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Mannheim Research Institute for the Economics of Aging

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The Saving Behavior of German Families: Heterogeneity in the Effect of Children on Annual Saving, Saving Motives, and the Regularity of Saving

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IMPRESSUM

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Abstract:

This study investigates education, income and age driven heterogeneity in the effect of children in and outside the household on annual saving, the importance of saving motives, and the regularity of saving, using the 2005-2007 waves of the German SAVE dataset. Children are found to have a negative effect on the level and the regularity of saving, and they appear to intensify the competition among saving motives, shifting the relative importance towards saving for home acquisition, debt reduction, children's education/support, bequest, and taking advantage of state subsidies at the expense of saving for large purchases, travel, unforeseen events, and old-age provision. When children leave the household, their influence gets usually weaker, but shows more persistence in high education households, at least with respect to the level and the regularity of saving. This is suggested to be a consequence of intergenerational educational immobility and the resulting tendency of highly educated parents to invest more in their children's human capital. Unfortunately, there is less evidence for educational differences in the effect of children on saving motives—in particular with respect to the motives children's education/support and bequest—that would reinforce this hypothesis. Household income and, to a lesser extent, the age of the household head appear to alleviate the effect that children have on saving behavior. Instrumenting fertility by exogenous variation created by peer group effects does not indicate that the pattern outlined above is driven by endogenous fertility.

When the results are used to adjust life cycle consumption profiles, it is concluded that accounting for the number of children significantly reduces the 'hump shape' in consumption and can thus contribute to the explanation of the consumption/income parallel, in particular after the first third of the life cycle.

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1 Introduction and Motivation

Micro data reveals that households differ widely in their saving behavior (see, e.g., Browning & Lusardi (1996, pp. 1797, 1848); Alessie et al. (1997, pp. 21-31)). This observable heterogeneity concerns not only the decision how much to save, but also the motives out of which households save, the fact whether or not they save for a specific saving goal, the extent to which they save on a regular basis, and the kinds of assets they invest in. Thus, the saving decision appears to be quite complex. It gets even more intricate if it is assumed that household saving is not only a means to shift consumption between periods, but that it could also be stimulated by the social recognition that might stem from wealth (Corneo and Jeanne (2001a, b)) or even by the sheer pleasure of accumulating resources. This would imply that savings may create utility not only when they are transformed into consumption, but also at the time when they are accumulated.

Overall, the complexity of the saving decision and the resulting heterogeneity in household saving behavior is still not very well understood and subject to many open questions (Browning & Lusardi (1996, pp. 1849-1850)). One of these questions is how a household's fertility affects its saving behavior and how this effect interacts with other household characteristics. This study wants to contribute to the exploration of this issue by investigating heterogeneity in the effect of children on household saving behavior. The major contribution to the existing literature is considered to be threefold. First, to capture the complexity of saving behavior, three dimensions are considered and the results set into context. Besides the amount

of annual saving, these dimensions comprise the different motives out of which households save (saving motives) as well as the regularity with which households set aside money (regularity of saving). Second, I distinguish between the effects of children living in their parents' household and of those living outside the household as a proxy for the children's age and needs. Finally, these effects are allowed to vary by the parents' educational level, income, and age—with a focus on education.

To shed light on this issue is of considerable interest for several reasons. The first constitutes an advancement of economic theory, in particular the life cycle hypothesis, whose theoretical predictions have been challenged by empirical evidence, as will be outlined in more detail in the next section. Understanding the relationship between fertility and saving behavior and extending the model by incorporating important household characteristics—in particular household composition, education, and the interaction of the two—may help to reconcile theoretical predictions and empirical observations.

Second, while understanding the effects of changes in household characteristics on saving behavior as such is deemed interesting from an economist's point of view, it might also yield helpful implications for policy makers. By revealing which types of households save how much and out of which reasons as well as how different household types react to changes in their economic circumstances, such understanding can help not only to assess the interaction of policy reforms and household private saving (Schunk (2007, p. 2)) but also to develop target oriented policy tools to alter the saving

behavior of specific household types, e.g., to stimulate or repress their saving. The economic desirability of such interventions hinges on the assumption that a household's saving decision is either not completely rational and/or incorporates social externalities (Harris et al. (2002, p. 207)). For instance, in the presence of a social security system, a more even distribution of wealth can lessen the burden on social security since private savings instead of welfare payments could serve as a buffer against unforeseen events. In this context, my analysis may help to identify which household types are limited in their ability or willingness to save and for which reasons.

In addition to the distribution of saving between households, policy makers may be concerned about dynamic aspects of saving, especially with respect to the foreseeable demographic transition and aging population in many Western economies. While some effort is made to encourage childbearing in order to counteract the demographic transition (e.g., via the newly introduced 'Elterngeld' in Germany), a rise in the ratio of retirees to workers appears to be inevitable. The resulting financial burden on tomorrow's diminishing workforce could be alleviated by an increase in private savings today that lowers the dependence on public pension schemes tomorrow. But if households are expected both to raise more children and to accumulate more savings to provide for their retirement, it is crucial to understand the relationship between households' fertility and saving behavior. Do households with children neglect saving for other purposes, such as their old-age provision? Do children reduce the overall level of household saving or the regularity, with which households save? An analysis of the effect of children on saving motives as well as on the level and the regularity of saving can yield

some answers to these questions. In particular, the investigation of heterogeneity among households can help to design policies that specifically assist those households for which a possible tradeoff between raising children and accumulating savings is most severe—without producing large windfall gains. If, for instance, households who give birth to children at an early age face more problems to combine raising children and saving than older ones, transfer payments could be differentiated according to the age of the household head. Similarly, young children may deter saving more or less than older ones, and a possibility to account for that would be a differentiation of transfer payments according to the children's age.

Third, and last, investigating saving behavior at the household level provides a basis for analyses of aggregate saving. A major advantage of micro data over aggregate data is the possibility to assess the effect of household characteristics and their interactions on saving (Attanasio & Weber (1995, p. 1122)). Of special interest is the effect of variables whose likely future development can be predicted by extrapolating ongoing trends, such as the number of children per family (decreasing) and households' educational level (increasing). An empirical evaluation of these effects might help to predict future aggregate saving, which is crucial for economic growth.

To summarize, assessing heterogeneity in the effect of children on household saving behavior can be considered as a significant contribution to the literature. In fact, Browning and Crossley (2001, p. 20) note that in the context of consumption and saving behavior, "the most important issue may be the need to allow for heterogeneity."

Such a detailed micro analysis regarding the effect of children on saving behavior has not yet been provided for Germany.

The remainder of this study is structured as follows. Section 2 outlines the significance of fertility for the theory of consumption and saving (2.1). On the basis of theoretical considerations (2.2), and former empirical evidence (2.3), hypotheses on the effect of children on saving behavior are formulated (2.4). Section 3 describes the data (3.1), especially the construction of key variables (3.2), as well as certain data limitations (3.3), which result in sample restrictions (3.4). This section concludes with a description of sample characteristics (3.5). Section 4 provides a descriptive analysis of fertility behavior (4.1), the evolution of key variables over the life cycle (4.2), and the relationship between fertility and the three dimensions of saving behavior examined (4.3). Section 5 specifies econometric models (5.1) and discusses some econometric issues (5.2). Section 6 presents the estimation results of these models for annual saving (6.1), saving motives (6.2), and the regularity of saving (6.3). This section also illustrates how instrumenting fertility affects the results (6.4), and uses them to adjust life cycle profiles of consumption and saving for the number of children (6.5). Finally, section 7 concludes and outlines future research perspectives.

2 Theory and Discussion of the Existing Literature

This section further motivates the investigation of the effect of children on saving behavior as an important component of the explanation of one of the major challenges to the life cycle hypothesis (2.1). After discussing possible effects from a theoretical perspective (2.2), former empirical evidence is presented (2.3). On this basis, the section concludes with specific hypotheses on the effect of children on annual saving, saving motives, and the regularity of saving (2.4).

2.1 Theoretical Background

In his *General Theory*, Keynes (1936, p. 57) assumes that "*net income* is what we suppose the ordinary man to reckon his available income to be when he is deciding how much to spend on current consumption." This has widely been interpreted as suggesting that current net income determines current consumption although even Keynes (1936, p. 95) admits that "Changes in expectations of the relation between the present and the future level of income […] may affect considerably a particular individual's propensity to consume." However, he concludes that "there is, as a rule, too much uncertainty for it to exert much influence" (Keynes (1936, p. 95)).

In contrast to this view, the Life Cycle/Permanent Income Hypothesis (LCPIH), whose general ideas can be attributed mainly to Fisher (1930) and Modigliani and Brumberg (1954) for a finite horizon and Ramsey (1928) and Friedman (1957) for an infinite horizon, postulates that the decision on current consumption is based on permanent income rather than current income, i.e., on the total lifetime re-

sources available to the agent. The basic version of the model assumes agents with an intertemporally additive, quadratic utility function and rational expectations, who face perfect capital markets and perfect certainty—alternatively to the latter, they may behave as expected utility maximizers (Browning & Lusardi (1996, pp. 1800-1801)). In this model, optimal behavior involves a constant (discounted) marginal utility of consumption over the life cycle. Assuming that the marginal utility is decreasing in consumption but independent of other factors that change over the life cycle, this means that agents 'smooth consumption' in the sense that consumption opportunities out of transitory income shocks are spread equally over the whole life cycle. In other words, the shape of the consumption path over an individual's lifetime is expected to be independent of the shape of the expected income path and should only depend on the ratio of the discount rate to the interest rate (Deaton (1992, p. 26), Browning & Lusardi (1996, p. 1800)). If net income exhibits a predictable inverted U-shape, also called 'hump shape', over the life cycle as it is typically observed, an optimal and thus flat or, accounting for differences between the interest rate and the discount rate, trending consumption profile would imply that agents should borrow prior to labor market entry, repay these debts and accumulate savings while they are working, and dissave during retirement (Browning & Crossley (2001, p. 14)).

This testable prediction has been challenged by a whole lot of empirical evidence. Thurow (1969, pp. 324-325) was among the first to observe that both income and consumption follow very similar hump shapes over the life cycle, peaking roughly at the same age. Neither in their youth nor during retirement, agents actually dissave.

The observation that consumption seems to track current income has been supported by a number of studies (e.g., Browning et al. (1985, pp. 528-531), Carroll & Summers (1991, pp. 318-327), Attanasio & Weber (1995, S. 1127-1128), Attanasio & Browning (1995, p. 1121), Attanasio et al. (1999, pp. 23-24), Browning & Crossley (2001, pp. 11-12), Browning & Ejrnaes (2002, pp. 12-13), Freyland (2005b, p. 26)). Carroll & Summers (1991, pp. 315-318) call this puzzle the "consumption/income parallel" and interpret it as evidence against long-term consumption smoothing. Other authors refer to it as the "'excess sensitivity' of consumption growth to expected income growth" (e.g., Attanasio & Browning (1995, p. 1118)).

A number of possible explanations of this finding have been elaborated, most of which seek to reconcile the theory with the empirical evidence by relaxing some of the basic and somewhat restrictive assumptions.

The first explanation interprets the correlation between current income and current consumption as a *causal* relationship, i.e., agents are assumed to have a short planning horizon and rather passively follow a rule of thumb and consume—or save, respectively—a fixed fraction of current income. This interpretation is very close to the Keynesian view outlined above, that uncertainty is too large for future income expectations to have much influence. Still, as Browning & Lusardi (1996, p. 1801) in reference to Deaton (1992, pp. 110-112) note, the LCPIH could be formally correct, if income was a non-stationary process. Under this condition, current consumption might track current income even if *anticipated* income changes are

uncorrelated with changes in consumption. Indeed, if income was a random walk, any income changes would come at surprise and current income would be the 'best guess' about permanent income. As a result, consumption smoothing would *predict* consumption to track current income. However, since most agents face a *predictable* income growth at the beginning of their life cycle, this explanation is not satisfying and in fact, though it might save the LCPIH from being formally rejected, it would render it rather useless for behavioral predictions.

The second explanation goes back to Thurow (1969, pp. 325-326), who suggests that while agents favor a flat consumption profile, liquidity constraints may prevent them from realizing this optimal behavior. In other words, the assumption of perfect capital markets is unlikely to hold. He estimates optimal consumption of a specific age group by the income level at which the average member of this group has zero saving, and compares the resulting 'optimal profile' with the actual life cycle profile of consumption means (pp. 326-329). The results suggest that especially young agents consume less than they would like to, probably because of borrowing constraints. However, while this might be a reason why agents do not run into debts early in life, it fails to explain the peak in consumption around age 45 and significant saving rates in retirement.

Nagatani (1972) questions Thurow's method to derive an optimal consumption profile and proposes a third explanation. Given that future income is uncertain, he assumes that agents behave 'prudent' in the sense that they treat future income expectations cautiously and exhibit a lower propensity to consume from (uncertain) future in-

come than from (certain) current income, which implicitly builds upon the notion of precautionary savings introduced by Leland (1968, p. 468-470).[1] Under this assumption, the realized income profile matters: As agents age, they accumulate more information about their actual income profile and revise their consumption plans without changing the general behavioral rule (Nagatani (1972, p. 348)). The revised consumption profile resembles the hump shape in the income profile (p. 351). This introduction of a 'precautionary saving motive' into the LCPIH model has received much attention in the literature (see, e.g., Carroll (1997) and the references therein). However, as with liquidity constraints, precautionary saving may explain the presence of positive saving early in life, but fails to give convincing reasons for consumption to track income later in life.

A forth alternative explanation is suggested by Heckman (1974, p. 189). Assuming a (predictable) hump-shaped wage rate profile over the working life, he argues that if individual labor supply and consumption expenditures are complements (e.g., due to work related costs), a positive response of labor supply to the wage rate would cause labor supply, income, and consumption to exhibit similar hump shapes—even with perfect certainty and without liquidity constraints. While this would indeed explain the similar shapes of income and consumption over the *whole* life cycle, it critically hinges on the assumption that labor supply and consumption as well as labor supply and wages are both Frisch complements (i.e., complements *within* a period). Especially the first part of the assumption is questionable since consumption opportunities (holidays, sports, or

[1] Leland shows that a utility function incorporates a precautionary saving motive if the third derivative with respect to consumption is positive.

cultural entertainment) are rather negatively correlated with labor supply, and empirical evidence suggests that consumption and labor supply are substitutes rather than complements (Browning et al. (1985, p. 535)).

It is worth noting that most explanations discussed so far interpret the LCPIH's optimality condition of equal (discounted) marginal utility to predict that agents should prefer a flat or, accounting for differences between the interest rate and the discount rate, trending consumption path to a hump-shaped one if there is no uncertainty. But this may be a misconception if the marginal utility of consumption—at a given level of consumption—is allowed to vary over the life cycle. Then, as Browning & Crossley (2001, p. 4) note, keeping marginal utility constant "may involve quite variable expenditures."

Tobin (1967) was the first to suggest that the marginal utility of consumption is likely to be affected by the evolution of household characteristics over the life cycle. Hence, the incorporation of household characteristics might help to explain the hump shape in consumption if their life cycle profiles tend to increase marginal utility of consumption early in life and to decrease it in old age. Besides the state of health and the labor market status of household members, household composition, in particular the number of children living in a household, is considered as an important factor that might induce such a life cycle pattern of marginal utility. As suggested by Tobin (1967, pp. 249-251), Browning et al. (1985, pp. 529-531) show that the life cycle profile of children living in a household indeed displays a hump shape in U.K. data. Attanasio et al. (1999, pp. 23-24) reproduce this finding with U.S. data, and At-

tanasio & Weber (1995, p. 1127) find a similar pattern for family size. Given that the life cycle profile of children is hump-shaped and assuming that children increase the marginal utility of consumption, keeping marginal utility constant is argued to result in an optimal consumption profile that is hump-shaped as well.

While it is now widely accepted that household characteristics, in particular household size and composition, do matter (Browning & Crossley (2001, p. 14)), the question, how much household size can contribute to the explanation of the consumption/income parallel, has been subject to considerable debate. Gourinchas & Parker (2002) as well as Attanasio et al. (1999) come to the conclusion that though accounting for family composition can reduce the excess sensitivity of consumption to current income, a precautionary motive is needed to predict an optimal hump-shaped consumption profile that is close to the observed pattern. Other articles that are discussed in the following suggest that accounting for family size and composition can completely remove the excess sensitivity of consumption.

Attanasio & Browning (1995) find the familiar hump shapes of income and consumption, but when they regress year-cohort means on the number of children and adults along with a dummy for children and the log of family size and plot the residuals against age, the profile of consumption adjusted for household composition is remarkably flat (pp. 1121-1122). The household scales of consumption implied by this basic regression are quite plausible: A two adult, one child household consumes 24% more than a two adult household, the corresponding number for a two adult, two child household

being 58%. They conclude that "controlling in a simple way for changes in average family composition over the life cycle eliminates completely the life cycle correlation of income and consumption" (p. 1122). This conclusion is supported by the finding that the effect of income growth on consumption growth vanishes in their regression of an Euler equation once they control for characteristics such as household composition (pp. 1128-1130).

Similar in spirit, Browning & Ejrnaes (2002) estimate a "child response function" that relates consumption expenditures on children to the number of children, accounting for economies of scale and the children's age (pp. 14-20). Assuming that fertility is completed at the wife's age of 37, they also estimate completed fertility for each household (pp. 21-23). Combining the two components, they adjust consumption profiles in low and high education households for changes in household composition and find that adjusted consumption does not track income. Indeed, the hump shape is almost completely removed (p. 23-25). Thus, they conclude that taking "proper account of the numbers and age of children, family composition can 'explain' completely the hump-shape in consumption" (p. 26).

Finally, Attanasio & Weber (1995) show that besides not properly accounting for household composition, earlier rejections of the LCPIH concerning the overidentifying restrictions of the model were caused by the use of aggregate time-series data (pp. 1135-1137) and non-separability between food, which is often taken as a proxy for non-durable consumption, and other non-durables (pp. 1141-1143).

While it is not an issue of this study, whether or not household composition completely explains the observed patterns of consumption and saving, the discussion suggests that children are an important factor in explaining consumption and saving behavior. This is taken as motivation to shed more light on the effect of children on different aspects of saving behavior and how it varies with parents' educational level, income, and age as well as the children's household affiliation (i.e., whether or not they live in their parents' household).

2.2 Theoretical Analysis of the Effect of Children on Saving Behavior

Incorporating all the various channels on which children and other household characteristics may affect saving into a (testable) life cycle model is a very challenging task. Since both determinants of saving—consumption and income—are affected by household decisions, either directly (consumption) or via labor supply (income), one would have to model how decisions of both kinds depend on the evolution of household characteristics over the life cycle—accounting for the fact that some characteristics like children might be endogenous to saving behavior[2]. To the know-ledge of the author, this has not yet been mastered thoroughly and is well beyond the scope of this study. Still, to give some taste for the complexity of the matter, this subsection proceeds as follows. First, a rather simple life cycle model of income and consumption—and hence saving—is outlined that does not model the impact of children explicitly. Then, the various channels on which children may have an impact on sav-

[2] The problem of endogenous fertility behavior will be addressed in more detail in sections 5.2.2 and 6.4.

ing behavior are discussed on the basis of intuitive arguments and some hints are given, which components of the formal optimization problem could be affected. I am well aware that this kind of theoretical analysis is somewhat limited and unsatisfying, but providing at least some theoretical discussion and reference points to a formal model is nevertheless considered to yield valuable insights.

A Formal Model of Life Cycle Saving Without Children

Assume that a household with rational expectations maximizes an intertemporally additive and separable utility function and faces perfect capital markets as well as perfect certainty. Let the household's maximization problem at a period t = 0 be given by[3]

$$(1) \quad \max_{\{C_t^{CS}, C_t^{CC}, L_t^M, L_t^F\}_{t=0}^{T}} \sum_{t=0}^{T} \left(\frac{1}{1+\rho}\right)^t U(C_t^{CS}, C_t^{CC}, L^* - L_t^M, L^* - L_t^F)$$

s.t.

$$\sum_{t=0}^{T} (1+r)^{-t} (C_t^{CS} + C_t^{CC}) \leq A_0 + \sum_{t=0}^{T} (1+r)^{-t} (w_t^M L_t^M + w_t^F L_t^F + Y_t)$$

$$0 \leq L_t^M \leq L^*, \; 0 \leq L_t^F \leq L^*,$$

where C_t^{CS} denotes consumption of goods that are 'substitutes for children' (e.g., expensive vacations, restaurant meals, cultural entertainment, and tobacco), C_t^{CC} consumption of goods that are 'complements to children' (e.g., housing and related durables like furniture or home appliances, children's education[4], clothing and food),

[3] This model follows loosely those of Börsch-Supan et al. (2006, pp. 633-634) and MaCurdy (1981, pp. 1060-1061).

[4] Strictly speaking, expenditures on children's education are investments in human capital and could be regarded as saving. However, when data is collected, saving is usually defined as *monetary* saving, and therefore, educational expenditures are surveyed as part of consumption.

L_t^M (L_t^F) is male (female) labor supply, L^* the period time budget (thus $L^* - L_t^M$ ($L^* - L_t^F$) is male (female) leisure), A_0 initial wealth, w_t^M (w_t^F) the male (female) wage rate, and Y_t non-labor income such as transfers; ρ is the discount rate and r the interest rate. In addition, assume strictly positive first derivatives of U with respect to all four arguments, and strictly negative second derivatives. Apart from the budget constraint, an inner solution of this problem is characterized by the following set of first order conditions:

$$(2) \quad U_{C_t^{good}}(...) = \lambda\left(\frac{1+\rho}{1+r}\right)^t \qquad \forall t = 0,...,T;\ good = CS, CC$$

$$(3) \quad U_{L^*-L_t^{gen}}(...) = w_t^{gen}\lambda\left(\frac{1+\rho}{1+r}\right)^t \quad \forall t = 0,...,T;\ gen = m, f,$$

where subscripts to U denote first derivatives and λ is the shadow prize of the present value of lifetime wealth. The corresponding Euler equations for two subsequent periods t and t+1 are

$$(4) \quad \frac{U_{C_{t+1}^{good}}(...)}{U_{C_t^{good}}(...)} = \frac{1+\rho}{1+r} \qquad good = CS, CC$$

$$(5) \quad \frac{U_{L^*-L_{t+1}^{gen}}(...)}{U_{L^*-L_t^{gen}}(...)} = \frac{w_{t+1}^{gen}}{w_t^{gen}}\frac{1+\rho}{1+r} \qquad gen = m, f.$$

If, for the sake of exposition, we impose $r = \rho$ and both L_t^M and L_t^F to be exogenously assigned to a household, the Euler equations imply a constant marginal utility of both kinds of consumption over the life cycle (and thus constant total consumption), which is the predic-

tion of the basic version of the LCPIH ($r > \rho$ $(r < \rho)$ would implement some upward (downward) trend in consumption).

If L_t^M and L_t^F are endogenously determined, the model can also illustrate explanation four of the consumption/income parallel (Heckman (1974)). Assuming that labor supply and wages are Frisch complements, an increase (decrease) in the wage rate causes an increase (decrease) in labor supply [or a decrease (increase) in leisure] to satisfy equation (5). If in addition, consumption and labor supply are Frisch complements as well, consumption needs to increase (decrease) for equation (4) to hold (as already mentioned, this assumption is very questionable, in this setting particularly with respect to the consumption of children-complements).

Potential Impacts of Children on Saving Behavior

Now, let us turn to the channels on which children may have an impact on saving behavior. In reference to the common definition of saving as net income minus consumption, one can distinguish two main channels: Those that affect saving via consumption expenditures ($C_t^{CS} + C_t^{CC}$), henceforth referred to as *direct cost effects*, and those that affect saving via labor earnings ($w_t^M L_t^M + w_t^F L_t^F$) and non-labor earnings (Y_t), referred to as *opportunity cost effects*.

Let us first consider **direct cost effects**. Obviously, the children's needs have to be satisfied, which should ceteris paribus (c. p.) increase consumption expenditures (Kelley (1973, p. 408), Smith & Ward (1980, p. 244), Browning & Ejrnaes (2002, p. 5)). This is essentially the channel that the literature on the 'household characteristics explanation' of the consumption/income parallel mainly refers

to when suggesting that children increase the marginal utility of consumption (e.g., Attanasio & Browning (1995)). In the model above, this could be incorporated by allowing the marginal utility of children-complements, $U_{C_t^{CC}}$, to depend positively on children. However, this does not necessarily imply that children increase *total* consumption since it is likely that children cause substitution effects on the consumption of other family members (Henderson (1949-50, p. 129), Eizenga (1961, p. 74), Kelley (1973, p. 408), Smith & Ward (1980, pp. 244-245), Browning & Ejrnaes (2002, p. 19)). In terms of the model, this would mean that the marginal utility of children-substitutes, $U_{C_t^{CS}}$, could depend negatively on children.

Thus, the *net* effect of children on total consumption expenditures is unclear. Abstracting from the model above, it is likely to depend on various other household characteristics that affect the children's needs on the one side and the household's ability and willingness to adjust its consumption portfolio on the other side. Among the former, the children's age is likely to be an important factor as it is commonly found that expenditures on children rise in their age (Espenshade (1974, p. 375), Attanasio & Browning (1995, p. 1120)). Among the latter, both income and the parent's age play an important role in determining the household's consumption portfolio before the arrival of children. The consumption portfolio is important since if it consists to a considerable fraction of substitutes for children, the ability to adjust household consumption is greater than if a household mainly spends its money on goods necessary for survival and complements to children (like housing and durables). The fraction of children-substitutes is expected to increase in household income (Kelley (1973, pp. 408-409)) and the parents' age, since

older parents are likely to have already acquired most durables that are necessary to set up a household and their consumption portfolio should thus have made the transition from being dominated by children-complements to being dominated by children-substitutes (Smith & Ward (1980, p. 245)).

In addition to income and age, cost effects of children may also depend on the parents' educational level. In particular, one can argue that parents with a high educational level spend more on their children. The main argument is that there is convincing evidence for educational immobility, i.e., children of parents with a higher educational level tend to achieve higher educational levels as well (see, e.g., Becker & Tomes (1986), Black et al. (2005a), and the references therein). This can be due to either pure selection or causation (Black et al. (2005a, pp. 437-439)). Pure selection means that educational immobility is a result of partial inheritance of genetic endowment, i.e., highly educated parents tend to have a higher innate ability which is passed on to their children, and this higher innate ability is the reason for the children's higher educational level. Causation means that instead of innate ability, parental education has a causal effect on the children's education. Such a causal effect may arise if either parental education increases the children's 'cultural endowment' or if higher education causes parents to have a stronger taste for the education of their offspring. If either genetic or cultural endowment is partially inherited and increases the children's return on education, it is actually rational to anticipate resulting differences in the return on education and parents with a higher educational level should invest more in their children's human capital than those with a lower educational level (Becker & Tomes (1986, pp. S5-S8)). The

latter may find it optimal to invest more in physical bequest instead. In any case, this suggests that children of highly educated parents are more likely to achieve a high educational level, and therefore, highly educated parents are likely to spend more on the education of their children but to save less for physical bequests.

Now, let us turn to **opportunity cost effects** via labor supply and earnings. On the one hand, it is likely that children increase the value of time spent at home and thus the opportunity cost of time spend at the labor market (Smith & Ward (1980, p. 244)). This may particularly apply to women, though this 'traditional' pattern is subject to change. This channel could be incorporated in the model by a positive effect of children on the marginal utility of leisure and would hint towards a negative effect of children on labor supply. On the other hand, if children increase consumption needs, the marginal utility of an extra euro of earnings and thus of time spent at the labor market might increase as well. This would hint towards a positive effect of children on labor supply. Which effect prevails for which household member is thus an empirical question. According to Angrist & Evans (1998, p. 450), numerous studies find fertility (or family size) and female labor supply to be negatively correlated. Instrumenting fertility with sibling sex composition and twinning, they show that while OLS estimates seem to be upward biased, also exogenous increases in the number of children significantly reduce female labor supply (p. 463). This effect is found to be particularly strong for women with a low educational level (p. 467). In contrast to that, male labor supply responds very little to changes in the number of children present in the household (p. 464), and the effect might be even positive.

Besides labor supply, children may affect another component of labor earnings, the wage rate, especially for women (w_t^F in the model above). Theoretically, an observed wage penalty for women with children—referred to as the 'family gap in pay'—might be due to either self selection into motherhood and employment (e.g., mothers prefer family friendly, but lower pay employment) or to causation, which may exist if children reduce the mother's accumulation of human capital via less education and/or working experience (Viitanen (2004, p. 3). Viitanen (2004, pp. 13-15)) investigates the effects of children on female wages in the U.K. and finds a raw wage differential of 40.5% between wages of women with and without children, that reduces to around 20% in an OLS regression and 10-13% (still significant) if one simultaneously corrects for endogeneity of labor force participation and fertility. Davies & Pierre (2005, pp. 477-478) estimate the gap for eleven European countries and find it to be in a similar range for Germany, around 12%. While this hints to a negative effect of children on family income, children may also affect household income positively via transfer payments to families (Y_t in the model above), such as 'Kindergeld' and the newly introduced 'Elterngeld' in Germany, or bonuses to unemployment benefits.

In addition to these two main channels, there are other potential channels, which to model would require imposing far more structure on the utility function itself. Therefore, the remainder of the discussion provides only intuitive arguments.

A third channel might operate through an effect of children on **households' motives and overall motivation to save**. Theoreti-

cally, one can think of a host of such effects. Children might increase a household's risk aversion and prudence and thus the importance of a precautionary motive. Especially young children might increase the demand for housing and strengthen the home acquisition motive, while they are likely to weaken the motive to save for expensive travels. As children get older, saving for their education may gain in importance, and even later in life, saving for the children's bequest might encourage household saving—whether out of altruistic reasons or as a part of an intergenerational convention (see, e.g., Villanueva (2005, pp. 512-515) for different models that incorporate a bequest motive). Also, children and old-age provision saving could be treated as substitutes, and thus children potentially reduce the importance of the old-age provision motive, although using "children as a vehicle for shifting consumption from one period to another" (Cigno & Rosati (1996, p. 1568)) seems to be more likely in less developed countries (also see Hammer (1986, pp. 107, 111) and Schultz (2007, p. 40)). We can conclude that children can change the overall motivation and willingness to save as well as the importance of different saving goals, which in turn may have an effect on the *level* of saving as well.

Finally, observed saving behavior does not only depend on what the household plans to do, but also whether it adheres to its plans. According to behavioral concepts, even households that are able and willing to save might fail to do so if they lack the required **willpower and self control** (Thaler & Shefrin (1981), Laibson (1997)). For instance, people might succumb to the temptation of high temporary consumption in the face of a positive transitory income shock. In this context, it is conceivable that children have an influ-

ence on a household's ability to exercise self control, which would be a forth channel on our list. Such a channel could be observable if households with children c. p. save more or less regularly than households without children assuming that households who save regularly exercise more self control.[5] Whether children alleviate or aggravate self-control problems may depend on household characteristics, in particular the level of education. For instance, by achieving a higher educational level, people may have learned to react to challenges that require them to withstand temptations, such as the self commitment to learn for exams, by exercising more self control. Such experience may help them to exercise more self control and to withstand consumption temptations in response to the challenge of bringing up children.

To summarize, children potentially affect household saving behavior on several channels, and the impact of these channels is likely to depend on various household characteristics, like the educational level, income, and age.

[5] I admit that this is disputable. For instance, the commitment to regular saving plans could also be a sign for a lack of self control, which households attempt to overcome by the commitment. Households that do not have a problem with self control might have no gain from such a commitment. From this perspective, households that do not save at all might have more severe problems with self control than households that regularly save a *fixed* amount, while in turn such a commitment might be a sign for less self control than reflected by saving regularly a *flexible* amount.

2.3 Empirical Evidence on the Effect of Children on Saving Behavior in the Literature

Given that there are a number of different, but often interrelated theoretical channels on which children may affect saving behavior and that one can find arguments for a particular channel to work in one direction or the other, what does former empirical evidence suggest about the effect of children on the saving dimensions investigated in this study, i.e., annual saving, saving motives, and the regularity of saving?

Saving Motives

Harris et al. (2002, pp. 208-210) provide an interesting descriptive analysis of the importance of saving motives for different age groups and households with and without children. They report that saving for durables and travel becomes less important over the life cycle, while saving for old-age provision and unforeseen events becomes more important. The presence of children is primarily associated with a gain in importance of saving for their education. DeVaney & Chien (2002, pp. 67-68) estimate the odds of children's education being the most important saving motive and find the number of children age 18 and below, a good state of health and full time work of the household head as well as a working spouse among the most important factors with a positive effect. Furthermore, Xiao & Noring (1994, pp. 34-35) conclude that children's education is more important for household heads that are male, married, highly educated, and younger than 45. In addition to a positive correlation between the number of children and the importance of saving for their education, Yilmazer (2002, pp. 77-79, 95) finds the number of

children to be positively related to saving for retirement, but negatively to saving for unforeseen events. DeVaney et al. (2007) choose a different approach and rank saving motives from physiological or basic needs over safety and security needs, societal needs, and luxury needs to self actualization. They conclude that having more family members makes it more likely to move up this hierarchy up to societal needs, but less likely to move from societal to higher needs (p. 184).

Annual Saving and the Regularity of Saving

The empirical evidence on the effect of children on saving is not clear-cut. There are relatively few studies that are explicitly dedicated to the estimation of this effect, and their results are sometimes hard to compare since they are for different countries and use different saving measures and specifications for the explanatory variables. Table 1 gives an overview.

Table 1: Overview: Effects of Children on Saving in the Literature

Reference	Dependent Variable	Country	Effect of Children
Espenshade (1974)	consumption expenditures	U.S.	1st child costs about twice as much as 2nd and 3rd child. Costs increase in children's age. Costs increase in income, but proportional costs decline.
Kelley (1972)	saving rate	U.S.	Effect on saving is non-existent for the 1st child, positive for the 2nd child, and negative thereafter.
Espenshade (1975)	saving level	U.S.	Children's age matters, not their number: Having young children reduces saving whereas having older children increases saving.
Smith & Ward (1980)	saving level	U.S.	Small children depress saving in young families but increase saving for couples married longer than 5 years. Older children have no significant influence on saving.
Yilmazer (2002)	saving level	U.S.	An additional child reduces saving for young household heads, but increases saving for old household heads.
Harris et al. (2002)	saving (ordinal)	Australia	Presence and no. of children reduce the prob. of saving.
Murata (2003)	assets/ perm. income	Japan	Children lower the asset to permanent income ratio.
Orbeta (2006)	saving level and rates	Philippines	Negative effect of children on saving levels and rates.
Freyland (2005b)	saving rate	Germany	Positive effect of children on saving rates in young households and for younger children, but negative effect in older households and for older children.
Schunk (2007)	saving rate	Germany	Insignificant effect of children.

Kelley (1972) estimates the effect of children on saving rates using an 1889 sample of 1,956 U.S. households employed in heavy industries. He allows each child in the birth order to affect saving rates differently and distinguishes between a direct effect (holding income constant) and an indirect effect (via income adjustments). Though not linear, the former is always found to be negative, the latter to be positive. The net effect is non-existent for the first child, positive for the second child and negative thereafter. According to Espenshade (1975, p. 124), these predictions are very sensitive to the treatment of insignificant coefficients. Using the 1960-1961 young family sample of the U.S. Consumer Expenditure Survey (CES), he concludes that not the number but the age of children affects annual net saving: Having young children reduces saving whereas having older children stimulates saving (pp. 124-125). He explains this finding with the anticipation of college expenditures. However, in my opinion, his specification of children's age—6 dummies for different age patterns—is somewhat crude and might very well confound the effects of children's age and number. In an earlier paper, he defines the cost of a child as the "difference in after tax money incomes required by n child and n-1 child families to maintain the same standard of living" (Espenshade (1974, p. 360)), using the proportion of after tax income spend on food as an index for the standard of living. His most important findings are the following: First, the first child costs about twice as much as the second and third child, which are roughly equally expensive; second, costs increase in the child's age; and third, while expenditures on children increase in income, the proportional costs (i.e., as a fraction of household income) decline (p. 375).

Smith & Ward (1980) provide a thorough investigation of the first two channels outlined in section 2.2 using a subsample of couples of the U.S. Panel Study of Consumer Durables and Installment Debt 1968-1970. They use the same set of variables to assess the effect of children under 18 on financial assets, durable assets, wife annual hours and income, and consumption with simple linear models. Their main finding is that small children depress saving—measured as the change in financial assets—in young families but increase saving for couples married longer than 5 years (pp. 252-253). This net effect is a result of the following impacts: Small children reduce both family consumption and income; the latter effect is due to a decline in the wife's labor supply, while the husband's labor supply rises. For young families, consumption declines less than income since their consumption portfolio consists to a large fraction of durables, i.e., children-complements, while the sign is reversed for older families, whose consumption portfolio has shifted towards children-substitues. Older children have no significant influence on the level of saving but change the composition of assets towards durables. Thus, they find some evidence for heterogeneity in the children effect over marriage duration and children's age.

More recent studies that are at least partly dedicated to the effect of children on saving(s) are those of Yilmazer (2002) for the U.S., Harris et al. (2002) for Australia, Murata (2003) for Japan, Orbeta (2006) for the Philippines, and Freyland (2005a, b) and Schunk (2007) for Germany.

Yilmazer (2002) examines the effects of children on portfolio shares, the interrelation between having children, income uncer-

tainty, and saving, and the effect of financing college education on saving[6]. With respect to portfolio choice, the number of children is found to have a significant positive effect both on the probability of owning a home as well as on the portfolio share of housing. This goes at the expense of other assets, especially retirement accounts (pp. 11-12). While higher income uncertainty does not affect saving systematically, it is negatively correlated with the probability of having children (p. 59-61). An additional child reduces saving for young household heads, but increases saving for old household heads (p. 62). This is partly explained by saving for college education, which rises in the age of the household head (pp. 4-5, 93).

Harris et al. (2002, p. 217) operate with a children dummy and the number of children in the same regression and find that "the presence of children has a detrimental effect on the probability of saving, and the more children in a household, the more difficulty a household has saving anything." Similar to that, Orbeta (2006, p. 2) reports a negative effect of children on both saving levels and rates, which is regressive in income, and Murata (2003, p. 33) finds that children lower the asset to permanent income ratio.

For Germany, the empirical evidence is quite scarce. Using the German Socioeconomic Panel 1992-2001, Freyland (2005b) analyzes the effect of household composition—the presence and age of children, the intra household distribution of income, and the parents' age sex composition—on household saving. In contrast to Espenshade (1975), Smith & Ward (1980), and Yilmazer (2002), he obtains positive effects of children on saving rates in young house-

[6] This is less of an issue in Germany because of very moderate or even zero tuition fees.

holds and for young children, but negative effects in older households and for older children (pp. 42-43, 46). The coefficient of a dummy for children outside the household is negative but its significance depends on the specification used. The coefficients of all other variables describing household composition are insignificant and some of them have a different sign than expected (pp. 45-46).

From this analysis, my study takes up the part on the effect of children on saving and expands it mainly in three dimensions. First, it accounts for the number of children instead of only a dummy; second, it allows for heterogeneity in the effect of children over educational levels, income, and age; and third, it considers several aspects of saving behavior. In the latter respect, my analysis is closest to Schunk (2007), who uses the 2003 random sample of the German SAVE survey to examine the effects of saving motives and various household characteristics, including the number of children, on saving rates and the tendency to save on a regular basis. He finds that for young household heads, solely the old-age provision and the home acquisition motive are positively correlated with the saving rate, while for old household heads, this is the case for the precautionary and the bequest motive (pp. 15-16). With respect to the regularity of saving, his results suggest that households for which the old-age provision motive is important save more regularly, while the opposite is the case for households who consider the precautionary motive as important (pp. 19-20). Unfortunately, the coefficients of most household characteristics, including the number of children, are insignificant, which is probably due to the small sample size.

While this study looks at very similar dimensions of saving behavior, the main difference to Schunk (2007) is that I do not try to explain one dimension by another, but I take the same set of household characteristics to explain each dimension separately. This is done for two main reasons. First, the direction of causality between the three dimensions is unclear and they are likely to be jointly determined.[7] Second, including the other dimensions of saving behavior in the explanation of annual saving takes away the indirect effect that children have on saving *via* changing the importance of saving motives or the regularity of saving.

2.4 Hypotheses on the Effect of Children on Saving Behavior

Section 2.2 concluded that children may affect saving behavior on a number of theoretical channels, whose respective direction is likely to depend on household characteristics. Also, the empirical results on the net effect of children in section 2.3 vary quite a bit in sign between countries, samples, and specifications. This further hints to the fact that taking proper account of heterogeneity in household characteristics and resulting variation in the effect of children is of utmost importance. Based on both the theoretical considerations and the former empirical evidence, one can set up hypotheses on the *net* effect of children in and outside the household on annual saving, the importance of saving motives, and the regularity of saving, and how these effects interact with the parent's educational level, income, and age.

[7] In fact, the most thorough analysis should estimate the equations for all three dimensions jointly, allowing for possible feedback between them. However, to the knowledge of the author, such an analysis has not yet been provided and is clearly beyond the scope of this thesis.

On average, the net effect of children on annual saving can be expected to be negative since former empirical evidence suggests that the cost effect of children is predominant. With respect to the regularity of saving, the direction of the impact of children is difficult to predict. The cost effect of children, especially unanticipated costs, suggests that children deter households from saving regularly. But if children encourage a household to exercise more self control, the opposite could be the case. With respect to saving motives, I would expect children to increase the importance of saving for children-complements—such as the acquisition of a home, the education and support of children, and bequests—and to decrease the importance of saving for children-substitutes, such as expensive travels and old-age provision. The effect of children on saving for large purchases is ambiguous, since large purchases could refer to children-complements (e.g., furniture, expensive housing appliances) as well as to children-substitutes (e.g., expensive sport equipment, fancy cars). Since children probably increase the risk of unanticipated expenditure shocks, we might also expect a positive effect of children on the importance of saving for unforeseen events and the reduction of debts. Finally, children are likely to increase the importance of saving as a means to take advantage of state subsidies since state subsidies are often more generous for households with children.

These effects of children on saving behavior are expected to be regressive in income and age, since both higher income and higher age contribute to the transformation from a children-complement to a children-substitute consumption portfolio and thus make it easier to adjust the consumption of other family members in response to chil-

dren. In other words, as children impose less (relative) burden on the household, their influence on saving behavior should decline.

It is more difficult to speculate on the influence of the educational level on the effect of children. On the one hand, if better educated parents are able to exercise more self control in the face of challenges that require them to withstand temptations, it might be easier for them to reduce their own consumption in response to the children's needs. In other words, education may amplify positive effects of children on self control (henceforth referred to as education induced self control effects (of children on saving behavior)). On the other hand, if the educational immobility story is true and higher educated parents invest more in their children's human capital, a higher level of education may increase the costs of children, some of which might be unanticipated (education induced cost effects (of children on saving behavior)). Thus, the direction of the interaction effect of children and a high parental education depends on which of the following effects prevails: Education induced self control effects may *alleviate* the negative effects of children on the level and the regularity of saving, whereas education induced cost effects may *aggravate* these negative effects, especially when some of these costs are unanticipated.

Moreover, if the reason for educational immobility is that highly educated parents have a stronger preference for their children's education rather than for physical bequests, one would also expect the interaction of children and a high parental education to have a positive effect on the motive to save for the education and support of

children, but a negative effect on the motive to save for leaving a bequest.

Finally, when children leave the household and start making their own living, their effect on all three dimensions of the parents' saving behavior is likely to decline. In this context, the educational immobility argument suggests that because of longer periods of education, children of highly educated parents depend longer on their parents, which might cause their effect on saving behavior to be more persistent when they leave the household.

Before we can turn to an empirical investigation of the matter, section 3 provides a description of the data that is used for the descriptive and regression based analysis.

3 Description of the Data, Data Limitations, and Sample Restrictions

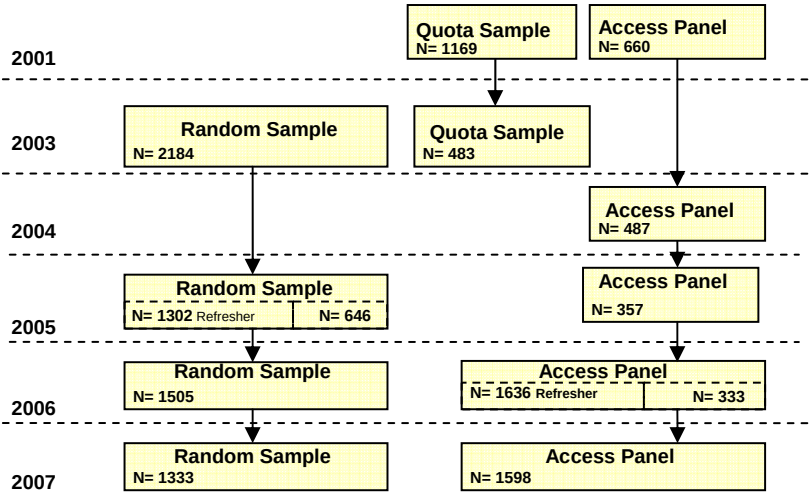
This section describes the design of the German SAVE survey (3.1), the construction of key variables (3.2), data limitations (3.3) that lead to sample restrictions (3.4), the construction of weights and resulting sample characteristics (3.5).

3.1 The German SAVE Survey

To obtain a more thorough understanding of the many facets of household saving behavior and to assist policy makers in reforming the social security system in the face of demographic transition, the German SAVE survey has started in 2001 to collect not only detailed information on household financial variables such as income, saving, and asset holdings, but also a wide range of demographic, sociological, and psychological characteristics. Among the latter are questions regarding the state of health, social environment, expectations, planning horizon, risk attitude, and further information on character traits of the respondent that are potentially important for explaining saving behavior. This richness and depth of household information makes the SAVE data set unique for analyzing saving behavior in Germany. The survey has been repeated in 2003 and conducted on an annual basis since 2005. Since first, the design of the questionnaire and the method of collecting the data have evolved quite a bit in the first years, and second, both interviewers and respondents have learned significantly how to deal with the questions such that the data quality has increased over the years, only waves 2005 to 2007 are used in the analysis. Since most questions, espe-

cially on the financial situation of the household, refer to the preceding year, the observation period corresponds to 2004 to 2006. As figure 1 illustrates, a significant fraction of households is interviewed repeatedly, resulting in a panel structure for most of the sample.

Figure 1: SAVE Sample Design



Source: Börsch-Supan et al. (2008, p. 36).

Note that the sampling techniques differ between the two sub samples. While the Random Sample is obtained by a multiple stratified multistage random route procedure, the Access Panel is based on a quota sample where the quotas are in proportion to the 2000 Mikrozensus collected by the Statistisches Bundesamt and relate to age, whether the household head is a wage earner or salaried employee,

and household size (Börsch-Supan et al. (2008, pp. 35-38), also refer to this source for more information on the methodology used in SAVE). It appears that on average, members of the Access Panel are slightly better educated, and also do a bit better with respect to net income, annual saving, and wealth. But since both sub samples yield similar results, it seems justifiable to combine them for the sake of efficiency, as also done by Börsch-Supan et al. (2007, p. 5).

3.2 Description of Key Variables

Before we can analyze the relationship between different variables in the dataset and interpret the results correctly, we need to have a precise notion of the respective variables, i.e., what exactly they measure and how this measurement is conducted. Therefore, this subsection describes the construction of key variables such as annual saving, the importance of saving motives, the regularity of saving, and the educational level.

The definition of **annual saving** is not straightforward. Most commonly, saving is defined either as net income minus consumption ($Y_t - C_t$) or as the change in household assets ($A_t - A_{t-1}$) (Browning & Lusardi (1996, pp. 1812-1814), Börsch-Supan et al. (2003, pp. 65-66)). The main difference between these two definitions is that changes in asset real prices are commonly not considered as income but change the value of household asset holdings. Further issues are whether contributions to the public pension system are regarded as taxes (and thus reduce net income) or as saving and whether certain expenditures with investment character—such as education expenditures that can be regarded as investments in the stock of human capi-

tal—are considered as saving or consumption. According to Browning & Lusardi (1996, p. 1814), there is not a single 'correct' definition of saving. As a result, different studies use different saving measures and the usefulness of the definition applied depends on the purpose of the analysis.

The purpose of this study is to assess how households adjust saving in response to the number of children, and thus, a 'useful' saving measure should be under the control of the household to reflect *planned* saving behavior. This is also referred to as "discretionary saving" (Börsch-Supan et al. (2003, p. 66)). In SAVE, respondents are asked for the total amount of money they and their partner have saved during the preceding year. The variable is left-censored at zero since respondents can indicate either a positive Euro amount or that they have saved nothing or liquidated savings, both which is encoded as zero saving. Using such a direct question as an annual saving measure involves a number of advantages and disadvantages. The left-censoring of the variable precludes the observation of dissaving, but to a certain extent that can be dealt with in the regression based analysis using a Tobit model. More severe is that the formulation of the question does not state precisely whether the household should indicate annual saving *net* of loan uptake and repayments or *gross* annual saving. Thus, one might be concerned that a household who takes on a loan and deposits the money into an account overstates its saving—though I do not think that this applies to many households—or that households do not report loan repayments as saving. Therefore, some studies (e.g., Börsch-Supan et al. (2008, p. 63)) adjust the reported measure by adding loan repayments and deducting loan uptake unrelated to home acquisition. I do not follow

this procedure for a number of reasons. First, households might already have indicated net saving such that such a procedure would do more harm than good. Second, since households cannot report the liquidation of savings, loan-financed consumption would be treated as dissaving, whereas savings-financed consumption would not. As a result, the adjustment procedure would not yield a reliable measure of net saving even if every household would report gross saving. Finally, the more variables are used to construct the dependent variable, the higher is the fraction of households who do not report at least one of the components (28.1% for the adjusted measure, but only 9.3% for annual saving). Since the imputation procedure applied to non-negative variables such as loan uptake and repayments is suspected to bias the imputed values upwards as will be discussed in the next subsection, the use of a measure constructed from a couple of these variables would either yield a severely biased measure (if imputed values are included) or a small and probably selective sample (if imputed values are excluded). A similar problem would occur if the change in wealth would be used as a saving measure, since wealth consists of a large number of variables with high missing rates. According to Lusardi et al. (2001, p. 766), high missing rates "raise concerns about the accuracy of the reports" and hint to severe measurement error, which can be amplified by imputation. Differencing such a noisy wealth series could lead to a very high but spurious variation in the saving level (Browning & Lusardi (1996, p. 1814)).

If all these issues are taken into account, using the direct question for annual saving without adjustment for loan uptake and repayments may be the best choice available. Indeed, since this is what

households report as their annual saving, it is probably the amount they have in mind when facing saving decisions. Thus, as Schunk (2007, p. 7) reasons, such a measure for 'active' saving can be considered suitable to assess 'active' saving decisions, which is the goal of this study.

Following the question on annual saving, the respondent is asked to rank the **importance of each of nine saving motives** on a scale from 0 (totally unimportant) to 10 (very important) with one point increments. These nine motives refer to the acquisition of a home (henceforth the *home acquisition motive*), provision for unforeseen events (*precautionary motive*), reduction of debts (*debt reduction motive*), old-age provision (*old-age provision motive*), travels during vacation (*travel motive*), large purchases (*large purchases motive*), education or support of (grand)children (*education/support motive*), bequests to (grand)children (*bequest motive*), and taking advantage of state subsidies (*state subsidies motive*). I refer to this ordinal measure as the *absolute* importance of a saving motive because households are not forced to discriminate between motives and may rate each motive as very important or totally unimportant. Indeed, the pair wise correlation coefficients between these motives are all positive—they range between close to 0 and almost 0.5—and thus, some households tend to assign higher scores on average than others. If crowding out effects between saving motives are low or non-existent and thus households who assign higher scores on average also consider saving more important, a comparison of absolute measures is insightful. But if some households by character or chance tend to assign higher scores while others tend to assign lower scores (henceforth referred to as 'individual scaling') without a con-

nection to the overall level of importance or if one is interested in relative shifts in the importance of different motives in response to changes in household characteristics, a relative measure that enforces discrimination between the motives would be more meaningful. Such a measure of *relative* importance of a saving motive is constructed by dividing the score given to a particular motive by the sum of scores given to all motives.[8] Most probably, different levels of average importance are a result of both explanations: While some variation is due to individual scaling, it is likely that households who assign, for instance, an eight on average consider saving more important than those assigning an average of three. The analyses are conducted for both measures since each measure can yield insights the other cannot give: The absolute measure can indicate whether a particular variable amplifies the *overall importance* of saving, while the relative measure better reflects *relative shifts in the importance* of different motives in response to changes in household characteristics.

The main advantage of such 'subjective measures', which are directly reported by households, is that item non-response rates are negligible due to low cognitive burden (Schunk (2007, pp. 3-4)). A common critique is that they are susceptible to misreporting, in particular if certain responses are socially desired. In the case of saving motives, this means that households might, for example, understate the importance of the travel motive and overstate the importance of the education/support motive. But since this study is more interested in changes in the importance of saving motives in response to

[8] If a household assigns 0 to all motives (52 obs. = 0.7% of the final sample), the measure of relative importance is set to 1/9 since all motives are considered equally important (just as each was assigned the same positive number).

changes in household characteristics rather than in absolute levels of importance, this problem might be less severe, at least if the 'misreporting bias' is similar for all households (i.e., if all households overstate the importance of some motive by a one point increment, changes in the characteristics still lead to the same changes in importance of saving motives as without overstatement).

The **regularity of saving** is surveyed as a direct question as well, and households can indicate whether they save regularly a fixed amount (henceforth *regular fix savers*), put money aside each month but determine the amount according to the respective financial circumstances (*regular flexible savers*), put money aside whenever there is something left to save (*irregular savers*), do not save due to financial constraints (*no money non-savers*) or do not save since they prefer to enjoy life now (*enjoy life non-savers*).

With respect to the **educational level**, households are divided into two groups, high and low education households. High education households are those whose household head has graduated from secondary school with 'Fachhochschulreife' or 'Abitur', which consists of 12 or 13 years of schooling and is equivalent to high school graduation. Low education households are all remaining households and are headed by graduates from Haupt-, Real- or Polytechnische Oberschule (9 or 10 years of schooling). The variable itself is constructed as a dummy for Fachhochschulreife/Abitur, *FHR_Abitur*. Note that while this definition relies on the assumption that the educational level of the person who identifies him-/herself as household head is decisive, the conclusions of this study do not change if the educational level of a household is defined either as the highest of

the educational levels of respondent and partner or as the educational level of the household member who is indicated to make financial decisions, choosing the highest educational level if both respondent and partner decide together (this changes the educational level for only 6.1% or 5.7% of the households, respectively).

Moreover, relating education to two schooling groups rather than the commonly used highest educational attainment is done for several reasons. In Germany, school degrees are related to different school types with a different educational goal and thus provide a good indicator, which kind of profession an individual will pursue (e.g., Abitur is a prerequisite for university education). After school, individuals split up into many different types of higher educational or professional training, some of which comprise only a small number of observations. As a result, interaction effects would not be measurable with precision. Thus, using *FHR_Abitur* as an indicator for a high educational level is considered to produce two groups of distinct educational level that comprise enough households for a sufficiently precise estimation.

For further reference, table A.1 (appendix) gives a description of all variables used in the analysis.

3.3 Imputation and Data Limitations

Since detailed financial questions are susceptible to item nonresponse, an iterative multiple imputation procedure using a Markov-Chain Monte-Carlo method has been applied to all waves of SAVE (see Schunk (2008) for more information on the proce-

dure). The goal of this procedure is "to preserve the correlation structure of the data set as much as possible" (Schunk (2008, p. 102)). If this is achieved, imputation can both reduce the item non-response bias that occurs if observations with and without missings differ systematically and increase efficiency (Schunk (2008, p. 103)). The result of the multiple imputation algorithm are five data-sets, in which missing values have been replaced by imputed values. Since the imputation is stochastic, the five data sets differ with respect to these values, reflecting the uncertainty that is associated with imputation. To incorporate this uncertainty into the succeeding descriptive and regression based analyses, each dataset is examined separately, and the results are combined using Rubin's method (Rubin (1987, pp. 20-22, 81-87; 1996, pp. 476-477), see section 5.2.1 for some further remarks).

This short introduction to imputation has been given since there are some issues with the SAVE imputation procedure that motivate restrictions and adjustments imposed on the sample used for the analysis. The problems mainly apply to censored metric variables, such as annual saving, which is left-censored at 0. The imputation of this variable is conducted in the following steps. First, the probability of reporting positive saving is estimated by a probit. Second, if the predicted value of this probit estimation is below 0.5 for an observation reporting a missing, annual saving is set to 0. Otherwise, annual saving is imputed by predictions from an OLS regression of positive non-missing values of annual saving on a large set of covariates. To reflect uncertainty, a random draw from a normal distribution with mean 0 and a standard deviation equal to the standard error from the regression is added to the predicted value (henceforth,

this is referred to as 'adding a standard error' though not the standard error as such but a random draw is added). Since this may produce imputed values below 0, the absolute values of further random draws are added to the imputed value until it is at least as large as the minimum positive non-missing value. The same is done in the opposite direction if the imputed value exceeds the maximum non-missing value. Thus, in the end, all imputed values should lie in the range of non-missing values. This so-called 'shooting' process is applied to prevent the generation of 'imputation outliers'.

However, the combination of an OLS regression in levels, adding a standard error, and 'shooting' is suspected to bias the imputed values upwards. If we compare the mean of imputed and non-missing values of annual saving (upper left corner of table 2), the average imputed value is twice to almost four times as high as the average non-missing value. Although this is suspect, it is no clear evidence for a biased imputation since observations with a missing for annual saving may systematically differ in other respects from observations that report a value. If this is the case, the difference in the means could be a result of the desired correction for item non-response bias. Thus, to draw conclusions about 'imputation bias', we should rather compare the distributions of non-missing values and of those values the imputation procedure would generate for these non-missing values (henceforth referred to as imputed non-missing values). Since these values are not included in the final data sets, I re-run the last loop of the imputation of annual saving for each year and create imputed values for all observations (lower left corner of table 2). While the mean imputed *missing* value is in the range of the mean of the five imputed data sets (the difference is due to the sto-

chastic elements in the imputation procedure), the imputed *non-missing* values are on average much higher than the original non-missing values and rather in the range of the imputed missing values. In fact, they are significantly different from the original values, but not significantly different from the imputed missing values. This is some evidence that the imputation generates an upward bias in annual saving.

Table 2: Mean Annual Saving: Non-Missing vs. Imputed Values

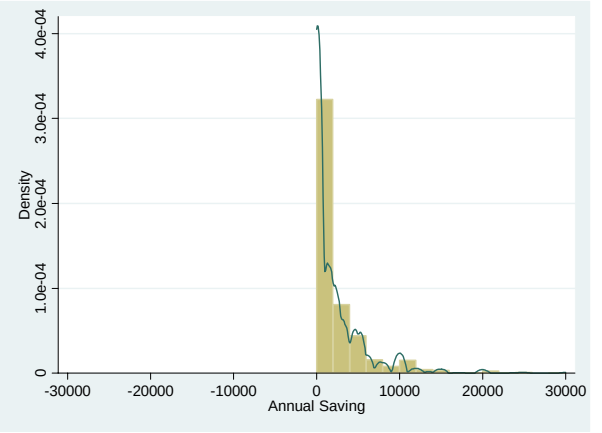
	Mean annual saving			**No. of observations**		
SAVE sample	2005	2006	2007	2005	2006	2007
Non-missing	2,308	3,482	2,934	2,088	3,168	2,640
Imputed missing (mean over 5 datasets)	4,088	12,838	9,073	217	306	291
Imputed non-missing (5^{th} loop)	3,410	12,407	8,162			
Imputed missing (5^{th} loop)	3,774	13,068	9,413			

If we reproduce the imputation procedure outlined above step by step, it becomes evident where this bias comes from. Figure 2 shows the distribution of *original* non-missing values and *imputed* non-missing values over the stages of the imputation procedure, exemplarily for 2007 (it is similar for 2005 and 2006). If anything, the distribution of original non-missing values (1) resembles a log normal distribution (with large σ). Before the standard error is added, the distribution of the predicted values from an OLS regression (2) rather looks like a normal distribution—apart from the spike at zero, which is due to zero values predicted by the preceding probit. While the regression preserves the mean, the main problem is the left tail below zero. This problem is amplified by adding a standard error

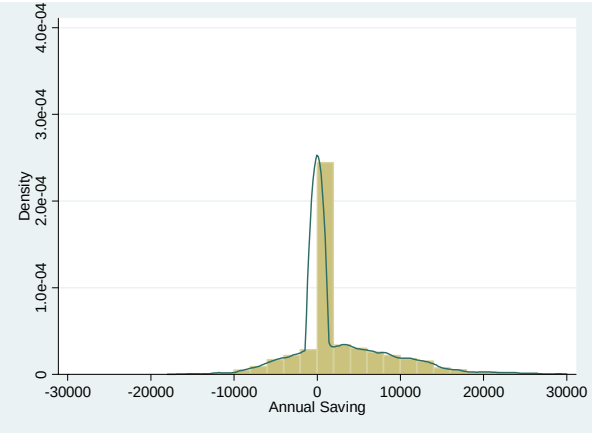
(3), which is large due to a poor fit of the regression and ‘stretches out’ the entire distribution. That is, most values to which a negative (positive) standard error is added become negative (positive). Since the shooting process (4) adds absolute, and thus positive values of standard errors to those values below zero, positive standard errors are added to *almost all* values in the end—either in stage (3), or in stage (4) if the standard error in stage (3) was negative. But adding far more positive than negative standard errors along with a large standard error results in serious upward bias.

Figure 2: Distribution of Annual Saving over the Stages of the Imputation Process—Histogram and Kernel Density of Non-Missing Values

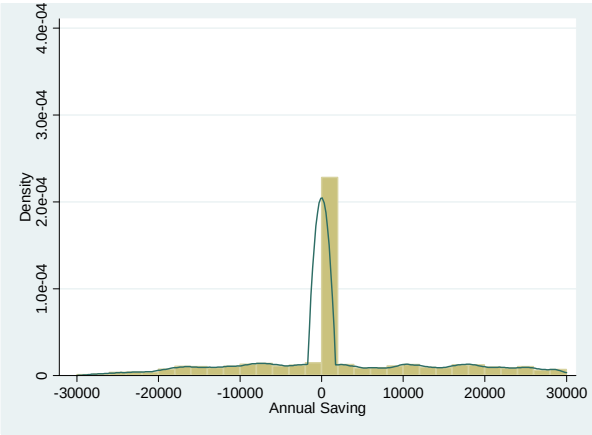
(1) Original Non-Missing Values



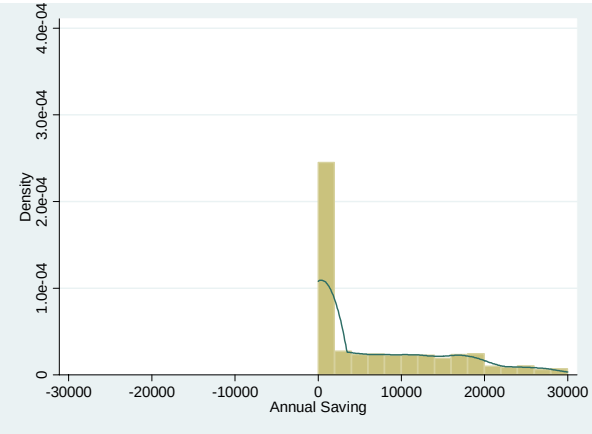
(2) Imputed Non-Missing Values—
OLS Predicted Values before Adding a S.E.



(3) Imputed Non-Missing Values—
OLS Predicted Values after Adding a S.E.



(4) Imputed Non-Missing Values—
OLS Predicted Values after 'Shooting'



Note: Values are limited to the range +/- 30,000.
Source: SAVE 2007, own calculations.

3.4 Sample Restrictions

The deficiencies of the imputation procedure outlined above create the following trade-off: On the one hand, if the imputed values of annual saving are included in the sample, they most probably suffer from severe overestimation bias. On the other hand, if one excludes these values (as in Attanasio & Weber (1995, p. 1125)), the sample might suffer from non-response bias. The following arguments have let me come to the conclusion that an exclusion of imputed values is likely to be the lesser evil. First, the results of section 3.2 suggest that an inclusion of the imputed values would fail to reduce the non-response bias and rather introduce a far more pronounced 'imputation bias'. Second, even if the imputation procedure would do a better job, there would be a certain danger that it might introduce—or at least reinforce—a correlation between the dependent variable and the regression covariates of the succeeding analysis since the imputation uses some of these covariates to predict missing values of annual saving. Then, observed partial correlations could in fact be a result of the imputation rather than a feature of the original data. Thus, observations with imputed annual saving are excluded from the sample (814 obs. = 9.3% of the original sample). The imputation of the other dependent variables—saving motives and the regularity of saving—is considered to induce less problems since due to their categorical character, they have been imputed by a hotdeck procedure, which gives no concern for a bias similar to the regression +

shooting procedure. Thus, observations with imputed values of these variables are used in the analysis.[9]

A couple of further adjustments have been applied to the sample, which are outlined in the remainder of this subsection. All of these have in common that they serve to adjust for outliers, either by reducing obvious measurement error or by correcting for further imperfections of the imputation procedure. This is mainly achieved by making use of the panel structure of SAVE, which is neglected in the original data cleansing and imputation process. Altogether, the sample is reduced from 8,710 to 7,847 observations (90.1%). Note that all restrictions and adjustments described in this subsection do not alter the main results and conclusions of this study.

Adjustments With Respect to Annual Saving

First, if a household reports no extraordinary one-time earnings, annual saving of and above €100,000 that is at least 50 times bigger than its value in the preceding or following year is divided by 100 [7 adjustments]. In these cases, values are very likely to be reported as Euro and Cent amounts but encoded disregarding the decimal point (e.g., €2,000.00 is encoded as €200,000).

Second, a few respondents are likely to have entered a stock value (savings) instead of the requested flow figure (saving). To reduce

[9] The only variable that may raise concern in this context is the importance of the old-age provision motive, which a majority of respondents erroneously was not asked for in 2007. Since all respondents in 2007 also have been interviewed in 2006, the imputation is mainly based on the value indicated in the previous year. If there are no large shifts in importance, this should yield a good prediction. Those who mistrust the predictive power of the imputation procedure may disregard the results for the old-age provision motive, but they are included in this thesis for the matter of completeness.

this problem, observations with annual saving of at least €100,000, an annual net income of less than €100,000, and no extraordinary one-time earnings are excluded from the sample if they are observed in a single year only [1 observation].

The author judges this procedure to delete less 'true' variation in the data than a cut-off at, e.g., the 99 percentile (which is done frequently to reduce the influence of outliers, for instance in Freyland (2005b, pp. 34-35)) since some of the extreme values are surprisingly consistent if one compares annual saving with net income and the values of extraordinary one-time earnings. All values of at least €100,000 [15 observations] have been checked in the data and this procedure has been considered best by the author to comply with both the need to reduce outliers due to measurement error, which in the worst case can drive the results, and the fact that some outliers are consistent while making the adjustment process reproducible to the critical reader.

Adjustments With Respect to Net Income

In the same spirit, net income is adjusted for outliers in five steps. The 99 percentile of monthly net income is approximately €10,000 such that values of and above €10,000 are considered as possible outliers [74 observations]. In a first step, the procedure adjusts for *non-imputed* values of and above €10,000 that are at least 10 times higher in one year than in the preceding or following year, given that the latter has not been imputed. If in addition, the household head was at least 30, income is divided by 12 [10 adjustments] since it is very likely that the respondent reported annual rather than monthly net income. This view is supported by the fact that all of

these cases occur in 2005, when the questionnaire was relatively new to most respondents and interviewers. Household heads below 30 are exempted from this correction since such income 'jumps' may occur when individuals first enter the labor market or at early stages of their career.

In a second step, non-imputed values of and above €10,000 are corrected if they are at least 5 times higher than the value in the preceding or following year, given that the latter has not been imputed, the household head is at least 30, and one of the following conditions is true: The household head does not report unemployment in the year compared to which the value of net income is at least 5 times higher; the unemployment question is imputed in one of the years in question; or the household head reports unemployment in the year where he or she indicates a monthly net income of at least €10,000 [1 adjustment]. In these cases, the author considers it very likely that the reported value is measured with error and it is replaced by the value of the preceding or following year given that one of these values is not imputed or to the mean of these values given that they are both original.

In a third step, *imputed values* of at least €10,000 are set equal to the value of the preceding or following year given that one of these values is not imputed or to the mean of these values given that they are both original [23 adjustments]. Note that the conditions for this adjustment are less strict than for non-imputed values due to less reliable information.

In a forth step, all remaining observations with imputed values of at least €10,000, which are at least twice as high as in the preceding or following year are excluded from the sample [8 observations]. Finally, observations are excluded if their imputed monthly net income is at least €10,000 and they are observed in a single year only [2 observations].

The adjustment and exclusion of imputed values solely at the top end of the income distribution may raise concerns that the weight of lower income groups in the sample is artificially enhanced. However, there are three arguments in favor of this procedure. First, because net income is left-censored, a simple cut-off method, e.g., at the 99 percentile, would induce even higher selectivity and delete plausible values. Second, the imputation of income is likely to suffer from similar though less severe overestimation bias than annual saving (less severe since many people indicated an income cluster if they refused to report a point estimate, and the imputed value is constrained to lie within the borders of the cluster). Thus, correcting for huge and implausible imputed values is considered to reduce estimation bias since the reduction of 'imputation bias' probably outweighs possible selection bias. Third, while the imputation tends to 'overshoot' the actual value there is no evidence that the opposite is a problem, i.e., there are no imputed values below €10,000 if the (non-imputed) value in the preceding or following year is above €10,000.

Adjustments With Respect to Wealth

While it seems reasonable to exploit the panel structure of SAVE to correct a relatively stable variable like net income—and to a lesser

extent annual saving—no convincing and consistent way has been found to distinguish 'true' and 'false' outliers in wealth. Total wealth is a sum of many variables with high non-response rates and does not tend to be as stable as income in the SAVE data. Reflecting this uncertainty about the correctness of specific high and low values, it was decided to truncate the remaining sample at the 0.5 and 99.5 percentile of the wealth distribution (19 and 19 observations). While this is not completely satisfying, it seems to be better than pretending to be able to identify misreported values.

3.5 Weights and Sample Characteristics

Weights

To adjust for sample selection, the descriptive statistics in this section and in section 4 are weighted using the corresponding Mikrozensus collected by the Statistisches Bundesamt as a representative reference sample. The weighting criteria used in this study are income and household size, i.e., the observations in SAVE are grouped into 9 cells according to 3 income and 3 household size classes. To obtain the weight of a cell, the relative frequency in a cell is divided by the relative frequency in the corresponding cell of the Mikrozensus (for more information on the precise calculation of weights in SAVE, see Schunk (2006, pp. 17-19) and Börsch-Supan et al. (2008, pp. 172-175)). Because of the adjustments outlined in section 3.4, the weights have been recalculated for the restricted sample. Note that weights are not used for the regression based inference in section 6 since their use is not without controversy in this context (Winship & Radbill (1994, pp. 242-247)).

Sample Characteristics

Table A.2 in the appendix shows characteristics of the restricted sample, stratified by educational group, weighted, and averaged over the 5 imputed datasets (Stratification by year does not reveal significant differences between the different waves of SAVE). Highly educated household heads appear to be somewhat younger on average and consistently have more children living inside their household but less children living outside their household than low education household heads. With respect to other demographic characteristics, they are more likely to be male, non-German, and of a better state of health. The latter is probably due to the difference in the age distribution, at least in part. They earn and save more on average, and are thus able to accumulate larger amounts of total wealth.[10] As expected, low education household heads are more likely to have a blue collar job but less likely to be white collar workers, civil servants, freelancers or self employed. This pattern also holds if one adjusts for the larger fraction of retired low education household heads, which probably reflects the larger fraction above age 65. While the unemployment rate is higher among low education households, the fraction of households who are in education, in an apprenticeship or on parental leave or who do military service is higher among high education households. This fits neatly the larger fraction of very young households among the highly educated and the fact that their education lasts longer. The higher fraction of full-time working high education household heads vanishes for the most part if one conditions on employment (40.8%/62.2% = 65.6% vs. 28.3%/46.0% = 61.5%). With respect to other economic

[10] Note that the extreme values of wealth are close to each other over years and educational groups as a result of the truncation described in 3.4

and financial characteristics, high education household heads are more optimistic about future income prospects and are more likely to make regular support payments, to repay mortgages, and to have disability insurance. A part of these differences may again be attributable to high education household heads being younger on average. With respect to psychological variables finally, differences are not very large, but high education household heads appear to be more likely to be optimistic, but less likely to be a creature of habit, to live for the moment, and to be a smoker.

4 Descriptive Analysis

This section provides a descriptive analysis of fertility and saving behavior, using the restricted sample described in section 3. As an introduction, section 4.1 links fertility to household income, age, and educational level. Section 4.2.1 presents life cycle profiles of income, consumption[11], saving, and the number of children living in- and outside the household to reproduce the findings of other studies and data sets with the SAVE. The same is done for the importance of saving motives in section 4.2.2. Section 4.3 provides a more detailed descriptive investigation of the relationship of the number of children to annual saving (4.3.1), saving motives (4.3.2) and the regularity of saving (4.3.3), respectively, and how this relationship varies over the parents' educational level, income, and age[12]. All figures in section 4 are weighted and represent averages over the five imputed datasets. Note that any relationships established in this section cannot be interpreted as causal relations but merely as observed correlations. Thus, if for the matter of legibility, it is said that a particular variable increases (decreases) in the number of children, the correct, but lengthy formulation would be that the average value of this variable is higher (lower) in groups consisting of households with more children than in groups of households with fewer children. Also note that because of the short observation period, it is not possible to distinguish properly between age and

[11] Consumption is calculated as annual net income minus saving. Since the saving measure is left censored, consumption is underestimated for households who dissave. Thus, the measure is somewhat crude but the best one available.

[12] Since there are only few insights with respect to variation by age, they are discussed for all three dimensions together at the end of section 4.3.

cohort effects, and what is referred to as differences by age could also be differences between cohorts.

4.1 Fertility Behavior by Household Income, Age, and Educational Level

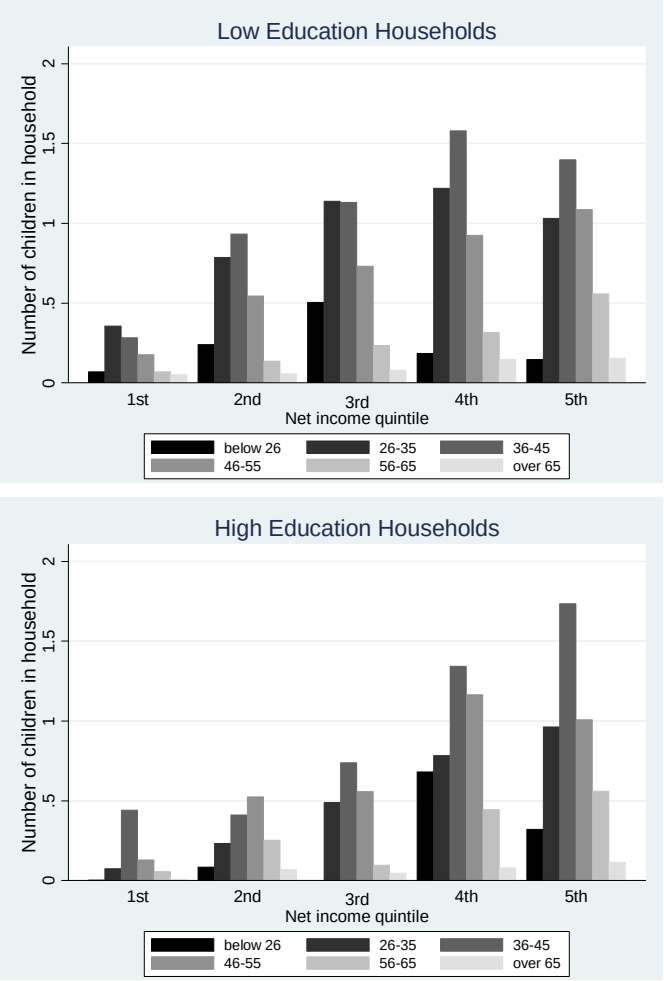
Figures 3 and 4 show the average number of children living in the household and outside the household, respectively, stratified by the household head's educational level (2 groups; left vs. right hand graph), net income (quintiles[13]), and age (6 groups, different colors of bars).

Figure 3 suggests that low education households get their children earlier in life than high education households since especially the bars referring to younger age groups tend to be higher.[14] However, while at the low educational level, households with higher net income tend to get their children later in life, this is not the case at the high educational level: Except for the first quintile, fertility in high education households rather shifts to younger ages as income increases. Furthermore, for a given age group and a given educational level, there appears to be a positive relationship between income and the number of children in the household, which is somewhat stronger for high education households. Perhaps, more educated households judge more carefully whether or not they can afford children.

[13] These net income quintiles are calculated for the entire sample, i.e., they are the same for both educational levels.
[14] As already pointed out, this might also be a cohort effect if fertility has decreased over cohorts at the high educational level but not at the low educational level.

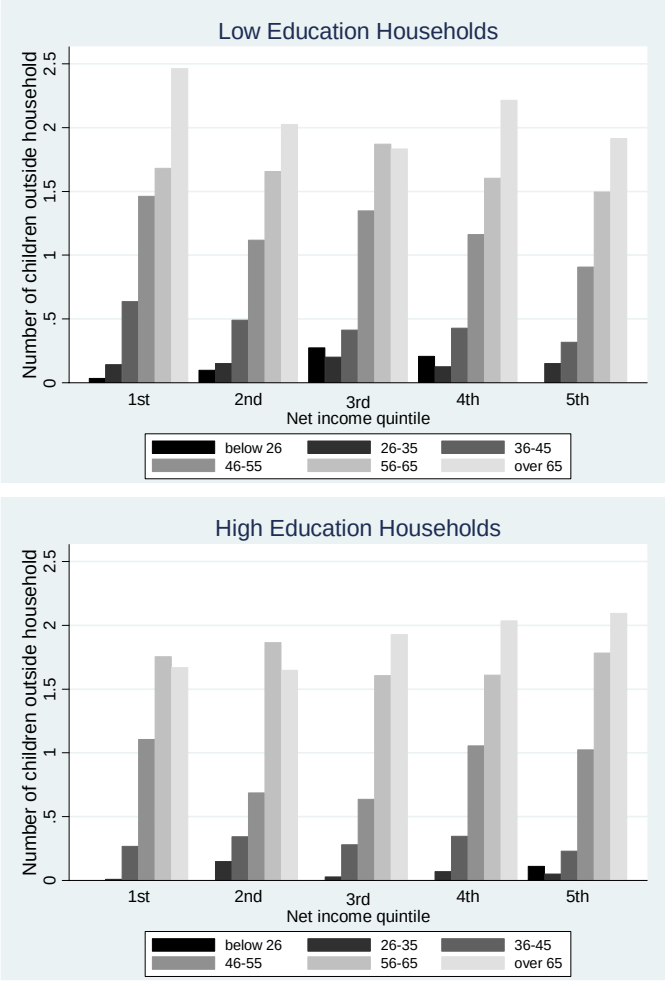
Figure 4 suggests that children tend to leave high education households later in life than low education households. Particularly in the second and third income quintile, i.e., with a monthly net income between €1,117 and €2,300, most children leave high education households after the household head's age of 55, but considerably earlier in low education households (compare the bars referring to age group 46-55). If children of highly educated parents tend to obtain a higher educational level as well, this could be due to the fact that children of high education but lower income households stay longer with their parents since they cannot afford setting up their own household before entering the labor market (whereas children of higher income households can afford that). In the lowest two age groups however, the fact that there are more children outside low education households might hint to a higher fraction of divorces or extramarital children at the low educational level.

Figure 3: Number of Children Living in the Household by Income, Age, and Education



Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

Figure 4: Number of Children Living Outside the Household by Income, Age, and Education



Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

4.2 Life Cycle Profiles

To get a first impression about the effect of children on consumption, saving, and saving motives over the life cycle, the most natural thing to do would be to compare life cycle profiles of these variables for households with and without children. The main problem with this is that there are only very few households younger than 30 with children as well as childless households above 45. This makes the profiles very unreliable at either earlier or later stages of the life cycle and precludes a thorough comparison. Thus, it is proceeded in a different way, which is to pool households with and without children and to compare the behavior of life cycle profiles of the variables of interest with the profiles of the number of children in and outside the household. This gives at least some intuition about whether there is a co- or countermovement over the life cycle.

4.2.1 Life Cycle Profiles of Income, Consumption, Saving, and Children

To illustrate the evolution of annual net income, consumption, saving, and the number of children living in and outside the household over the life cycle, 13 5-year cohorts, starting with those born 1925-1929[15], are constructed and the cohort means of the corresponding variables plotted against age, the age of a cohort being set equal to the mid point of the youngest and oldest members of the cohort (i.e., the cohort born 1960-1964 is assigned age 43 in 2005, 44 in 2006, and 45 in 2007). This is done separately for the two educational

[15] Cohorts born before 1925 (age > 80) are not shown due to very thin data support (cell sizes drop below 10 observations). Even so, these cohorts fit in nicely if included.

groups. Figure A.1 in the appendix shows the result of this cohort analysis. The first row corresponds to low education households, the second to high education households. The first graph in each row refers to income, consumption, and saving and is thus comparable to those produced by the literature as outlined in section 2.1. The second and third graphs show consumption and saving, respectively, along with the number of children in and outside the household. Since in some cases, the cohorts constructed consist of only a relatively small number of observations—especially for older cohorts and the high education sub sample—the graphs are quite noisy, particularly for annual saving. Therefore, figure A.2 pools all three years and provides the same graphs but with 10 year moving averages of means over age (thick lines) instead of cohort means.[16] To reflect the variability of the data, a corridor with limits equal to the mean per age group (not the moving average!) +/- one standard error is shown as well (thin lines of the same color).[17] The resulting age profiles are smoother than those of the cohort means, but they might confound age, cohort, and year effects. However, because of the short observation period, the cohort analysis does not help much to distinguish cohort and age effects anyway, and since both variants yield similar conclusions, I mainly refer to the moving averages, which often give a clearer picture of the overall trend.

As observed in other data sets, both income and consumption exhibit a similar hump shape over the life cycle and consumption seems to track income, peaking around age 45 for low education

[16] Again, households older than 80 are not shown due to cell sizes below 10 observations.

[17] Note that the *moving average* of means may lie outside this corridor since it may be smaller or larger than the mean of a particular age group +/- one standard error.

households and around age 55 for high education households (1st graph). Since consumption is constructed as income minus saving, this is due to a relatively flat saving profile: Though saving increases at the beginning of the life cycle and—at least for low education households—declines late in life, the hump shape in saving is far less pronounced than the one in income. In part, this may be due to the left-censoring of the saving measure that precludes dissaving.

The educational differences in the income profiles are in line with common findings. Since on average, household heads with a higher educational level enter the job market later than low education household heads, they start at age 19 with lower average income but face a far steeper income profile at the beginning of their career such that they surpass their low education counterparts in the second half of their 20s and end up earning almost one and a half times as much. In addition, annual saving shows a more pronounced increase in younger years and is more than twice as high by age 40.

Also in line with the literature documented in section 2.1 is the hump-shaped life cycle profile of children living *in* the household (2nd graph). Let us first look at low education households. The peaks in consumption and the number of children in the household appear around the same age, in the late 30s or early 40s. From around age 45 on, both consumption and the number of children in the household decline, though consumption declines at a lower rate. If there is a positive causal link between the number of children and household's consumption, the fact that consumption does not decline as fast as the number of children inside the household could be explained by the rising number of children *outside* the household. That

is, the negative effect of a declining number of children in the household could be partly offset by a positive effect of a rising number of children outside the household. Since the number of children outside the household rises faster than the number of children inside the household declines—to a certain extent probably due to cohort effects—the positive effect of children on consumption appears to be much smaller but still present once they have left the household. However, that there really is such a causal relationship cannot be established in this descriptive analysis. If it exists, the increase in saving in the second half of their 50s (3rd graph) suggests that low education households shift a part of their income from consumption towards saving once children start to leave the household. This would be in line with a stronger bequest motive among older low education households with children.

The pattern of consumption, saving, and children is similar for high education households with some important differences. First, as already noted in section 4.1, they get their children later in life. Second, consumption does not seem to decline as much and appears to track the number of children outside the household more closely later in life than for low education households (look at the humps in both profiles in the late 60s and early 70s). Of course, since we look at different cohorts, it could be that both profiles of consumption and children are driven by income, i.e., cohorts with higher average income consume more and have given birth to more children. If however, at least a part of the comovement of consumption and children is causal, the fact that consumption tracks the number of children outside the household more closely for high education households suggests that the effect of children on consumption de-

creases less than in low education households when children leave the household. Further support for this hypothesis can be drawn from the observation that saving does not increase when children start to leave high education households in their 50s, as it was observed at the low educational level. This would be in line with the hypothesis that in high education households, investment in the human capital of older children is more important than saving for physical bequests.

To summarize, consumption seems to track not only income, but also the number of children in the household, and, to a lesser extent, the number of children outside the household. While the latter particularly applies to high education households, low education households seem to shift more income from consumption towards saving once children have left the household. This fits the educational immobility story and the resulting hypotheses of section 2.4 pretty well.

4.2.2 Life Cycle Profiles of Saving Motives

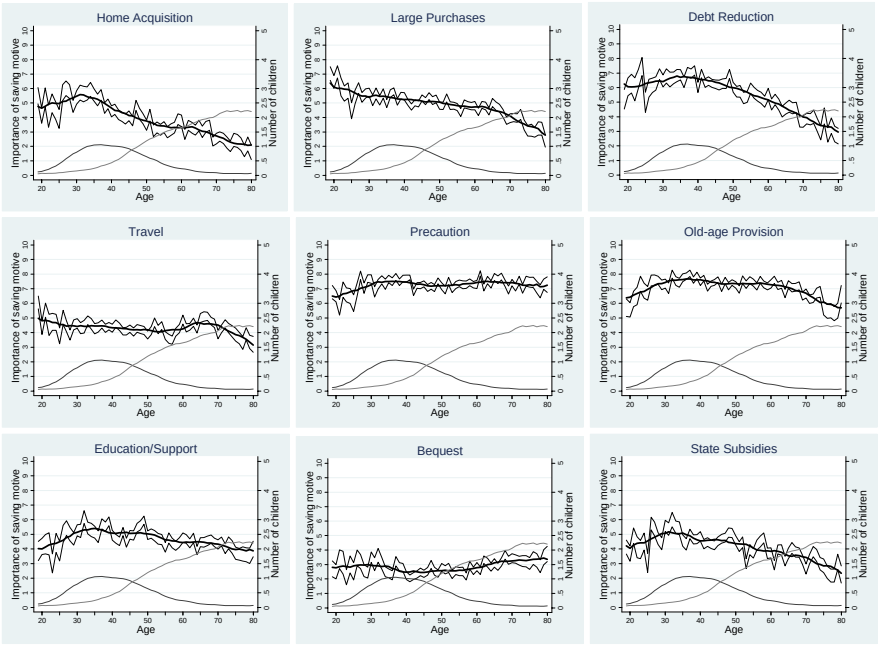
Figures 5 and 6 show life cycle profiles of the importance of the nine saving motives—for the absolute and relative measure, respectively—along with those of children in and outside the household separately for the two educational levels (again, the thick black line represents the moving average, the thin lines the corridor constructed by the mean +/- one standard error).

Not surprisingly, the **home acquisition motive** is particularly important for young households in both absolute and relative terms,

and it is ranked higher by high education households. Its importance peaks around age 30—and thus roughly 10 years ahead of the peak in the number of children in the household—and continuously falls thereafter. Thus, it seems that households anticipate the rise in the number of children and the resulting increase in the demand for housing and consequently attach more importance to saving for the acquisition of a home early in life. Afterwards, the home acquisition motive becomes less important as either a home has already been acquired or children start to leave the household, reducing the demand for housing.

Figure 5: Life Cycle Profiles of the Absolute Importance of Saving Motives

Low Education Households



High Education Households

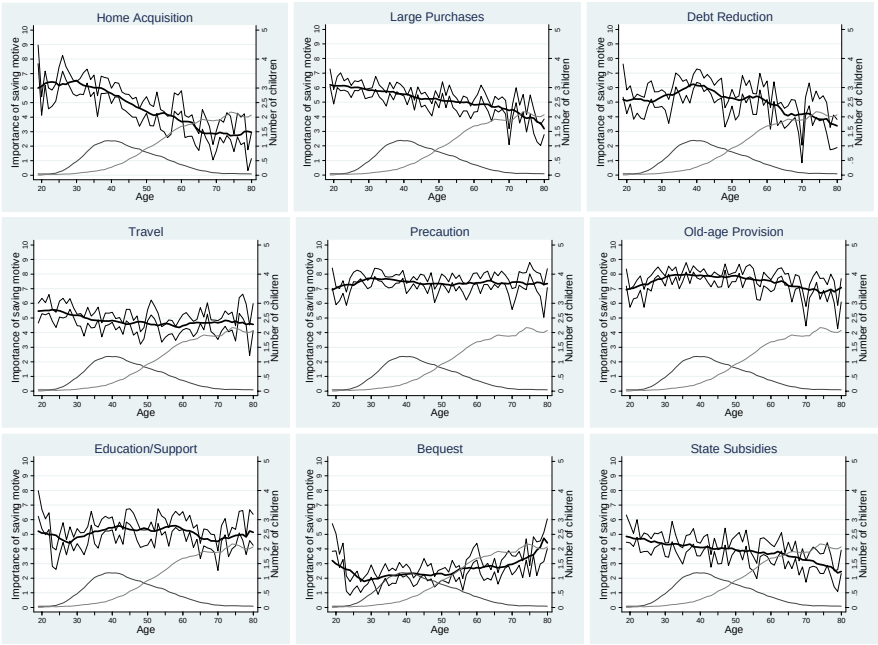
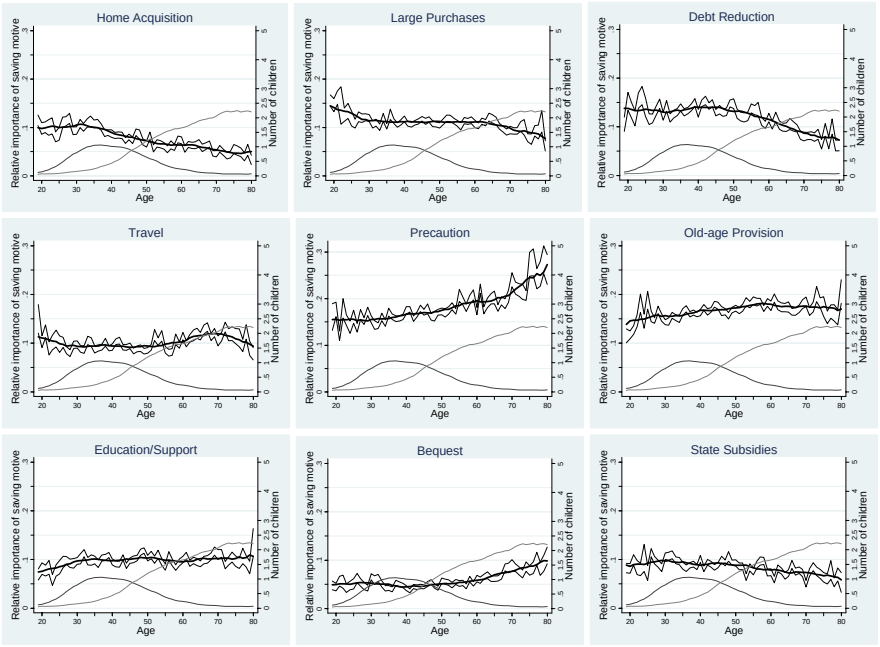


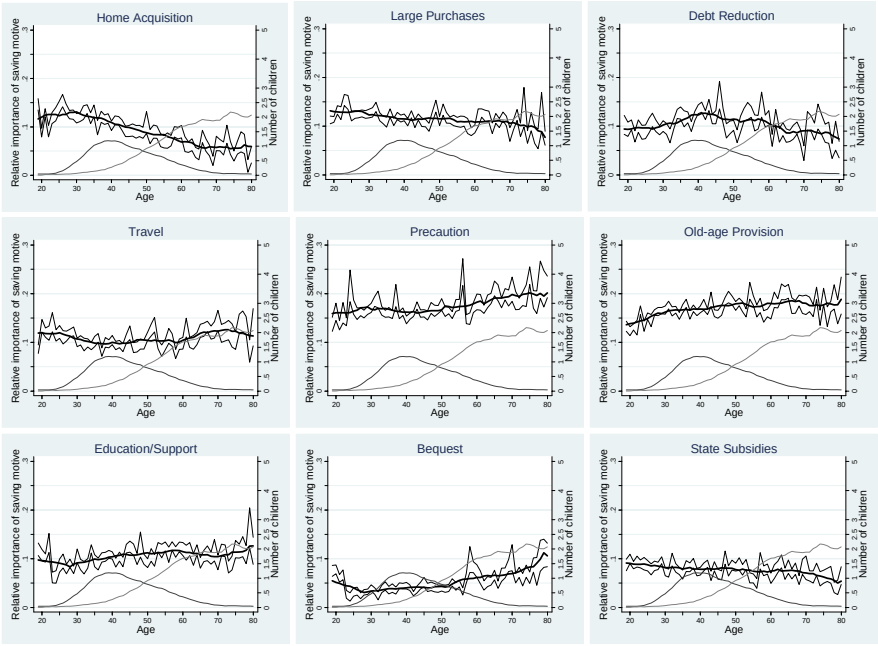
Figure 6: Life Cycle Profiles of the Relative Importance of Saving Motives

Low Education Households



Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

High Education Households



Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

Similarly, the **large purchases motive** starts as quite important at the beginning of the life cycle but continuously decreases in absolute and relative importance. In contrast to the home acquisition motive, there is no hump at the beginning of the life cycle. Furthermore, shape and level of the profile are very similar for both educational levels.

The life cycle profile of the **debt reduction motive** looks much like a right shift of the profile of the home acquisition motive, peaking around age 40 just as the life cycle profile of children in the household. The motive appears to be a bit more important for low education households, which may be due to a greater need for borrowing to set up a household as a result of lower earnings.

The travel motive is relatively important early in life before the arrival of children and from the late 50s onwards when most children have left the household. This U-shape is more apparent for the relative measure than for the absolute measure. Beginning in their late 60s, low education households attach less importance to the travel motive, probably due to their health condition. The same can be observed for high education households above age 80 (not shown here).

Combining the observations on the motives home acquisition, large purchases, debt reduction, and travel suggests that with respect to the consumption of specific goods, households save for the acquisition of homes and expensive durables primarily at the beginning of their life cycle before giving birth to children. Then, they acquire

these goods and save for the repayment of resulting debts mainly during the years of highest earnings later in their working life. Before and after the presence of children, households attach more importance to the travel motive. These shifts in the importance of saving motives are in line with those reported by Harris et al. (2002, p. 209) for different age groups and constitute some support for the hypothesized shift from a children-complement consumption portfolio, dominated by durables, to a children-substitute consumption portfolio.

Together with the old-age provision motive, the **precautionary motive** is the most important motive over the whole life cycle. After a rise in early years, its absolute importance is very stable over the life cycle and at a very similar level for the two educational groups. In relative terms however, there is a continuous rise in the importance of this motive, particularly in low education households. This might hint to an increasing risk aversion in age or for older cohorts.

In absolute terms, the importance of the **old-age provision motive** displays a slight hump shape over the life cycle, which is more pronounced for low education households. For the relative measure, there rather appears to be a slight increase in importance over the life cycle, at least up to retirement age.

For low education households, the profile of the absolute importance of the **education/support motive** exhibits a shape similar to the profile of children in the household. That is, it peaks in their late 30s and decreases steadily thereafter. This decline cannot be observed for high education households, for whom the profile of the educa-

tion/support motive also seems to track the profile of children living *outside* the household. In terms of relative importance however, the profiles are very similar between age 30 and 80 and remain roughly stable at about 10%, maybe a bit higher for high education households.

The **bequest motive** shows a reverse pattern: As long as children are present in the household, its importance is very low in both absolute and relative terms, but rises when children leave the household. For the absolute measure, this increase is more distinct in high education households, whereas the shapes for the relative measure are very similar for the two educational levels.

Finally, we can observe an educational difference in the importance of the **state subsidies motive**. While it steadily declines in high education households, it shows a hump shape for low education households, just like the profile of children in the household. This is probably due to the fact that many saving subsidies that are related to children are more attractive for low income households.

Combining the observations on the motives precaution, old-age provision, education/support, bequest, and state subsidies indicates that households attach more importance to saving related to their children's education/support when children are present, and to bequest saving late in life. Although the absolute importance of the precautionary and the old-age provision motive remains roughly stable or even decreases late in life, their relative importance appears to increase over the life cycle. The main difference between the educational levels is that low education households are more attracted by

state subsidies when children are present, whereas high education households seem to care more about their children's education after the children have left home. While this is in line with the hypothesis that high education households have a stronger taste for the education of their children, particularly when children get older, there is no support for the hypothesis that low education households attach more importance to the bequest motive instead.

A nice feature of the life cycle profiles is that we get a good impression of the life cycle variation in saving, saving motives, and the number of children. However, we cannot say whether a comovement between, for instance, the home acquisition motive and children is really caused by households with children attaching more importance to this motive. To investigate this more thoroughly, the next subsection stratifies the sample by the number of children and some other criteria and looks at the variation in saving behavior over the number of children.

4.3 Saving Behavior and the Number of Children, Income, Age, and Education

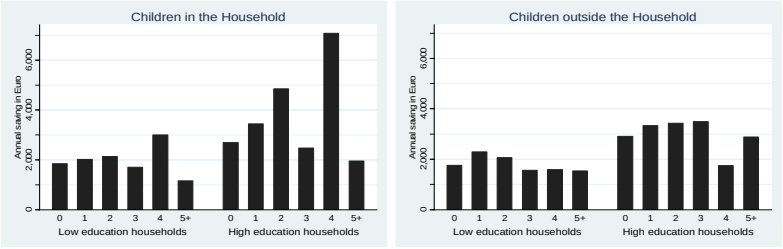
4.3.1 Annual Saving

A major shortcoming of descriptive analyses is the limited capability to control for other variables. How important that can be when analyzing the relationship between annual saving and children can be demonstrated in this subsection. The first row of figure 7 reports mean annual saving, stratified by educational level and the number of children inside (left) or outside (right) the household, respectively

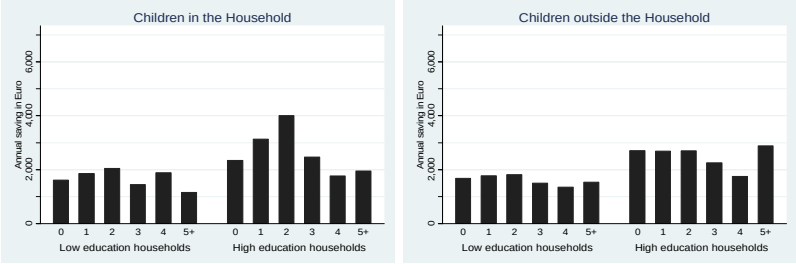
(from 0 to 5 and more children). To limit the influence of outliers, which can drive mean saving of groups with many children but few observations, annual saving is truncated above the 99.5 percentile for the remainder section 4.3.1. The second row of figure 7 shows how this affects the results. From these graphs, we cannot say much about the relationship between saving and children—if anything, we would suppose that there is no relation.

Figure 7: Annual Saving by the Number of Children and Education

Restricted Sample



Restricted Sample with Additional Truncation at the 99.5 Percentile of Annual Saving



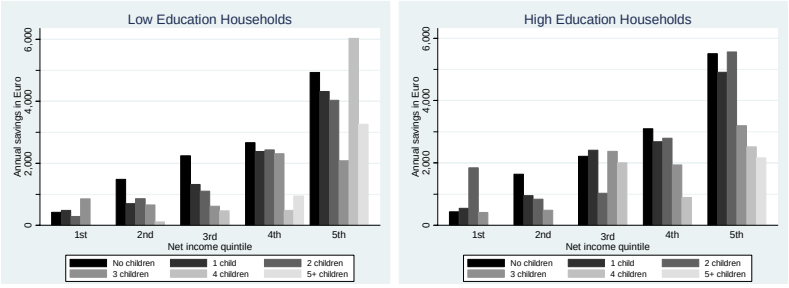
Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

But as observed in section 4.1, households with higher net income tend to have more children. Thus, a positive effect of income on saving and a negative effect of children on saving could cancel out in figure 7. Therefore, figures 8 and 9 additionally stratify by income quintiles. Now, we can make four major observations. First, being in a higher income quintile is positively related to annual saving if the number of children and the educational level is hold fixed (i.e., we compare bars of the same color for a particular educational level). Second, for a given income quintile and a particular number of children in the household, we do not observe a consistent relationship between the educational level and annual saving (i.e., we compare the bars that refer to a particular income quintile and a particular number of children between the left and the right graph). Though these observations just refer to (conditional) correlations and can by no means be interpreted as ceteris paribus effects yet, they suggest a level effect of income—but not of education—on saving. Third, within each income quintile, annual saving decreases in the number of children in the household, at least from the second income quintile onwards (figure 8). Households in the lowest income quintile save very little anyway and might thus not be able to reduce saving further if the number of children increases. Note that there are no obvious educational differences in the relationship between annual saving and children in the household. Fourth, while the negative relationship between saving and children persists when children leave high education households (neglecting the outlier in the second income quintile), this cannot be observed for low education households (figure 9). Here, annual saving remains quite stable over the number of children outside the household. In reference to the hypotheses of section 2.4, this pattern suggests that education

induced self control and cost effects of children cancel out as long as children live inside the household, but that education induced cost effects prevail after children have left the household.

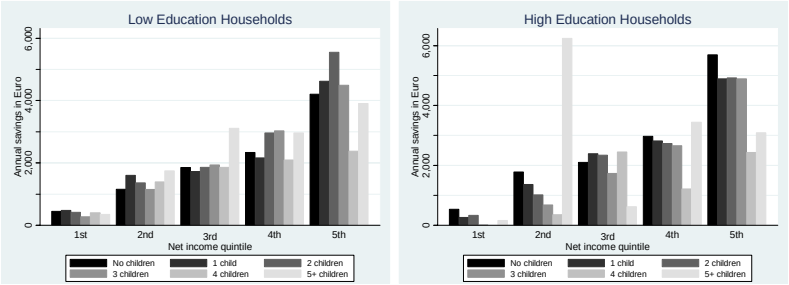
As shown, stratification by an additional variable helps to isolate the effect of children on saving from the effect of other variables. The other side of the coin is that the sizes of cells over which mean annual saving is calculated get smaller, the more variables are stratified by. This makes the mean prone to biases from outliers and measurement error and thus less reliable, especially in groups with many children, which comprise a small number of observations anyway. Therefore, it does not seem reasonable to stratify by more than three variables at the same time. Controlling for more variables simultaneously will be postponed to the regression based analysis in section 6.

Figure 8: Annual Saving by the Number of Children in the Household, Income, and Education



Source: SAVE 2005-2007, restricted sample with additional truncation, weighted, and averaged over the five imputed data sets.

Figure 9: Annual Saving by the Number of Children outside the Household, Income, and Education

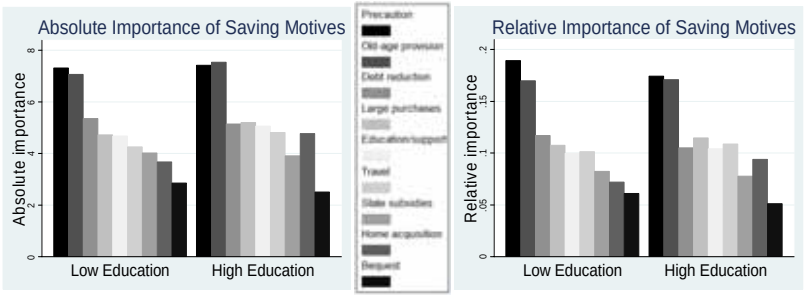


Source: SAVE 2005-2007, restricted sample with additional truncation, weighted, and averaged over the five imputed data sets.

4.3.2 Saving Motives

Figure 10 illustrates that for both educational levels, the precautionary and the old-age provision motive clearly rank highest with respect to both absolute and relative importance, followed in low education households by the motives debt reduction, large purchases, education/support, travel, state subsidies, home acquisition, and bequest. In high education households, debt reduction is considered a bit less important, while large purchases, home acquisition, and travel are attached more importance. However, these 'educational' differences could well be due to high education households being younger on average. Especially with respect to the most and least important saving motives, this ranking is similar to the one found by Reil-Held (2007) in SAVE 2001-2006 and it is in line with the findings of Harris et al. (2002, pp. 208-209) in Australian data, except for the fact that particularly the motives travel and home acquisition were ranked higher in the latter.

Figure 10: Absolute and Relative Importance of Saving Motives by Education



Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

If we plot the mean absolute importance of saving motives against the number of children *inside* the household (upper half of figure 11), we can observe very similar patterns for both educational groups. The absolute importance of the motives large purchases, precaution, and old-age provision remains roughly constant over the number of children. If anything, there is a slight hump shape. For the motives home acquisition, debt reduction, bequest, and state subsidies, the absolute importance increases up to the third or fourth child and declines thereafter. This decline is a bit more pronounced for low education households. Not surprisingly, the importance of the education/support motive rises sharply with the first child, but remains quite constant thereafter, maybe slightly increasing for the high education sub sample. Finally, the travel motive declines in importance over the number of children in low education households while remaining roughly constant in high education households.

Since the absolute importance of most saving motives exhibits a more or less pronounced hump shape over the number of children in the household, it seems that the competition among different saving motives is highest for households with some but not too many children. If this is taken into account by looking at the relative rather than the absolute importance of saving motives (figure 12, left graph), it is not surprising that the relationship between children in the household and the relative importance of most saving motives is less pronounced than for the absolute measure, and that the increase in competition goes at the expense of motives with a constant absolute importance over the number of children in the household (precaution, old-age provision, and large purchases), now showing a decreasing or slightly U-shaped pattern.

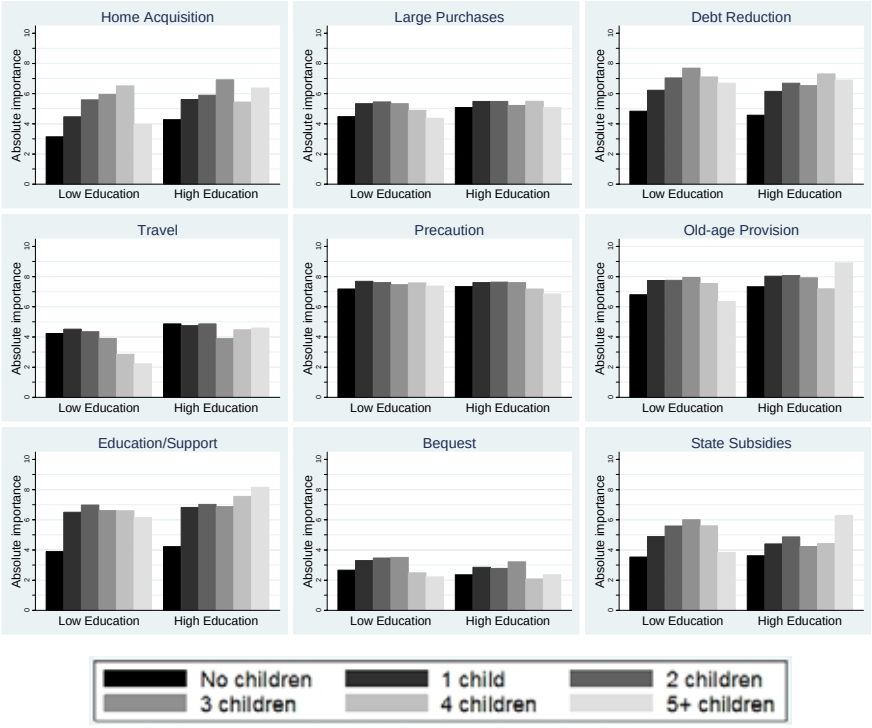
The mean absolute importance of most saving motives stratified by the number of children *outside* the household (lower half of figure 11) is again very similar for the two educational groups and does not change very much over the number of children. While the motives education/support and bequest are somewhat more important for households with some children outside the household, the motives home acquisition, large purchases, debt reduction, and state subsidies are somewhat more important for households without any children outside the household. However, this might be due to the fact that the 'no children outside the household' group contains young households whose children are still all present in the household. With respect to the relative importance of saving motives, similar observations hold (figure 12, right graph).

Comparing the relative measure of importance for children in and outside the household yields another interesting observation. The

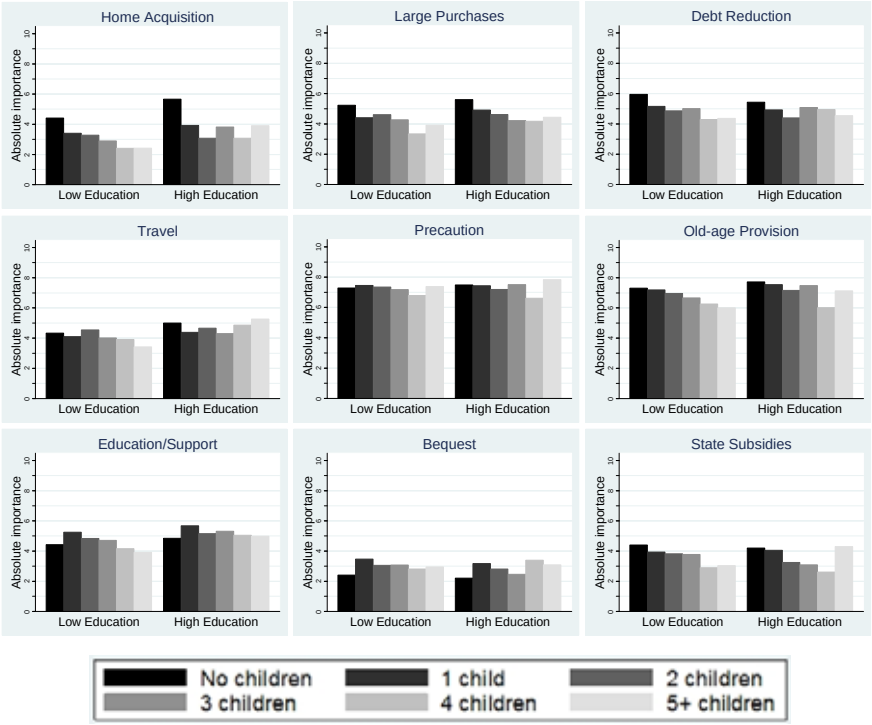
relative importance of some motives, like home acquisition and state subsidies, increases over groups with more children in the household but decreases over groups with more children outside the household, whereas the relative importance of other motives, such as travel and precaution, shows a reverse pattern. This suggests that households attach more importance to some motives while children are present and to compensate for that after children have left the household.

Figure 11: Absolute Importance of Saving Motives by Children and Education

Children in the Household

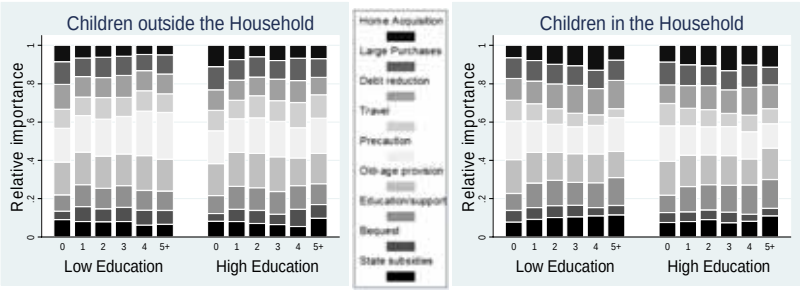


Children outside the Household



Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

Figure 12: Relative Importance of Saving Motives by Children and Education



Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

Figure 13 to 15 additionally stratify by income quintiles. In general, similar patterns than without stratification by income quintiles (figures 11 and 12) can now be observed for a given income quintile. However, the relationship between the absolute importance of some saving motives and the number of children *in* the household (figure 13) exhibits some tendency to get weaker as one moves up the income distribution.[18] This would be in line with the theoretical hypothesis that income alleviates the effect of children on saving motives.

Turning to the relation between the absolute importance of saving motives and children *outside* the household (figure 14), income seems to matter in some cases. For low education households and a

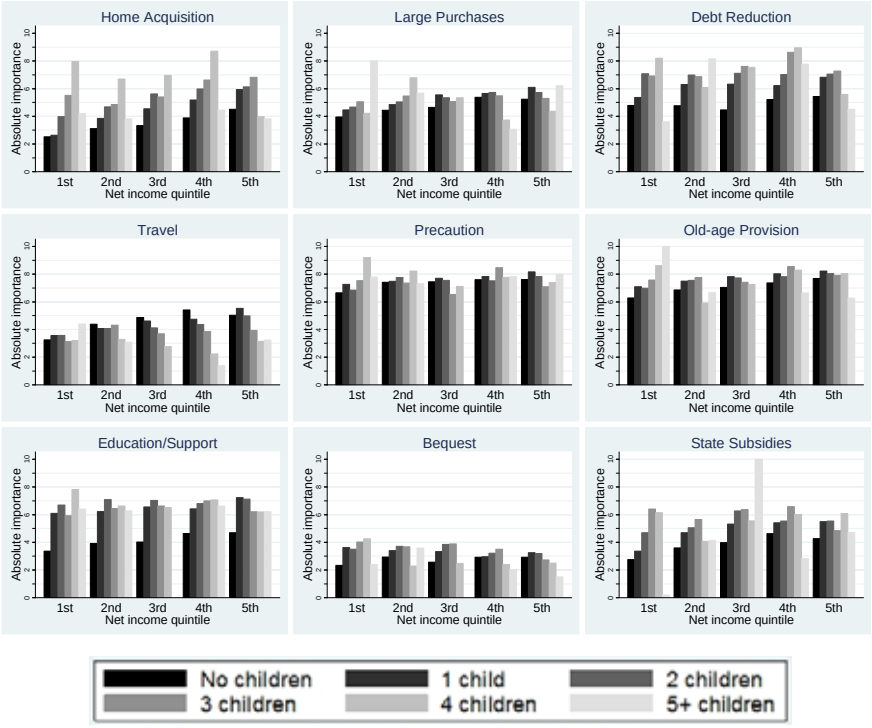
[18] For example, look at the absolute importance of the home acquisition motive in low education households in figure 13. While the mean absolute importance of this motive increases by 5 from about 3 to 8 between the 'no children' group and the group with the highest mean (4 children), this increase approximately halves if we compare the corresponding groups at the top income quintile (no children vs. 3 children).

given number of children, the absolute importance of all motives is positively related to income. That is, among the less educated, high income households appear to attach more importance to saving in general than low income households. For high education households, income seems to matter for the relation between children outside the household and the motives home acquisition and debt reduction: While in all income quintiles, the first child is associated with a decline in importance, the importance rises again for households with more than one child in the lowest two income quintiles, but keeps falling in the upper three income quintiles. If this finding is not driven by outliers, it could mean that low income households with many children outside the household have to make more effort to accumulate the starting capital for buying a home and for the repayment of debts thereafter.

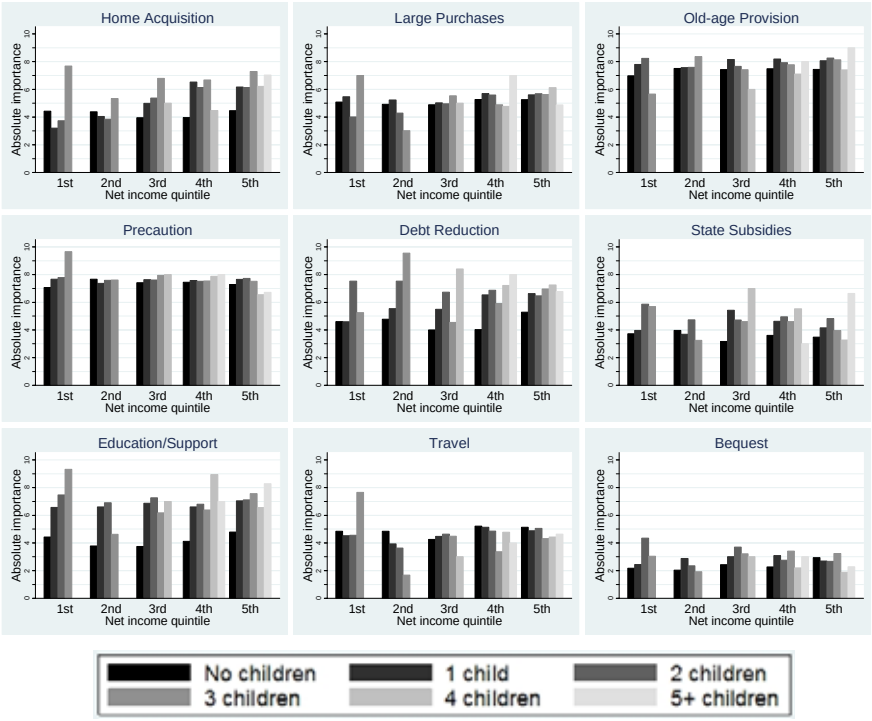
With respect to the relative importance of saving motives (figure 15), similar conclusions than without stratification by income quintiles (figure 12) hold within most income quintiles. The only qualification is that households in higher income quintiles tend to attach more relative importance to the motives home acquisition and travel, but less to the precautionary motive.

Figure 13: Absolute Importance of Saving Motives by Children in the Household, Income, and Education

Low Education Households



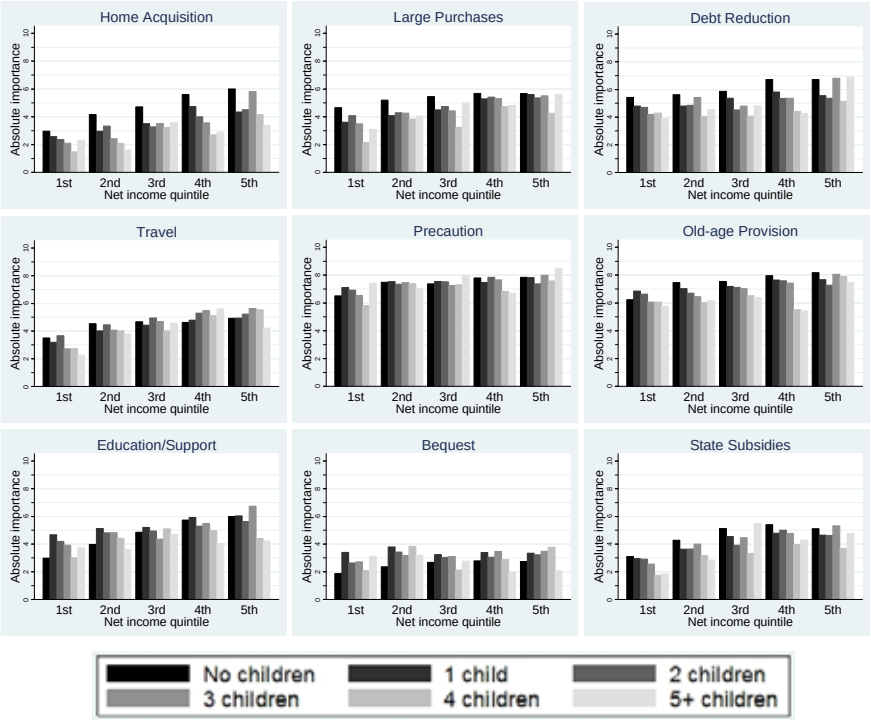
High Education Households



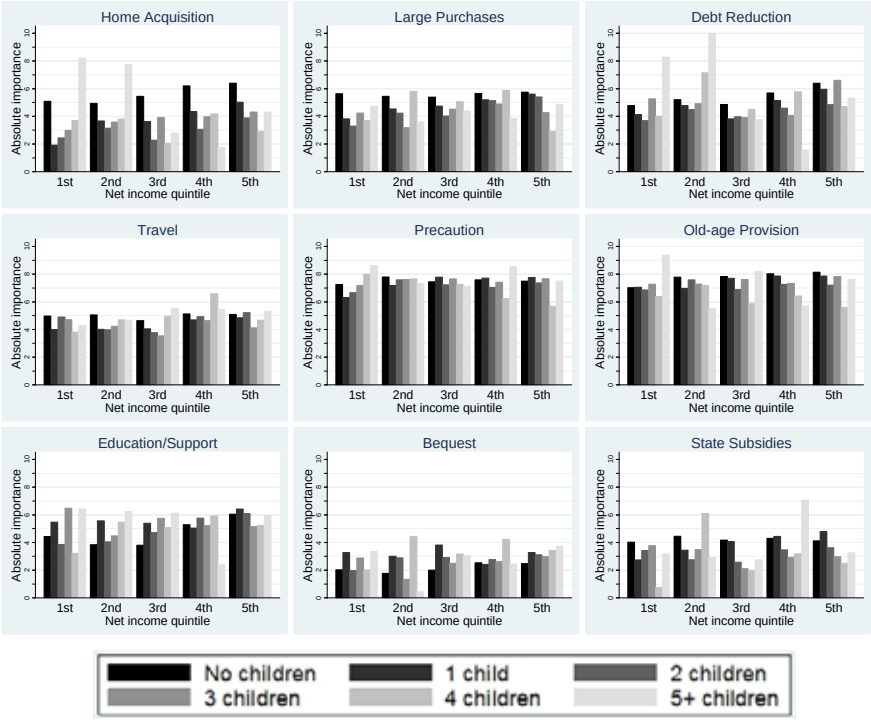
Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

Figure 14: Absolute Importance of Saving Motives by Children outside the Household, Income, and Education

Low Education Households



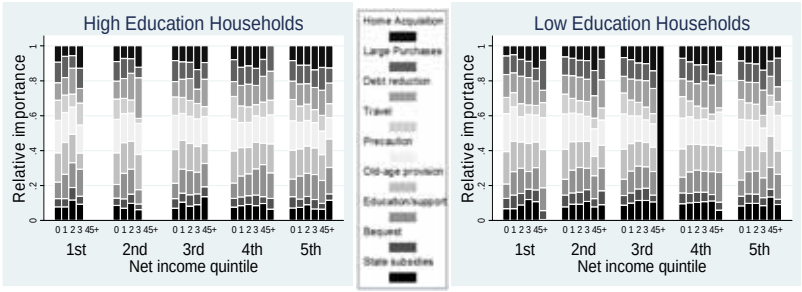
High Education Households



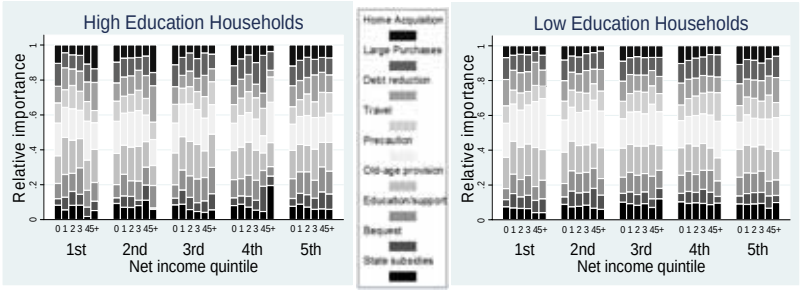
Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

Figure 15: Relative Importance of Saving Motives by Children, Income, and Education

Children in the Household



Children outside the Household

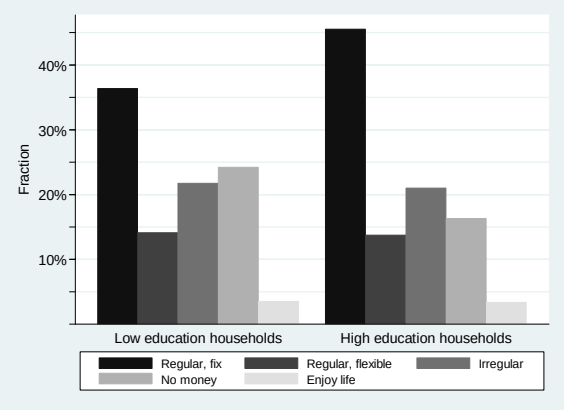


Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

4.3.3 Regularity of Saving

According to figure 16, a clear majority of households saves a fixed amount on a regular basis. However, the fraction of regular fix savers is almost 10% higher among high education households (46% vs. 37%), while the opposite is the case for no money non-savers (17% vs. 25%). The fractions of regular flexible savers (14%), irregular savers (21-22%) and enjoy life non-savers (3%) are strikingly similar for both educational levels.

Figure 16: Regularity of Saving by Education



Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

Stratifying by the number of children in and outside the household, respectively (figure 17), we can observe that also for a given number of children, the fraction of regular fix savers is higher in high education households, while the fraction of no money non-savers is lower.

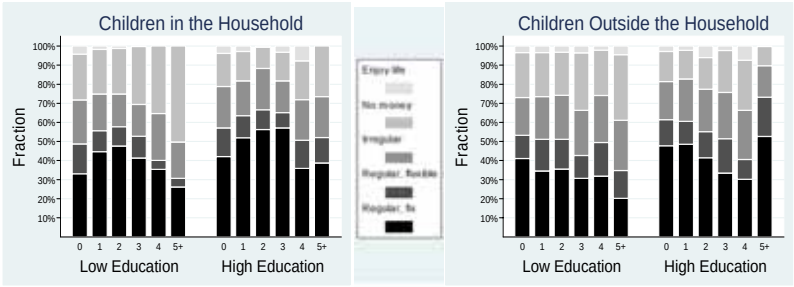
Moreover, for a given level of education, the fraction of regular fix savers increases over the number of children in the household up to the 2nd or 3rd child at the expense of all other saver types. Afterwards, the fraction of regular fix savers appears to be negatively related to the number of children in the household, and the fraction of no money non-savers increases. This suggests that children initially increase the household's willingness to commit to regular saving, but once the number of children passes some threshold (e.g., 3 children), the financial burden makes it difficult to adhere to regular saving and a rising fraction of households is unable to save. However, the graphical analysis may be confounded by self selection problems, e.g., households with higher income or smoother income profiles may be more likely to give birth to children and save more regularly at the same time, which would explain the initial increase in the fraction of regular fix savers. Indeed, the fraction of households with children rises continuously from the first (58%) to the fifth income quintile (85%). Moreover, if we stratify by income quintiles (figure 18), it becomes evident that higher income households tend to save more regularly. As a result, the hump shape in the fraction of regular fix savers over the number of children in the household is less pronounced within income quintiles, and there rather is a negative trend, at least in the fraction of all regular savers (i.e., those saving either a fixed or a flexible amount). However, the pattern within income quintiles is quite volatile (especially for the smaller sample of high education households). More obvious is that the fraction of no money non-savers increases in the number of children in the household. Overall, these findings suggest a negative relationship between regular saving and the number of children in the household. However, this negative relationship seems to be

weaker in higher income quintiles, at least at the low educational level. Also note that in the regression based analysis, which controls for income and income variability, no evidence is found that the first 2 or 3 children increase the probability of regular fix or regular flexible saving. Instead, a negative effect is found for each child. This further hints to the conclusion that the initial increase in the fraction of regular savers in the left-hand graph in figure 17 is due to the fact that higher income households are both more likely to have children and to save more regularly.

With respect to children outside the household, the right-hand graph in figure 17 suggests that their number is negatively related to saving a fixed amount, but positively related to saving irregularly or not at all. However, once income is accounted for (figure 19), there is less evidence that children outside the household are negatively related to the regularity of saving.

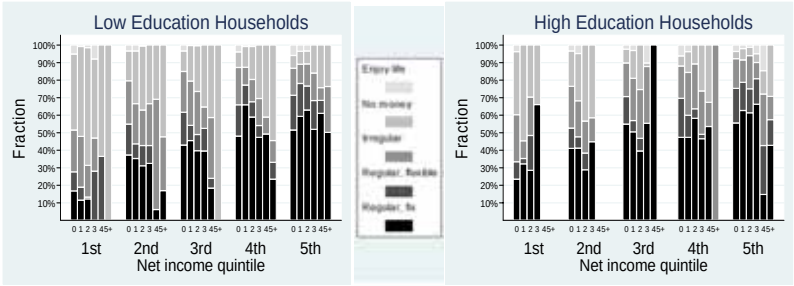
Overall, these observations suggest that children induced (negative) cost effects on the regularity of saving outweigh possible (positive) self control effects—at least as the number of children gets large. This negative effect appears to get weaker when children leave the household.

Figure 17: Regularity of Saving by the Number of Children and Education



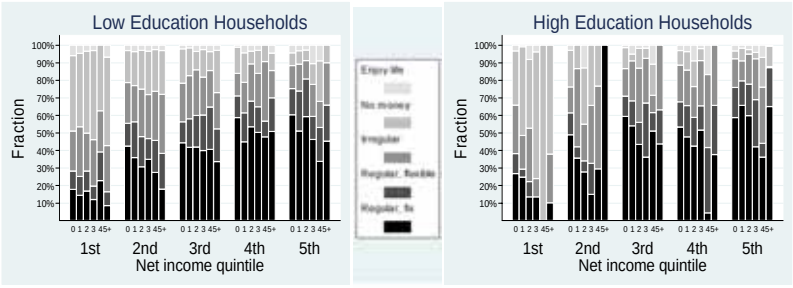
Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

Figure 18: Regularity of Saving by Children in the Household, Income, and Education



Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

Figure 19: Regularity of Saving by Children outside the Household, Income, and Education



Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

Stratification by Age Groups

Since this study investigates heterogeneity in the effect of children not only with respect to income and education but also with regard to age, the sample was also stratified by age groups (instead of income) in addition to the number of children and the educational level. However, this does not yield many additional conclusions such that it is not discussed in detail (figures A.3 to A.9 in the appendix; note that because of very thin data support, the graphs for children in (outside) the household omit the highest (lowest) age group). Worth noting is that for very young households, children outside the household are negatively related to the level and the regularity of saving as well as to the absolute importance of most saving motives. This can probably be explained by the fact that children outside very young household are likely to be connected to divorce or extra-marital birth and the financial burden of mandatory support payments. Also, very young households generally save less

than older ones, and for a given age group, more educated households save more, but this might just as well be an income effect.

Summary of Main Results

To conclude this section, let us briefly summarize the main results of section 4.3.

Once differences in income are accounted for, we find the expected negative relationship between annual saving and the number of children in the household, which appears to be independent of the educational level. When children leave the household, this negative relationship persists only in high education households. Also, higher income households save more, and very young households save less than older ones, especially if they have children outside the household.

With respect to saving motives, the number of children in the household is positively related to the absolute importance of the motives home acquisition, debt reduction, education/support, bequest, and state subsidies, but negatively to the travel motive. While the absolute importance of the motives large purchases, precaution, and old age provision appears to be unaffected, these motives decrease in relative importance since children intensify the competition among saving motives. While educational differences are negligible, the children-saving-relationship gets weaker in income. When children leave the household, their influence on most motives seems to vanish.

Finally, children in the household seem to be negatively related to regular saving once we account for income. Income as such is posi-

tively related to regular saving and weakens the influence of children. When children leave the household, their effect appears to get weaker as well.

While these findings are mostly consistent with the theoretical hypotheses or suggest that children induced cost effects outweigh children induced self control effects, remember that all potential relationships between children, education, and saving behavior proposed so far do not need to be causal and could very well be driven by other variables not controlled for if these variables are correlated with the stratification variables considered in this section. Thus, a regression based inference that ideally takes into account all relevant variables is clearly warranted.

5 Econometric Models and Issues

This section describes the econometric models and methods applied to measure heterogeneity in the effect of children on saving behavior (5.1) and discusses possible econometric issues (5.2).

5.1 Econometric Models

5.1.1 Types of Models Applied

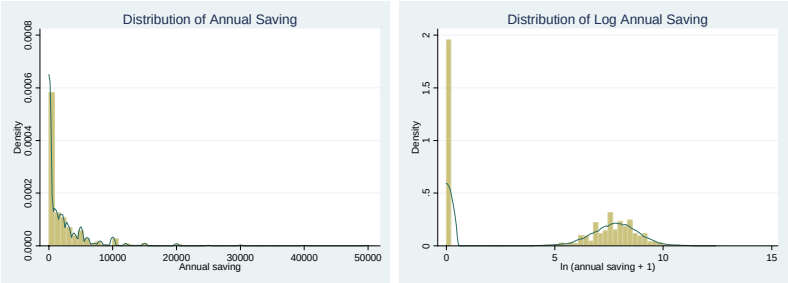
Since the distribution of **annual saving** resembles a log-normal distribution (figure 20, left), it is transformed into (natural) logs for the regression based analysis. Taking logs is supposed to reduce both the problems of outliers and heteroskedasticity, but because annual saving is reported as 0 for a large fraction of the sample, it requires annual saving to be scaled up by 1 Euro. The distribution of log annual saving (figure 20, right) resembles a normal distribution except for the peak at 0, which results from the left-censoring of saving. This left-censoring is taken into account by estimating a Tobit type I model for log annual saving, i.e., *observed* log annual saving (y_i) reflects the latent variable *actual* log annual saving (y_i*) only if it is positive and equals 0 otherwise:

(6) $$y_i = \begin{cases} y_i^* = x_i'\beta + \varepsilon_i & if\ y_i^* > 0 \\ 0 & if\ y_i^* \le 0 \end{cases}$$

(Wooldridge (2002, pp. 517-521))

[x_i is a vector of explanatory variables, β a vector of coefficients, and ε_i an error term.]

Figure 20: Distribution of (Log) Annual Saving—Histogram and Kernel Density



Source: SAVE 2005-2007, restricted sample.

The **absolute importance of saving motives** is surveyed as an ordinal variable and thus an ordered probit model is appropriate, i.e., the observed variable y_i is related to the latent variable y_i* via ten unknown threshold values $\mu_1<\ldots<\mu_{10}$ in the following manner:

(7) $y_i^* = x_i'\beta + \varepsilon_i$ (Wooldridge (2002, pp. 504-508))

$$y_i = \begin{cases} 0 & if \quad y_i^* \le \mu_1 \\ 1 & if \quad \mu_1 < y_i^* \le \mu_2 \\ \vdots & \vdots \\ 10 & if \quad \mu_{10} < y_i^* \end{cases}$$

In this model, a positive (negative) sign of an element of β indicates that a variable shifts probability mass towards higher (lower) categories of the dependent variable.

Calculating the **relative importance of saving motives** implicitly assumes equal distances between different categories and yields

values on the [0, 1] interval for each motive. To restrict predicted values to this interval, a two-sided Tobit model is applied, i.e.:

$$(8) \qquad y_i = \begin{cases} 0 & if\ y_i^* < 0 \\ y_i^* = x_i'\beta + \varepsilon_i & if\ y_i^* \in [0, 1] \\ 1 & if\ y_i^* > 1 \end{cases}$$

The five categories measuring the **regularity of saving** do not imply an obvious ranking. While regular fix and regular flexible savers obviously save more regularly than irregular savers or no money non-savers, there is no clear-cut ordering between the first two categories, to say nothing of the category enjoy life non-savers. Thus, a multinomial logit model for unordered categories is applied to this variable, as also done in Schunk (2007, pp. 17-20). In this model, the response probability for each category j = 1, …, J is given by

$$(9) \qquad P(y_i = j \mid x_i) = \frac{exp(x_i'\beta_j)}{\sum_{h=1}^{J} exp(x_i'\beta_h)}$$

(Wooldridge (2002, pp. 497-499)).

In order to identify the model, the elements of the coefficient vector of the base category, which is chosen to be no money non-savers, are set to 1. Regarding the estimation technique, all models presented in this subsection can be estimated by maximum likelihood.

5.1.2 Econometric Equations

The basic econometric equation that is substituted for $x_i'\beta$ or $x_i'\beta_j$, respectively, in equations (6) to (9) is the following, suppressing subscripts i and j[19]:

$$
\begin{aligned}
x'\beta = \beta_0 &+ \beta_C' \begin{pmatrix} children\_in\_h \\ children\_out\_h \end{pmatrix} \\
&+ \beta_{CE}' \begin{pmatrix} children\_in\_h \\ children\_out\_h \end{pmatrix} \times FHR\_Abitur \\
&+ \beta_{CI}' \begin{pmatrix} children\_in\_h \\ children\_out\_h \end{pmatrix} \times (netinc - 26.7) \\
&+ \beta_{CA}' \begin{pmatrix} children\_in\_h \\ children\_out\_h \end{pmatrix} \times (age - 51) \\
&+ \beta_{SD}' sociodemo + \beta_F' finance + \beta_P' psycho + \beta_Y' year \\
&+ \varepsilon
\end{aligned}
\tag{10}
$$

where *children_in_h* and *children_out_h* denote the number of children living inside and outside the household, respectively, which both enter interacted with a dummy for a high educational level of the household head (*FHR_Abitur*), annual net household income (*netinc*), and the age of the household head (*age*). The latter two are rescaled to their sample means to get meaningful estimates of β_C (i.e., at mean age and mean income instead of zero age and zero income). Since the effect of children might be non-linear, modifications of this specification have been run for each dependent variable. First, the number of children has been split up into one variable being 1 or 2 if the household has one or two children and zero other-

[19] Note that the constant term, β_0, is set to 0 in the ordered probit estimation of equation (7) to identify the model.

wise (*children_in_h_12*, *children_out_h_12*) and another variable being 3, 4, 5, … if the household has more than 2 children and 0 otherwise (*children_in_h_3+*, *children_out_h_3+*). That is, the marginal effect of the first and second child is allowed to differ from the effect of succeeding children. The second modification distinguishes the effects of less than 4 and more than 3 children in the same way (*children_in_h_123*, *children_out_h_123*, *children_in_h_4+*, *children_out_h_4+*). Third, two children dummies (*child_in_h*, *child_out_h*) have been included along with the number of children to test whether only the presence or the number of children matters. Since each of these modifications doubles the quantity of children variables, the interaction effects have been restricted to the educational level in these cases. Otherwise, the estimation would become increasingly imprecise. To avoid a huge number of mostly redundant tables, only the specification that appeared to be most suitable is reported.

Besides the educational level of the household head, the vector *sociodemo* contains other sociodemographic characteristics that are assumed to have an influence on saving behavior: *age* (quadratic) to capture age and cohort effects; *female* to control for gender differences in taste; *east* as a dummy for residence in Eastern Germany to control for the still different (economic) environment in the newly formed German States; *foreign* as a dummy for non-German citizenship to account for cultural differences in taste and the special situation of foreign citizens; *partner* as a dummy for sharing the household with a partner to capture household size effects other then those related to children; and *good_state_of_health* as a dummy for a good health condition since this is supposed to affect not only pre-

sent and future income opportunities but also utility derived from different consumption goods and thus saving behavior.

Since there is no direct measure of permanent income and the panel is too short to construct one from averages as done frequently, the vector *finance* includes current net income in quadratic form (*netinc, netinc2*) along with a number of subjective measures regarding past income variability (*high_inc_var, low_income_var*) and future income prospects, in particular the subjective probability of a raise in income (*increased_inc_prob*) and of receiving a major gift or heritage that would significantly improve the households financial situation (*highheritage_prob*). To control for positive transitory income shocks, dummies for exceptional one-time earnings below and above two times monthly net income (*except_earn_low*, *except_earn_high*) are included, not counting tax refunds, which often occur each year, are to a certain extent predictable, and thus not really unanticipated transitory shocks. Exposure to exceptional financial burdens on the other side is accounted for by including dummies for making regular support payments to persons outside the household (*pay_support*) and paying off a home loan (*repay_homeloan*) or mortgage (*repay_mortgage*). The latter two also account for the possibility that people might not consider loan repayments as saving. Further measures of exposure to income risk are a dummy for a temporary work contract (*job_contract_l*) and the subjective probability of becoming unemployed in the near future (*probjobloss*). Job dummies (*blue_collar, white_collar, civil_servant, self_employed, freelancer*) might also reflect exposure to income risk, but since people self select into different occupations, they might rather reflect different tastes towards risk. Other

proxies for risk aversion are dummies for having occupational disability insurance (*insur_disability*) and liability insurance (*insur_liab*). Furthermore, *finance* includes dummies for full-time, part-time, and minor employment (*work_full, work_part, work_little*), retirement (*retired*), unemployment (*unemployed*), and homeownership (*homeowner*) as well as total *wealth* (quadratic), which can reflect differences in the households' general taste for saving or discount rates (Browning & Lusardi (1996, p. 1845)).

Besides sociodemographic and financial characteristics, heterogeneity in saving behavior might be due to psychological factors (Browning & Lusardi (1996, p. 1850)). Thus, the vector *psycho* consists of a small set of psychological variables that are supposed to capture the influence of certain character traits on the taste for saving. These variables are dummies that rely on the respondent's self description and concern the household's *optimism*, planning horizon (living for the moment rather than planning the future (*easy_going*), spontaneous rather than observant (*spontaneous*)), and tendency to behave like a creature of habit (*habit*). In addition, a *smoker* dummy is supposed to account for differences in time preferences (Khwaja at al. (2006, pp. 674-676), Khwaja et al. (2007, pp. 942-946)). *live_shorter* and *live_longer* are dummies for the expectation to live shorter or longer than a person of the same age on average and thus constitute a subjective measure of individual life expectancy. Finally, *year* consists of two dummies for households observed in 2005 and 2007, respectively, and controls for time effects on the dependent variable.

As already mentioned at the end of section 2.3, applying the same specification of $x'\beta$ to each of the dependent variables is not postulated to be the most appropriate one could think of to explain each variable separately. Rather, the specification has been chosen to explain the level of annual saving as well as possible, both with respect to theoretical considerations and the fit of the specification. Then, the same specification has been applied to saving motives and the regularity of saving to shed more light on the channels on which the explanatory variables affect annual saving (a method similar to the one applied by Smith and Ward (1980, p. 247)). This is considered more insightful than including saving motives and the regularity of saving in the regression of annual saving, since the latter neglects that the three dimensions are probably jointly determined and would also take away the indirect effect that some explanatory variables, e.g., children, have on annual saving *via* changing the importance of saving motives or the regularity of saving.

5.2 Econometric Issues

5.2.1 Calculation of Standard Errors

Two features of the SAVE data make the computation of correct standard errors of regression coefficients non-trivial. First, because of time invariant individual specific effects, the error terms of respondents that are interviewed repeatedly are likely to be serially correlated. This serial correlation can be taken into account if we regard observations on the same household in different years as one cluster and allow the error terms within each cluster to be correlated. Assuming the matrix of regressors, *X*, to be exogenous, this affects the variance-covariance matrix of the estimated coefficients,

$var(b) = (X'X)^{-1} X' E(\varepsilon\varepsilon') X (X'X)^{-1}$, in the following way: If all observations were independent, $E(\varepsilon\varepsilon') = \sigma^2 I$ since all diagonal elements of $E(\varepsilon\varepsilon')$ are σ^2 and all off-diagonal elements are zero, i.e., $E(\varepsilon_i \varepsilon_j)$ equals σ^2 (homoscedasticity) for i = j and zero for i ≠ j. With clustering, $E(\varepsilon_i \varepsilon_j)$ with i ≠ j is allowed to differ from zero if observations i and j belong to the same cluster (Rogers (1993, pp. 19-20), Wooldridge (2002, pp. 328-331)).

Second, stochastical multiple imputation makes it necessary to account not only for the variability of the estimated coefficients *within* one dataset (the so-called within-imputation variability (*WIV*)) but also *between* the five imputed datasets (between-imputation variability (*BIV*)). Therefore, Rubin's method (Rubin (1987, pp. 20-22, 81-87; 1996, pp. 476-477)) is applied, i.e., the variance-covariance matrix of the mean coefficient $\bar{b} = \frac{1}{5} \sum_{m=1}^{5} b_m$, in which b_m is the coefficient estimated using the m^{th} imputed version of the dataset, is calculated as *WIV* + (6/5)*BIV* with $WIV = \frac{1}{5} \sum_{m=1}^{5} var(b_m)$ and $BIV = \sum_{m=1}^{5} (b_m - \bar{b})(b_m - \bar{b})' / 4$.

5.2.2 Endogeneity of Fertility Behavior

The interpretation of the estimated coefficients of the children variables as causal effects and not just as partial correlations crucially depends on the assumption that fertility behavior is exogenous to saving behavior. There is some concern in the literature that causation might run in both directions, i.e., that the ability and willingness to save affect the number of births as well as vice versa, or, even

more likely, that both are jointly determined (Smith & Ward (1980, p. 247), Cigno & Rosati (1996, pp. 1561-1562), Angrist & Evans (1998, p. 451), Schultz (2007, p. 3)). Joint determination means that households jointly decide upon both the saving profile and the number of children given birth to based on other household characteristics, some of which are commonly unobserved, e.g., exposure to risk, risk aversion, time preferences, and other kinds of tastes. In any of the two cases, observed partial correlations could not be interpreted as pure causal effects from one variable on the other. If, for instance, more risk averse households save more but give birth to fewer children and risk aversion is not appropriately controlled for, the causal effect of children on saving would be biased downwards, i.e., a negative effect of children would be overestimated in absolute terms.

One common way to deal with endogenous variables is instrumentation. One of the most prominent instruments for fertility are twins or multiple births, which can be regarded as exogenous 'shocks' to fertility (see, e.g., Rosenzweig & Wolpin (1980a, b), Angrist & Evans (1998, pp. 469-473), Black et al. (2005b, pp. 681-683)). Other instruments are a woman's experience of miscarriage on first pregnancy, which is negatively related to the number of children ever born (Schultz (2007, p. 23)), and the sibling sex composition, assuming that parents prefer a mixed sex composition and are thus more likely to have another child if present children are of the same sex (Angrist & Evans (1998, pp. 456-458), Black et al. (2005b, pp. 676-677)). However, all these instruments have significant drawbacks. Twins occur infrequently resulting in small sample sizes (Schultz (2007, p. 17)) and are in fact more likely for older women

(Angrist & Evans (1998, p. 458)). In addition, twins may differ in their effect from the separate birth of two children. If this is the case, the effect identified with twins would not be representative for the effect of children in general. Miscarriages occur more frequently than twins but are likely to be reported with error, which makes the instrument rather weak (Schultz (2007, p. 23)). Finally, sibling sex composition is a weak instrument as well since it depends on tastes regarding the children sex mix that might be heterogeneous in the population. In fact, differences in the probability of getting another child between same sex sibling households and mixed sex sibling households turn out to be small (Angrist & Evans (1998, p. 457), Orbeta (2006, p. 7)). A further disadvantage of this instrument is that the sample is restricted to households with at least two children. This is critical since it yields small samples for industrialized countries and identifies the effect only for more than two children, which might be different from the effect of the first and second child.

In my opinion, no convincing and readily applicable way has been found to deal with the endogeneity problem. As a result, many studies mention the problem but do not even pretend to deal with it (e.g., Smith & Ward (1980), Attanasio & Weber (1995), Harris et al. (2002), Freyland (2005b)). If instruments are applied, there usually is some evidence for endogeneity in the context of labor market behavior. Commonly, the effect of instrumented fertility on labor supply is smaller than without instrumentation but has the same sign and is still significant (see, e.g., Angrist & Evans (1998, pp. 466-467)). How much of this reduction is due to weak instruments and measurement error is an open question. According to Schultz (2007, p. 40), there is much less empirical evidence on the effect of exoge-

nous shifts in fertility on saving, but the little existent evidence suggests that using instruments does not change the sign of the effect.

I think there is some reason to believe that the endogeneity problem might not be so severe in my analysis. First, at least in the short term, the impact of fertility on saving is probably stronger than in the other direction since fertility decisions are longer ranged than saving decisions in the sense that the latter can be revised, whereas the decision to get a child cannot be reversed once the child is born. In other words, at a given point of time, the number of children is more likely to affect annual saving than vice versa, though there might be some feedback. Second, the problem of joint determination is reduced since measures of risk aversion, exposure to risk, time preferences, and other character traits are explicitly controlled for. Bearing all that in mind, it seems justifiable to refrain from the use of instruments for the most part of the analysis. Instead, it is considered more fruitful to run ordinary regressions, keeping in mind that the actual causal effects might be bit smaller than the observed partial correlations but presumably have the same sign. To provide some support for this view, section 6.4 introduces a different approach to instrument fertility than the ones described above. The results suggest that accounting for endogeneity via instrumentation does not change the main conclusions of this study.

5.2.3 Omitted Variables and Further Specification Issues

While the specification allows for some heterogeneity in the effect of children with respect to their household affiliation as well as their parents' income, age, and education, some potential heterogeneity is still unaccounted for. For instance, as former empirical evidence in

section 2.3 has pointed out, the effect of children in the household is likely to vary with the children's age, which unfortunately is not observed in the SAVE data. As a result, the analysis might confuse the effects of the children's age and the parents' age, which are likely to be positively correlated but to affect saving in different directions. There are further variables that might moderate the effect of children on saving and could be correlated with the ones controlled for (education, income, and age), like the marital status of the household head, the duration of the marriage or partnership, the spacing of births, and other characteristics of the children like their gender and state of health. Most of these variables are not observed in the data but even if that was the case, the sample size would make it difficult to control for all possible interaction effects.

Another problem is that saving is a result of an intertemporal decision, and thus, children may cause households to save less during some stages of the life cycle but more during other stages. Such intertemporal variation in the effect of children can only very imperfectly be accounted for by controlling for whether children live in or outside the household and an interaction of the children variables with the parents' age.

However, despite these imperfections, the analysis can yield a first impression about whether there is considerable heterogeneity in the effect of children and if it is worth to do further research in this direction.

6 Results

This section describes and discusses the estimation results of the equations introduced in section 5.1 (6.1 – 6.3) as well as the construction of an instrument for fertility and the associated results (6.4). Finally, these results are used to adjust saving and consumption profiles for the number of children (6.5). If not otherwise indicated, statistical significance refers to the one percent level.

6.1 Annual Saving

For annual saving, the best specification of the children effect turns out to be a linear one since the effect of an additional dummy is both statistically and economically insignificant and the per child effect of more than 2 or more than 3 children does not differ much from the per child effect of up to 2 or up to 3 children. Since the dependent variable is measured in logs, this linear specification implies a constant *relative* effect of an additional child on annual saving.

In the first column of table A.3, the number of children in and outside the household is interacted solely with the educational level of the household head. The results indicate that children in the household have a negative impact on annual saving: Holding all other covariates constant, the difference in the log of annual saving between low education households with n and n+1 children is esti-

mated as -0.722[20], implying that an additional child reduces the level of annual saving by just over 50% (exp(-0.722) – 1 = -0.514). This effect is significant and does neither economically nor statistically significantly differ between the educational levels.

Children *outside* the household are estimated to reduce annual saving by roughly one fourth per child for low educational households (a log difference of -0.279 implies a reduction of 24.3% per child). While the effect is still significantly different from 0, it is also significantly smaller than the effect of children *in* the household as a Wald Test indicates. This does not hold for high education households, for which the total effect of a child outside the household amounts to -0.717 or -51.2%. This is significantly larger than for low educational households and very close to the effect of a child in the household (-0.708 or -50.7%), from which it does not significantly differ.

This finding essentially fits the results of the descriptive analysis in section 4.3.1: Children have a significant negative effect on annual saving, but while this effect diminishes in low education households when children leave the households, it remains roughly at the same

[20] The reported coefficients correspond to marginal effects in the latent variable model, i.e., $\frac{\partial E(y^*)}{\partial x}$. More commonly, marginal effects for the observed left-censored variable are reported, i.e., $\frac{\partial E(y^* \mid y>0)}{\partial x} = \frac{\partial E(y \mid y>0)}{\partial x}$, since one is ultimately interested in what happens to the observed variable that is restricted to be above 0. In the case of annual saving however, the left-censoring is a relict of the way the data was collected (respondents could not indicate dissaving) rather than an inherent feature of the variable of interest itself. Thus, in this special case, we are ultimately interested in what happens to the latent rather than the observed variable in response to changes in x.

level in high education households. This suggests that education induced cost effects outweigh education induced self control effects after children have left the household.

This pattern of educational interaction effects still holds when the number of children is additionally interacted with net income (column 2). Furthermore, there is evidence that income alleviates the negative effect of children on annual saving since the coefficients of children in and outside the household interacted with income are both positive and significant at the 5 percent level. In numbers, earning an additional €1,000 per year reduces the negative effect of children on saving by 0.8 percentage points (no matter whether the children live in or outside the household). This means that a low education household needs an income of somewhat more than €32,000 above the mean income of €26,700 for the effect of children outside the household on saving to turn positive, while a high education household would need almost an additional €100,000. Thus, educational level and net income work in different directions and the educational difference in the effect of children is not due to differences in income.

Additional interaction with age (column 3) does not change the findings for the interaction effects of children with the educational level and net income. It further suggests that older households save less per child *in* the household than younger ones, but more per child *outside* the household. However, note that only the latter effect is significant. Nevertheless, a positive correlation between the age of the household head and the age of his/her children could explain the first interaction effect if the cost of a child living in the household

rises in the child's age, as it is commonly found (see, e.g. Espenshade (1974, p. 375)). Then, the finding would suggest that older children deter more from saving than younger children. This relationship reverses when children have left the household, since they get more and more financially independent from their parents as they get older, finish education, climb up the upward sloping life cycle income profile, and have successfully set up their own household. Instead of spending money on their children, older households might actually save for bequests, but whether this is the case will be investigated in the next subsection.

Before turning to the effect of children on the importance of saving motives, let us have a look at the coefficients of the other covariates. With few exceptions that will be pointed out, they are very similar across the three specifications. The coefficients of *age* and *age2*—both significant in columns 1 and 2—imply a negative, but in absolute terms diminishing effect of the household head's age on saving. The effect of age does not turn positive until the age of 90, which is almost beyond the age range observed. However, once interacted with the number of children, the level effect of *age* and *age2* gets insignificant, mainly due to smaller estimated coefficients (column 3). The coefficients of other demographic characteristics indicate that households headed by a woman save significantly less at the 5 percent level, while those located in the east of Germany, shared with a partner, and/or reporting a good state of health save significantly more (*east* is significant only at the 10 percent level).

As expected, current annual net income exhibits a significant positive, but deminishing impact on annual saving, not turning negative

until an annual income of more than €456,000, which is more than 17 times above the mean. With respect to past income variability, only *high_income_var* shows a significant effect, which is negative. This conflicts with the hypothesis that for a fixed income, higher income uncertainty should induce *more* saving. However, a negative coefficient might be explicable if either selection into occupations with high income variability is negatively related to risk aversion and prudence and thus to the taste for (precautionary) saving (Browning & Lusardi (1996, p. 1837)) or if high past income variability is caused by severe disruptions in a persons life, which deter from saving. The fact that civil servants, though having the safest jobs, save significantly more than the base group (farmers, family members working in family business, willingly not in paid employment but not retired) and insignificantly more than other occupational groups, holding income and the other covariates constant, gives some credibility to the first supposition. Unemployed household heads save significantly less than the base group, which might be due to the incentives set by social security, which essentially discourages saving by setting upper wealth limits for the receipt of financial support. This could also explain why expected future unemployment (*probjobloss*) does not induce higher, but lower saving, significant at the 10% level. Retirement has a significant positive effect on saving, but since income is hold fixed, this does not contradict the intuition that households save less when they retire and encounter a significant reduction in income. Considering that this coefficient compares retirees to non-retired (and probably younger) base group members, the positive sign of the coefficient might be explained by different consumption portfolios, especially with respect to the acquisition of expensive durable goods, which is usually

less important for retirees than for young households. Quite surprisingly, regular support payments to other households encourage saving, but this is significant at the 10% level only in column 3. Possible explanations are that households who make these payments either expect them to increase in the future, e.g., in the case of support payments to children in education, or build up a buffer to be able to afford them in 'bad times'. This would be in line with the LCPIH or at least its theoretical extensions. Also in line with this theory are the highly significant and positive coefficients on the dummies for one-time earnings, indicating that a significant share of positive transitory income shocks is transformed into saving. With respect to the discussion in section 3.2 whether households regard home loan and mortgage repayments as saving, their negative, though insignificant, coefficients suggest that households do not.

Furthermore, if the possession of liability insurance is a good measure for risk aversion, its significant positive coefficient is line with theory. The same applies to the negative effect of being a smoker if this is a signal for a high discount factor. Other psychological variables also affect saving in a significant and quite intuitive way. People with a shorter planning horizon (*easy_going, spontaneous*) save less, whereas optimistic and habitual people save more. Surprisingly, the expectation to live either longer or shorter than the average increases saving, but only the effect of *live_shorter* is significant. A priori, one would have expected those with a higher life expectancy to save more but those with a lower life expectancy to save less (Bloom et al. (2003, pp. 320-321)). Considering that a majority of household heads expects to live as long as the average (almost exactly 2/3), the observed pattern could indicate that either

people who expect to live shorter more readily anticipate the future financial burden of medical treatment or that household heads reporting an expectation other than 'as long as average' are those spending more time on thinking and worrying about the future and thus those who save more. Finally, the positive, but decreasing effect of wealth is consistent with heterogeneity in discount rates or the general taste for saving. Since wealth is a result of saving, it is potentially endogenous. However, removing it from the list of covariates does not lead to severe changes in the results.

Overall, the outlined pattern of coefficients, in particular with respect to the children variables and their interactions, has proven quite robust to changes in the specification. Except for those variables, with which the children variables were interacted, i.e., *FHR_Abitur*, *netinc*, and *age*, all other covariates can be removed without changing the overall pattern of children effects. Furthermore, the pattern is not sensitive to adding a variety of variables, but these variables are either insignificant (e.g., the number of grandchildren, dummies for persons living in the household other than children and partner, past unemployment, past smoker, voluntary social engagement, long-term health problems, keeping record of income and expenditures, possession of business wealth as well as direct measures on the attitude towards financial risk and future health expectations) or potentially endogenous to saving behavior (e.g., having a fixed saving goal, keeping a minimum amount on the current account, and a dummy for credit refusal to capture liquidity constraints).

Also, estimating a Tobit model with random effects (column 4) instead of a pooled cross section Tobit with clustering, does not change the conclusions. The coefficients tend to be a bit lower in absolute terms, but are more precisely estimated, resulting in higher t-values for most coefficients. In addition to the coefficients described above, the negative effect of *foreign* and the positive effects of *highheritage_prob*, *pay_support* and *live_longer* are now significant at the 5 or 10 percent level, respectively, whereas *probjobloss* and *white_collar* are not significant any more.

6.2 Saving Motives

Table A.4 reports the results for the effect of children on the importance of saving motives (complete regression outputs are available from the author upon request). As a common reference point, columns 1 (absolute measure) and 3 (relative measure) refer to a linear specification of children, interacted with *FHR_Abitur* only, while columns 2 and 4 show either the results for additional interaction with income and age or for one of the non-linear specifications of children if this is found to be more appropriate than a linear one (home acquisition, education/support, bequest, state subsidies). Note that *repay_homeloan* and *repay_mortgage* are not included in the equations of the motives home acquisition and debt reduction, where they are probably endogenous.

Home Acquisition Motive

At the low educational level, children in the household encourage saving for the acquisition of a home in both absolute and relative terms. In high education households, this is not the case up to the

second child, but having a high education has a significant positive effect on the importance of this motive *regardless* of the number of children. Thus, it seems that high education households attach more importance to the home acquisition motive anyway, while in low education households, it gains in importance only when children are present. Children outside the household have a significant effect only in high education households, which is negative up to the second child. Interactions with net income and age are not found to be significant and not reported here.

Large Purchases Motive

The number of children in the household has a negative effect on both the absolute and relative importance of the large purchases motive, which hints towards large purchases being mainly children-substitutes. This applies even more so to high education households, though the educational difference is significant only for the absolute measure. Children outside the household also reduce the importance of this motive, but significantly less so. When additionally interacted with age and net income, these interaction terms are positive and almost all significant, indicating that the negative effect of children in and outside the household on the importance of the large purchases motive diminishes in absolute terms as a household earns more or gets older.

Debt Reduction Motive

As expected, the importance of the debt reduction motive increases in the number of children in the household. This effect is significantly stronger in high education households, at least for the relative measure. When children have left the household, the effect on the

relative measure persists only in high education households while becoming insignificant in low education households. However, in *childless* households the motive is significantly less important at the high educational level. While there appears to be no significant interaction with age, the interaction terms with income are significantly negative, indicating that children have less of an effect on the importance of the debt reduction motive in high income households.

Travel Motive

Independent of the educational level, the number of children *in* the household has a large and significant negative effect on both the absolute and relative importance of the travel motive, while there is no significant effect of children *outside* the household. Again, higher income (significantly) and age (insignificantly) reduce the effect of children on the importance of this motive.

Precautionary Motive and Old-age Provision Motive

Like in the descriptive analysis, only little evidence is found for an effect of children on the *absolute* importance of these motives—only the negative effect of children outside the household on the old-age provision motive is significant. In contrast, the *relative* importance of these motives is significantly reduced by the number of children in the household, regardless of the educational level. When children leave the household, the negative effect on the precautionary motive persists only in high education households, while the negative effect on the old-age provision motive per-sists in both educational groups, but gets significantly smaller. Finally, high education households generally attach more importance to the old-age provision motive than low education households, but there is not

much evidence for an interaction effect of children with age or income.

Education/Support Motive and Bequest Motive

With respect to these motives, the specification with an additional dummy is considered most appropriate since the large and highly significant effect of the dummy indicates that most of the positive effect on these motives can be attributed to the first child. For the absolute measure, additional children exhibit no significant effect, while for the relative measure, additional children *in* the household have a significant positive, but much smaller effect than the first child. For the bequest motive, it does not seem to matter whether children live in or outside the household (both dummy coefficients are very similar), whereas the effect on the education/support motive is significantly lower for children outside the household. This suggests that investments in the children's human capital play a larger role when children are young, while the importance of investments in the children's physical capital seems to be unaffected by the children's age.

State Subsidies Motive

Up to the third child, the number of children in the household significantly increases the absolute and relative importance of the state subsidies motive, but only in low education households. Children outside the household do not appear to have a significant effect.

Looking at the results from a bit farther distance, we can conclude that children in the household increase the absolute importance of most saving motives, thereby intensify the competition among them,

and shift the relative importance towards home acquisition, debt reduction, education/support, bequest, and state subsidies, at the expense of large purchases, travel, precaution, and old-age provision. When children leave the household, their effect usually gets weaker. There is not much evidence that the effects of children are more persistent in high education households, but some evidence that income and—to a lesser extent—age alleviate these effects.

Table A.5 gives an overview over other selected covariates, reporting only the sign of significant effects to get a general idea of the overall pattern. Households headed by a woman and shared with a partner attach more, while Eastern German households attach less absolute importance to most saving motives, which suggests that the former have a stronger, the latter a weaker taste for saving in general. However, these characteristics play less of a role for explaining shifts in relative importance: Households headed by a woman attach less relative importance to the motives home acquisition and large purchases. The same applies to Eastern German households, who, in addition, attach more relative importance to the education/support motive. Thus, while the effects of *female* and *east* on the overall importance of saving go in opposite directions, they have very similar effects on the relative importance of saving motives. This demonstrates that both measures are meaningful. Furthermore, sharing the household with a partner increases the relative importance of the state subsidies motive but decreases the relative importance of the precautionary motive, which actually makes sense considering intra-household risk sharing (Lusardi (1998, p. 453)). Also quite intuitively, healthy households rather save for large purchases and travel

at the expense of debt reduction and precaution, which is reflected by both measures of importance.

With respect to age, the findings for both measures of importance are very similar but deviate in part from those generated by the life cycle profiles in section 4.2.2, which did not control for other variables. The effect on the importance of the old-age provision motive is positive up to a very high age, while the effect on the importance of the motives large purchases and debt reduction is hump-shaped, peaking around age 45 for the absolute measure and shortly after retirement for the relative measure. By contrast, the effect of age on the motives home acquisition, education/support, and bequest is negative over the whole life cycle, except for the bequest motive, for which it becomes positive at high ages.

Net income affects the importance of the home acquisition and the travel motive positively, at the expense of the state subsidies motive. Households who experienced more income variability tend to attach more importance to the motives home acquisition and debt reduction, but this could also reflect a non-linear age effect (not captured by *age* and *age2*) since households commonly experience more income variation early in life. Expecting an improved income situation increases the importance of the motives home acquisition and bequest at the expense of the precautionary motive, which is quite intuitive.

Households with regular support payments attach more absolute importance to most saving motives; in relative terms however, the motives education/support and bequest gain in importance at the

expense of the motives travel, precaution, and old-age provision. The obligation to repay home loans and mortgages, which is strongly positively correlated with the motives home acquisition and debt reduction, consistently reduces the importance of most other saving motives except for state subsidies. Similarly, unemployment reduces the absolute importance attached to most saving motives, but in relative terms, only the motives travel, education/support, and bequest are negatively affected in favor of the motives debt reduction, precaution and, astonishingly, old-age provision. In contrast, households with a higher risk aversion as indicated by possessing occupational and/or liability insurance and those with higher wealth generally attach more absolute importance to most saving motives. In the case of wealth, this applies to all but the debt reduction motive, which renders some credibility to the hypothesis that wealth reflects the general taste for saving. Homeownership consistently increases the relative importance of debt reduction, home acquisition, and state subsidies, at the expense of travel, precaution, and old-age provision.

With respect to character traits, being a creature of habit and being optimistic increases the absolute importance of most saving motives, while the opposite is the case for the indicators of having a short planning horizon, especially *easy_going*. In relative terms, habitual people attach less importance to the travel motive but more to the precautionary motive, which is consistent with intuition. Spontaneous people on the contrary save for large purchases and travel rather than for home acquisition, precaution, and old-age provision. Finally, smokers attach more importance to the debt reduction motive and less to the motives home acquisition, large purchases, and

travel, but causality might actually run in the opposite direction, i.e., people might smoke because they have large debts and no money left to save for large purchases and travel.

6.3 Regularity of Saving

Just as for annual saving, no significant evidence is found against a linear specification of the number of children in the estimation of the regularity of saving. The results are reported in table A.6. The coefficients in the upper table (A.6 (a)) refer to the marginal effects on the log odds ratio between the category indicated in the header and the base category (no money non-saver). More generally, marginal effects on the log odds ratio between categories j and k are calculated by

$$\frac{\partial \log \frac{Pr(y_i = j)}{Pr(y_i = k)}}{\partial x_i} = \beta_j - \beta_k \tag{11}$$

(Wooldridge (2002, pp. 497-499).

Since taking logs is a strictly positive monotone transformation, we can conclude that an explanatory variable increases the probability of being saver type j *relative* to being a no money non-saver if β_j is positive and relative to another saver type k if ($\beta_j - \beta_k$) is positive. Since this does not tell us how the *unconditional* probability of being a certain saver type responds to changes in the explanatory variables, marginal effects of the children variables and *FHR_Abitur* on this probability have been calculated at the means of the explanatory variables (lower table, A.6 (b)).

The results suggest that households are increasingly deterred from regular saving as the number of children rises. Interestingly, children inside the household affect the probability of regular fix saving relative to regular flexible saving positively, while it is the other way around for children outside the household. Indeed, if marginal effects on unconditional probabilities are computed (A.6 (b)), children inside the household have a significant negative effect only on the probability of regular flexible saving but not on the probability of regular fix saving, while it is the other way around for children outside the household. Maybe, expenditures on children in the household occur more regularly and are thus easier to plan (housing, clothing, food), whereas expenditures on children outside the household occur rather infrequently (e.g., support when expensive durables are bought). However, both children in and outside the household significantly increase the probability of no money non-saving. While there is no evidence for educational differences in the effect of children in the household, the positive effect of children on no money non-saving (and thus the negative effect on the regularity of saving) diminishes significantly stronger at the low educational level when children leave the household. Finally, children in the household reduce the probability of enjoy life non-saving relative to no money non-saving, which is not surprising.

To summarize, there are three conclusions worth noting. First, children deter households from regular saving and increase the probability that households do not save at all. Second, children *inside* the household reduce the probability of regular flexible saving in the first place, while children *outside* the household reduce the probability of regular fix saving. Third, in low education households, the

negative effect of children on the regularity of saving diminishes significantly stronger than in high education households when children leave the household.

With respect to the additional interactions of children with age and net income, it appears that the negative effect of children on the regularity of saving is lower for higher income households and, in the case of children outside the household, older households, but the interaction effects are mostly insignificant.

Regarding age effects, older households are more likely to be either regular fix savers or no money non-savers than one of the other saver types. This is consistent with the presumption that older household experience fewer income variability and generally have less need for large acquisitions and are thus either or not able and willing to save a constant fraction of their income. Also quite intuitively, health, net income, and retirement have a significant positive effect on the regularity of saving, while high income variability, the obligation to repay home loans or mortgages, and unemployment have a negative effect. With respect to tastes and personal traits, those with a higher risk aversion (*insur_disability*, *insur_liab*), a stronger taste for saving (*wealth*), and greater optimism save more regularly, whereas those with a shorter planning horizon (*spontaneous*, *easy_going*) or a higher discount factor (*smoker*) save less regularly.

Summary and Discussion of the Main Results

Let us summarize the empirical results of sections 6.1 to 6.3, which illustrate that children play an important role for explaining household saving behavior. Most findings are in line with the theoretical hypotheses of section 2.4:

- Cost effects appear to outweigh self control effects since on average, children have a negative effect on the level and the regularity of saving. Children also shift the relative importance towards the saving motives home acquisition, debt reduction, education/support, bequest, and state subsidies, at the expense of large purchases, travel, precaution, and old-age provision. This shift results from children intensifying the competition among saving motives by increasing the absolute importance attached to most of them, which causes the precautionary and the old-age provision motive to decline in *relative* importance although their *absolute* importance is not significantly affected (in fact, the coefficients are insignificant positive). Except for the precautionary motive, the effects are in line with the hypotheses of section 2.4 and suggest, furthermore, that large purchases are mainly children substitutes.

- In low education households, the negative effects of children on the level and the regularity of saving diminish after children have left the household but stay significant. There is more persistence in high education households, for which the effects of children outside the household on the level and the regularity of saving are significantly stronger than in low education households. The fact that there are no significant educational differ-

ences in the effect of children *inside* the household, but a stronger effect of children *outside* the household at the high educational level suggests that education induced self control effects and education induced cost effects of children cancel out for children in the household, while the latter prevail for children outside the household. This supports the hypothesis that higher parental education induces higher investments in the children's human capital and thus higher expenditures on older children.

- Unfortunately, the pattern is not as clear-cut for the importance of saving motives in this respect. The interaction effects of children and the educational level are mostly insignificant, and only for the relative importance of the debt reduction and the precautionary motive, there is some evidence for more persistence in high education households. Especially the educational interaction effects on the relative importance of the motives education/support and bequest are somewhat disappointing. If one calculates the total effect of children on these two motives using the results from table A.4, column (4), and compares them between educational levels (table 3), there is some weak evidence that for most of the children groups, high education households attach more relative importance to the education/support motive than low education households, but less to the bequest motive. This would be in line with the idea of intergenerational educational immobility, but since most of the interaction effects are insignificant, it is not really convincing. Maybe, educational differences in the effects are confounded by a tendency to give answers that are socially desired.

Table 3: Total Effect of Children on the Relative Importance of the Motives Education/ Support and Bequest

	Education/Support				**Bequest**			
	children_in_h		*children_out_h*		*children_in_h*		*children_out_h*	
	L.E.	H.E.	L.E.	H.E.	L.E.	H.E.	L.E.	H.E.
No children	0.0000	0.0085	0.0000	0.0085	0.0000	-0.0018	0.0000	-0.0018
1 child	0.0654	0.0723	0.0391	0.0388	0.0340	0.0271	0.0333	0.0224
2 children	0.0726	0.0810	0.0393	0.0433	0.0380	0.0319	0.0309	0.0229
3 children	0.0798	0.0896	0.0395	0.0477	0.0420	0.0367	0.0285	0.0235
4 children	0.0869	0.0982	0.0397	0.0522	0.0460	0.0415	0.0261	0.0240
5 children	0.0941	0.1069	0.0400	0.0566	0.0501	0.0463	0.0238	0.0245

- As expected, higher net income tends to alleviate the negative effect of children on the level and the regularity of saving and, though less significant and not always reported, also the effect of children on the importance of most saving motives. The same applies to age when interacted with the number of children outside the household, with the qualification that this interaction effect is insignificant for most saving motives. It suggests that children tend to be less of a burden the longer they have left the household and thus the more likely they are to make their own living. The interaction effect of age and children in the household is insignificant in most cases, which may suggest that higher cost effects of older children (given that older parents tend to have older children) and the effect of a progressive transformation to a children-substitute consumption portfolio cancel out for most dependent variables.

6.4 Instrumentation

As mentioned in section 5.2.2, there is some concern that fertility might be endogenous. Therefore, this subsection attempts to exam-

ine whether endogenous fertility behavior leads to serious biases in the results presented so far. The examination is limited to annual saving, which is of most interest among the three dimensions of saving behavior considered. Since instruments are hard to find and often weak, the following procedure is applied to remove, or at least reduce endogeneity:

First, the sample is split up into 72 cells depending on age (6 groups as in section 4.1), the educational level (2 groups), whether or not the household is shared with a partner (2 groups), and the municipal type (3 groups). The municipal type variable is a consolidation of an original variable with 10 categories and reflects whether a household lives in the core of a municipality with at least 100,000 inhabitants (type 1), outside the core of a municipality of that size or in a municipality of 50,000 to below 100,000 inhabitants (type 2), or in a municipality with less than 50,000 inhabitants (type 3). This consolidation from originally 10 to 3 groups is based on two goals: First, to get groups of roughly equal size, and second, to consolidate subgroups with a similar number of children. Indeed, the average number of children is very similar across subgroups *within* each of the three consolidated municipality types, but rises from type 1 to 3, i.e., fertility rises from city cores to rural regions.

In a second step, the variable *cih_cell* is constructed. For a particular household, this variable equals the average number of children in *other* households that belong to *the same cell* as the particular household. Similarly, the variable *coh_cell* equals the average number of children outside other households in the same cell. The idea is that within a given cell, other members of the same cell represent a

reference group for the fertility behavior of a specific member. That is, other households of the same age, educational level, and partner status, who live in a similar environment (municipality type), function as a 'peer group' for a particular household, and the fertility behavior of the peer group affects its own fertility behavior. Indeed, the cell mean of the number of children in (outside) the household *excluding* the current observation is positively correlated with the number of children of the current observation, with a Pearson correlation coefficient of 0.501 (0.523). This appears to be some justification to consider the average number of children in and outside *other* households of the same cell (henceforth simply referred to as the cell mean (*cih_cell*, *coh_cell*)) as an instrument for the number of children of a *particular* household.

In order to be a valid instrument, the cell mean has to satisfy two conditions (Wooldridge (2002, pp. 84-85)). First, it has to be partially correlated with the individual number of children once all other exogenous explanatory variables are controlled for. This appears to be the case because if we regress *children_in_h* on *cih_cell* and all the other explanatory variables, the coefficient of *cih_cell* is significant on all conventional levels with an F-value of 402.4, and if the same is done for *children_out_h* and the instrument *coh_cell*, *coh_cell* is significant as well with an F-value of 79.9[21].[22] Second, the instrument must be uncorrelated with the error term, which also

[21] These values refer to the first of the five imputed datasets but are similar for the other ones.

[22] Since more than one variable is instrumented in the regression, we cannot use the Staiger-Stock rule of thumb (Staiger & Stock (1997)) that the instrument is weak if the corresponding F-value of the first stage regression is smaller than 10. Nevertheless, the high F-values are some evidence that the instruments are not weak.

implies that the only causal impact of the instrument on the dependent variable works through the instrumented variable. This should be satisfied if the number of children of *other* households in a cell can be considered as exogenous for a particular household and if the number of children of other households in the same cell as such has no causal effect on the saving behavior of a particular household. The most critical assumption in this line of argumentation is that the cells created by the stratification criteria constitute a reference group for fertility behavior but not for saving behavior as well. Otherwise, variation over cell means could capture a causal effect of the saving behavior in the reference group on individual saving behavior. Since three of the four stratification criteria (age, education, partner status) are explicitly controlled for in the equation of annual saving, the crucial assumption is that the municipal type creates variation that affects individual fertility but not saving behavior. While I cannot prove this assumption, the fact that average saving in a cell is much weaker correlated with individual saving (Pearson correlation coefficient of 0.15) than average fertility with individual fertility gives some credit to this assumption.

Thus, though far from being perfect, there is some reason to consider the cell mean as a valid instrument to capture exogenous variation in fertility and one can estimate a Tobit model for log annual saving with endogenous regressors, i.e.,

$$(12) \qquad y_i = \begin{cases} y_i^* = c_i'\gamma + x_{1i}'\beta + \varepsilon_i & if\ y_i^* > 0 \\ 0 & if\ y_i^* \le 0 \end{cases}$$

$$c_i = x_{1i}'\Pi_1 + x_{2i}'\Pi_2 + u_i \qquad ,$$

where y_i denotes observed log annual saving and y_i* the corresponding latent variable; c_i is the vector of endogenous variables, i.e., the children variables; x_{1i} is the vector of exogenous regressors, i.e., all other explanatory variables; x_{2i} is the vector of additional instruments, i.e., the cell means for the children variables; and γ and β are structural parameters, while Π_1 and Π_2 are matrices of parameters in the equation for the endogenous variables, which is written in reduced form (Wooldridge (2002), pp. 530-533)).

Such a model can be estimated by maximum likelihood using the Newton-Raphson algorithm as optimization technique (table A.7). Since the log-likelihood function may not be concave, convergence is very slow and gets slower, the more variables are instrumented. Therefore, specification 1 estimates the model without any interaction of the number of children but instruments *children_in_h* and *children_out_h* with the corresponding cell means. Specification 2 adds an interaction with *FHR_Abitur*, but this already requires more than 80 iterations of the algorithm to get stable results.

In specification 1, children in the household have a negative impact on annual saving despite in-strumentation, which is significant at the 10 percent level. The coefficient is even a bit larger than the ordinary Tobit estimate, but far less precisely estimated because of the inefficiency resulting from instrumentation. The effect of children outside the household is considerably smaller and insignificant, but in the range of the ordinary Tobit estimate for low education households.

When interacted with the educational level (column 2), the coeffi-

cients get even less precise. Those on children in the household are negative, but insignificant. For a low educational level, the effect of children outside the household is positive, but insignificant as well. This positive sign deviates from the ordinary Tobit estimation but would actually be in line with the hypothesis that low education households save for physical bequests to older children rather than further investing in the children's human capital. Anyway, the core result is that at the high educational level, children outside the household have a negative effect on saving (0.533+(-1.132)= -0.599), which does not significantly differ from the effect of children inside the household (-0.476+(-0.385) = -0.861), and that the educational difference in the effect of children outside the household is significant at the 1 percent level. Finally, with respect to other covariates, the coefficients show a similar pattern than without instrumentation.

What we essentially get from this exercise is that using instruments yields a similar, though less precise pattern of the effects of children on saving than an ordinary Tobit. This gives some credibility to interpreting the ordinary Tobit estimates as causal effects. At least, there is no evidence that endogenous fertility would bias them so seriously that we would have to discard the main results found in sections 6.1 to 6.3 as driven by endogenous fertility behavior.

6.5 Adjusted Life Cycle Profiles of Consumption and Saving

In section 4.2.1, it was shown that consumption seems to track current net income since both follow a pronounced hump shape over the life cycle. This is at odds with the prediction of the basic version

of the LCPIH. Sections 2.1 and 2.2 developed that a positive effect of children on the marginal utility of consumption is a possible explanation for the hump-shaped consumption profile, which could reconcile the theoretical prediction and the empirical evidence. And indeed, it was found in section 6.1 that for a given income level, the number of children depresses annual saving and thus increases household consumption. Thus, it appears natural to adjust the life cycle profiles of saving and hence consumption for the effect of children and to check whether adjusted consumption still tracks current income. Of course, this is somewhat of a back-of-the-envelope calculation since, as pointed out in section 5.2.3, intertemporal and life cycle variation in the children effect is likely to be insufficiently modelled due to data limitations. Nevertheless, it is interesting to see whether or not the hump shape in consumption is significantly reduced.

Using the estimated coefficients on the number of children in and outside the household and on their interactions with the educational level, income, and age from column (3) of table A.3, log annual saving is adjusted for the number of children related to the household, i.e.,

$$\begin{aligned}\ln(saving_{adj}+1) = \ln(saving+1) \\ - [-0.848 - 0.068*FHR\_Abitur + 0.009*(netinc - \\ 26.7) - 0.013*(age - 51)] *children\_in\_h \\ - [-0.480 - 0.560*FHR\_Abitur + 0.010*(netinc - \\ 26.7) + 0.020*(age - 51)]*children\_out\_h.\end{aligned}$$

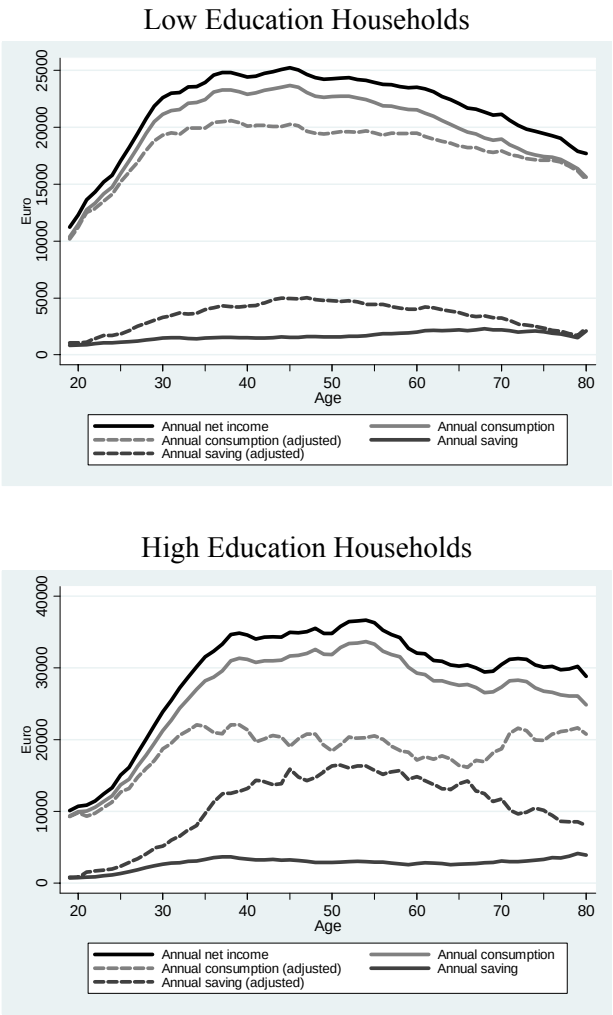
The corresponding level of adjusted annual saving contains a few huge outliers that would have an overwhelming impact on mean

saving such that the distribution is cut-off at the 99.5 percentile. Separately for each educational level, figure 21 shows age profiles constructed as in section 4.2.1 for net income, consumption, and saving along with adjusted saving and adjusted consumption (dashed lines). The latter is calculated as net income minus adjusted saving.

Indeed, adjusting for the number of children turns the age profile of annual saving from a rather flat profile to a hump-shaped one. Though the hump shape in the consumption profile is not completely removed, it is reduced quite a bit for households above 30, especially at the high educational level. Essentially, adjusted consumption appears to track income only up to age 30. This might be explained by liquidity constraints and precaution, but also by another facet of household composition: Up to age 30, an increasing fraction of households starts sharing the household with a partner, which tends to increase both household income and consumption. But since the estimation results indicate that having a partner also increases saving, it is not easy to adjust consumption for having a partner, and it cannot be done with the estimation results of this study.

Nevertheless, we can conclude that accounting for the number of children significantly reduces the hump shape in consumption, especially in high education households. Thus, it can be considered as an important factor in explaining the consumption/income parallel within the framework of the LCPIH, in particular after the first third of the life cycle, where liquidity constraints and precautionary saving loose explanatory power, as argued in section 2.1.

Figure 21: Life Cycle Profiles of Adjusted Consumption and Saving



Source: SAVE 2005-2007, restricted sample with additional truncation, weighted, and averaged over the five imputed data sets.

7 Conclusion

This study investigated education, income and age driven heterogeneity in the effect of children in and outside the household on annual saving, the importance of saving motives, and the regularity of saving, using the 2005-2007 waves of the German SAVE dataset. As an introduction, it was shown that a better understanding of the link between fertility and saving can both yield helpful implications for policy makers in the face of demographic transition and may contribute to the reconciliation of theoretically predicted and empirically observed life cycle saving behavior. On the basis of theoretical considerations and former empirical evidence, hypotheses on the effect of children on the three dimensions of saving behavior were formulated. The results of the descriptive and regression based analysis were mostly in line with these hypotheses. Children were found to have a negative effect on the level and the regularity of saving, and they appear to intensify the competition among saving motives, shifting the relative importance towards children-complements (home acquisition, debt reduction, education/support, bequest, and state subsidies) at the expense of children-substitutes (large purchases, travel, precaution, and old-age provision). When children leave the household, their influence gets usually weaker, but shows more persistence in high education households, at least with respect to the level and the regularity of saving. It was hypothesized that this is a result of higher parental education inducing higher investment in the children's human capital, which outweighs possible education induced effects of children on self control. Unfortunately, there is less evidence for educational differences in the effect of children on saving motives—in particular with respect to

the motives education/support and bequest—that would reinforce this hypostudy. However, this lack of educational differences in the observed pattern of motives to save might be attributable to the subjective measurement of these variables, i.e., educational differences could be confounded by a tendency to give answers that are socially desired. Finally, higher household income and, to a lesser extent, higher parental age were found to alleviate the effect of children on saving behavior.

Since the critical reader could be concerned that the estimated coefficients might be biased by endogenous fertility behavior, the number of children was instrumented relying on exogenous variation in fertility created by peer group effects. The results do not indicate that the pattern outlined above is driven by endogenous fertility. This gives some reason to believe that the links between the number of children and household saving behavior are indeed causal.

When the results were used to adjust consumption profiles, it was concluded that accounting for the number of children significantly reduces the hump shape in consumption and can thus contribute to explaining the consumption/income parallel, in particular after the first third of the life cycle.

Of course, this analysis is not without weaknesses. Some of these weaknesses are a result of data limitations. Besides the deficiencies of the imputation procedure, a clear shortcoming of the data is the imprecise formulation of the question asking for annual saving that leaves the definition of saving to the respondent and makes the responses difficult to interpret (see section 3.2). To reduce the meas-

urement error in this question, it should be restated to precisely ask for net annual saving. For instance, one could add the remark: "Please note that loan repayments are a part of your saving, while loan uptakes used to cover consumption expenditures reduce your saving." Furthermore, respondents who indicate dissaving should be able to report a specific amount. This would remove the artificial left censoring of the data.

Also, the observation period of three years is too short to distinguish properly between age and cohort effects. Both the construction of life cycle profiles in the descriptive analysis and the regression based analysis would significantly profit from a panel over a longer time period, which would allow for investigating life cycle variation in the effects of children more thoroughly.

Besides settling these issues, further research on this topic could advance the analysis in mainly four directions.

First, heterogeneity in effect of children should be considered with respect to further dimensions. Most important would be the children's age, which was only very imprecisely approximated by the children's household affiliation. In particular, it would be interesting to see if the interaction effect of children in the household and the parent's age on annual saving turns positive if the children's age is controlled for. Besides pure age effects, information on the children's age would also allow to control for child spacing, i.e., the age gap between the children of a household (see, e.g., Freedman & Coombs (1966)). Other dimensions along which the children effect might vary are wealth, the marital status of the household head, the

duration of the marriage or partnership, the child's gender and health, measures for risk aversion, and other character traits. A thorough investigation of these interaction effects could answer questions like: Do the effects of children differ by the children's gender? Do more risk averse parents save more per child? Do children in wealthier households affect saving motives differently than in less wealthy households? However, such a more detailed investigation would probably require larger sample sizes and less item non-response.

Second, more reliable instruments for the number of children could be constructed to address the endogeneity problem more thoroughly. For example, one could use an approach similar to the one in section 6.4, but use a larger dataset like the Mikrozensus of the Statistisches Bundesamt to calculate cell means. This would yield larger cell sizes and the possibility to stratify by more criteria, e.g., the geographic region the household lives in. Another possible instrument would be something like the distance to the next day nursery, but this is hard to survey.

Third, the analysis could be expanded by investigating the influence of children and various interactions on other dimensions of saving behavior, e.g., the composition of assets. In particular, it would be interesting to know whether the children induced shift in the relative importance of saving motives also affects the composition of assets. For instance, do children increase the fraction of housing and other real wealth? How does the number of children affect the fraction of risky assets? Do households with children provide less for their old-age? Answers to these questions could reveal if households with

children are potentially undersupplied with certain assets, in particular old-age provision.

Fourth, similar analyses could be conducted for other countries and their results compared to the ones established for Germany. Such international comparisons could answer questions like: Is there a similar pattern of effects of children on saving behavior across countries or are there important international differences? If the latter is the case, what does cause these differences? Especially, do households with small children save more in countries with higher tuition fees and other educational expenses? Further, is the educational difference in the effect of children more pronounced in these countries?

Thus, there is a bunch of open questions that deserve attention. Their answers and some of the insights gained in this study may help to get a better understanding of the relationship between fertility and saving behavior, and how it is affected by household characteristics. The results can serve as guidance for policy makers, who want to know about the ability of different household types to cope with the multiple task of raising children, making a living, and providing for unforeseen events and retirement. In the end, this knowledge may help to design target-oriented tools that alleviate resulting tradeoffs specifically for those households for which these tradeoffs are most severe. Since the ability to explain heterogeneity in the effect of children is crucial in this context, and since the results of this study suggest that we are able to explain some of this heterogeneity and that better data and further research is likely to help explaining a good deal more, this topic is definitely worth to be pursued further.

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Appendix

Table A.1: Description of Variables

Variable	Description
saving	Annual household saving in €, left-censored at 0.
mot_[…]	Absolute importance of a saving motive on a scale from 0 (totally unimportant) to 10 (very important). *mot_homeacquisition* = home acquisition motive *mot_largepurchases* = large purchases motive *mot_debtreduction* = debt reduction motive *mot_precaution* = precautionary motive *mot_oldageprov* = old-age provision motive *mot_travel* = travel motive *mot_education* = education/support motive *mot_bequest* = bequest motive *mot_statesubsidies* = state subsidies motive
mot_[…]_rel	Relative importance of a saving motive on a scale from 0 to 1.
savereg	Categorical variable for the regularity of saving: *savereg* = 1 [*save_enjoy* = 1]: enjoy life non-saver *savereg* = 2 [*save_no_money* = 1]: no money non-saver *savereg* = 3 [*save_irreg* = 1]: irregular saver *savereg* = 4 [*save_reg_flex* = 1]: regular flexible saver *savereg* = 5 [*save_reg_fix* = 1]: regular fix saver
consumption	Annual household consumption, defined as *netinc**1000 – *saving*.
children_in_h *children_in_h_12* *children_in_h_3+* *children_in_h_123* *children_in_h_4+* *child_in_h*	Total number of children and children-in-law living inside the household. *children_in_h_12* = *children_in_h* if *children_in_h* < 3; 0 otherwise *children_in_h_3+* = *children_in_h* if *children_in_h* ≥ 3; 0 otherwise *children_in_h_123* = *children_in_h* if *children_in_h* < 4; 0 otherwise *children_in_h_4+* = *children_in_h* if *children_in_h* ≥ 4; 0 otherwise *child_in_h* = 1 if *children_in_h* > 0.
children_out_h *children_out_h_12* *children_out_h_3+* *children_out_h_123* *children_out_h_4+* *child_out_h*	Total number of children and children-in-law living outside the household. *children_out_h_12* = *children_out_h* if *children_out_h* < 3; 0 otherwise *children_out_h_3+* = *children_out_h* if *children_out_h* ≥ 3; 0 otherwise *children_out_h_123* = *children_out_h* if *children_out_h* < 4; 0 otherwise *children_out_h_4+* = *children_out_h* if *children_out_h* ≥ 4; 0 otherwise *child_out_h* = 1 if *children_out_h* > 0.

Variable	Description
FHR_Abitur	Dummy: 1 if the household head has Fachhochschulreife or Abitur (high school leaving certificate or a comparable certificate for a university of applied sciences).
age, age2	*age* is the age (in years) of the household head, *age2* is squared *age*.
female	Dummy: 1 if the household head is female.
east	Dummy: 1 if the household head lives in Eastern Germany.
foreign	Dummy: 1 if the household head is not a German citizen.
partner	Dummy: 1 if the household head lives together with a partner.
good_state_of_health	Dummy: 1 if the household head describes his state of health as good or very good.
netinc, netinc2	*netinc* is annual net household income in €1,000, *netinc2* is squared *netinc*.
low_inc_var, *high_inc_var*	Dummies for subjective categorical variable "income variability over the last 5 years": *high_inc_var* = 1 if the variability was considered significant. *low_inc_var* = 1 if the variability was considered low. base group: no income variability.
increased_inc_prob	Subjective probability of a raise in the household head's income one year ahead on a scale from 0 to 1 with 0.1 increments.
highheritage_prob	Subjective probability of receiving a heritage or gift that would significantly improve the household's financial situation on a scale from 0 to 1 with 0.1 increments.
except_earn_low, *except_earn_high*	Dummies for exceptional one-time earnings above €500 (such as bequests, gifts, lottery prizes, life insurance payouts), except for tax refunds. *except_earn_low* = 1 if 0 < one-time earnings < 2 * monthly net income. *except_earn_high* = 1 if one-time earnings ≥ 2 * monthly net income. base group: no exceptional one-time earnings.
pay_support	Dummy: 1 if the household makes regular support payments exceeding €25 per month to persons outside the household.
repay_homeloan	Dummy: 1 if the household currently pays off a home loan (Bausparvertrag).
repay_mortgage	Dummy: 1 if the household currently pays off a mortgage.
job_contract_l	Dummy: 1 if the household head has a temporary work contract.
probjobloss	Subjective probability of loosing the current place of employment in the year of the survey, on a scale from 0 to 1 with 0.1 increments.

Variable	Description
blue_collar, white_collar, civil_servant, self_employed, freelancer	Dummies for categorical variable "employment status" of the household head: *blue_collar* = 1 if current type of employment is blue-collar worker. *white_collar* = 1 if current type of employment is white-collar worker. *civil_servant* = 1 if current type of employment is civil servant. *self_employed* = 1 if current type of employment is self-employed. *freelancer* = 1 if current type of employment is freelancer. base group: none of these (farmers, family members working in family business, currently not in paid employment).
unemployed	Dummy: 1 if the household head is currently unemployed.
retired	Dummy: 1 if the household head is retired.
work_full, work_part, work_little	Dummies for categorical variable "extent of employment" of the household head: *work_full* = 1 if the household head has full-time employment. (at least 35 hours per week) *work_part* = 1 if the household head has part-time employment. (at least 15 hours, but less than 35 hours per week) *work_little* = 1 if the level of employment is low or even casual. (less than 15 hours per week) base group: not in paid employment.
insur_disability	Dummy: 1 if the household head or his/her partner is insured against occupational disability.
insur_liab	Dummy: 1 if the household head or his/her partner has liability insurance.
wealth, wealth2	*wealth* is total net wealth of the household in €1,000 (i.e., savings investments, savings bonds, share- and real-estate bonds, occupational and private pension schemes, real estate, business wealth etc.). *wealth2* is squared *wealth*.
homeowner	Dummy: 1 if the household owns a home.
habit	Dummy: 1 if the household head describes himself as a creature of habit (at least 6 on a scale from 0 (totally inapplicable) to 10 (totally applicable).
optimism	Dummy: 1 if the household head describes himself as rather optimistic (at least 6 on a scale from 0 (totally inapplicable) to 10 (totally applicable).
easy_going	Dummy: 1 if the household head describes himself as living for the moment rather than planning the future (at most 4 on a scale from 0 (living for the moment) to 10 (exactly planning the future).

Variable	Description
spontaneous	Dummy: 1 if the household head describes himself as spontaneous rather than observant (at most 4 on a scale from 0 (spontaneous) to 10 (observant).
smoker	Dummy: 1 if the household head is a smoker.
live_shorter, *live_longer*	Dummies for living shorter or longer than persons of the same age *live_shorter* = 1 if the household head expects to live shorter. *live_shorter* = 1 if the household head expects to live longer. base group: household head expects to live roughly as long as average.

Table A.2: Sample Characteristics by Year and Educational Level

Characteristics	SAVE 2005 - 2007	
	Low Education	High Education
Observations	5,726	2,121
Fraction	72.98%	27.02%
Sociodemographic		
Female	53.16%	44.06%
East	30.43%	28.75%
Foreign citizenship	2.28%	4.27%
Partner	52.89%	55.89%
Good state of health	48.52%	65.85%
Age		
19 - 25	3.93%	8.40%
26 - 35	9.59%	19.29%
36 - 45	19.57%	20.67%
46 - 55	19.60%	16.44%
56 - 65	20.49%	15.73%
over 65	26.82%	19.47%
mean (std. dev.)	53.79(15.81)	48.11(16.81)
No. of Children in Household		
0	71.58%	69.02%
1	14.58%	14.97%
2	10.19%	11.53%
3	2.67%	3.59%
4	0.70%	0.56%
5+	0.28%	0.33%
mean (std. dev.)	0.47(0.88)	0.53(0.92)
No. of Children outside Household		
0	41.82%	57.72%
1	20.00%	15.52%
2	21.06%	15.78%
3	10.16%	6.67%
4	3.77%	2.29%
5+	3.19%	2.02%
mean (std. dev.)	1.27(1.48)	0.87(1.26)

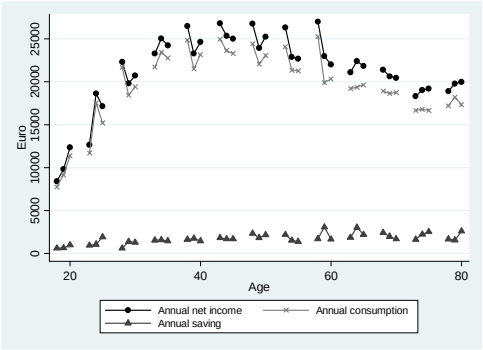
Characteristics	SAVE 2005 - 2007	
	Low Education	High Education
Financial/Economic		
Monthly Net Income Quintiles and Median		
Min	0	0
20th percentile	994	1,050
40th percentile	1,400	1,900
Median	1,600	2,200
60th percentile	1,917	2,600
80th percentile	2,600	3,500
Max	40,000	26,000
mean (std. dev.)	1,866(1,386)	2,451(1,649)
Annual Saving Quintiles and Median		
Min	0	0
20th percentile	0	0
40th percentile	0	100
Median	200	1,000
60th percentile	1,000	2,000
80th percentile	2,800	4,972
Max	250,000	200,000
mean (std. dev.)	1,898(5,826)	3,068(7,880)
Total Wealth Quintiles and Median		
Min	-203,505	-207,081
20th percentile	0	1,320
40th percentile	7,500	24,000
Median	24,791	57,190
60th percentile	66,000	112,522
80th percentile	203,000	291,781
Max	2,500,000	2,499,381
mean (std. dev) [in €1,000]	113.6(212.3)	163.7(262.6)
Past Income Variability		
Significant	27.41%	29.74%
Slight	44.95%	43.97%
None (base)	27.64%	26.30%
Exceptional Earnings		
High	10.16%	12.32%
Low	6.53%	11.34%

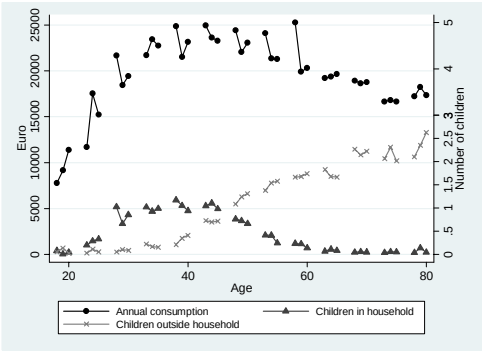
Characteristics	SAVE 2005 - 2007	
	Low Education	High Education
Employment Status		
Retired	39.54%	25.46%
Blue-collar	16.31%	4.74%
White-collar	20.95%	35.42%
Civil servant	2.06%	8.04%
Self-employed	2.97%	5.10%
Freelancer	1.11%	5.20%
Unemployed	11.69%	6.96%
Education/Apprenticeship/ Parental leave/Military service (base)	5.37%	9.08%
Extent of Employment		
Full-time	28.29%	40.83%
Part-time	9.60%	10.35%
Casual	8.15%	11.02%
None of these (base)	53.96%	37.80%
Increased income probability	17.45%	32.56%
High heritage probability	2.96%	5.10%
Regular support payments	12.64%	19.72%
Repayment home loan	7.58%	7.92%
Repayment mortgage	12.84%	18.60%
Temporary work contract	6.16%	9.56%
Probability of loosing employment	11.46%	12.88%
Disability insurance	19.59%	31.55%
Liability insurance	79.06%	84.46%
Homeownership	44.16%	46.95%
Psychological		
Creature of habit	58.73%	54.94%
Optimistic	65.67%	73.09%
Easy going	15.49%	11.08%
Spontaneous	26.59%	29.77%
Smoker	32.00%	23.24%
Life Expectancy		
Live shorter than average	17.72%	17.62%
Live longer than average	15.34%	20.30%
Live as long as average (base)	66.94%	62.08%

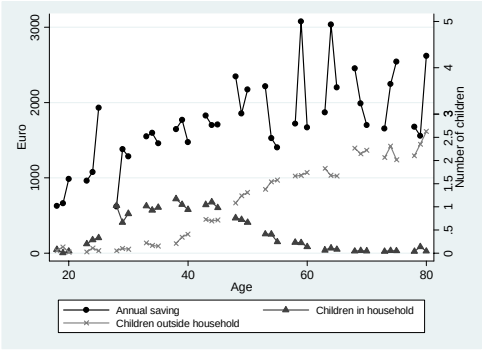
All statistics are weighted and represent averages over the 5 imputed datasets.

Figure A.1: Cohort Analysis of Annual Net Income, Consumption, Saving, and Children, Stratified by Education

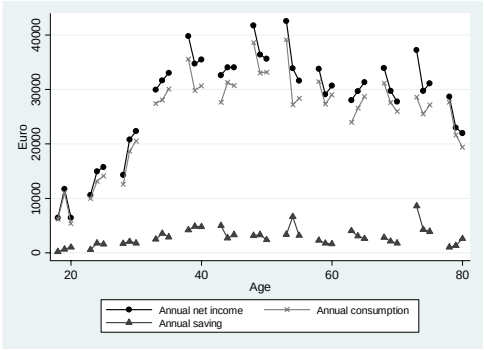
Low Education Households

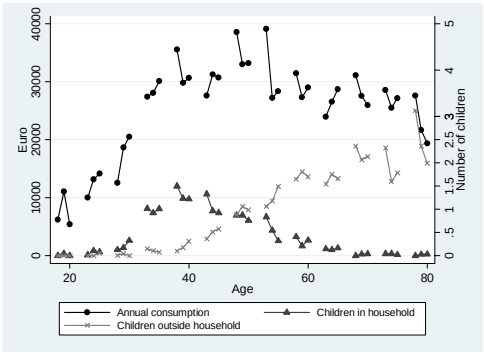


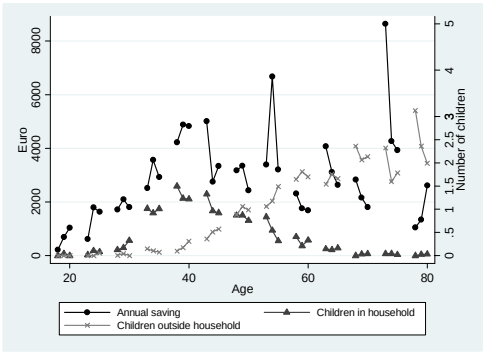




High Education Households



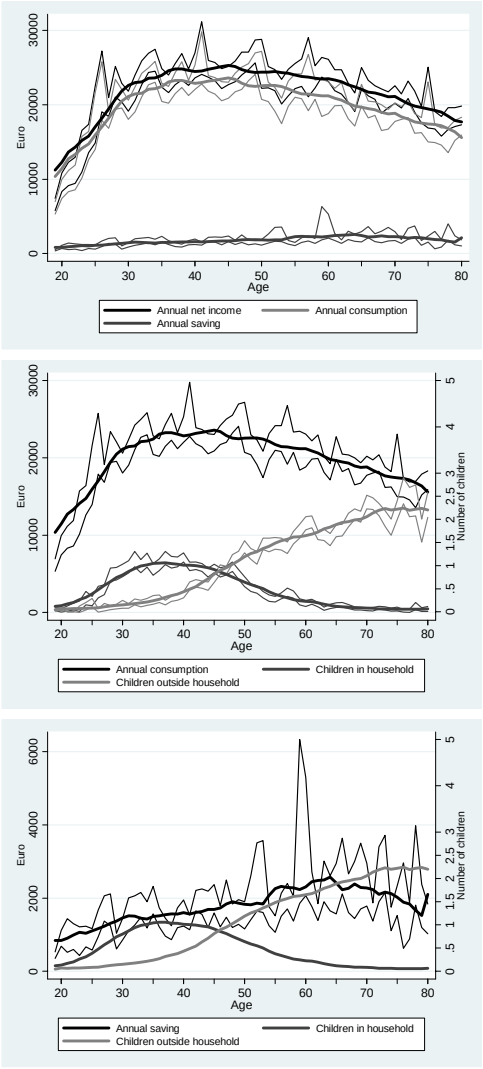




Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

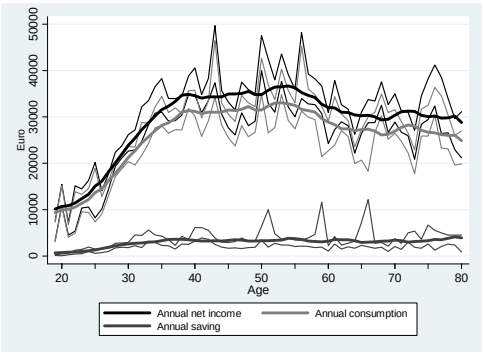
Figure A.2: Age Profiles of Annual Net Income, Consumption, Saving, and Children, Stratified by Education

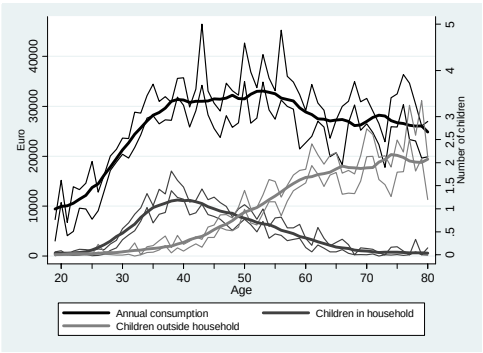
Low Education Households

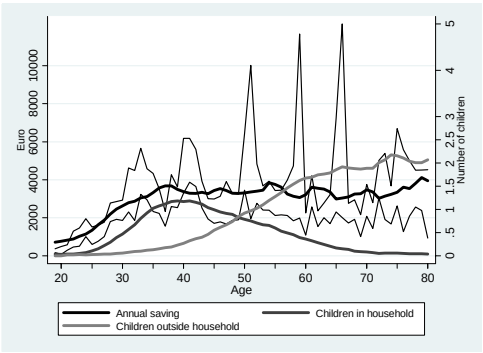


X

High Education Households





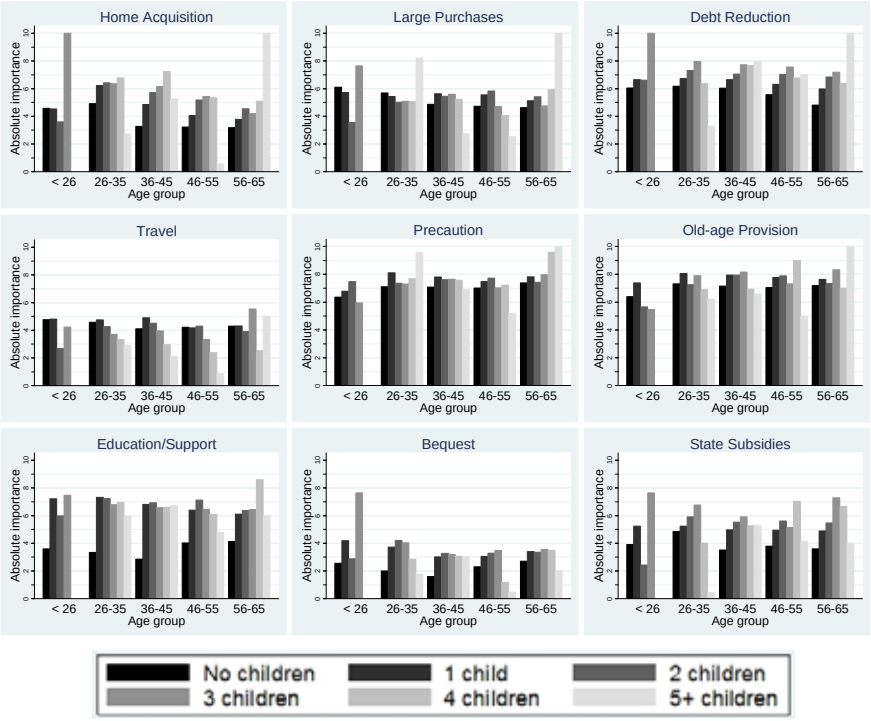


Thick lines represent 10 year moving averages of means; thin lines mark a corridor with limits equal to the mean +/- one standard error.

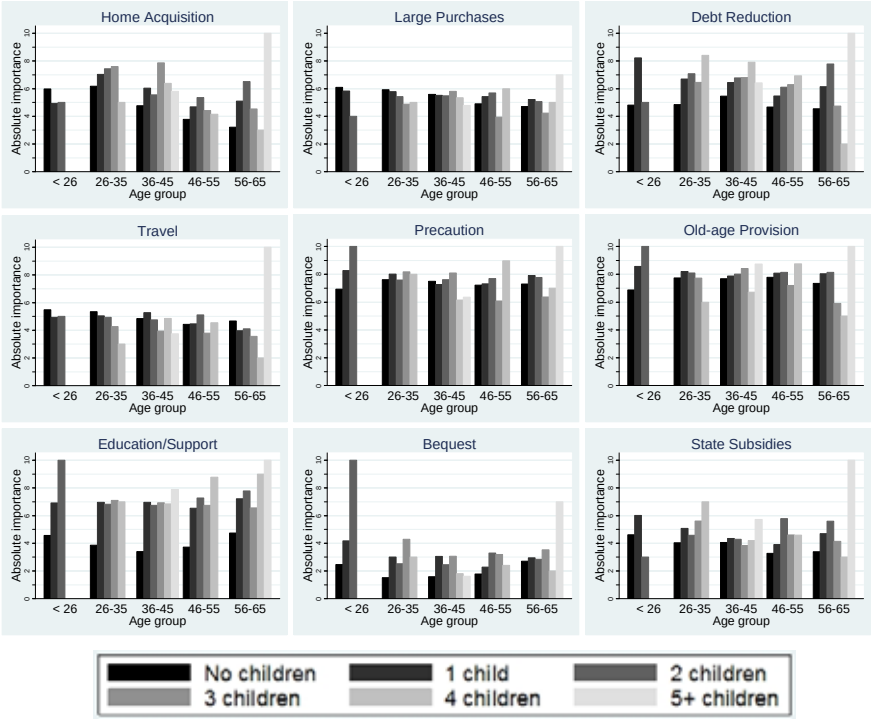
Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

Figure A.3: Absolute Importance of Saving Motives by Children in the Household., Age, and Education

Low Education Households



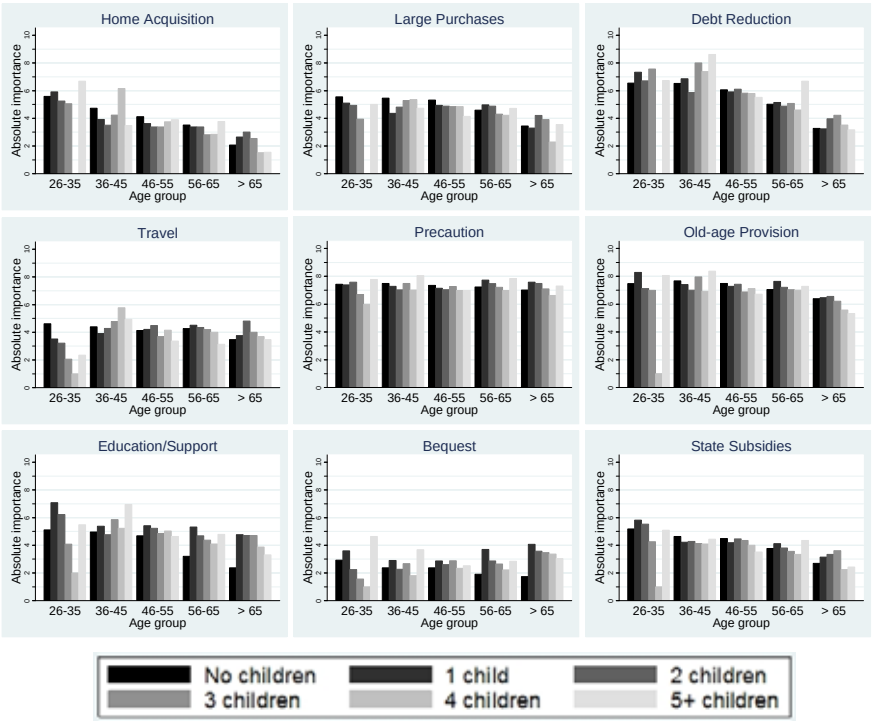
High Education Households



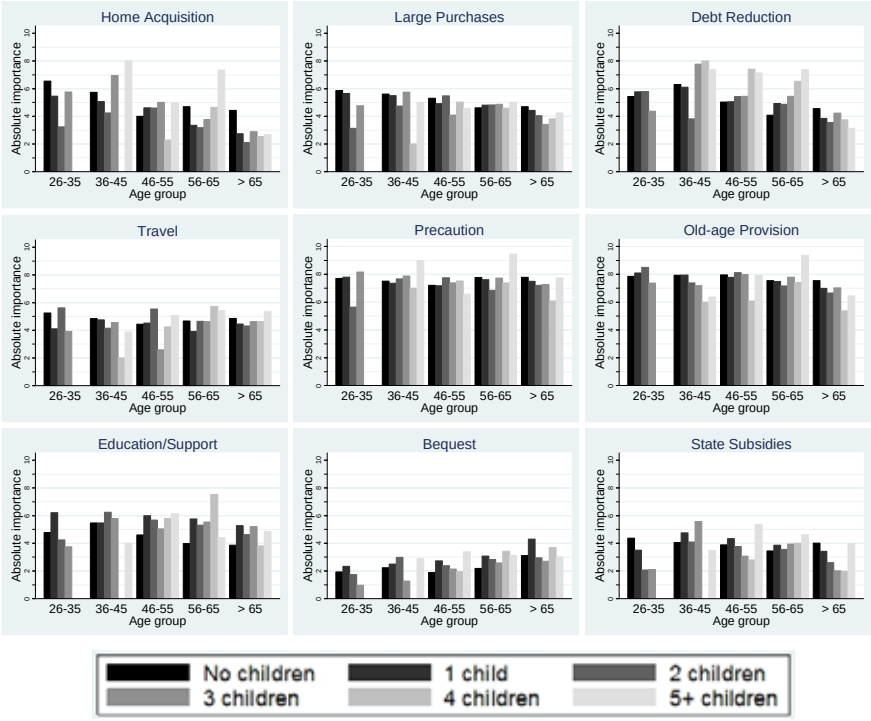
Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

Figure A.4: Abs. Importance of Saving Motives by Children outside the Household., Age, and Education

Low Education Households



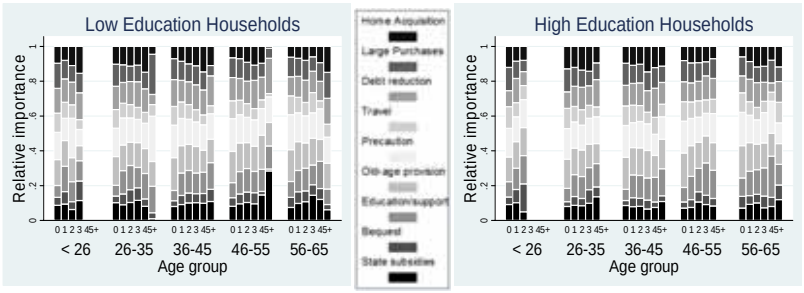
High Education Households



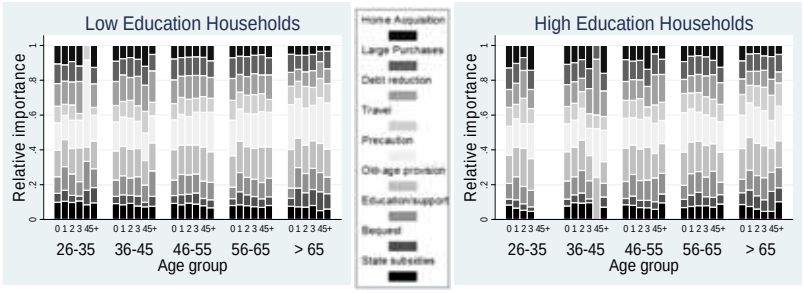
Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

Figure A.5: Relative Importance of Saving Motives by Children, Age, and Education

Children in the Household

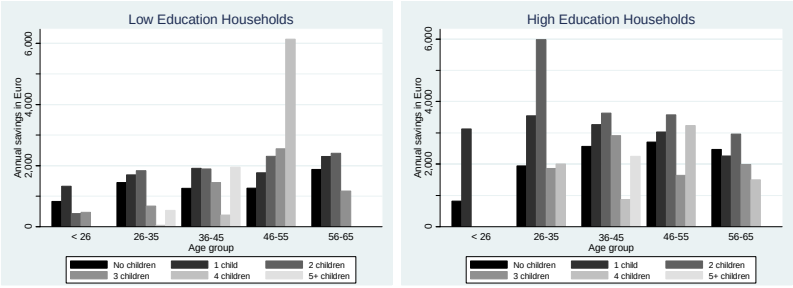


Children outside the Household



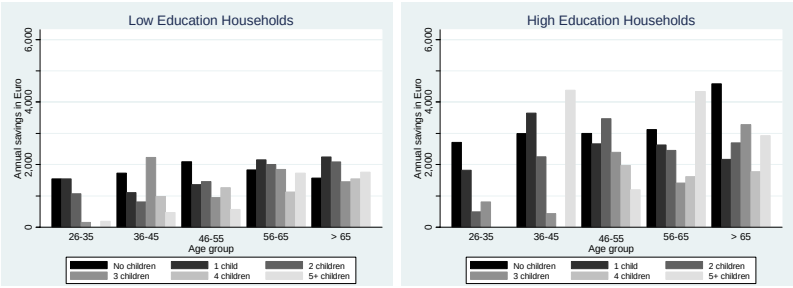
Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

Figure A.6: Annual Saving by the Number of Children in the Household, Age, and Education



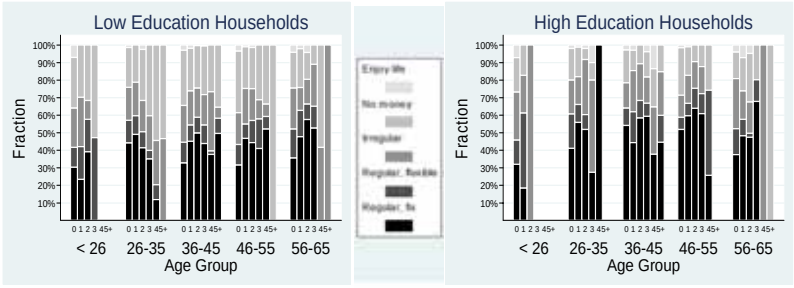
Source: SAVE 2005-2007, restricted sample with additional truncation, weighted, and averaged over the five imputed data sets.

Figure A.7: Annual Saving by the Number of Children outside the Household, Age, and Education



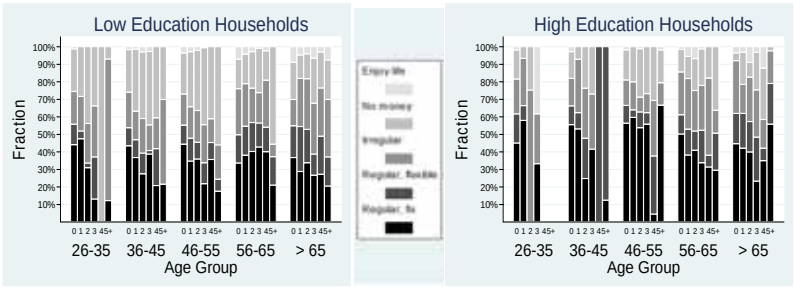
Source: SAVE 2005-2007, restricted sample with additional truncation, weighted, and averaged over the five imputed data sets.

Figure A.8: Regularity of Saving by Children in the Household, Age, and Education



Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

Figure A.9: Regularity of Saving by Children outside the Household, Age, and Education



Source: SAVE 2005-2007, restricted sample, weighted, and averaged over the five imputed data sets.

Table A.3: Regression Results for Annual Saving (Tobit Estimates[2])

	(1)		(2)		(3)		(4)	
Variable	**coef.**	**(s.e.)**	**coef.**	**(s.e.)**	**coef.**	**(s.e.)**	**coef.**	**(s.e.)**
children_in_h	-0.722 ***	(0.129)	-0.722 ***	(0.130)	-0.848 ***	(0.144)	-0.577 ***	(0.090)
*children_in_h*FHR_Abitur*	0.014	(0.216)	-0.062	(0.218)	-0.068	(0.220)	0.087	(0.159)
children_in_h(netinc-26.7)*			0.008 **	(0.004)	0.009 **	(0.004)		
children_in_h(age-51)*					-0.013	(0.009)		
children_out_h	-0.279 ***	(0.087)	-0.257 ***	(0.088)	-0.480 ***	(0.123)	-0.223 ***	(0.066)
*children_out_h*FHR_Abitur*	-0.438 ***	(0.160)	-0.532 ***	(0.165)	-0.560 ***	(0.165)	-0.301 ***	(0.116)
children_out_h(netinc-26.7)*			0.008 **	(0.004)	0.010 ***	(0.004)		
children_out_h(age-51)*					0.020 ***	(0.007)		
FHR_Abitur	0.356	(0.299)	0.456	(0.301)	0.451	(0.302)	0.187	(0.229)
age	-0.107 ***	(0.039)	-0.101 ***	(0.039)	-0.029	(0.045)	-0.082 ***	(0.029)
age2	1.2E-03 ***	(3.8E-04)	1.1E-03 ***	(3.8E-04)	3.8E-04	(4.5E-04)	9.3E-04 ***	(2.9E-04)
female	-0.507 ***	(0.194)	-0.476 **	(0.195)	-0.479 **	(0.196)	-0.371 **	(0.146)
east	0.380 *	(0.208)	0.398 *	(0.209)	0.407 *	(0.208)	0.315 **	(0.157)
foreign	-0.915	(0.571)	-0.898	(0.572)	-0.913	(0.566)	-0.798 **	(0.382)
partner	0.646 ***	(0.228)	0.649 ***	(0.227)	0.643 ***	(0.227)	0.743 ***	(0.164)
good_state_of_health	0.878 ***	(0.191)	0.873 ***	(0.191)	0.855 ***	(0.190)	0.679 ***	(0.139)
netinc	0.074 ***	(0.009)	0.067 ***	(0.008)	0.065 ***	(0.008)	0.058 ***	(0.006)
netinc2	-1.6E-04 ***	(3.1E-05)	-2.2E-04 ***	(4.4E-05)	-2.3E-04 ***	(4.5E-05)	-1.3E-04 ***	(2.2E-05)
low_income_var	-0.057	(0.182)	-0.050	(0.182)	-0.033	(0.183)	0.025	(0.145)
high_income_var	-1.046 ***	(0.222)	-1.038 ***	(0.222)	-0.990 ***	(0.223)	-0.651 ***	(0.169)
increased_inc_prob	0.279	(0.270)	0.307	(0.270)	0.299	(0.269)	0.060	(0.209)
highheritage_prob	0.767	(0.499)	0.753	(0.497)	0.810	(0.497)	0.887 **	(0.432)
except_earn_low	1.212 ***	(0.250)	1.207 ***	(0.252)	1.205 ***	(0.250)	0.803 ***	(0.211)
except_earn_high	1.659 ***	(0.227)	1.648 ***	(0.226)	1.631 ***	(0.227)	1.218 ***	(0.188)
pay_support	0.291	(0.223)	0.252	(0.223)	0.392 *	(0.227)	0.396 **	(0.170)

[2] Columns (1) to (3) refer to a pooled cross section Tobit with clustering, column (4) to a random effects Tobit.
Reported standard errors are robust to serial correlation, and coefficients and standard errors are estimated using Rubin's method.
*,**, and *** refer to significance at the 10, 5, and 1 percent level, respectively.

	(1)		(2)		(3)		(4)	
Variable	**coef.**	**(s.e.)**	**coef.**	**(s.e.)**	**coef.**	**(s.e.)**	**coef.**	**(s.e.)**
repay_homeloan	-0.371	(0.284)	-0.365	(0.284)	-0.361	(0.284)	-0.132	(0.216)
repay_mortgage	-0.208	(0.239)	-0.206	(0.239)	-0.217	(0.238)	-0.181	(0.185)
job_contract_l	-0.329	(0.356)	-0.367	(0.356)	-0.319	(0.355)	-0.192	(0.262)
probjobloss	-0.595 *	(0.342)	-0.581 *	(0.341)	-0.587 *	(0.340)	-0.403	(0.256)
blue_collar	0.795	(0.599)	0.822	(0.598)	0.832	(0.597)	0.301	(0.429)
white_collar	1.001 *	(0.575)	1.019 *	(0.575)	1.043 *	(0.574)	0.568	(0.409)
civil_servant	1.837 ***	(0.662)	1.857 ***	(0.662)	1.882 ***	(0.661)	1.376 ***	(0.519)
self_employed	0.677	(0.669)	0.687	(0.669)	0.699	(0.667)	0.391	(0.487)
freelancer	0.556	(0.743)	0.578	(0.742)	0.568	(0.742)	0.344	(0.549)
unemployed	-1.910 ***	(0.387)	-1.889 ***	(0.387)	-1.857 ***	(0.389)	-1.433 ***	(0.275)
retired	1.105 ***	(0.371)	1.129 ***	(0.371)	1.022 ***	(0.371)	0.768 ***	(0.267)
work_full	0.412	(0.562)	0.412	(0.562)	0.381	(0.560)	0.634	(0.414)
work_part	0.356	(0.566)	0.328	(0.565)	0.276	(0.563)	0.253	(0.415)
work_little	0.478	(0.510)	0.471	(0.511)	0.417	(0.510)	0.446	(0.357)
insur_job	0.268	(0.211)	0.277	(0.210)	0.268	(0.210)	0.242	(0.161)
insur_liab	1.927 ***	(0.266)	1.926 ***	(0.266)	1.881 ***	(0.265)	1.434 ***	(0.194)
wealth	6.7E-03 ***	(8.6E-04)	6.6E-03 ***	(8.6E-04)	6.6E-03 ***	(8.6E-04)	5.6E-03 ***	(6.3E-04)
wealth2	-3.5E-06 ***	(5.5E-07)	-3.5E-06 ***	(5.5E-07)	-3.5E-06 ***	(5.5E-07)	-2.9E-06 ***	(3.8E-07)
homeowner	-0.042	(0.239)	-0.043	(0.239)	-0.020	(0.239)	0.005	(0.177)
habit	0.483 ***	(0.158)	0.488 ***	(0.158)	0.493 ***	(0.158)	0.359 ***	(0.122)
optimism	0.365 **	(0.183)	0.351 *	(0.183)	0.361 **	(0.183)	0.255 *	(0.134)
easy_going	-1.287 ***	(0.260)	-1.289 ***	(0.260)	-1.280 ***	(0.260)	-0.890 ***	(0.183)
spontaneous	-0.335 *	(0.181)	-0.337 *	(0.181)	-0.333 *	(0.181)	-0.286 **	(0.134)
smoker	-0.341 *	(0.206)	-0.326	(0.206)	-0.296	(0.205)	-0.378 **	(0.150)
live_shorter	0.580 ***	(0.223)	0.582 ***	(0.223)	0.588 ***	(0.222)	0.378 **	(0.169)
live_longer	0.211	(0.213)	0.222	(0.213)	0.225	(0.213)	0.283 *	(0.163)
Y2005	0.439 ***	(0.162)	0.444 ***	(0.162)	0.421 ***	(0.162)	0.366 ***	(0.132)
Y2007	-0.190	(0.138)	-0.198	(0.138)	-0.205	(0.138)	-0.145	(0.119)
const	-0.814	(1.005)	-0.822	(1.004)	-2.210 **	(1.103)	0.648	(0.754)
Log Pseudolikelihood		-16,560		-16,556		-16,546		-16,718

Table A.4: Regression Results for Saving Motives (Ordered Probit and Tobit Estimates[3])

Home Acquisition	**Absolute Importance**			
	(1)		**(2)**	
Variable	**coef.**	**(s.e.)**	**coef.**	**(s.e.)**
children_in_h	0.080 ***	(0.022)		
children_in_h_12			0.091 ***	(0.028)
children_in_h_3+			0.077 ***	(0.028)
*children_in_h*FHR_Abitur*	-0.040	(0.034)		
*children_in_h_12*FHR_Abitur*			-0.096 **	(0.046)
*children_in_h_3+*FHR_Abitur*			-0.020	(0.042)
children_out_h	-0.001	(0.016)		
children_out_h_12			0.020	(0.031)
children_out_h_3+			-0.007	(0.016)
*children_out_h*FHR_Abitur*	-0.045	(0.029)		
*children_out_h_12*FHR_Abitur*			-0.184 ***	(0.050)
*children_out_h_3+*FHR_Abitur*			-0.013	(0.031)
FHR_Abitur	0.095 *	(0.050)	0.173 ***	(0.053)
Home Acquisition	**Relative Importance**			
	(3)		**(4)**	
Variable	**coef.**	**(s.e.)**	**coef.**	**(s.e.)**
children_in_h	0.005 **	(0.002)		
children_in_h_12			0.005 *	(0.003)
children_in_h_3+			0.006 **	(0.003)
*children_in_h*FHR_Abitur*	-0.003	(0.003)		
*children_in_h_12*FHR_Abitur*			-0.008 *	(0.004)
*children_in_h_3+*FHR_Abitur*			-0.001	(0.004)
children_out_h	-0.001	(0.002)		
children_out_h_12			0.001	(0.003)
children_out_h_3+			-0.001	(0.002)
*children_out_h*FHR_Abitur*	-0.004	(0.003)		
*children_out_h_12*FHR_Abitur*			-0.018 ***	(0.005)
*children_out_h_3+*FHR_Abitur*			-0.001	(0.003)
FHR_Abitur	0.013 **	(0.005)	0.021 ***	(0.005)

[3] Columns (1) and (2) refer to an ordered probit estimation, columns (3) and (4) to a two-sided Tobit estimation.
Reported standard errors are robust to serial correlation, and coefficients and standard errors are estimated using Rubin's method.
*,**, and *** refer to significance at the 10, 5, and 1 percent level, respectively.

Though not shown here, all regressions control for the same set of covariates as in table A.3, except for the regressions for the motives home acquisition and debt reduction, which do not include *repay_homeloan* and *repay_mortgage* since these variables are likely to be endogenous with respect to these two motives.

Large Purchases	**Absolute Importance**					
	(1)			**(2)**		
Variable	**coef.**		**(s.e.)**	**coef.**		**(s.e.)**
children_in_h	-0.051	***	(0.018)	-0.012		(0.021)
*children_in_h*FHR_Abitur*	-0.051	*	(0.029)	-0.055	*	(0.030)
children_in_h(netinc-26.7)*				6.4E-04		(5.1E-04)
children_in_h(age-51)*				5.8E-03	***	(1.5E-03)
children_out_h	-0.028	**	(0.014)	-0.044	***	(0.016)
children_out_h_FHR_Abitur	-0.009		(0.024)	-0.015		(0.026)
children_out_h(netinc-26.7)*				9.1E-04		(6.1E-04)
children_out_h(age-51)*				2.1E-03	**	(9.6E-04)
FHR_Abitur	0.018		(0.046)	0.014		(0.046)
Large Purchases	**Relative Importance**					
	(3)			**(4)**		
Variable	**coef.**		**(s.e.)**	**coef.**		**(s.e.)**
children_in_h	-0.008	***	(0.001)	-0.006	***	(0.001)
*children_in_h*FHR_Abitur*	-0.003		(0.002)	-0.003		(0.002)
children_in_h(netinc-26.7)*				9.3E-05	***	(3.4E-05)
children_in_h(age-51)*				3.0E-04	**	(1.2E-04)
children_out_h	-0.003	**	(0.001)	-0.004	***	(0.001)
children_out_h_FHR_Abitur	0.000		(0.002)	0.000		(0.002)
children_out_h(netinc-26.7)*				1.1E-04	**	(4.7E-05)
children_out_h(age-51)*				1.5E-04	**	(7.5E-05)
FHR_Abitur	0.003		(0.004)	0.004		(0.004)

Debt Reduction	**Absolute Importance**					
	(1)			**(2)**		
Variable	**coef.**		**(s.e.)**	**coef.**		**(s.e.)**
children_in_h	0.093	***	(0.020)	0.104	***	(0.023)
*children_in_h*FHR_Abitur*	0.012		(0.034)	0.025		(0.034)
children_in_h(netinc-26.7)*				-1.3E-03	**	(5.4E-04)
children_in_h(age-51)*				1.8E-03		(1.7E-03)
children_out_h	0.024		(0.015)	0.021		(0.017)
*children_out_h*FHR_Abitur*	0.032		(0.029)	0.050	*	(0.030)
children_out_h(netinc-26.7)*				-1.4E-03	**	(6.6E-04)
children_out_h(age-51)*				-1.7E-04		(1.0E-03)
FHR_Abitur	-0.141	***	(0.054)	-0.160	***	(0.055)
Debt Reduction	**Relative Importance**					
	(3)			**(4)**		
Variable	**coef.**		**(s.e.)**	**coef.**		**(s.e.)**
children_in_h	0.005	**	(0.002)	0.006	**	(0.002)
*children_in_h*FHR_Abitur*	0.007	**	(0.003)	0.008	**	(0.003)
children_in_h(netinc-26.7)*				-1.2E-04	*	(6.5E-05)
children_in_h(age-51)*				1.6E-04		(1.6E-04)
children_out_h	0.002		(0.002)	0.002		(0.002)
*children_out_h*FHR_Abitur*	0.007	**	(0.003)	0.009	***	(0.003)
children_out_h(netinc-26.7)*				-1.5E-04	*	(8.0E-05)
children_out_h(age-51)*				-2.0E-05		(1.2E-04)
FHR_Abitur	-0.018	***	(0.006)	-0.020	***	(0.006)

Travel	**Absolute Importance**					
	(1)			**(2)**		
Variable	**coef.**		**(s.e.)**	**coef.**		**(s.e.)**
children_in_h	-0.125	***	(0.020)	-0.103	***	(0.024)
*children_in_h*FHR_Abitur*	-0.007		(0.034)	-0.025		(0.034)
children_in_h(netinc-26.7)*				2.0E-03	***	(6.9E-04)
children_in_h(age-51)*				3.2E-03	**	(1.6E-03)
children_out_h	-0.013		(0.016)	-0.018		(0.017)
*children_out_h*FHR_Abitur*	0.003		(0.027)	-0.014		(0.027)
children_out_h(netinc-26.7)*				1.8E-03	***	(6.7E-04)
children_out_h(age-51)*				1.3E-03		(1.1E-03)
FHR_Abitur	0.008		(0.050)	0.022		(0.051)
Travel	**Relative Importance**					
	(3)			**(4)**		
Variable	**coef.**		**(s.e.)**	**coef.**		**(s.e.)**
children_in_h	-0.015	***	(0.002)	-0.014	***	(0.002)
*children_in_h*FHR_Abitur*	0.000		(0.003)	-0.002		(0.003)
children_in_h(netinc-26.7)*				2.2E-04	***	(5.0E-05)
children_in_h(age-51)*				9.5E-05		(1.3E-04)
children_out_h	-0.002		(0.002)	-0.002		(0.002)
*children_out_h*FHR_Abitur*	0.002		(0.002)	0.000		(0.002)
children_out_h(netinc-26.7)*				1.9E-04	***	(5.5E-05)
children_out_h(age-51)*				1.5E-04		(1.1E-04)
FHR_Abitur	0.002		(0.004)	0.004		(0.004)

Precaution	**Absolute Importance**					
	(1)			**(2)**		
Variable	**coef.**		**(s.e.)**	**coef.**		**(s.e.)**
children_in_h	0.015		(0.020)	0.011		(0.023)
*children_in_h*FHR_Abitur*	-0.024		(0.032)	-0.026		(0.032)
children_in_h(netinc-26.7)*				2.7E-04		(4.6E-04)
children_in_h(age-51)*				-5.5E-04		(1.6E-03)
children_out_h	-0.014		(0.014)	-0.025		(0.016)
*children_out_h*FHR_Abitur*	-0.015		(0.025)	-0.022		(0.026)
children_out_h(netinc-26.7)*				5.7E-04		(5.6E-04)
children_out_h(age-51)*				1.2E-03		(9.0E-04)
FHR_Abitur	-0.019		(0.048)	-0.015		(0.048)
Precaution	**Relative Importance**					
	(3)			**(4)**		
Variable	**coef.**		**(s.e.)**	**coef.**		**(s.e.)**
children_in_h	-0.007	***	(0.002)	-0.009	***	(0.002)
*children_in_h*FHR_Abitur*	0.002		(0.002)	0.002		(0.002)
children_in_h(netinc-26.7)*				3.1E-05		(5.1E-05)
children_in_h(age-51)*				-3.1E-04	**	(1.4E-04)
children_out_h	0.001		(0.002)	0.001		(0.001)
*children_out_h*FHR_Abitur*	-0.006	***	(0.002)	-0.006	***	(0.002)
children_out_h(netinc-26.7)*				-2.6E-05		(6.2E-05)
children_out_h(age-51)*				-4.6E-05		(1.1E-04)
FHR_Abitur	0.005		(0.004)	0.006		(0.004)

Old-age Provision	**Absolute Importance**					
	(1)			**(2)**		
Variable	**coef.**		**(s.e.)**	**coef.**		**(s.e.)**
children_in_h	0.001		(0.020)	0.017		(0.027)
*children_in_h*FHR_Abitur*	-0.030		(0.039)	-0.030		(0.039)
children_in_h(netinc-26.7)*				7.4E-05		(4.7E-04)
children_in_h(age-51)*				2.2E-03		(1.9E-03)
children_out_h	-0.037	***	(0.013)	-0.031	*	(0.017)
*children_out_h*FHR_Abitur*	-0.009		(0.034)	-0.005		(0.034)
children_out_h(netinc-26.7)*				-1.6E-04		(5.4E-04)
children_out_h(age-51)*				-4.8E-04		(1.1E-03)
FHR_Abitur	0.060		(0.051)	0.056		(0.051)
Old-age Provision	**Relative Importance**					
	(3)			**(4)**		
Variable	**coef.**		**(s.e.)**	**coef.**		**(s.e.)**
children_in_h	-0.008	***	(0.001)	-0.008	***	(0.002)
*children_in_h*FHR_Abitur*	0.001		(0.003)	0.001		(0.003)
children_in_h(netinc-26.7)*				-3.4E-05		(4.7E-05)
children_in_h(age-51)*				-3.7E-05		(1.3E-04)
children_out_h	-0.004	***	(0.002)	-0.003	*	(0.002)
*children_out_h*FHR_Abitur*	0.001		(0.002)	0.001		(0.002)
children_out_h(netinc-26.7)*				-5.1E-05		(5.4E-05)
children_out_h(age-51)*				-1.5E-04		(9.5E-05)
FHR_Abitur	0.008	**	(0.004)	0.008	**	(0.004)

Education/Support	**Absolute Importance**					
	(1)			**(2)**		
Variable	**coef.**		**(s.e.)**	**coef.**		**(s.e.)**
child_in_h				0.732	***	(0.062)
children_in_h	0.300	***	(0.022)	0.041		(0.028)
*child_in_h*FHR_Abitur*				-0.009		(0.121)
*children_in_h*FHR_Abitur*	0.019		(0.039)	0.013		(0.060)
child_out_h				0.340	***	(0.060)
children_out_h	0.040	***	(0.014)	-0.014		(0.018)
*child_out_h*FHR_Abitur*				-0.125		(0.111)
*children_out_h*FHR_Abitur*	0.032		(0.026)	0.061		(0.040)
FHR_Abitur	-0.058		(0.057)	0.001		(0.062)
Education/Support	**Relative Importance**					
	(3)			**(4)**		
Variable	**coef.**		**(s.e.)**	**coef.**		**(s.e.)**
child_in_h				0.058	***	(0.005)
children_in_h	0.028	***	(0.002)	0.007	***	(0.002)
*child_in_h*FHR_Abitur*				-0.003		(0.009)
*children_in_h*FHR_Abitur*	1.0E-03		(3.1E-03)	1.5E-03		(4.6E-03)
child_out_h				0.039	***	(0.005)
children_out_h	7.0E-03	***	(1.4E-03)	2.2E-04		(1.7E-03)
*child_out_h*FHR_Abitur*				-0.013		(0.009)
*children_out_h*FHR_Abitur*	1.5E-03		(2.4E-03)	4.2E-03		(3.5E-03)
FHR_Abitur	2.1E-03		(4.9E-03)	8.5E-03		(5.3E-03)

Bequest	**Absolute Importance**					
	(1)			**(2)**		
Variable	**coef.**		**(s.e.)**	**coef.**		**(s.e.)**
child_in_h				0.361	***	(0.069)
children_in_h	0.151	***	(0.022)	0.034		(0.035)
*child_in_h*FHR_Abitur*				-0.040		(0.126)
*children_in_h*FHR_Abitur*	-0.013		(0.034)	-0.004		(0.059)
child_out_h				0.368	***	(0.054)
children_out_h	0.030	**	(0.015)	-0.036	**	(0.018)
*child_out_h*FHR_Abitur*				-0.123		(0.112)
*children_out_h*FHR_Abitur*	0.009		(0.025)	0.034		(0.044)
FHR_Abitur	-0.126	**	(0.054)	-0.068		(0.060)
Bequest	**Relative Importance**					
	(3)			**(4)**		
Variable	**coef.**		**(s.e.)**	**coef.**		**(s.e.)**
child_in_h				0.030	***	(0.006)
children_in_h	0.014	***	(0.002)	0.004	**	(0.003)
*child_in_h*FHR_Abitur*				-0.006		(0.011)
*children_in_h*FHR_Abitur*	-9.8E-04		(2.9E-03)	7.6E-04		(4.8E-03)
child_out_h				0.036	***	(0.005)
children_out_h	4.1E-03	***	(1.5E-03)	-2.4E-03		(1.9E-03)
*child_out_h*FHR_Abitur*				-0.012		(0.010)
*children_out_h*FHR_Abitur*	4.7E-04		(2.6E-03)	2.9E-03		(4.4E-03)
FHR_Abitur	-7.8E-03		(4.9E-03)	-1.8E-03		(5.3E-03)

State Subsidies	**Absolute Importance**			
	(1)		**(2)**	
Variable	**coef.**	**(s.e.)**	**coef.**	**(s.e.)**
children_in_h	0.085 ***	(0.021)		
children_in_h_123			0.121 ***	(0.022)
children_in_h_4+			0.017	(0.040)
*children_in_h*FHR_Abitur*	-0.069 **	(0.033)		
*children_in_h_123*FHR_Abitur*			-0.108 ***	(0.037)
*children_in_h_4+*FHR_Abitur*			0.014	(0.065)
children_out_h	0.003	(0.017)		
children_out_h_123			0.036	(0.022)
children_out__h_4+			-0.011	(0.020)
*children_out_h*FHR_Abitur*	-0.023	(0.030)		
*children_out_h_123*FHR_Abitur*			-0.081 ***	(0.036)
*children_out_h_4+*FHR_Abitur*			0.016	(0.043)
FHR_Abitur	-0.105 **	(0.052)	-0.051	(0.053)
State Subsidies	**Relative Importance**			
	(3)		**(4)**	
Variable	**coef.**	**(s.e.)**	**coef.**	**(s.e.)**
children_in_h	0.005 **	(0.002)		
children_in_h_123			0.006 ***	(0.002)
children_in_h_4+			0.004	(0.005)
*children_in_h*FHR_Abitur*	-0.005	(0.003)		
*children_in_h_123*FHR_Abitur*			-0.006 *	(0.003)
*children_in_h_4+*FHR_Abitur*			-0.003	(0.006)
children_out_h	-0.001	(0.002)		
children_out_h_123			0.001	(0.002)
children_out__h_4+			-0.003	(0.002)
*children_out_h*FHR_Abitur*	-0.001	(0.003)		
*children_out_h_123*FHR_Abitur*			-0.006 *	(0.003)
*children_out_h_4+*FHR_Abitur*			0.002	(0.004)
FHR_Abitur	-0.007	(0.005)	-0.004	(0.005)

Table A.5: Regression Results for the Importance of Saving Motives: Explanatory Variables Other than Children and Education

	Home Acquisition		Large Purchases		Debt Reduction		Travel		Precaution		Old-age Provision		Support/ Education		Bequest		State Subsidies	
	abs	rel	abs	rel	abs	rel	abs	rel	abs	rel	abs	rel	abs	rel	abs	rel	abs	rel
age	− ***	− ***	+ **	+ ***	+ *	+ ***		+ *			+ ***	+ ***	− ***	− ***	− ***	− ***		
age2	+ *	+ **	− ***	− ***	− ***	− ***	− **	− **		+ **	− ***	− ***	+ ***	+ ***	+ ***	+ ***		
female		− **		− ***	+ ***		+ **		+ ***		+ ***		+ **		+ **			
east	− ***	− ***	− ***	− *	− **				− ***		− ***			+ ***				
partner	+ **		+ ***				+ **		+ ***	− ***	+ ***		+ ***				+ ***	+ ***
good_state_of_health			+ ***	+ **	− *	− **	+ ***	+ ***		− *	+ ***							
netinc	+ **	+ **	+ *				+ ***	+ ***				− *					− *	− **
netinc2	− **	− **	− **				− ***	− ***				+ ***						
low_income_var	+ **	+ **	+ *			+ **				− ***	+ **				+ *			
high_income_var	+ **	+ **			+ ***	+ ***		− **			+ **							
increased_inc_prob	+ ***	+ ***					+ **		− **	− ***					+ *	+ *		
pay_support	+ **		+ **		+ ***			− **		− ***		− ***	+ ***	+ ***	+ ***	+ **		
repay_homeloan			− **	− **				− *		− **		− *	− ***	− ***	− ***	− ***	+ ***	+ ***
repay_mortgage			− **	− ***			− ***	− ***		+ *		− ***		− **		− *		
unemployed	− *		− **			+ *	− ***	− ***	− *	+ **		+ ***	− ***	− ***	− **	− **	− **	
insur_job	+ **	+ *		− ***				− ***			+ ***	+ **					+ ***	+ **
insur_liab		− *	+ **	+ *			+ ***	+ **	+ ***		+ *						+ ***	+ **
wealth		− **	+ ***		− ***	− ***	+ ***		+ ***		+ **		+ *		+ ***	+ ***		
wealth2			− ***		+ ***	+ ***	− ***	− *	− ***						− ***	− ***		
homeowner	+ ***	+ ***	+ *		+ ***	+ ***	− **	− ***		− ***		− ***	+ **		+ *		+ ***	+ ***
habit	+ *		+ ***		+ *			− ***	+ ***	+ **	+ **				+ **			
optimism	+ *		+ ***			+ *	+ ***	+ **	+ *		+ ***						+ *	
easy_going	− ***	− **	− ***		− ***		− **		− ***	+ **	− ***		− ***	− ***	− ***	− **	− ***	− *
spontaneous	− *	− *	+ **	+ **			+ ***	+ ***	− ***	− ***	− ***	− *						
smoker	− *	− *	− ***	− **	+ **	+ ***	− ***	− ***									− ***	− ***

*,**, and *** refer to significance at the 10, 5, and 1 percent level, respectively.

Table A.6: Regression Results for the Regularity of Saving (Multinomial Logit Estimates)

(a) Marginal Effects on the Log Odds Ratio (Base Group: No money non-savers)

	Regular Fix		Regular Flexible		Irregular		Enjoy Life	
Variable	**coef.**	**(s.e.)**	**coef.**	**(s.e.)**	**coef.**	**(s.e.)**	**coef.**	**(s.e.)**
children_in_h	-0.410 ***	(0.062)	-0.543 ***	(0.083)	-0.378 ***	(0.068)	-0.797 ***	(0.188)
*children_in_h*FHR_Abitur*	-0.065	(0.106)	-0.076	(0.138)	0.089	(0.102)	0.280	(0.259)
children_in_h(netinc-26.7)*	7.5E-05	(3.8E-03)	-4.0E-04	(4.6E-03)	-2.6E-03	(3.7E-03)	3.8E-03	(4.9E-03)
children_in_h(age-51)*	-5.4E-03	(4.2E-03)	-4.6E-03	(5.0E-03)	-8.1E-03 *	(4.2E-03)	1.6E-03	(1.1E-02)
children_out_h	-0.203 ***	(0.053)	-0.109 *	(0.065)	-0.091	(0.056)	-0.168	(0.109)
*children_out_h*FHR_Abitur*	-0.170 **	(0.084)	-0.131	(0.098)	-0.139 *	(0.083)	-0.145	(0.140)
children_out_h(netinc-26.7)*	2.6E-03	(3.5E-03)	2.8E-04	(3.8E-03)	1.1E-03	(3.4E-03)	1.3E-03	(4.8E-03)
children_out_h(age-51)*	5.7E-03 **	(2.7E-03)	6.3E-04	(3.2E-03)	2.1E-03	(2.7E-03)	4.8E-03	(5.1E-03)
FHR_Abitur	0.194	(0.160)	0.070	(0.186)	0.203	(0.161)	0.022	(0.266)
age	-0.001	(0.022)	-0.076 ***	(0.024)	-0.044 **	(0.021)	-0.051	(0.037)
age2	7.7E-06	(2.3E-04)	8.3E-04 ***	(2.5E-04)	5.0E-04 **	(0.000)	5.1E-04	(3.6E-04)
good_state_of_health	0.284 ***	(0.090)	0.403 ***	(0.110)	0.205 **	(0.089)	0.149	(0.177)
netinc	0.050 ***	(0.008)	0.067 ***	(0.009)	0.032 ***	(0.008)	0.062 ***	(0.011)
netinc2	-9.6E-05 **	(4.3E-05)	-2.2E-04 ***	(6.7E-05)	-4.3E-05	(4.4E-05)	-1.4E-04 **	(6.0E-05)
high_income_var	-0.351 ***	(0.108)	-0.196	(0.128)	-0.112	(0.109)	-0.341	(0.208)
repay_homeloan	-0.074	(0.152)	-0.533 ***	(0.197)	-0.031	(0.162)	-0.275	(0.355)
repay_mortgage	-0.272 **	(0.135)	-0.383 **	(0.161)	-0.312 **	(0.141)	-0.805 ***	(0.287)
unemployed	-0.710 ***	(0.151)	-0.685 ***	(0.206)	-0.242 *	(0.141)	-0.677 *	(0.368)
retired	0.420 **	(0.167)	0.329	(0.198)	0.298 *	(0.166)	-0.027	(0.320)
insur_job	0.525 ***	(0.110)	0.330 **	(0.132)	0.166	(0.115)	-0.029	(0.240)
insur_liab	0.884 ***	(0.108)	0.523 ***	(0.131)	0.442 ***	(0.104)	0.180	(0.185)
wealth	3.9E-03 ***	(6.1E-04)	4.1E-03 ***	(6.6E-04)	2.4E-03 ***	(6.1E-04)	5.3E-03 ***	(9.4E-04)
wealth2	-2.0E-06 ***	(2.9E-07)	-1.8E-06 ***	(3.0E-07)	-1.1E-06 ***	(2.7E-07)	-2.2E-06 ***	(3.9E-07)
optimism	0.333 ***	(0.083)	0.213 **	(0.100)	0.108	(0.087)	0.233	(0.178)
easy_going	-0.424 ***	(0.114)	-0.474 ***	(0.142)	-0.215 *	(0.115)	0.668 ***	(0.176)
spontaneous	-0.270 ***	(0.089)	-0.266 **	(0.107)	-0.197 **	(0.091)	0.345 **	(0.155)
smoker	-0.169 *	(0.094)	-0.104	(0.114)	-0.202 **	(0.097)	0.013	(0.183)
const	-1.737 ***	(0.516)	-0.990 *	(0.591)	-0.369	(0.494)	-1.334	(0.900)

The variables female, east, foreign, partner, increased_inc_prob, highheritage_prob, low_income_var, except_earn_low, except_earn_high, pay_support, job_contract_l, prob_jobb_less, work_full, work_part, work_little, home_owner, habit, live_shorter, live_longer, as well as the job and year dummies are included in the regression but the coefficients are not displayed here since they are mostly insignificant.. Complete regression tables are available from the author on request.

(b) Marginal Effects on the Probability to Belong to a Certain Category (Calculated at Means)

	Regular Fix		Regular Flexible		Irregular		No Money		Enjoy Life	
Variable	**m.e.**	**(s.e.)**	**m.e.**	**(s.e.)**	**m.e.**	**(s.e.)**	**m.e.**	**(s.e.)**	**m.e.**	**(s.e.)**
children_in_h	-0.018	(0.012)	-0.026 ***	(0.008)	-0.002	(0.010)	0.056 ***	(0.007)	-0.010	(0.010)
*children_in_h*FHR_Abitur*	-0.023	(0.019)	-0.010	(0.013)	0.024 *	(0.014)	0.002	(0.012)	0.007	(0.007)
children_in_h(netinc-26.7)*	2.7E-04	(4.4E-04)	2.2E-05	(3.7E-04)	-4.8E-04	(3.6E-04)	8.4E-05	(4.7E-04)	9.9E-05	(7.0E-05)
children_in_h(age-51)*	-2.0E-04	(7.8E-04)	5.6E-05	(5.0E-04)	-7.6E-04	(6.2E-04)	7.5E-04	(4.7E-04)	1.5E-04	(4.9E-04)
children_out_h	-0.032 ***	(0.009)	0.003	(0.006)	0.010	(0.007)	0.020 ***	(0.006)	-0.001	(0.002)
*children_out_h*FHR_Abitur*	-0.017	(0.014)	0.000	(0.009)	-0.002	(0.011)	0.020 **	(0.010)	0.000	(0.003)
children_out_h(netinc-26.7)*	4.9E-04	(3.7E-04)	-1.8E-04	(2.4E-04)	-8.8E-05	(2.7E-04)	-2.2E-04	(4.3E-04)	-4.0E-06	(8.3E-05)
children_out_h(age-51)*	1.1E-03 *	(5.4E-04)	-3.8E-04	(3.2E-04)	-2.5E-04	(4.2E-04)	-4.8E-04 *	(2.9E-04)	3.7E-05	(1.3E-03)
FHR_Abitur	0.021	(0.026)	-0.011	(0.016)	0.014	(0.021)	-0.021	(0.018)	-0.003	(0.005)

Reported standard errors are robust to serial correlation, and coefficients and standard errors are estimated using Rubin's method.
*,**, and *** refer to significance at the 10, 5, and 1 percent level, respectively.

Table A.7: Instrumented Regression Results for Annual Saving (Instrumented Tobit Estimates)

	(1)			(2)		
Variable	**coef.**		**(s.e.)**	**coef.**		**(s.e.)**
children_in_h	-1.062	*	(0.547)	-0.476		(0.601)
*children_in_h*FHR_Abitur*				-0.385		(0.472)
children_out_h	-0.286		(0.914)	0.533		(0.798)
*children_out_h*FHR_Abitur*				-1.132	***	(0.306)
FHR_Abitur	-0.075		(0.235)	1.340	**	(0.581)
age	-0.104		(0.076)	-0.140	*	(0.071)
age2	1.1E-03	**	(5.0E-04)	1.3E-03	**	(5.0E-04)
female	-0.463	*	(0.243)	-0.614	***	(0.238)
east	0.315		(0.277)	0.264		(0.266)
foreign	-0.913		(0.575)	-0.909		(0.577)
partner	0.728	*	(0.424)	0.435		(0.392)
good_state_of_health	0.851	***	(0.209)	0.977	***	(0.205)
netinc	0.075	***	(0.009)	0.079	***	(0.009)
netinc2	-1.6E-04	***	(3.5E-05)	-1.8E-04	***	(3.5E-05)
low_income_var	-0.077		(0.187)	-0.075		(0.186)
high_income_var	-1.076	***	(0.267)	-1.139	***	(0.250)
increased_inc_prob	0.334		(0.292)	0.254		(0.288)
highheritage_prob	0.760		(0.505)	0.714		(0.515)
except_earn_low	1.193	***	(0.261)	1.250	***	(0.266)
except_earn_high	1.661	***	(0.230)	1.679	***	(0.232)
pay_support	0.149		(0.433)	0.078		(0.390)
repay_homeloan	-0.310		(0.314)	-0.418		(0.319)
repay_mortgage	-0.153		(0.256)	-0.216		(0.258)
job_contract_l	-0.366		(0.360)	-0.358		(0.359)
probjobloss	-0.547		(0.342)	-0.569		(0.348)
blue_collar	0.887		(0.634)	0.930		(0.623)
white_collar	1.121	*	(0.620)	1.069	*	(0.600)
civil_servant	2.048	***	(0.694)	1.882	***	(0.684)
self_employed	0.811		(0.711)	0.752		(0.710)
freelancer	0.693		(0.807)	0.652		(0.809)
unemployed	-2.017	***	(0.391)	-1.848	***	(0.396)
retired	0.997	**	(0.406)	1.145	***	(0.415)
work_full	0.199		(0.565)	0.433		(0.569)
work_part	0.233		(0.577)	0.390		(0.565)
work_little	0.368		(0.536)	0.446		(0.528)
insur_job	0.319		(0.215)	0.295		(0.215)
insur_liab	1.939	***	(0.269)	1.968	***	(0.269)
wealth	6.5E-03	***	(9.1E-04)	7.0E-03	***	(9.0E-04)
wealth2	-3.5E-06	***	(5.6E-07)	-3.7E-06	***	(5.6E-07)
homeowner	0.030		(0.246)	0.007		(0.246)
habit	0.482	***	(0.159)	0.458	***	(0.160)
optimism	0.374	**	(0.182)	0.359	*	(0.185)
easy_going	-1.280	***	(0.269)	-1.269	***	(0.265)
spontaneous	-0.357	*	(0.194)	-0.389	**	(0.190)
smoker	-0.349	*	(0.211)	-0.373	*	(0.214)
live_shorter	0.583	***	(0.225)	0.577	**	(0.225)
live_longer	0.231		(0.242)	0.143		(0.240)
Y2005	0.467	***	(0.167)	0.476	***	(0.164)
Y2007	-0.200		(0.139)	-0.175		(0.139)
const	-0.378		(1.655)	-0.509		(1.605)

Instrumented: *children_in_h children_in_h*FHR_Abitur children_out_h children_out_h*FHR_Abitur*
Instruments: *FHR_Abitur age age2 female east foreign partner good_state_of_health netinc netinc2 low_income_var high_income_var increased_inc_prob highheritage_prob except_earn_low except_earn_high pay_support repay_homeloan repay_mortgage job_contract_l probjobloss blue_collar white_collar civil_servant self_employed freelancer unemployed retired work_full work_part work_little insur_job insur_liab wealth wealth2 homeowner habit optimism easy_going spontaneous smoker live_shorter live_longer Y2005 Y2007 cih_cell cih_cell*FHR_Abitur coh_cell coh_cell*FHR_Abitur*

Reported standard errors are robust to serial correlation, and coefficients and standard errors are estimated using Rubin's method.
*,**, and *** refer to significance at the 10, 5, and 1 percent level, respectively.

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