Household Economies of Scale for Wealth: The Benefits of Sharing with Wealth-in-Utility

Severin Rapp

November 21, 2023

Measures of private wealth often refer to households or tax-units. But how does household wealth map into individual welfare? Analogous to household economies of scale for consumption, this paper is the first to offer a methodology and empirical results to account for household wealth scale effects based on wealth-in-utility preferences. I propose scale effects that differ by savings purpose – funding consumption as opposed to holding wealth for motives such as status (wealth-in-utility savings). Using the German Socio-Economic Panel's stated preference data, I estimate that economies of scale for wealth-in-utility savings are high. In addition, the paper offers an empirical application to inequality measurement. Since high wealth-in-utility economies of scale dominate among the wealthy, estimates of inequality increase. Accounting for scale effects increases inequality estimates, such as the Palma ratio for Germany by up to 16% and the Gini index by 3%. The results matter for the measurement of inequality and optimal taxation.

Severin Rapp: Vienna University of Economics and Business, Department of Economics. I gratefully acknowledge helpful comments and suggestions to Max Kasy, Frank Cowell, Francisco Ferreira, Salvatore Morelli, Josef Falkinger, Pirmin Fessler, Emanuel List, Charles Louis-Sidois, H. Xavier Jara, Alyssa Schneebaum, Sofie Waltl, Wilfried Altzinger, Jesús Crespo Cuaresma, Stefan Humer, Jan Gromadzki, and the participants of the 10th ECINEC Meeting, the RISIng Winter School, the Vienna Workshop on Wealth Inequality and Intergenerational Mobility, and the Austrian Chamber of Labour's Young Economists Conference.

1. Introduction

Introducing his study on consumption and household size of Belgian worker-families, Engel (1895) argues that "everything humans do happens for the sake of consumption". Ever since, the concept of household economies of scale has focused on consumption. If individuals live together in households, they can share consumer goods. Sharing gives rise to economies of scale, such that the level of per-capita expenditure necessary for a given standard of living falls as household size increases. Consumption scale effects are vital for analysing household expenditure. However, it is not clear whether the traditional notion of scale effects is also suitable for studying household wealth held for reasons beyond funding consumption, such as bequests and status. This paper extends the concept of economies of scale to household wealth. Does a given level of per-capita wealth yield the same level of welfare for a single individual vis-à-vis individuals in larger households?

It is possible to think of economies of scale for wealth in terms of two extremes (Frémeaux and Leturcq 2020):[1] The ownership perspective and the access-to-wealth perspective. The access-to-wealth approach assumes perfect economies of scale to household wealth. From this perspective, additional members do not reduce the welfare associated with access to a certain level of household wealth. Assuming that all household members share equal access to household wealth, no adjustment for size is necessary when comparing households with different compositions. In contrast, the ownership approach assumes that wealth is a purely private good. Under the equal sharing assumption, comparing wealth levels between households with different compositions is based on per-capita wealth. This paper offers a framework to integrate these perspectives and intermediate approaches based on a model of consumption and savings. I employ this framework to obtain empirical estimates of economies of scale and adjust inequality estimates for the benefits of sharing.

The first contribution of this paper is theoretical. It departs from the idea that economies of scale are independent of people's motives to hold wealth. To

[1] Examples of either extreme or an intermediate version of both in research on taxation, household finance and inequality include Christelis, Georgarakos, and Haliassos (2013); Kuhn, Schularick, and Steins (2020); Kindermann, Mayr, and Sachs (2020).

accommodate this insight, I integrate a parametric class of equivalence scales with a simple wealth-in-utility model (Bakshi and Chen 1996; Carroll 1998). On the one hand, parametric equivalence scales are a flexible way to express the ratio of household resources to scale-effects adjusted individual resources as a function of household characteristics.[2] On the other hand, the model can explain what savings motive dominates in a given household. It assumes that wealth contributes to individual utility through both consumption and non-consumption channels. For example, people enjoy utility from warm-glow bequests (Kopczuk 2007) and status wealth confers on asset holders (Bakshi and Chen 1996; Michaillat and Saez 2021).[3] The model yields an optimal allocation of wealth between consumption and wealth-in-utility savings - the residual of total household wealth and consumption. If economies of scale for consumption and wealth-in-utility savings differ, the relative importance of different savings motives determines the magnitude of overall wealth scale effects. Founding economies of scale for wealth in economic theory supplements ad-hoc approaches dominating the literature so far.

In addition to providing a theoretical framework for wealth scale effects, I break new ground by exploring wealth economies of scale empirically. Are empirical estimates of economies of scale closer the ownership or the access to wealth perspective? I use stated preferences from German survey data to measure utility, and estimate the parameters of the equivalence scale, which reflect the structural model parameters of the utility function. Therefore, I fit several non-linear regression equations to both dichotomised and linearised data, drawing on cross-sectional and panel estimation. The third contribution in this paper is an empirical application of the calibrated equivalence scale to the measurement of wealth inequality. The application contrasts my approach with hitherto methods,

[2] For an application of the standard parametric equivalence scale $E = h^{\theta}$ (a function of household size h and the equivalence scale elasticity θ) to household wealth, see Sierminska and Smeeding (2005).

[3] The idea of wealth-in-utility features already in early economic thinking. This includes the writings of Adam Smith (1853), John Maynard Keynes (1932) and Max Weber (1934). However, wealth-in-utility preferences are also becoming increasingly common in modern economics (Saez and Stantcheva 2018; Benhabib and Bisin 2018; Michaillat and Saez 2021; Rannenberg 2021). Most frequently, a preference for holding wealth is rationalised through power, status/prestige, and security that comes with wealth ownership. Further microfoundations for wealth-in-utility preferences are benefits from entrepreneurship, bequest motives and liquidity (Stantcheva 2020). It may also be the case that individuals save for the mere satisfaction they derive from wealth accumulation (Steedman 1981).

unveiling strong implications for estimates of inequality.

Overall, I find that household returns to scale for wealth are almost perfect as the share of wealth-in-utility savings reaches its maximum. In line with the access-to-wealth perspective, the equivalence scale for wealth-in-utility savings is close to unity and only weakly dependent on household size, as the equivalence scale elasticity corresponds to 0.03. This implies that wealth-in-utility household savings enter individual utility almost directly. As a result, households that hold a low share of their wealth to fund consumption enjoy high returns to scale. At the other side of the spectrum, households accumulating wealth for consumption only face returns to scale similar to traditional consumption scale effects. Correcting for returns to scale in the measurement of wealth inequality, I find that wealth inequality in Germany increases by up to 16% as measured by the Palma ratio. The Gini coefficient increases by up to 3%. I show that these findings are robust to a wide range of sensitivity checks, including portfolio composition, life-cycle savings patterns and assumptions about the utility function. In particular, I demonstrate that the economies of scale parameter estimated in this model falls in the category of unconditional equivalence relations - allowing welfare comparisons by taking into account fertility preferences and the endogeneity of household size.

This paper is related to the literature in several ways. Firstly, it informs the debate on optimal taxation. In the design and appraisal of tax policy, a central principle is horizontal equity (Atkinson and Stiglitz 2015; Saez and Stantcheva 2016). While the view that household size is a criterion that justifies differential treatment of otherwise similar individuals is widely reflected in tax systems, it has also inspired horizontal equity constraints on utilitarian social welfare functions (Balcer and Sadka 1986; Muellbauer and Van De Ven 2004). The empirical estimates of economies of scale in this paper can inform assessments of horizontal equity, by quantifying the welfare effects of sharing household wealth. My findings emphasise the importance of accumulation motives for assessing horizontal equity.

Household returns to scale for wealth are also subject to controversy when it comes to the measurement of wealth inequality (Sierminska and Smeeding 2005; Kuhn, Schularick, and Steins 2020; Cowell et al. 2017; Saez and Zucman 2020). Measures of wealth usually refer to the household level. When analysing inequality across households with different compositions, assumptions about economies of scale are necessarily involved. Different approaches to economies of scale matter: Cross-country comparisons show that differences in the household structure account for a substantial share of the cross-national variation in inequality (Fessler, Lindner, and Segalla 2014; Bover 2010). Some papers employ the ownership perspective, either using per-capita wealth at the household level or an allocation method to account for within household inequality in ownership (Davies et al. 2009; Frémeaux and Leturcq 2020). Others take household wealth (or the total wealth of a tax unit) as the starting point of their analysis, without making adjustments for individuals (Piketty and Saez 2003; Piketty, Saez, and Zucman 2018).[4] Finally, some contributions on wealth inequality strike a middle ground by adjusting household wealth for consumption economies of scale (Jäntti, Sierminska, and Van Kerm 2013; Fisher et al. 2020). The approach presented in this paper provides a theoretically informed parameter for wealth returns to scale to household size. I explicitly take into account properties previously identified as desirable for this parameter (Sierminska and Smeeding 2005; Cowell et al. 2017). For example, the scale effects depend on individual and household motives for wealth accumulation.

Finally, the article relates to a set of studies that estimate parameters of utility functions from stated preferences. In contrast to previous contributions, I estimate a wealth-in-utility model, rather than focusing on the marginal utility of income (Layard, Mayraz, and Nickell 2008). Thus, I provide evidence on important structural parameters of a model type increasingly used by economists to study puzzles raised by traditional approaches to consumption and saving (Kumhof, Rancière, and Winant 2015; Michaillat and Saez 2021) and financial markets (Roussanov 2010; Michau, Ono, and Schlegl 2023).

This paper's argument proceeds as follows. Section 2 formalises the relative importance of different savings motives for household wealth accumulation, allowing returns to scale to differ across accumulation motives. Subsequently, Section 4 introduces the SOEP data, before Section 3 sets out the empirical approach. Estimates of wealth economies of scale follow in Section 5. Section 6 offers an

[4] From a welfare perspective, this would be equivalent in many cases to assuming that a couple filing jointly reaches the same level of welfare as an individual filer with the same level of wealth. This access-to-wealth perspective requires wealth to be a public good within the household or tax unit.

application where I take economies of scale into account in the measurement of wealth inequality, before Section 7 concludes.

2. Utility from Wealth and Household Size

The goal of Subsection 2.1 is to derive a functional form for linking wealth measured at the household or tax unit level to individual welfare. It derives an optimal allocation between consumption and wealth-in-utility savings at the household level. In a second step, Subsection 2.2 combines the functions determining optimal behaviour with a flexible family of equivalence scales describing economies of scale as a function of household size and a set of parameters. This yields an expression of equivalent wealth, lending itself to welfare analysis and further empirical estimation.

2.1. Accumulation Motives and Individual Utility

Accumulation models with wealth-in-utility preferences distinguish wealth held for consumption purposes from wealth that individuals own because they derive direct utility from wealth (wealth-in-utility savings). The key feature of the model is that wealth does not only matter to utility because it provides consumption opportunities, but also for its own sake. Importantly, this captures several more specific motives for deriving direct utility from wealth accumulation, including the non-monetary benefits of home-ownership, bequests and status, as long as they enter utility as a type of luxury good. Secondly, wealth-in-utility preferences can be extended to feature economies of scale, which gives a neat framework to directly estimate wealth-in-utility savings scale effects as a structural model parameter.

Formally, the wealth-in-utility model introduces wealth as an argument in the utility function in addition to consumption. Deciding on an allocation of resources between consumption c_k and wealth-in-utility savings s_k (both yielding utility directly), individuals i in households k face a one-period maximisation problem as in Carroll (1998). Considering the remaining lifetime of each individual as one period is a simplification that yields an analytical solution and parsimonious expressions.[5] The latter can be used for household size adjustments and empirical estimation with low data requirements. With wealth in the utility function, individuals choose consumption levels to maximise utility over consumption and wealth:

$$\max_{c_k}\{u_i(c_k, s_k)\} \quad \text{s.t. } s_k = w_k - c_k \tag{1}$$

The formulation of the utility function follows Bakshi and Chen (1996), assuming that consumption and wealth enter utility in a multiplicative way. The utility function has a form similar to the one in Bakshi and Chen (1996), with two exponents ρ and α, where $\alpha \geq \rho$. The choice of a multiplicative utility function over an additive form as in Carroll (1998), for example, derives from its straightforward linearisation. Moreover, I construct the wealth-argument in the utility function such that a certain threshold level of wealth is required before the preference for wealth becomes operative (Carroll 1998; Francis 2009; Heng-fu 1995): The γ parameter ensures that up to a certain level of initial wealth, individuals will always derive more utility from consuming additional resources. In addition, a vector $Z_{i,k}$ of variables modelled as exogenous enters the utility function. The characteristics in $Z_{i,k}$ refer to both household (such as a debt indicator) and individual level characteristics (the personal wealth share, for instance), such that the individual index i is required. They are linked to utility through the parameters Φ. This gives rise to a Cobb-Douglas utility function with consumption and wealth, where $\exp(\Phi Z_{i,k})$ is a preference shifter.

$$U_{i,k}(c_k, s_k, Z_{i,k}) = \left(\frac{c_k}{E}\right)^{\rho} \left(\frac{w_k - c_k}{T} + \gamma\right)^{\alpha} \exp(\Phi Z_{i,k}) \tag{2}$$

[5] Modelling the prevalence of different savings motives over the life-cycle may reveal that a larger share of wealth serves funding future consumption among individuals close to retirement as opposed to individuals at the end of their life-cycle, for example. Therefore, some applications may require adjusting wealth for age effects before deriving the optimal allocation between consumption and the share of wealth-in-utility savings. Whereas adjusting wealth for age is not the primary focus of this paper, an extensive literature discusses this issue. For example, Almås and Mogstad (2012) provide a methodology compatible with the adjustment discussed in this paper. In view of the one-period approach's capacity to serve as a structural model for estimating parameters empirically, Appendix C demonstrates that the results hold across age groups and remain robust to residualising wealth with respect to age before estimation.

In this specification, consumption c_k and initial wealth w_k are measured at the household level. Divided by the equivalence scales E and T, only some ("equivalent") fraction of total household resources enters individual utility. Importantly, it is possible that $E \neq T$. If scale effects were only a function of household size, perfect economies of scale and the access to wealth perspective would imply unity for E and T, while no benefits from sharing imply that the denominator corresponds to the household size (ownership perspective). It is important to note that the aim of this paper is to make wellbeing comparisons of individuals living in different types of households (Decancq, Fleurbaey, and Schokkaert 2015). Modelling economies of scale and equivalence scales as a part of individual utility functions as in Equation 2 implies a utilitarian approach to welfare, where individual utility is the equalizandum.

Assuming that households choose welfare maximising levels of consumption c_k^* and wealth-in-utility savings $s_k^* = w_k - c_k^*$, it is possible to derive the first order condition. This gives the following optimal level of consumption:

$$c_k^* = \Psi \left(w_k + T\gamma \right), \quad \Psi = \frac{\rho}{\alpha + \rho} \tag{3}$$

Equation 3 illustrates has several important properties of optimal behaviour. Firstly, with a positive γ parameter, this rule implies that the share of wealth-in-utility savings in total wealth will increase in total household wealth. Secondly, Equation 3 illustrates that the importance of wealth as an end may differ across household types, depending on the magnitude of scale effects T. The lower the returns to scale to wealth-in-utility savings, the higher will be the share of wealth put aside for consumption in large households compared to small households. Finally, the expression for c_k^* includes the parameter Ψ, which is a function of the exponents of the utility function. The emergence of Ψ reflects the idea that the exponents in the Cobb-Douglas utility function can be normalised to unity without changing the optimal behaviour that follows from the utility function. Therefore, it can be interpreted as the parameter in the exponent of the first argument in the utility function with normalised exponents.

In addition to the form of the utility function, the approach outlined in this section entails further simplifying assumptions. Firstly, the household is assumed to allocate wealth between consumption and wealth-in-utility savings in a joint decision. To ensure that this simplification does not drive the results, the baseline model includes the share of household wealth that belongs to individual i in $Z_{i,k}$. Thus, the model allows for household members that do not own any share in the household wealth to derive lower utility from household wealth. Secondly, the analysis largely abstracts from debt. The model ensures that households cannot consider debt in their optimal decision by imposing that $c^*_k \leq w_k$. Much like in the approach outlined by Carroll (1998), household consumption is constrained by the level of household wealth. Therefore:

$$\bar{c_k} = \min(c^*_k, w_k) \tag{4}$$

This constraint gives rise to a kink in the consumption and savings function. One way to describe the resulting solution is the use of an activation function for the optimal level of wealth-in-utility savings. The activation function ensures zero savings at wealth levels where Equation 3 implies negative wealth-in-utility savings, while maintaining the allocation from Equation 3 where wealth-in-utility savings are positive. An activation that is frequently used in economics and machine learning is the SoftPlus[6] function (Mian, Straub, and Sufi 2021), which I will use to approximate the optimal policy with the borrowing constraint. Yet, ensuring that the choice of wealth concept does not affect estimation results, $Z_{i,k}$ also includes a measure of household debt.

2.2. A Parametric Family of Equivalence Scales

The literature on household scale effects has found a number of ways to express and operationalise household scale effects. One approach that maintains flexibility and allows the incorporation of different assumptions on scale effects is to choose a parametric family of equivalence scales to represent E (Cowell and Mercader-Prats 1999). This paper combines E and T in a family of equivalence scales for household wealth. In principle, parametric families of equivalence scales have the following form,[7] where equivalised consumption $\tilde{c}$ is consumption c divided

[6] The SoftPlus corresponds to $\mathrm{SP}(x) = \log(1 + \exp(x))$

[7] Household subscripts of c and x are omitted for simplicity.

by the scale E, which is a function of c, household characteristics x and a set of parameters θ:

$$\tilde{c} = \frac{c}{E(c, x, \theta)} \tag{5}$$

The most common and simple choice of $E()$ is a power function of household size, where the exponent θ ranges between zero and unity.[8] In one extreme with $\theta = 0$, economies of scale are perfect. In the other, $\theta = 1$ such that there are no economies of scale. The well-known square root equivalence scale is a special case where $\theta = 0.5$. Combining this parametric family of equivalence scales with the model set out in Subsection 2.1 results in the replacement of E and T with functions of household size such that:

$$E = h^{e} \quad \text{and} \quad T = h^{\tau} \tag{6}$$

Thus, I maintain the idea that scale effects associated with consumption and wealth-in-utility savings may differ from each other. The equivalence scale for total wealth w_k is a function of the scale effects parameters for consumption and wealth-in-utility savings, household size and wealth, in addition to γ and Ψ. It follows from the distinction between assets held for consumption purposes and wealth held for other reasons as stipulated by the wealth-in-utility model. I apply τ to the wealth-in-utility component of total household wealth $\bar{s_k}$, and e to consumption $\bar{c_h}$. This gives an analogous expression to Equation 5 for equivalised wealth $\mathcal{W}_k$:[9]

[8]Most equivalence scales used in practice to adjust income for household size are well approximated by this functional form (Buhmann et al. 1988). However, it should be noted that some scales do not only take household size, but also age structure, into account when adjusting income or consumption for scale effects. In particular, one may argue that children should be considered to impose lower costs on households than adults. I explore this proposition by extending the functional form of the equivalence scale by a parameter such that differences between children and adults in view of scale effects are reflected in the equivalence scale. The results of this exercise are summarised in Section D in the Appendix. Overall, the estimates of the wealth economies of scale presented in the main part of this paper are robust to differences in the household age structure.

[9]Again, dropping subscript k for $\mathcal{W}$, w and h, $\bar{s}$ and $\bar{c}$ in Equation 7.

$$\mathcal{W} = \frac{\bar{s}}{h^{\tau}} + \frac{\bar{c}}{h^{e}} = \begin{cases} 0 & \text{if } w = 0 \\ \frac{w}{h^{\tau+e}\left[h^{\tau}+\frac{\mathrm{SP}(w-\Psi(w+h^{\tau}\gamma))}{w}(h^{e}-h^{\tau})\right]^{-1}} & \text{if } w > 0 \end{cases} \tag{7}$$

Equation 7 is a tool to adjust household level wealth information for household scale effects. Following the logic of parametric equivalence scales, the denominator of Equation 7 allows for a straightforward appraisal of the sensitivity of an outcome of interest to the choice of different values of the parameters θ. For example, when measuring dispersion in the distribution of wealth, one may vary the parameters to explore whether household size adjustments affect the conclusions on levels and trends of inequality. Alternatively, one may find reasonable values for the θ parameters. Subjective judgements of the analyst or other evidence on social values could inform the choice of plausible values. While a large literature exists on the equivalence elasticity for consumption e,[10] the following Section, offers a methodology to recover the parameters Ψ and τ from survey data taking e as given.

3. Estimation Framework

Having derived the optimal allocation between consumption and wealth-in-utility savings and an equivalence scale to adjust household wealth for size, I use this information to estimate the parameters of the equivalence scale in Equation 7. e is fixed to 0.5, which is a standard and widely used parameter to account for economies of scale regrading consumption, also known as the square root scale (OECD 2018). For γ, I start with a value of 750,000, which is common in the literature (Francis 2009; Tokuoka 2012). However, robustness checks explore the sensitivity of the results with respect to the parameter γ. The parameters τ and Ψ are of primary interest in the following.[11]

The identification starts with the assumption that households allocate wealth

[10] For reviews see Cowell and Mercader-Prats (1999); Lewbel and Pendakur (2006); Schröder (2009).

[11] I estimate of the utility function parameters ρ and α to arrive at Ψ. Since only Ψ (the normalised value of ρ) enters the equivalence scale, I will not discuss ρ and α specifically.

between consumption and wealth-in-utility savings optimally.[12] Therefore, it is possible to substitute the expressions for optimal consumption and wealth-in-utility savings based on Equations 3 and 6 back into the utility function set out in Equation 2. The structural model in Equation 8 follows:

$$
\begin{aligned}
&U(c_k, s_k) = \\
&\left(\Psi \frac{\left[w_k + h_k^{\tau}\gamma\right]}{h_k^{e}}\right)^{\rho} \left(\left[w_k + h_k^{\tau}\gamma\right] \left[\frac{\alpha}{\alpha + \rho}\right] h_k^{-\tau}\right)^{\alpha} \exp(\Phi Z_{i,k})
\end{aligned}
\tag{8}
$$

In order to reduce the bias arising from measurement error and simplify the empirical implementation, the results rely on a linearised version of Equation 8. Taking the logarithms of Equation 8 yields the following specification:

$$
\begin{aligned}
\log(U_{i,t,k}) = \delta + \lambda \log(w_k + h_{t,k}^{\tau}\gamma) + \zeta \log(h_{t,l}) \\
+ \sum_{n=1}^{N} \beta_n (Z_{i,k,n}) + \eta_{t,i}
\end{aligned}
\tag{9}
$$

where

$$
\lambda = \rho + \alpha \quad \text{and} \quad \zeta = (e\rho + \tau\alpha)\,(-1)
\tag{10}
$$

Each of the n variables in $Z_{i,k}$ enters the model in an additive fashion along the other components. In addition to a set of standard control variables, the specification also features an error term $\eta_{t,i}$ and the intercept δ, which includes the constants remaining from the linearisation of Equation 8.

The second assumption necessary for the identification is that utility can be

[12]The estimation relies mainly on c^* and s^* as the optimal policy. This approach facilitates the linearisation of the estimation equations and ensures algorithmic convergence of the estimator. In Appendix B, I show that the conclusions drawn from models based on the constrained values of consumption and wealth-in-utility-savings yield qualitatively similar results.

approximated by direct survey responses on subjective satisfaction with economic outcomes (stated preferences). If it holds, Equation 8 can be estimated directly from survey data. An exhaustive body of literature shows that stated preferences are suitably approximating individual utility (Frey and Stutzer 2002; Kaiser and Oswald 2022). Therefore, a number of studies has employed such data to identify structural parameters in utility functions (de Ree, Alessie, and Pradhan 2013; Layard, Mayraz, and Nickell 2008). The use of data on satisfaction with economic outcomes is particularly popular in the recent literature on economies of scale (Schwarze 2003). Note that satisfaction is a specific type of utility. It caters to a notion of utility where individuals assess the extent to which they can fulfil their life plans. Hence, it respects individual preferences in accordance with the paradigm of Preference Welfarism (Decancq, Fleurbaey, and Schokkaert 2015).

The estimator in the main specification is based on a binary logit link function to map the nonlinear predictor of Equation 8 and the control variables into the binary outcome variable. Section 5 also presents modifications of this choice. Most importantly, it also provides results for a log-transformed dependent variable that is based on a numeric approximation of the Likert-scale variable.

In view of further identifying assumptions, I do not model the endogeneity of fertility explicitly. However, the estimate of τ may still capture direct utility that individuals derive from additional household members, compensating the former for having to share a given wealth endowment with a larger household. If individuals do not only consider the costs of larger households but also draw direct utility from certain household compositions, the amount of additional wealth required to maintain a given level of welfare as size increases falls. This should be reflected in a lower τ parameter. Drawing welfare comparisons between individuals in different household types requires taking this stream of utility into account. Only then are returns to scale estimated unconditionally, rather than conditional given the choice of household size (Pollak and Wales 1979).

To test for the unconditional character of the results, I compare estimates of τ between families who have at least as many children as they desire to have with and families with more children. The latter situation may arise from imperfect foresight, time-inconsistent preferences and twin births, for example. The comparison of these groups allows for disentangling the extent to which the positive welfare effects of living with children dominate their costs in terms of economic resources. If the τ parameter captures both costs and utility from additional household members, the τ-estimates in the group witch children in excess of their desired household size will be higher - consequently, scale effects are expected to be lower. Therefore, the estimate's sensitivity to the sample split serves as a test for the unconditionality of the scale effects parameter τ and hence its applicability in welfare analysis and optimal taxation.

A second threat to identification is unobserved individual heterogeneity that correlates with the measure of individual welfare employed in this paper (Frijters, Haisken-Denew, and Shields 2004). If individual heterogeneity in subjective satisfaction is systematic, the cross-sectional estimation approach may not deliver unbiased results. Therefore, I supplement the main findings with results from fixed-effects estimation. This limits the analysis to intrapersonal comparisons of welfare, requiring only that individuals' preferences are stable over time (i.e. that preferences do not adapt to situations). Kaiser and Oswald (2022) provide evidence for the persistence of subjective satisfaction measures over different situations.

4. Data

The main data source in this paper is the German Socio-Economic Panel (SOEP) (Liebig et al. 2019). Complementing comprehensive information on demographics, the SOEP includes a wealth-module for selected waves (2002, 2007, 2012, 2017). In addition, the SOEP provides a wide array of questions, not at least on the subjective wellbeing outcomes, which this treatment employs for identification. Another merit of the Socio-Economic Panel consists in the extensive survey metadata on the interview setting, which is important for the analysis of subjective outcomes.

For subjective wellbeing, this paper relies on income satisfaction data to measure utility, captured by a 0-10 Likert scale which is collapsed into a binary outcome variable. Collapsing measures of income satisfaction from a ordered categorical variable into binary outcomes has previously been shown to have little implications for the results regarding the estimates of household returns to scale for income. Figure A5 in the Appendix illustrates the distribution of of the satisfaction measure by survey wave.

In addition, the analysis requires data on household wealth. I use total gross household wealth matched to individual members to be consistent with the dependent variable, which inquires about satisfaction with household level resources. This is the sum of all household members' individual reported assets holdings, aggregated across asset classes. The main part of the analysis does not differentiate between different asset classes when it comes to measuring the relationship between wealth, household size and welfare. Yet, the results also provide specifications where assets are decomposed into different types of assets. Not at least to account for non-response for wealth items in the survey, the data producer offers multiple imputations for the wealth variables. For this analysis, I take the multiply imputed data structure into account. This implies averaging across all five implicates to obtain point estimates and computing the standard errors accordingly following Rubin's rule. Even though the SOEP oversamples high-income households, there are issues with appropriately covering the top of the wealth distribution, both in terms of item-non-response and unit-non-response. The extent of this underestimation is difficult to quantify, owing to a lack of external sources such as wealth tax revenue statistics to validate the aggregates. A comparison with other German wealth surveys suggests that the SOEP underperforms slightly relative to the German Federal Bank's PHF (Private Haushalte und ihre Finanzen) survey in capturing the assets of the very affluent (Grabka and Westermeier 2015). Given the problems with covering wealth at the top of the distribution, I drop the top 2.5% of observations in terms of gross wealth from the individual level analysis in order to obtain clean estimates of the model parameters. However, the robustness checks also provide results for the full sample.

Another key variable is current household size, which is measured in the survey at the household level and matched to individual observations. In order to ensure that measurement issues do not affect the results, further variables enter the specification as controls. In particular, the estimation accounts for the presence of debt and the share of household wealth held by the respondent. In order to explore the robustness of the results, further variables such as age, gender or marital status feature in some specifications. These variables have previously been found to either impact response behaviour with respect to subjective satisfaction outcomes, or actual wellbeing. The sensitivity analysis features additional household characteristics matched to individual household members, including the interview mode, which have been shown to affect subjective measurement outcomes (Conti and Pudney 2011). Since the SOEP follows a "mixed mode ap-

Variable	Min	Median	Mean	Max	SD
Household					
Gross wealth (in Thousands)	0	94.91	219.56	72085	854.97
Debt (0/1 Dummy)	0	0	0.4	1	0.5
HH size (n)	1	2	2.38	13	1.36
Individual					
Satisfaction (Likert Scale)	0	7	6.43	10	2.24
Satisfaction (Binary)	0	1	0.56	1	0.49
Wealth share (Percentage Share)	0	0.64	0.65	1	0.35

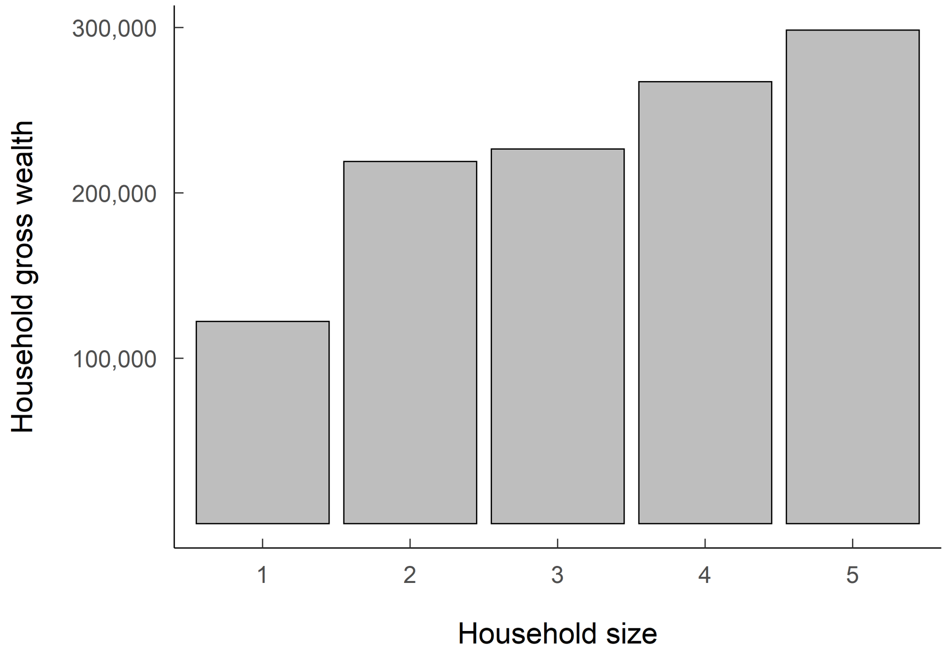
Note:
Minimum, mean, median, maximum and standard deviation for the key variables at household and individual level. Multiple imputations taken into account. Observations pooled across all waves (2002, 2007, 2012, 2017). Source: SOEP v.35, own calculations.

TABLE 1. Descriptive Statistics

proach" for interviews, this analysis differentiates between interviews carried out in presence and in absence of an interviewer. The first group includes the most prominent interview mode in the sample, which is computer-assisted personal interviewing (CAPI). The latter group of interviews includes those carried out in written correspondence via email, for example.

Table 1 provides descriptive statistics for the key variables in the German SOEP. It differentiates between variables measured at the household and the individual level. "Gross wealth" refers to total assets in €1,000. "Debt" is an indicator for the presence of debt in a household. "Household size" refers to the number of household members. Household income satisfaction data, the dependent variable, also features in Table 1. Summary statistics are provided both in terms of a 0 to 10 Likert scale and a binary scale collapsing all income satisfaction levels below 7 into zero and all other values into 1. The wealth share refers to the share of wealth held by each household member.

Figure 1 illustrates the bivariate realtionship between household size and wealth. It demonstrates how households that differ in their composition also have different levels of accumulated assets. On average, households with two members have twice as much wealth as single households. However, households



Mean gross wealth by household size for households with one to five members, 2.5% top coding. Source: SOEP v.35 (Waves: 2017), own calculations.

FIGURE 1. Mean Wealth by Household Size

comprising five members only have three times the amount of wealth that single households own.

For the appraisal of the implications of household size adjustments for inequality at the household level in Section 6, the entire sample features in the analysis, with the population weights employed accordingly to compile representative statistics. However, not all observations can be used for the individual level analysis carried out to obtain estimates of the scale effect parameter τ and Ψ in Subsections 5.1 and 5.3. Most importantly, while 55,254 household-wave observations with valid information on household wealth and composition exist for the years 2002, 2007, 2012 and 2017, only 95,495 individuals aged 18 years and above in 55,016 household-wave observations feature in the individual-level analysis. The reduction in the sampling size is due to the removing of all individuals with no or invalid information on satisfaction outcomes.

5. Results

This section starts out with the recovering of the structural model parameters as set out in the previous section. It presents various model specifications, discussing the sensitivity of the results. Subsequently, the estimates are used to arrive at each household's optimal combination of accumulation motives. To generate all results in this section, I use survey weights at the individual level. In addition to the reported coefficients, each model controls for the presence of debt in an individual's household, as well as the share of total household gross wealth held by the respondent.

5.1. Parameter Estimates

Based on the SOEP data, Table 2 presents the estimates for λ, ζ and τ, the latter referring to the scale effects elasticity for wealth-in-utility savings. From these parameter estimates, it is possible to derive the corresponding value of Ψ, which represents the normalised exponent of the first argument in the utility function. This value derives from the point estimates of the other coefficients as set out in Equation 10. Standard errors are reported in parentheses. For each model, the underlying assumption on γ is reported in the bottom line. The first model refers to the baseline logit-model, whereas the second uses a probit specification. After column 3 presents results of the same specification, though with a continuous numeric dependent variable, column 4 reports the findings from a fixed effects estimation approach. In each model, income satisfaction features as the outcome variable.

The results in the first column imply a value of 3.36 for λ, while ζ, the coefficient on the log of household size is estimated to -0.47. Given the relatively small standard error, the estimate of λ is statistically significant at conventional levels. Crucially, the first specification suggests that τ is close to zero, though positive and statistically significant. The coefficient magnitude is 0.08, in line with the idea that economies of scale are high for wealth-in-utility savings. Using the estimates for λ, ζ and τ, and exploiting prior information implying that $e = 0.5$, Ψ follows. This yields an estimate of 0.14. On the on hand, this estimate fulfils the condition that $\alpha \geq \rho$ set out in Section 2.1. On the other hand, it implies that the most affluent

Coefficient	Logit	Probit	Numeric	Fixed Effects
λ	3.355	1.992	0.536	2.7
	(0.094)***	(0.05)***	(0)***	(0.403)***
ζ	-0.474	-0.251	0.008	-0.425
	(0.096)***	(0.052)***	(0)***	(0.422)
τ	0.084	0.066	-0.122	0.093
	(0.029)**	(0.027)*	(0)***	(0.16)
Ψ	0.136	0.138	0.087	0.154
γ	750k	750k	750k	750k

Note:
* $p<0.05$; ** $p<0.01$; *** $p<0.001$. Survey weights and multiple imputations taken into account. Observations pooled across waves (2002, 2007, 2012, 2017). Each specification controls for debt and the personal wealth share. Standard errors in parentheses. Source: SOEP v.35, own calculations.

TABLE 2. Main Results: Income Satisfaction

households in the sample will only allocate approximately 14% of their wealth to consumption.

Rather than relying on a logit model, the next column describes a model based on the probit link function. The estimates for λ and ζ differ from the baseline estimates, both ranging at a significantly lower level in absolute terms. Even though both coefficients are affected by the changing estimation strategy, the composite effect on the Ψ ratio is negligible. Crucially, the estimate for τ only falls marginally in terms of coefficient magnitude when compared to the baseline logit model. The small changes suggest that τ is at 0.07, a point estimate that is smaller relative to the associated standard error compared to the previous column.

The third column in Table 2 summarises the results of a version of the baseline model with a numeric dependent variable. Rather than collapsing the Likert-scale of satisfaction scores of the dependent variable into a binary variable indicating high or low satisfaction, this specification treats the Likert-scale response as a random variable valued in real numbers. For the linearisation requires taking the logarithm at both sides of Equation 8, the Likert-scale outcomes are transformed using a log transformation. Column 3 reveals that some differences exist between the estimates based on a linear vis-à-vis binary dependent variable. The estimate for λ is significantly lower than in the initial specification. In contrast, ζ is somewhat higher. As a result, Ψ does change slightly when compared to the baseline specification. In contrast to the previous specifications, the estimate for τ falls, ranging at -0.12. This estimate is highly significant in statistical terms.

Column 4 replicates the baseline results using a fixed effects estimator. Thus, it can account for time constant, individual level factors that lead to higher income satisfaction. The results with fixed effects support the conclusions drawn from the first column. The key difference to the results without fixed effects is the estimate of λ, feeding into the estimate of the share of consumption wealth in total household wealth, Ψ. The fixed effects estimate of this parameter ranges slightly above the estimates reported in the first column. In contrast to the other models in Table 2, the scale effects estimate is indistinguishable from zero. However, in magnitude, it is comparable to the estimate from the logit model in column 1.

5.2. Conditional and Unconditional Scales

To what extent are the estimates of scale effects driven by sharing resources vis-à-vis the non-monetary benefits of larger households? To explore this question, I capitalise on a survey item inquiring about the ideal number of children that respondents would like to have.[13] Individuals who would like to have less children than they do in the current state of the world can be expected to generate less direct wellbeing from children compared to individuals with the optimal number of children. Conditional scales would not be sensitive to differences between those groups, since the economic implications of sharing are the same across those groups.

Table 3 replicates the baseline logit results from Table 2 for different subgroups of the sample. First, I reduce the sample to individuals that provided information on their ideal number of children in the survey. Then, I split this subsample into two groups: The first group in column 1 consists of individuals living in households with at least as many children as the preferred number of children. The second

[13]The survey elicits information on preferences over the ideal number of children in some waves for a subset of individuals. Therefore, only a limited number of observations where this data is available exists. The 2012 wave provides data on fertility preferences and wealth at the same time.

Coefficient	Optimal Family	Excess Kids
λ	6.029	26.52
	(1.991)**	(5.467)***
ζ	-1.804	-24.355
	(2.096)	(8.547)**
τ	0.262	0.938
	(0.254)	(0.176)***
Ψ	0.022	0.137
γ	750k	750k

Note:
* p<0.05; ** p<0.01; *** p<0.001. Survey weights and multiple imputations taken into account. Columns 1 and 2 refer to the 2012 wave. Each specification controls for debt and the personal wealth share. Standard errors in parentheses. Source: SOEP v.35, own calculations.

TABLE 3. Fertility

group in column 2 of Table 3 refers to individuals in households with more children than they prefer.

To begin with, some elements in the first column differ from the results reported in the main results - while maintaining its key conclusions. Compared to the model in Table 2, the number of observations is substantially lower (2,069 observations instead of 92,228 in the baseline specification). λ almost doubles, maintaining its statistical significance. At the same time ζ drops. However, the estimate is not precise, and confidence intervals include zero. Compared to the results in Table 2, the scale effects parameter τ increases to 0.26. However, the standard error of this estimate is large, such that it is not statistically significant at conventional levels. The changes in the paramters also lead to a fall in Ψ, which ranges below the original estimate for the group of individuals who have exactly as many children as they would ideally like to have.

The coefficients in the second column point towards the sensitivity of the estimation to the conditionality of the scale effects. While only a small group of individuals has more children than they prefer (200 observations), λ and ζ in this group are substantially higher in absolute magnitude than in any other specification. The same holds for the scale effects parameter, which is now at 0.94.

While this estimate is significantly different from zero at the usual significance levels, the 95%-confidence interval is still large and includes values of 0.45 for τ. Combining the parameter estimates to obtain Ψ yields a value of 0.13, which is consistent with the estimates provided in the main specifications.

5.3. Estimation Sensitivity Analysis

Table 4 provides additional specifications to explore the robustness of the results, reporting the same statistics as Table 2. To begin with, the first column in Table 4 adds further control variables to the initial specification which are known to impact survey respondents' perception of subjective wellbeing outcomes. In particular, this refers to the respondent age, gender, years of education, their marital status, as well as to the mode of data collection. To account for the latter, an indicator variable features in the model, distinguishing interviews where an interviewer was present from those that were carried out in the absence of an interviewer. I also include survey wave fixed effects. Both λ and ζ fall marginally to 3.15 and -0.53 respectively relative to the baseline logit model in Table 2. Both estimates maintain their statistical significance. The estimate of τ becomes statistically indistinguishable from zero, the point estimate ranging at 0.06. Compared to the previous results, Ψ assumes a relatively high value of 0.245.

The next column presents a model that controls for the household portfolio composition. It extends the baseline model by adding control variables for the share of household wealth held in home equity, business wealth, and tangible assets. This constitutes the majority of rather non-liquid assets. The estimates of λ and ζ increase, bringing ζ closer to zero while λ is estimates to 3.78. At the same time, τ remains in proximity to its value in the baseline model. The precision of the estimate increases relative to the specification with controls in the previous column, such that it becomes statistically significant at the five percent level. The resulting value of Ψ is marginally lower than the estimates resulting from the baseline model. Table A1 in Appendix A explores the role of scale effects for household wealth of different asset classes in more detail. It investigates the idea that rather than the wealth-in-utility model, the types of assets held by a household may provide information on accumulation motives, implying that different returns to scale are associated with various types of assets. The results generally support

Coefficient	Controls	Portfolio Composition	Credit Constraints	50+	Net Wealth
λ	3.147	3.782	2.689	3.494	2.53
	(0.104)***	(0.128)***	(0.095)***	(0.091)***	(0.342)***
ζ	-0.528	-0.445	-0.133	-0.429	-0.366
	(0.108)***	(0.111)***	(0.089)	(0.105)***	(0.688)
τ	0.06	0.066	-0.007	0.048	0.192
	(0.034)	(0.029)*	(0.036)	(0.032)	(0.233)
Ψ	0.245	0.117	0.109	0.164	0.108
γ	750k	750k	750k	750k	750k

Note:
* $p<0.05$; ** $p<0.01$; *** $p<0.001$. Survey weights and multiple imputations taken into account. Observations pooled across waves (2002, 2007, 2012, 2017). Each specification controls for debt and the personal wealth share. Standard errors in parentheses. Source: SOEP v.35, own calculations.

TABLE 4. Robustness Analysis

the use of the baseline model: Irrespective of asset class, the parameters are similar to those in the baseline model.

Subsequently, the column labelled "Credit constraints" controls for household credit constraints. Being credit constrained means that households need to hold higher levels of wealth than they would desire in absence of such constraints, since they cannot borrow to smooth consumption. If this prevents households from consuming all wealth, even though that would imply higher welfare, biased results could be the consequence. The specification uses an indicator assuming unity if liquid assets fall below two months of household income to measure credit constraints (Jappelli, Pischke, and Souleles 1998). Compared to the baseline estimates in Table 2, both λ and ζ shrink towards zero, while τ falls slightly below zero to -0.01. Overall, the effect on Ψ is small, resulting in an estimate of 0.11.

The fourth column labelled "50+" explores the role of expectations and the reference time period. Do individuals think of their current household size when they respond to questions on satisfaction with material circumstances, or do they consider future household compositions? In addition to controlling for household size, this column provides further results for the subsample of older individuals. As opposed to younger individuals who are more likely to increase their household size in the future when they raise children, older individuals may expect their household size to decline. Even if the sample is restricted to the older population, the differences to the baseline specification remain relatively limited. λ increases by a small margin to 3.49 relative to the first column in Table 2. ζ falls slightly, even though no changes in terms of statistical significance occur. The estimate of τ approaches zero, such that it becomes statistically insignificant. The changes in the parameter estimates result in an augmented value for Ψ, which is now at 0.16. The limited differences to the estimates reported in the baseline specification suggest that expectations concerning changes in the household composition that are not captured by the baseline specification do not jeopardise the conclusions.

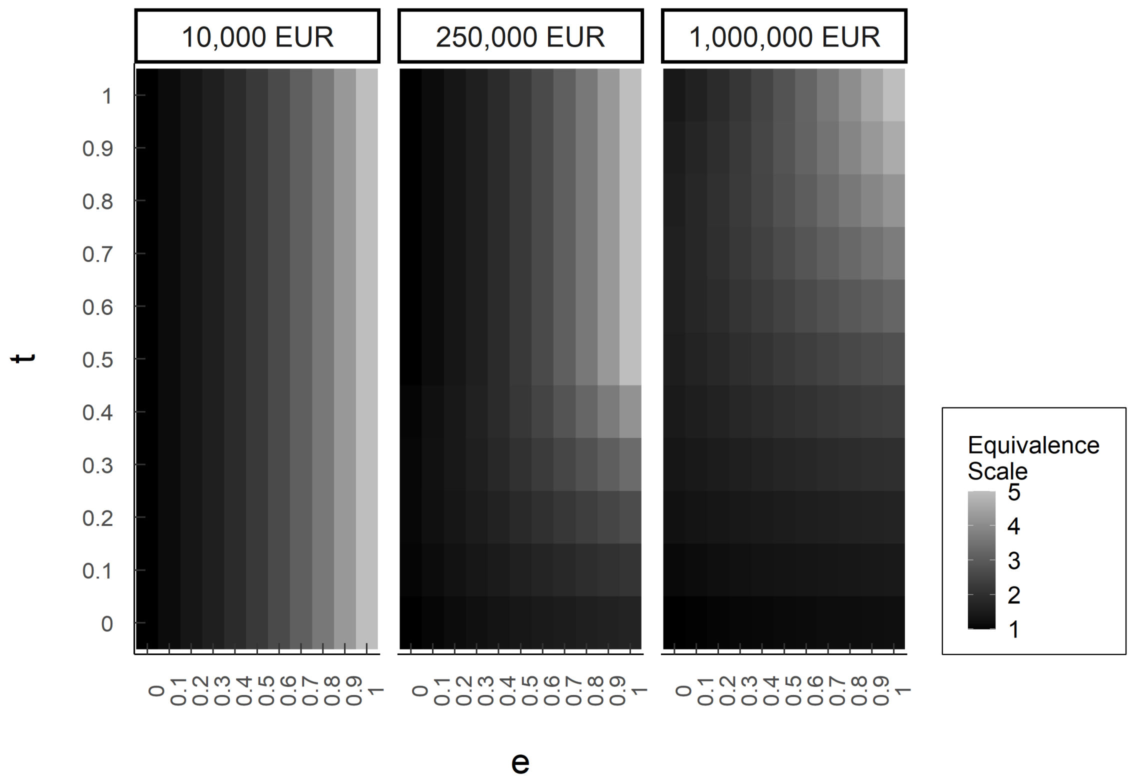
Finally, the last column "Net wealth" changes the definition of gross wealth to net wealth. At the same time, I also substitute the personal share in household gross wealth for an individuals share in net wealth as a control variable. Still, the specification controls for debt. λ (ζ) is lower (higher) than in the main specification, while the estimate of τ increases to 0.19 from 0.08 in the main specification reported in column 1 of Table 2. However, due to the relatively high standard error, the estimate is not statistically significant at conventional levels. Overall, compared to the main results, Ψ falls to 0.11.

The robustness checks reveal little sensitivity of the results for τ to changes in the model specification. In most cases, confidence intervals either include zero or the estimate of the baseline specification in Table 2. This can be considered as evidence in favour of the main finding: $\tau < e$. In addition, the estimates for Ψ exhibit only little variation. Across all specifications, this parameter ranges between 0.11 and 0.25.

Overall, the parameter estimates reported in Section 5 are realistic and consistent with previous research. Regarding the estimates for τ, it has been noted previously that if wealth is accumulated for the purpose of "status or power, there is little reason to adjust wealth for household size at all" (Cowell et al. 2017, p.177) – implying $\tau = 0$. If one interprets the wealth-in-utility savings component as a bequest motive, there are also arguments supporting high scale effects. For example, Kopczuk (2007) finds that bequest motives do not depend on whether an individual has children. This is in line with the high scale effects for τ, suggesting that a larger household does not induce the need for more wealth to be distributed among household or family members.

5.4. Consumption and Wealth-in-Utility Savings

Before showing the results for equivalised wealth $\mathcal{W}_k$ using the parameter estimate of τ, Figure 2 illustrates the mechanics of scale effects at a given level of Ψ (0.13, corresponding to the average from the main specifications in Table 2). The illustration is based on a household comprising 5 individuals. The three panels refer to different levels of household wealth (w_k), from low to high. On the x-axis, e changes from zero to one. The y-axis refers to τ. The equivalence scale for household wealth ($w_k/\mathcal{W}_k$) is on the z-axis. Figure 2 illustrates several important dynamics. Firstly, the implications of varying e and τ differ for households at different levels of wealth. The different shadings of the panels make the importance of initial wealth explicit. For instance, considering the first panel only, it is evident that changes in τ do not affect the scale effects for total wealth at low levels of wealth. At €10000 in w_k, all wealth is consumed such that only e matters. At higher levels of wealth w_k, total scale effects for wealth are a negative function of both e



Shade refers to ratio of household wealth w_k relative to equivalised wealth $\mathcal{W}_k$. X-axis displays different values for $e \in [0; 1]$. Y-axis refers to $\tau \in [0; 1]$. $\Psi = 0.13$ $\gamma = 750.000$. Planes refer to different levels of w_k. Simulation for 5-person household. Own calculations. 3-D interactive version available at `https://severin-rapp.github.io/assets/3d_plot5pers.html`.

FIGURE 2. Household Wealth Relative to Equivalised Wealth along τ and e

and τ.

Next, I use the estimates of both τ and Ψ to derive the proportion of consumption vis-à-vis wealth-in-utility savings for each household. τ is taken to be 0.03 - again the average of point estimates from Table 2. Combining this information with data on gross wealth yields for each household k the level of wealth accumulated for the purpose of consumption $\bar{c_k}$ and $\bar{s_k}$.

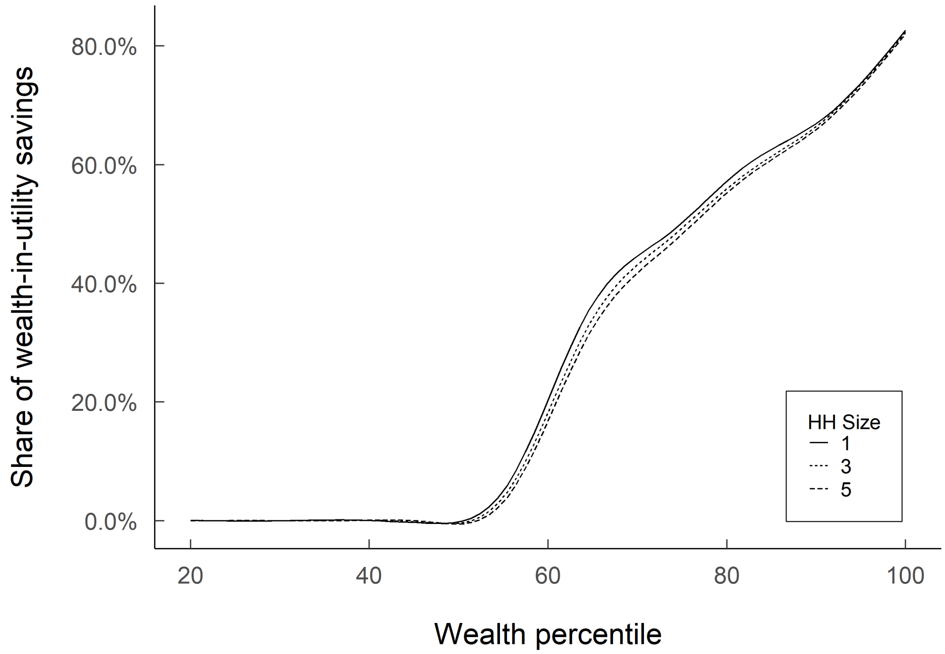
Figure 3 illustrates the result. It shows the share of wealth-in-utility savings along the distribution of gross wealth for all survey waves. The percentile grouping rests on the overall population rank of households in the distribution within each wave, rather than on their relative wealth rank within each household type. The y-axis gives a smoothed estimate of the mean share of wealth-in-utility savings by household. I obtain the smoothed curve through a generalized additive model featuring a penalized cubic regression spline. It is constructed by minimizing the following expression, where y_i is the share of wealth-in-utility savings for each household:

$$\sum_{i=1}^{n} \{y_i - g(x_i)\}^2 + \lambda \int g''(x)^2 dx \tag{11}$$

This smoother strikes a balance between model fit, quantified by the squared difference between y_i and the free parameters of the cubic spline, denoted as $g(x_i)$, and a penalty term for ensuring smoothness (Wood 2017). This penalty term corresponds to the widely-utilized integrated square second derivative cubic spline penalty. I employ a total of ten knots, which are evenly distributed across the covariate values.

Across waves, households hold all savings for consumption purposes up to roughly the 58^{th} percentile. This corresponds to approximately €132,000 in household gross wealth. As household wealth increases, the share of wealth-in-utility savings approaches $1 - \Psi$. Note that the share of wealth devoted to consumption does not only depend on the total level of household wealth. It is also a function of household size: Especially in the middle of the distribution, larger households tend to allocate more wealth to consumption than smaller households. This results from the τ parameter in Equation 3, which determines c_k^* and hence $\bar{c_k}$.

Following the adjustment set out by Equation 7 yields $\mathcal{W}_k$. While for single households, $\mathcal{W}_k = w_k$, this is not true for households with more than one member, where it generally holds that $\mathcal{W}_k < w_k$. Since the share of wealth held for consumption purposes is particularly high among households with a low level of assets, the equivalisation has pronounced effects in the lower parts of the distribution. In contrast, among affluent households, the adjustment has more moderate effects. This is illustrated in Figure 4. It plots equivalised wealth $\mathcal{W}_k$ as a share of unadjusted wealth w_k for different household sizes by equivlaised gross wealth quintile. The adjustment for scale effects has the strongest implications among large households – in this graph, households with five members – across the distribution.

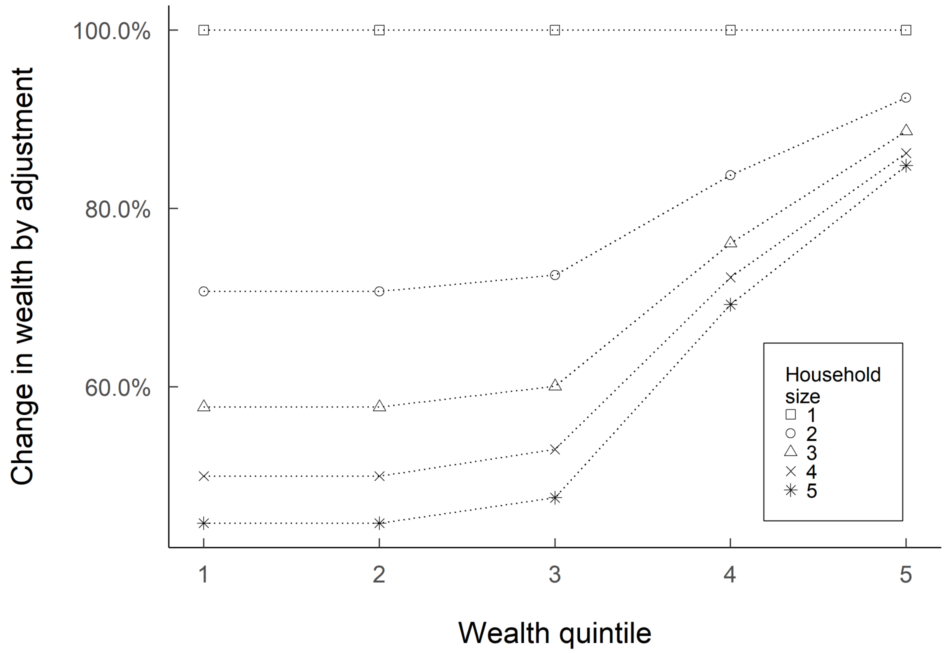


Share of wealth-in-utility savings (ordinate) by percentile of household gross wealth (abscissa). Smoothed estimate. Lower cutoff at percentile 20. Lines represent different household sizes, $\tau = 0.03$ and $\Psi = 0.13$. Source: SOEP v.35 (Waves: 2002, 2007, 2012, 2017), own calculations.

FIGURE 3. Share of Wealth-in-Utility Savings by Percentiles

6. Equivalised Wealth and Inequality

The asymmetric effects of adjusting for scale effects among households at different parts of the wealth distribution gives rise to distributional effects. Yet, the effects depend on the inequality measure by which the wealth distribution is summarised, since indicators vary in the extent to which they place weight on different parts of the distribution. A comparison of the influence functions of different inequality measures suggests that some indicators emphasise observations at the top of the distribution more strongly than others (Cowell and Flachaire 2007). Therefore, the higher the influence of households at the top for a given inequality measure, the lower will be the impact of the scale effects adjustment on inequality. Table 5 explores this proposition, examining the impact of the scale effects adjustment using different indicators for all SOEP waves featuring a wealth module. The results show that the impact of adjusting wealth for household scale effects depends on



Ratio of equivalised wealth $\mathcal{W}_k$ to household wealth w_k (ordinate) by quintile of the gross wealth distribution (abscissa), $\tau = 0.03$ and $\Psi = 0.13$, Source: SOEP v.35 (Waves: 2002, 2007, 2012, 2017), own calculations.

FIGURE 4. Ratio Equivalised to Household Wealth

the inequality indicator.

Overall, Table 5 suggests that there is some impact of the household scale effects adjustment on the Gini coefficient. The changes are most pronounced in earlier waves of the SOEP, while in 2017, the effects of the adjustment are less substantial. Across waves, the index increases by one to two percentage points. This may result from the Gini's relative strong emphasis on affluent households. The second pair of columns in Table 5 displays the effect of adjusting for household scale effects on distributional outcomes in terms of the Palma ratio. The ratio summarises the share of wealth held by the top decile relative to the share of wealth held by the bottom 40%. In contrast to the Gini-based assessment of the effect of household size adjustments, the changes are more significant. Indeed, the Palma ratio increases by more than 14 percent across all indicators, with a maximum increase in the 2002 and 2012 waves amounting to 16%.

It is noticeable that the household size adjustment proposed here differs from household size adjustments commonly employed to adjust household income.

	Gini		Palma	
	unadjusted	adjusted	unadjusted	adjusted
2002	0.72	0.74	60.90	70.25
2007	0.72	0.74	58.09	66.68
2012	0.70	0.72	50.18	58.30
2017	0.71	0.72	62.41	71.35

Note:
Source: SOEP v.35 (Waves: 2002, 2007, 2012, 2017), own calculations. $\tau = 0.03$, $\Psi = 0.13$

TABLE 5. Scale Effects and Inequality

	2002	2007	2012	2017
Household wealth: $w_{t,k}$	60.90	58.09	50.18	62.41
Wealth scale: $\mathcal{W}_{t,k}$	70.25	66.68	58.30	71.35
Square root scale: $w_{t,k}/h^{0.5} = w_{t,k}/\sqrt{h}$	53.09	51.83	45.60	56.31
OECD Scale	52.10	51.14	45.01	55.67

Note:
Source: SOEP v.35 (Waves: 2002, 2007, 2012, 2017), own calculations. $\tau = 0.03$, $\Psi = 0.13$

TABLE 6. Household Size Adjustment and Inequality: Palma Ratios

Using the square root scale or the OECD-scale for income adjustment, distributions tend to become more equal. Applying either of those scales to the wealth distribution has similar effects, leading to less dispersion. Table 6 illustrates this. For example, in 2017, the Palma ratio for household gross wealth is 62.41. Dividing by the square root of household size yields 56.31 for the same statistic. Employing the modified OECD scale yields even lower inequality, at a level of 55.67. Adjusting household wealth for scale effects in line with the procedure advanced here, the equivalised distribution for 2017 has a Palma ratio of 71.35. Despite the dramatic contrast to hitherto approaches, employing an adjustment procedure for wealth that differs along the distribution is sensible, since the nature of wealth ownership changes with the rank in the distribution.

The equivalisation procedure proposed in this paper is useful to draw cross-national comparisons involving countries with different household structures. A back-of-the-envelope calculation in Appendix F illustrates the impact of applying the wealth adjustment procedure estimated for Germany to other European economies. Based on data from the Household Finance and Consumption Survey (HFCS), the analysis reveals that country rankings in terms of the wealth Gini coefficient change substantially.

7. Conclusion

The goal of this paper is to provide a theoretical framework and empirical estimates for the household scale effects associated with wealth. While economies of scale for consumption are a well established as a concept, consumption is only an important driver of wealth accumulation at the lower tail of the distribution. Scale effects may differ if wealth is held for reasons other than consumption. I propose economies of scale that depend on the accumulation purpose. The paper shows that wealth-in-utility preferences combined with parametric equivalence scales to represent economies of scale can serve both as a theoretical framework for appraising the implications of scale effects regarding household wealth. I also demonstrate that this approach can be employed for empirical estimation. The paper draws on subjective satisfaction data to recover structural model parameters, including the parameter τ which represents economies of scale for wealth-in-utility savings. An empirical application to the measurement of wealth inequality suggests that scale effects have significant distributional implications.

This approach marks an important theoretical contribution to existing scholarship on household wealth. Rather than making more or less explicit ad-hoc assumptions about economies of scale at the household or tax-unit level, the paper offers a framework that is tailored to the study of household wealth. At the same time, it is the first to provide empirical estimates of a scale effects parameter. The estimation results suggest that household economies of scale are almost perfect for wealth-in-utility savings - corresponding to the access-to-wealth perspective. The application to inequality measurement suggests that the novel adjustment approach yields results that stand in sharp contrast to previous findings in the literature: Accounting for scale effects at the household level according to the approach outlined in this paper has disequalising effects on the distribution, rather than leading to a compression.

Future research could extend the framework offered in this article. Even though the analysis demonstrates that life-cycle patterns do not drive the findings, expectations could still play a role. For example, uncertainty about income or expenditure could be integrated in a more complex accumulation model.

Looking forward, I expect the economies of scale parameter to inform the monitoring of wealth inequality, both over time and across countries. Not at least against the background of demographic change and changing cohabitation patterns across countries, considering household structure for assessments of inequality will become even more crucial. In view of policy, models in optimal taxation may benefit from a clarification of the household's role in moderating the relationship between household wealth and welfare. For example, it allows appraising the implications of wealth taxation for horizontal equity. Another example is the design of inheritance taxation, where tax rates in practice are often functions of family size.

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Appendix A. Portfolio Composition and Returns to Scale

In addition to the results provided in Table 4, this section investigates the sensitivity of the results in view of portfolio composition further. Arguably, the types of assets held by an agent could provide information on the underlying accumulation motives. For example, home owners can be considered to have some housing-consumption motive, suggesting that some, though not perfect, economies of scale may be present. Against this background, it may not seem intuitive to adjust all wealth for perfect returns to scale, including housing assets. Instead, one might want to test for asset-specific household size returns to scale. Table A1 estimates returns to scale for household wealth by excluding different portfolio components from the analysis.

Coefficient	2017 Wave	Wealth + Vehicles	Durables	Financial Wealth
λ	3.02	3.073	2.873	10.575
	(0.07)***	(0.075)***	(0.041)***	(0.372)***
ζ	-0.192	-0.202	0.038	2.816
	(0.062)**	(0.066)**	(0.041)	(0.269)***
τ	0.025	0.024	-0.062	-0.276
	(0.023)	(0.023)	(0.016)***	(0.033)***
Ψ	0.081	0.086	0.086	0.012
γ	750k	750k	750k	750k

Note:
* p<0.05; ** p<0.01; *** p<0.001. Survey weights and multiple imputations taken into account. Columns 1 - 3: 2017 wave. Column 4: observations pooled across waves (2002, 2007, 2012, 2017). Each specification controls for debt and the personal wealth share. Standard errors in parentheses. Source: SOEP v.35, own calculations.

TABLE A1. Portfolio Composition

In order to fully explore this issue, the results reported in columns 1 to 3 are based on data from the 2017 wave only, because it is the only wealth survey wave of the SOEP that provides information on the value of vehicles owned by households. This allows studying whether the results are robust to including vehicles in the definition of household wealth. The first column relplicates the baseline logit model for the 2017 wave only, before the second column of Table 2 adds the value of vehicles to the measure of total gross wealth that underlies the estimation. The third column restricts the wealth measure to vehicles and the value of the main residence (durable goods). The final column estimates the model using only financial wealth. Overall, the results remain relatively stable in the first three columns. In particular, the τ estimate ranges around zero, while Ψ ranges slightly under the baseline estimate. In the final column that considers financial assets only, the estimates of τ and Ψ drop. The τ estimate corresponds to -0.28. The results for τ in particular suggest that the findings of Table 2 are widely robust across asset classes. In particular, the hypothesis that $\tau < e$ cannot be rejected.

Appendix B. Constrained Consumption

In Section 3, the optimal consumption level derives from Equation 3, before both c_k^* and s_k^* are constrained such that there is no negative level of wealth-in-utility savings. This Appendix uses the constrained values $\bar{c_k}$ and $\bar{s_k}$ to estimate the parameters ρ and τ directly. Therefore, I estimate the following specification:

$$
\begin{aligned}
\text{(A1)} \qquad \log(U_{i,t,k}) = {} & \hat{\delta} + \hat{\lambda}\Psi\log(w_k - SP(w_k - \Psi(w_k + h_{t,k}^{\tau}\gamma)) \\
& + \hat{\lambda}(1-\Psi)\log(h_{t,k}^{\tau}\gamma + SP(w_k - \Psi(w_k + h_{t,k}^{\tau}\gamma)) \\
& + \sum_{n=1}^{N} \hat{\beta_n}(Z_{i,k,n}) + \hat{\eta_{t,i}}
\end{aligned}
$$

This specification features more non-linearities compared to the initial model set out in Equation 9. Therefore, it is more difficult to achieve convergence of the estimation algorithm. As a result, all results presented in Table A2 are based on a non-linear least squares estimator, using the Likert-scale satisfaction responses as a dependent variable. I estimate one model that resembles the third column in Table 2. Column 2 of Table A2 relies on a version of the specification in the first column of the table, but with first-differences for each variable that features in the model. The final column replicates the results in column 1 of Table A2, though substituting gross wealth for net wealth.

Overall, the results confirm the findings presented as main results. The esti-

Coefficient	NLS	First Differences	Net Wealth
Ψ	0.08	0.232	0.033
	(0)***	(1.625)	(0)***
τ	-0.09	0	-0.013
	(0.001)***	(4.369)	(0.001)***
γ	750k	750k	750k

Note:
* p<0.05; ** p<0.01; *** p<0.001. Survey weights and multiple imputations taken into account. Observations pooled across waves (2002, 2007, 2012, 2017). Specification 1 and 3 control for debt and the personal wealth share. Standard errors in parentheses. Source: SOEP v.35, own calculations. NLS refers to Non linear least squares.

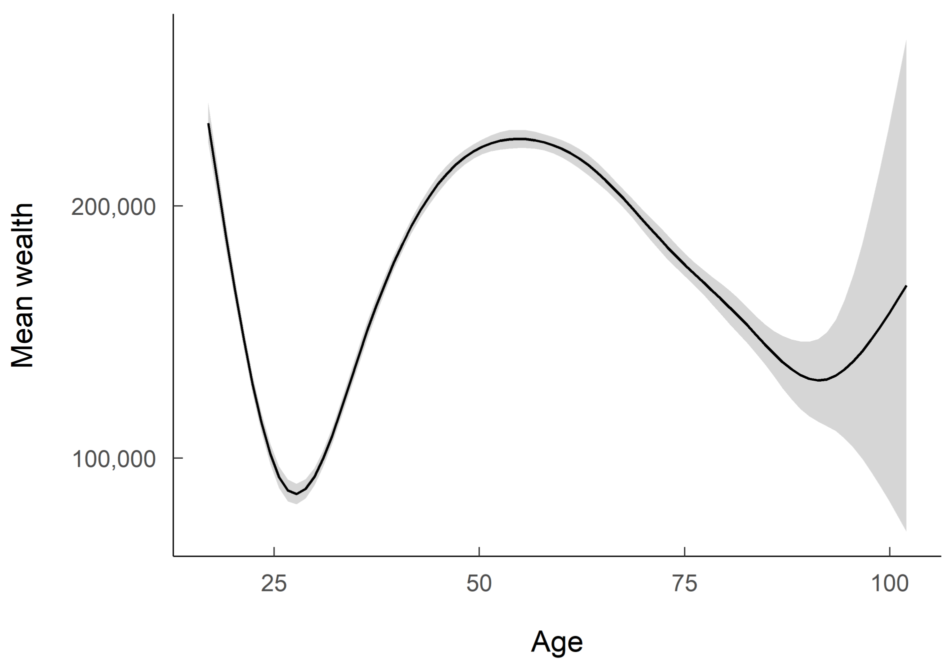
TABLE A2. Constrained Consumption

mate of τ is close to zero, or even slightly negative. The Ψ estimate shows considerable variation across specifications, ranging from 0.03 to 0.23. This range is consistent with the range of estimates presented in the Tables 2, 3 and 4.

Appendix C. Life-cycle effects

Wealth accumulation is a phenomenon closely associated with the life-cycle. Figure A1 illustrates this idea, providing a smoothed estimate of mean wealth over the life-cycle. In contrast, the model in Subsection 2.1 assumes that agents optimise their behaviour over one period, equivalent to the rest of their life. Therefore, this approach abstracts from life-cycle saving. As others have outlined methodologies to account for life-cycle wealth accumulation when studying household wealth and its distribution (Almås and Mogstad 2012), it is straightforward to implement the household size adjustment using the equivalence proposed in Equation 7 based on wealth adjusted for life-cycle effects. However, one may argue that individuals around the retirement age may hold a particularly high share of their wealth to fund consumption in retirement. As a result, behaviour according to Equation 3 may ascribe too much of their wealth to wealth-in-utility savings, only because they hold substantial assets due to their current stage in the life-cycle (and vice versa). Therefore, Table A3 provides several robustness checks to explore the implications of life-cycle saving for the results of this paper.

The first column in Table A3 restricts the sample to individuals older than 25 years. This removes the set of young individuals from the analysis who live in relatively affluent households. Most likely, this will be adolescents living with their parents. The results in the first column suggest that this group of individuals does not drive the results. Both λ and ζ, ranging at 3.29 and -0.38 respectively, are relatively close to the main results in Table 2. The same holds for τ, which is positive at 0.06 but statistically insignificant, as well as for Ψ, the standardised exponent of the first parameter in the utility function.



Smoothed estimate (cubic spline, 10 knots) of mean gross wealth over the lifecycle, pooled across waves for first implicate. Source: SOEP v.35 (Waves: 2002, 2007,2012, 2017), own calculations.

FIGURE A1. Household mean gross wealth over the lifecycle

The next column considers individuals in the age group between 45 and 65. This is the group with the highest level of life-cycle savings, according to Figure A1. Again, the results do not differ strongly from the main findings. Both λ and ζ are marginally higher in absolute magnitude than the coefficients reported in Table 2.

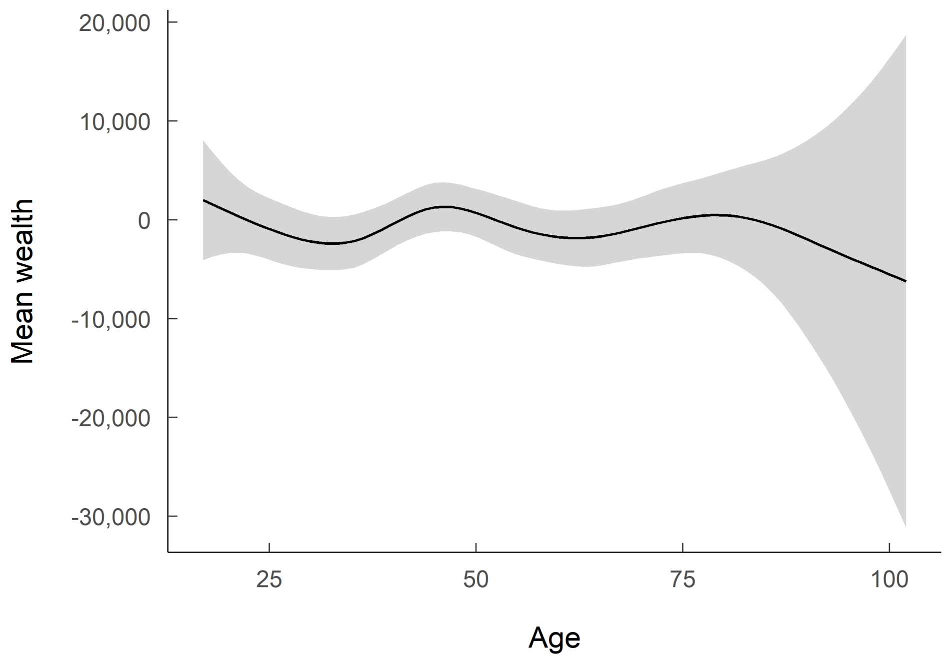
Coefficient	>25	45-65	Residualised age
λ	3.292	3.712	2.434
	(0.093)***	(0.379)***	(0.626)***
ζ	-0.378	-0.499	-0.014
	(0.096)***	(0.476)	(0.76)
τ	0.056	0.098	-0.111
	(0.03)	(0.15)	(0.273)
Ψ	0.131	0.131	0.145
γ	750k	750k	750k

Note:
* p<0.05; ** p<0.01; *** p<0.001. Survey weights and multiple imputations taken into account. Observations pooled across waves (2002, 2007, 2012, 2017). Each specification controls for debt and the personal wealth share. Standard errors in parentheses. Source: SOEP v.35, own calculations.

TABLE A3. Lifecycle effects

Again, τ is positive but statistically insignificant. The estimate of Ψ is identical to the estimate reported in the first column of Table A3.

Finally, the last column in Table A3 relies on a measure of gross wealth that controls for life-cycle accumulation patterns. It substitutes gross wealth as measured by the survey for the resuiduals of a regression of gross wealth on individual age. Figure A2 plots the residuals against age. In contrast to the relationship plotted in Figure A1, the relationship between age and residualised wealth is much weaker. If individuals consider their position in the life-cycle when responding to questions related to satisfaction outcomes, adjusting wealth as measured in the survey for individual age allows the first order condition in Equation 3 to identify wealth wealth held for future consumption net of life-cycle effects. The results in the final column of Table A3 support the idea that abstracting from life-cycle effects do not jeopardise the identification of the model parameters. While the absolute magnitude of the λ and ζ estimate falls, Ψ remains within the range of the previous estimates. τ drops to -0.11, remaining statistically insignificant.



Smoothed estimate (cubic spline, ten knots) of residualised mean gross wealth over the lifecycle, pooled across waves for first implicate. Residuals follow from a regression of wealth on individual age with a b-spline term (cubic, three knots). Source: SOEP v.35 (Waves: 2002, 2007,2012, 2017), own calculations.

FIGURE A2. Residualised household mean gross wealth over the lifecycle

Appendix D. Household Age Structure

Some specifications of parametric equivalence scales take the age structure within households into account. From the perspective of consumption, the argument is that households with an extra child might necessitate fewer resources than households with an additional adult. Against this backdrop, a variation of the power function scale is sometimes used, where the exponent is a function of the household composition. Analogously, allowing for household age structure to impact wealth scale effects requires adjusting the scale effects parameter τ as illustrated in the term labelled A2. σ captures that additional resource requirements differ between adults and children. A positive value for this parameter accounts for direct utility from children or differences in resource needs between children ($\bar{h}$) and adults ($h - \bar{h}$).

Coefficient	No Children	Children	Children coefficient
λ	3.506	3.017	2.679
	(0.3)***	(0.212)***	(0.364)***
ζ	-0.836	-0.09	0.237
	(0.535)	(0.145)	(0.302)
τ	0.204	-0.122	-0.188
	(0.161)	(0.068)	(0.17)
σ			0.003
			(0.003)
Ψ	0.09	0.24	0.124
γ	750k	750k	750k

Note:
* p<0.05; ** p<0.01; *** p<0.001. Survey weights and multiple imputations taken into account. Observations pooled across waves (2002, 2007, 2012, 2017). Each specification controls for debt and the personal wealth share. Standard errors in parentheses. Source: SOEP v.35, own calculations.

TABLE A4. Age Structure

$$h_k^{(\tau-\sigma\bar{h}_k)} \tag{A2}$$

Replacing τ in Equation 9 with $(\tau - \sigma\bar{h}_{t,k})$ yields an empirical specification that can be estimated analogously to the baseline models in Table 2.

Table A4 offers empirical results on the sensitivity of the scale effects parameter for wealth τ with respect to age structure within the household. In the first column, I estimate a model on the subsample of the population without children. The second column refers to the population subsample with children. The third column replaces τ in Equation 9 with $(\tau - \sigma\bar{h}_{t,k})$.

Reducing the sample to individuals without children has moderate implications for the results. λ remains relatively stable compared to the first column in Table 2, corresponding to 3.506 as compared to 3.355 in the baseline model. ζ also increases in absolute magnitude to -0.84. At the same time, the estimate of τ is positive at 0.2. While this is more than twice as high as in the baseline model in column 1 of Table 2, the coefficient estimate is statistically insignificant. Ψ amounts to 0.09, which is at the lower end of the spectrum of estimates presented in this paper.

Moving on to column 2, where only individuals with children are considered, the estimate of λ falls to 3.017. The same holds for the absolute value of ζ, which ranges below the value of the baseline estimate (0.474) by a substantial margin. τ drops to -0.12, yet remains statistically insignificant. Ψ increases to 0.24.

Finally, the last column of Table 3 estimates a model where I substitute the second term of Equation 9 with the term in Equation A2. Therefore, the results feature the parameter σ. The λ estimate in this model is lower than in the baseline logit specification, while the estimate of ζ turns positive. τ drops to -0.18, though remains statistically insignificant. The estimate of σ is statistically insignificant and small in terms of its economic significance. Overall, the changes in the parameters do not affect the estimate of Ψ substantially, which remains close to its original estimate at 0.12.

Appendix E. Further Sensitivity Analysis

This section offers further robustness checks. The first column in Table A5 shows the results from the full sample, removing the top coding. Including the top 2.5% of the sample in terms of gross wealth does affect the results. The outliers at the top drag down the estimate for τ. As a consequence, it ranges somewhat above -0.12. While this demonstrates some sensitivity of the results to the sample selection, it strengthens evidence against the hypothesis that the true value of τ is greater or equal to the parameter e, summarising returns to scale from household consumption. Compared to the baseline estimates, the absolute values of the coefficients on λ and ζ fall. In sum, the estimate for Ψ is higher than in the baseline model only by a small margin. Therefore, the results in column three do not contradict the baseline model findings.

The subsequent columns explore the sensitivity of the results to variations in the γ parameter. While in column 2, the parameter ranges 250,000 above the level assumed in the baseline specification, it is by 250,000 lower than in the baseline model in the next column. The results suggest that λ is positively related to the underlying value of γ. This does not hold for the ζ estimate. Crucially, in neither specification, a substantial change in γ leads to extreme variations in the

Coefficient	No Top Coding	High γ	Low γ
λ	2.497	4.241	2.46
	(0.025)***	(0.107)***	(0.076)***
ζ	0.048	-0.595	-0.36
	(0.001)***	(0.113)***	(0.083)***
τ	-0.115	0.096	0.066
	(0.002)***	(0.026)***	(0.036)
Ψ	0.156	0.108	0.183
γ	750k	1000k	500k

Note:
* p<0.05; ** p<0.01; *** p<0.001. Survey weights and multiple imputations taken into account. Observations pooled across waves (2002, 2007, 2012, 2017). Each specification controls for debt and the personal wealth share. Standard errors in parentheses. Source: SOEP v.35, own calculations.

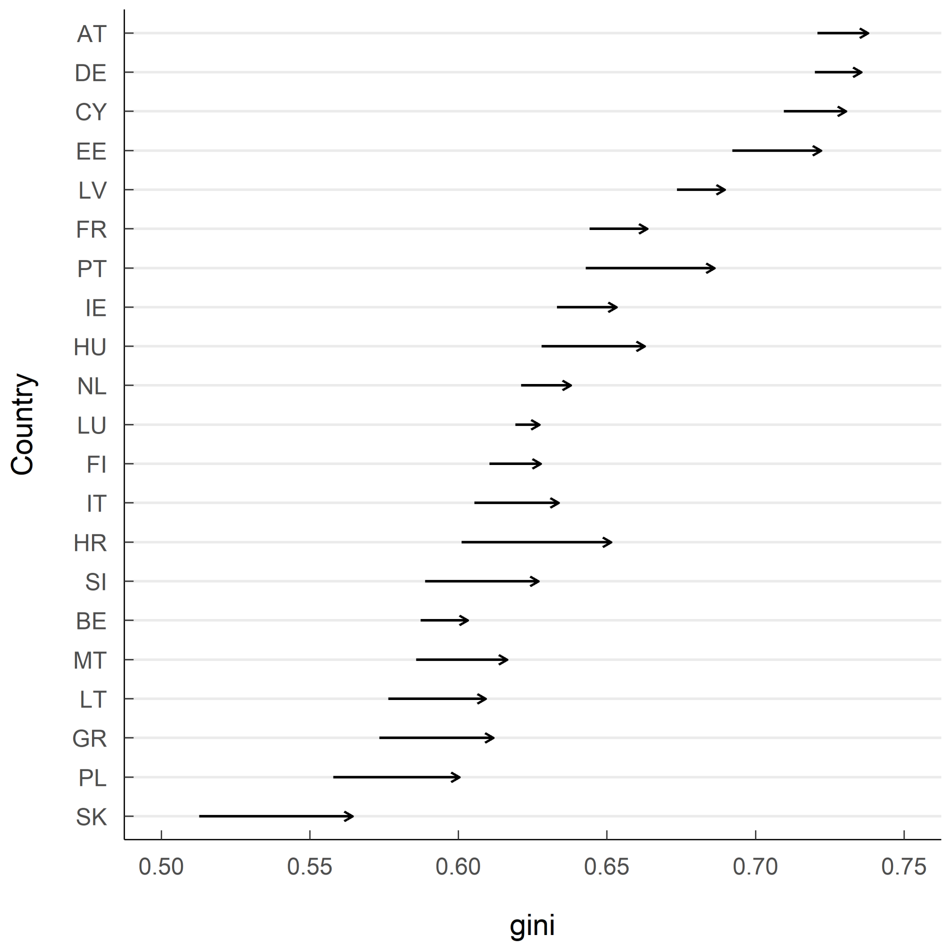
TABLE A5. Robustness Analysis: Further Results

τ estimate. The latter remains robustly close to zero for reasonable values of γ. Even so, changing γ is reflected in the resulting value of Ψ. High values for γ result in a lower value for Ψ.

Appendix F. Cross-Country Comparisons and Returns to Scale

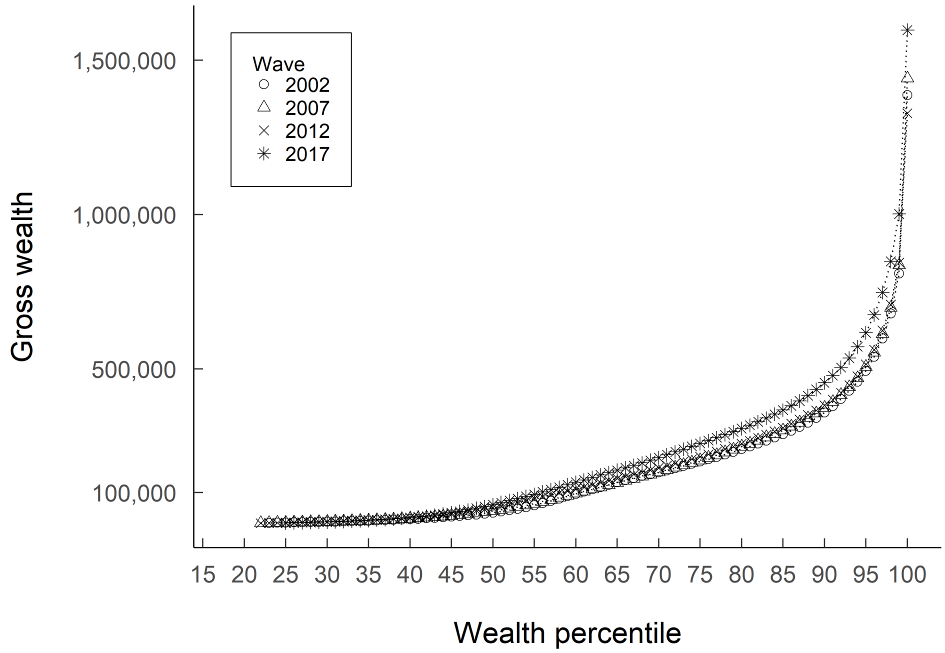
This section explores the implications of adjusting for household size for comparative cross-national wealth research, drawing on data of the HFCS. The HFCS is a dataset, originating from a research initiative conducted by the European Central Bank (ECB). It provides information about the the financial wellbeing of households within the Eurozone. Modelled after the Survey of Consumer Finances (SCF), the HFCS covers household balance sheets, income and employment characteristics, demographics, and a set of behavioural variables (including economic expectations, for example). It comes as a multiply imputed dataset with five implicates and complex survey weights. The data collection for the HFCS takes place in roughly triennial intervals, starting in 2010. For this paper, I use the third wave. Fieldwork for the third wave happened between 2016 and 2018 across the participating countries. The ECB European Central Bank (2020) provides detailed methodological reports.

In order to arrive at results comparable to those of the SOEP, I harmonise definitions. The underlying wealth concept in Figure A8 is gross wealth. Moreover, I deduct the value of vehicles from the gross-wealth measure. Results for the Gini coefficient are reported. Croatia and Slovakia see the most substantial relative increases in the Palma ratio and the Gini coefficient respectively. The Palma ratio increase in the first is approximately one third, and the Gini increase in the latter is approximately ten percent.



Impact of using the household size adjustment for wealth across countries. Across countries, the figure applies $\tau = 0.03$ and $\Psi = 0.13$. Source: ECB 2017, own calculations.

FIGURE A3. Comparative Effect of Scale Effects Adjustment



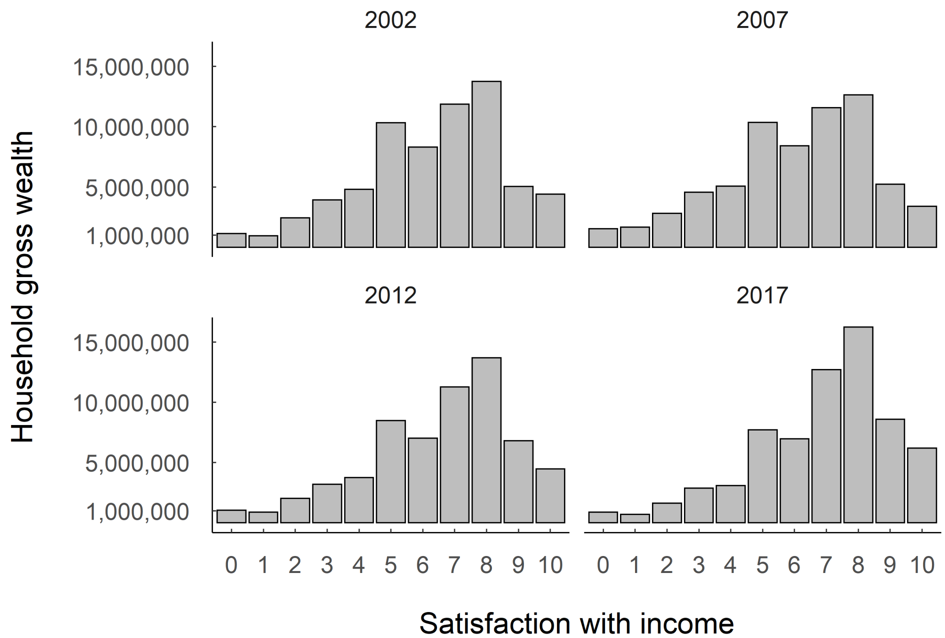
Graph displays average wealth for each percentile of the wealth distribution. No data can be reported for percentiles below 20 due to zero gross wealth observations and the smoothing method (rolling mean). Survey weights and multiple imputations are taken into account. Source: SOEP v.35 (Waves: 2002, 2007, 2012, 2017), own calculations.

FIGURE A4. Average Gross Wealth by Decile of the Gross Wealth Distribution

Appendix G. Further Descriptive Statistics

This section provides additional descriptive statistics, supplementing Table 2 and Figure 1. First, Figure A4 illustrates mean gross wealth by percentile of the distribution of gross wealth. Each line represents one wave of the SOEP. Approximately 20% of the population do not own wealth. Therefore, the graph leaves out the lowest quintile of the population in terms of net wealth.

Figure A5 summarises the distribution of the dependent variable. Before I collapse income satisfaction into a binary variable, it ranges from 1 to 10. There is also a number of individuals who do not respond to the question on income satisfaction. For the analysis, I drop these observations from the sample. In all waves of the SOEP, most respondents rate their income satisfaction at eight out of ten. The second largest group reports seven out of ten. The distribution of



Income satisfaction responses by survey wave. Source: SOEP v.35 (Waves: 2002, 2007, 2012, 2017), own calculations.

FIGURE A5. Distribution of Income Satisfaction

satisfaction is slightly skewed to the left. A sharp drop exists between four and five, where a substantial majority rates satisfaction above at five and above.

Appendix H. Results for Net Wealth

This section applies the parameters for net wealth to household net wealth outcomes. I take parameter estimates from the final column of Table 4. Figure A6 illustrates the share of net wealth held for consumption as a share of total household net wealth. Crucially, consumption wealth cannot be negative (Equation 4). Compared to the results for net wealth, wealth-in-utility savings gain relevance already around the fifth decile of the net wealth distribution. This shift is a result of the lower Ψ, falling by more than 0.1 units. Consequently, the effects of the household size adjustment are also concentrated in the lower sections of the wealth distribution. Figure A7 illustrates that it is primarily the first to third quintile of the wealth distribution that is affected by the adjustment.

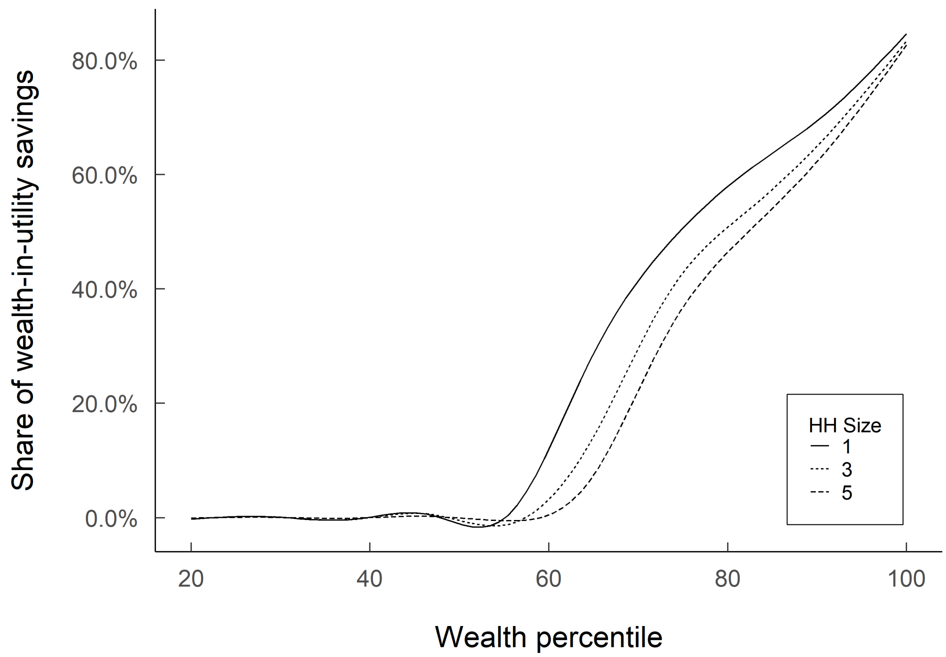


FIGURE A6. Share of Wealth-in-Utility Net Wealth by Percentiles

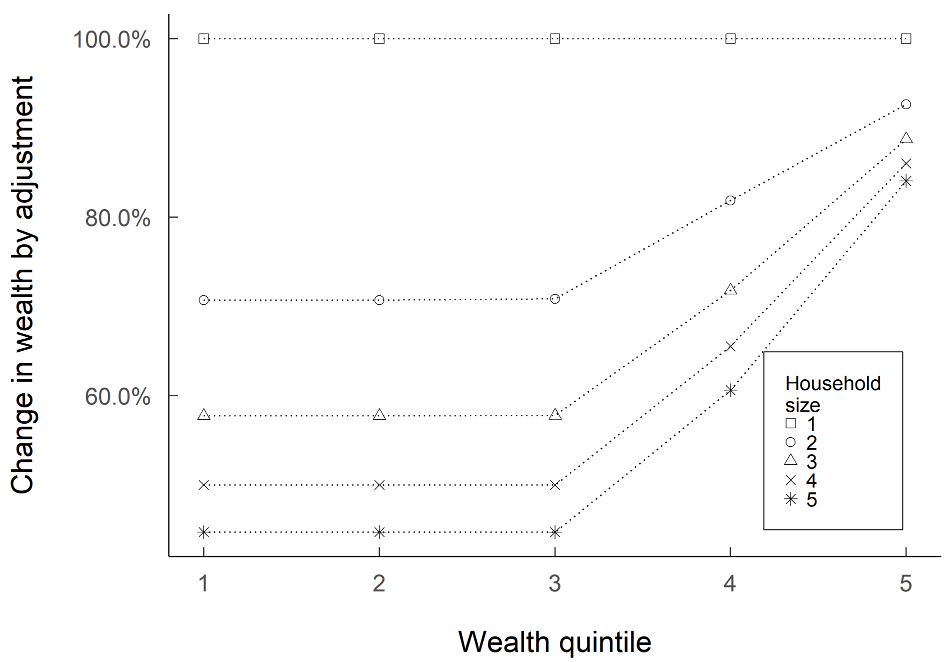


FIGURE A7. Share of Wealth-in-Utility Net Wealth by Percentiles

	Gini		Palma	
Country	Unadjusted	Adjusted	Unadjusted	Adjusted
AT	0.72	0.74	40.66	47.62
BE	0.59	0.60	6.95	7.87
CY	0.71	0.73	17.22	22.25
EE	0.69	0.72	14.93	17.52
FI	0.61	0.63	10.84	12.65
FR	0.64	0.66	16.87	20.47
GR	0.57	0.61	6.54	8.27
HR	0.60	0.65	6.60	8.96
HU	0.63	0.66	7.70	9.45
IE	0.63	0.65	10.57	13.17
IT	0.61	0.63	9.33	12.26
LT	0.58	0.61	4.95	5.91
LU	0.62	0.63	8.58	9.25
LV	0.67	0.69	15.78	16.91
MT	0.59	0.62	5.58	6.98
NL	0.62	0.64	15.78	18.27
PL	0.56	0.60	5.05	6.35
PT	0.64	0.69	9.07	12.22
SI	0.59	0.63	6.47	8.20
SK	0.51	0.56	3.57	4.71

Note:
Data from HFCS 3rd wave 2017. $\tau = 0$, $\Psi = 0.15$

TABLE A6. Cross-National Evidence

	Gini		Palma	
	unadjusted	adjusted	unadjusted	adjusted
2002	0.76	0.78	-91.09	-184.50
2007	0.77	0.78	-118.53	-220.18
2012	0.75	0.77	-61.79	-100.13
2017	0.74	0.75	-205.89	-527.10

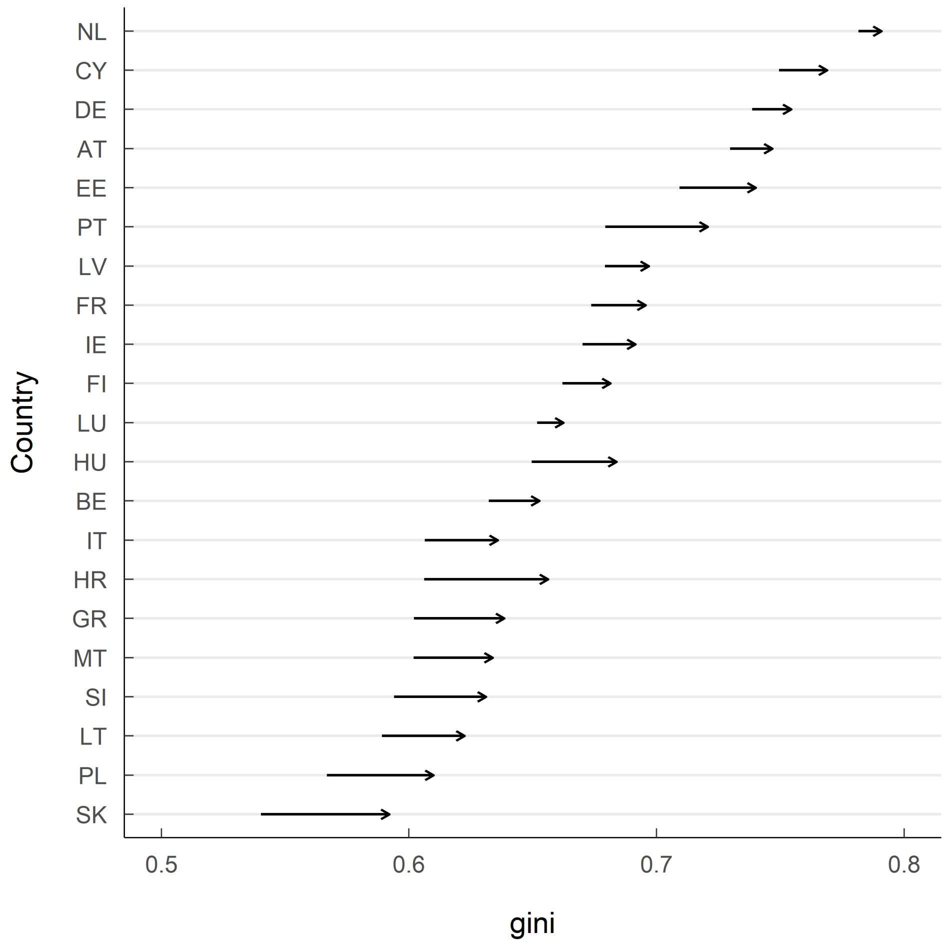
Note:
Source: SOEP v.35 (Waves: 2002, 2007, 2012, 2017), own calculations. $\tau = 0.19$, $\Psi = 0.11$

TABLE A7. Scale Effects and Inequality Net Wealth

	2002	2007	2012	2017
Household wealth: $w_{t,k}$	-91.09	-118.53	-61.79	-205.89
Wealth scale: $\mathcal{W}_{t,k}$	-184.50	-220.18	-100.13	-527.10
Square root scale: $w_{t,k}/h^{0.5} = w_{t,k}/\sqrt{h}$	-138.19	-169.40	-77.51	-411.55
OECD Scale	-146.54	-177.29	-82.06	-456.22

Note:
Source: SOEP v.35 (Waves: 2002, 2007, 2012, 2017), own calculations. $\tau = 0.19$, $\Psi = 0.11$

TABLE A8. Household Size Adjustment and Inequality: Palma Ratios Net Wealth



Impact of using the household size adjustment for wealth across countries. Across countries, the figure applies $\tau = 0.19$ and $\Psi = 0.11$. Source: ECB 2017, own calculations.

FIGURE A8. Comparative Effect of Scale Effects Adjustment - Net Wealth

	Gini		Palma	
Country	Unadjusted	Adjusted	Unadjusted	Adjusted
AT	0.73	0.75	42.91	47.88
BE	0.63	0.65	10.98	14.00
CY	0.75	0.77	37.65	54.26
EE	0.71	0.74	17.61	21.21
FI	0.66	0.68	23.33	29.83
FR	0.67	0.70	22.77	29.57
GR	0.60	0.64	9.17	11.70
HR	0.61	0.66	6.92	9.40
HU	0.65	0.68	9.43	11.69
IE	0.67	0.69	17.45	24.45
IT	0.61	0.64	9.33	12.38
LT	0.59	0.62	5.45	6.53
LU	0.65	0.66	12.25	14.12
LV	0.68	0.70	16.75	18.67
MT	0.60	0.63	6.38	8.22
NL	0.78	0.79	-26.84	-40.56
PL	0.57	0.61	5.46	6.86
PT	0.68	0.72	12.91	17.75
SI	0.59	0.63	6.88	8.67
SK	0.54	0.59	4.36	5.82

Note:
Net wealth including vehicles. Source: SOEP v.35 (Waves: 2002, 2007, 2012, 2017), own calculations. τ = 0.19, Ψ =0.11

TABLE A9. Cross-National Evidence - Net Wealth