. Studies devoted to the identification of equivalence scales from income satisfaction data need to pay closer attention to all possible determinants of the underlying subjective indicator. This might involve the investigation of channels such as habituation, reference or intra-household distributional effects. Only if one is able to distinguish such factors from market consumption possibilities, one may be able to approximate the money equivalence weights of specific household members. At the same time, it is crucial to test different methods to evaluate household production with respect to their power in predicting human behavior. While the latter suggestion is especially important if one wishes to consider unpaid work, the first one also relates to the standard, and possibly more policy-relevant definition of an equivalence scale that does not include a compensation for greater home production efforts associated with additional household members.

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Appendix

Table A.1: Sample Characteristics

	Sample Mean	Std. Dev.	N
Individual Characteristics			
Income Satisfaction	6.53	2.21	78,133
Female	0.54	0.50	78,133
Age	53.54	17.24	78,133
Years of Education	12.09	2.64	78,133
No German Nationality	0.06	0.24	78,133
Hours in Household Production	4.73	3.40	78,133
Household Characteristics			
Real Household Income	2245.97	1252.11	49,975
Number of Adults	1.56	0.50	49,975
Number of Children	0.45	0.88	49,975
Home Ownership	0.42	0.49	49,975
Residence in Rural Area	0.33	0.47	49,975
Presence of Person in Need of Care	0.03	0.18	49,975

Source: SOEP, own calculations.

Table A.2: Mean Value of Household Production by Household Type and Valuation Method

Household Type	Mean Value of Household Production			
	Average Wage Method	N	Generalist Method	N
1 Adult, no Children	1542.20 (868.72)	18,687	1134.65 (642.25)	11,078
1 Adult, 1 Child	3606.42 (1925.09)	1,996	2806.53 (1409.42)	728
1 Adult, 2 Children	4286.38 (1943.77)	821	3287.75 (1393.68)	303
1 Adult, 3 Children	4996.60 (1919.66)	254	3499.50 (1437.79)	88
2 Adults, no Children	3701.82 (1612.25)	18,503	2709.09 (1197.35)	11,413
2 Adults, 1 Child	6729.23 (2690.22)	3,650	4787.71 (1958.30)	2,251
2 Adults, 2 Children	7366.62 (2533.66)	4,220	5091.10 (1866.79)	2,283
2 Adults, 3 Children	7655.99 (2399.64)	1,402	5499.60 (1741.14)	579

Note: Standard deviations in parentheses.
Source: SOEP, Statistik der Bundesagentur für Arbeit, own calculations.

Table A.3: Estimation of Money Equivalence Scales from Income Satisfaction (Step 1) based on the Generalist Method

Dependent Variable:	Satisfaction with Household Income	
	(1) Baseline	(2) Age-dependent
Equivalent income	2.350***	2.356***
	(0.040)	(0.025)
Scale Parameter Adult	0.360***	0.364***
	(0.014)	(0.013)
Scale Parameter Children	0.161***	-
	(0.014)	
Scale Parameter Children 0-5	-	0.150***
		(0.017)
Scale Parameter Children 6-13	-	0.121***
		(0.012)
Scale Parameter Children 14-17	-	0.266***
		(0.019)
N	45,534	45,534
adj. R^2	0.313	0.314

Note: Standard errors in parentheses, clustered by households. All regressions include a constant, year and state fixed effects (not explicitly reported). Other control variables included are age, age squared, years of education and dummies for being female, unemployed, for home ownership, rural area, non-German nationality and presence of a person in need of care. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.4: Estimation of Household Production Equivalence Scales based on Monetary Evaluations of Time Use (Step 2) using the Generalist Method

Dependent Variable:	Value of Household Production	
	(1) Baseline	(2) Age-dependent
Scale Parameter Adult	0.395***	0.505***
	(0.045)	(0.045)
Scale Parameter Children	0.624***	-
	(0.019)	
Scale Parameter Children 0-5	-	1.176***
		(0.038)
Scale Parameter Children 6-13	-	0.641***
		(0.022)
Scale Parameter Children 14-17	-	0.159***
		(0.019)
Money Equivalent Income	-0.127***	-0.108***
	(0.009)	(0.008)
N	28,875	28,875
Adj. R^2	0.859	0.877

Note: Standard errors in parentheses, bootstrapped on both stages based on 1000 replications and clustered by households. All regressions include a constant, year and state fixed effects (not explicitly reported). Other control variables included are total nonworking hours and dummies for home ownership, rural area, non-German nationality and presence of a person in need of care.
** p < 0.10, ** p < 0.05, *** p < 0.01*

Table A.5: Extended Income Equivalence Scales (Step 3) based on the Generalist Method

Extended Income Equivalence Weight		
	(1) Baseline	(2) Age-dependent
Additional Adult	0.380	0.435
Children	0.391	-
Children 0-5	-	0.668
Children 6-13	-	0.565
Children 14-17	-	0.160