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International Comparison of Household Savings Behaviour: The German Savings Puzzle

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Content

This mea discussion paper presents excerpts of the International Savings Comparison Project covering household savings behaviour in seven countries. The whole series of comparative country studies can be found in a special issue of the journal “Research in Economics”, Volume 55, Number 2, June 2001.

The introduction gives an outline of the research program of the project.

A project as complex as the International Savings Comparison Project has sparked discussions and controversy. Tullio Jappelli, who has accompanied the International Savings Comparison Project since its inception, has accepted the invitation to write a critical discussion of the project’s work so far. His discussion and a brief rejoinder by Axel Börsch-Supan compose the second and third part of this discussion paper.

The last part of this paper presents the results of this project for Germany.

International Comparison of Household Savings Behaviour: A Study of Life-Cycle Savings in Seven Countries

Introduction

***By Axel Börsch-Supan*[1]**

1. Purpose of this special issue

Household saving is still little understood, and even the basic facts – for instance: How does saving change over the life cycle? Do the elderly draw down their wealth? – are controversial. Understanding saving behaviour is not only an important question because the division of income in consumption and saving concerns one of the most fundamental household decisions, but it is also of utmost policy relevance since private household saving as a private insurance interacts with social policy as public insurance. Population ageing and its threat to the sustainability of the public insurance systems has put the spotlight back on own saving as a device for old-age provision. Solving the pension crises therefore requires understanding saving.

This special issue of *Research in Economics* is devoted to a further step in this direction. It presents a first stock taking of the International Savings Comparison Project – a project performed under the auspices of a European Union sponsored network of researchers.[2] The main focus of this project is the interaction of household saving with public policy, notably the generosity and design of public pension systems. It is very much in the tradition of Feldstein's (1974) seminal study, but we transpose the inference from time series data to a set of international panel data.

Our inference is based on seven country studies. For space reasons, five country studies appear in this issue, while two country studies will appear in the following issue. The countries range from five European countries (France, Germany, Italy, the Netherlands and the United Kingdom) to Japan and the United States. In all these countries, pension reform is high up on the policy agenda. All countries have already introduced, or are contemplating introducing, the augmentation of their pay-as-you-go public pension systems with private (occupational and individual) funded pension plans. For this reason alone, the seven countries

[1] I am grateful for comments by Agar Brugiavini, Tullio Jappelli, Guglielmo Weber, and Joachim Winter.
[2] The TMR (Training and Mobility of Researchers') network on "Savings, Pensions and Portfolio Choice".

are interesting subjects for a study of saving behaviour.

The combination of the seven country studies, however, should be more than the sum of its parts. Understanding saving behaviour requires variation in the potential determinants of saving. Studies within a single country, however, often lack the necessary variation in public policies: the counterfactual is missing. This is most germane for cross sectional data from a single country that usually fail to have any policy variation. Traditional studies of household saving have therefore exploited the time series variation in aggregate data. Such studies, however, cannot really account for changes in the composition of a heterogeneous population. One obvious solution is to use panel data. Panel data sets that contain saving data, however, are usually short and therefore rarely include policy changes and "historical experiments". This particularly applies to our main determinant of interest: pension policy is not changed frequently, and this for a good reason. The main idea behind the International Savings Comparison Project is to exploit international variation that might provide additional variation in policy variables because different countries have widely different social policies, capital taxation regimes, etc.

A first objective of this project is therefore to set up a comparable longitudinal database that permits more insight in the relation between pension and other policies on the one hand and saving behaviour on the other hand. As a second objective, we test our working hypothesis: a major part of the differences in the age-saving patterns observed across European countries, Japan and the U.S. are generated by differences in national pension policies. The ultimate objective of the line of research pursued in this project is to construct a model that predicts life cycle saving patterns as a function of pension policies, taxes rules, and other determinants. While this last objective is not a realistic goal for this special issue, our work will be guided by such a frame of thinking.

More modestly, the papers fulfil two tasks. The first is descriptive: the papers collect the main saving measures by age and cohort. The second task is interpretation: the papers link saving patterns to country-specific policies, most prominently (but not exclusively) pension policies. At this stage of the project, this link is a rather informal one.

Specifically, each paper focuses on two issues:

- To measure how saving changes during the life cycle. This requires the separation of age and cohort effects, subject to a common treatment of time effects. It also requires a common definition of saving components in the various countries.
- To augment saving data by data on pensions. This includes mandatory contributions to unfunded pension plans on the one hand, and data on retirement income by source on the

other hand.

The work is in the tradition of earlier cross-national studies, and we are happy to be able to leverage earlier work – often done by the authors themselves – to new connections and insights. A particularly noteworthy foundation are the age-saving profiles for the G-7 countries (except France) that have been presented in the volume edited by Poterba (1994), referring to saving data until the mid 1980s. We update these profiles and base them on stricter common definitions. In addition, we extend the Poterba volume, which mostly relied on cross sectional evidence, by purging the age-saving profiles from cohort effects drawn from longitudinal data. This is important because apparent life-cycle effects in cross sectional data are severely confounded by changes from cohorts to cohort. How severe the resulting bias can be is demonstrated further below.

The papers in this special issue are brief and concise. They are, as mentioned before, only a first stock taking which stresses the main features in each country. The International Savings Comparisons Project will proceed with a second set of studies that are more detailed and more tightly structured around a set of common descriptions and analyses. The reader is referred to these papers which will appear in a volume (Börsch-Supan, 2001). This volume will also provide an extensive discussion of the methodological issues in identifying and measuring savings (Brugiavini and Weber, 2001) to which we only briefly allude in this introduction. Moreover, the volume will include a machine-readable appendix with the underlying data that will enable readers to generate alternative specifications of saving aggregates and to apply alternative assumptions for the separation of age, cohort, and time effects in saving behaviour.

2. Methodology

The papers in this special issue use a set of common saving concepts that are defined in the first part of this section. While these accounting definitions are tedious and may not be the matter that excites most economists, they are a crucial necessity for a meaningful cross-national comparison. The second part describes our approach to separate age, time, and cohort effects – a crucial requirement to analyse saving over the life course. As mentioned, a more extensive discussion of the various approaches to measure and identify saving behaviour is provided by Brugiavini and Weber (2001).

2.1 Saving Concepts

The starting point for our various saving concepts is a macroeconomic point of view: saving is the addition to the physical capital stock, W_t, during the period from time $t-1$ to time t. The central underlying equation is

(1) $W_t = (1+r_t)\, W_{t-1} + Y_t - C_t$

where Y_t stands for disposable labour and transfer income, net of taxes and contributions to unfunded social security schemes, and C_t for consumption expenditures. We will come back to this disposable income definition later. Capital income is $r_t W_{t-1}$ for the rate of return r_t.

We first distinguish between *active* and *passive* saving. Passive saving are capital gains that are automatically reinvested – the most salient example is stock market appreciation. If all capital income is automatically reinvested, and let us assume this for the rest of this introduction, active saving in equation 1 is $(Y_t - C_t)$ while passive saving is $r_t W_{t-1}$.

With suitable data, saving can be disaggregated in its portfolio components. Ideally, we observe daily inflows into, and outflows from, each separate account. We denote the active part of these in and outflows by D_{it} such that the sum over all portfolio items i yields $(Y_t - C_t)$. Hence,

(2) $W_{it} = (1+r_{it})\, W_{it-1} + D_{it}$

where W_{it} and r_{it} denote the respective stocks and returns.

Of particular importance for our analysis of household saving behaviour is the distinction between discretionary and mandatory saving. *Discretionary saving* is completely under the control of the households. The households choose its absolute value as well as its portfolio composition, given their budget constraints and applicable incentives such as tax relief and mandatory contributions to funded and unfunded pension schemes. In turn, *mandatory saving* is beyond the control of the household. The most important example is mandatory contributions to funded occupational pension plans. Here, the volume is prescribed (e.g., a fixed absolute sum or a fixed percentage of gross income) and frequently even the portfolio composition is outside the control of the household (e.g., the employer provides a single pension plan).

Where possible, we also distinguish between *financial* and *real saving*. This is now a microeconomic concept, departing from the macroeconomic view that all saving will ultimately be physical saving. *Active discretionary financial saving* is:

- Deposits into, minus withdrawals from, saving accounts, mutual money market accounts, and other money-like investments
- plus purchases of, minus sales of, bonds
- plus purchases of, minus sales of, stocks
- plus contributions to, minus out payments from, whole life insurance
- plus contributions to, minus out payments from, dedicated saving plans (defined by a contract that determines for which purpose withdrawals may be made, e.g., building

societies, individual health spending accounts, etc.)

- plus voluntary contributions to, minus payments from, individual retirement accounts and pension funds where withdrawals may be made only after retirement or a prespecified age
- plus amortisation of, minus take-up of, consumer loans.

In turn, *active discretionary real saving* consists of:

- Purchases of, minus sales of, real estate (including owner-occupied housing)
- plus expenditures in upkeep and improvement of housing, minus 2% depreciation
- plus amortisation of, minus take-up of, mortgages
- plus purchases of, minus sales of, gold and other jewellery.

We also report the corresponding stock measures, *financial* and *real wealth*. Note that mortgage loans count as (negative) *real* wealth.

We started by defining saving as additions to the physical capital stock. Some economists, however, prefer a broader definition of saving that also includes the addition of claims on unfunded pension benefits (Jappelli and Modigliani, 1998). Under such a broad view, contributions to pay-as-you-go financed pension schemes are considered saving. We will use at times the term *"notional saving"* for these contributions although we are aware that the term "saving" may be confusing here since these contributions do not contribute to the capital stock. Consequentially, receiving pension benefits is *"notional dissaving"*, and the current present value of pension benefit claims is dubbed *"notional wealth"*, *"unfunded pension wealth"*, or *"social security wealth"*.

While it may be controversial whether it makes semantic sense to call contributions to pay-as-you-go systems "saving", it is uncontroversial that it is important to take account of these contributions because they may substitute for actual saving. As a matter of fact, it is just this potential substitution which is at the core of this project and the papers in this special issue.

Similar to equation 1, the stock of social security wealth, SSW_t, evolves from time *t-1* to time *t* by active contributions, T_t (negative: benefit receipts, B_t) and passive appreciation at the pension systems internal rate of return, ir_t:

$$(3) \qquad SSW_t = (1+ir_t)\, SSW_{t-1} + T_t - B_t$$

Jappelli and Modigliani (1998) combine physical wealth W_t with notional social security wealth SSW_t to a measure of "total wealth" TW_t. By defining *earned income* as

$$(4) \qquad YE_t = Y_t + T_t - B_t$$

which is gross labour income net of taxes (but not net of social security contributions on the one hand, and not including transfer income from the social security system on the other

hand), one can combine equations (1) and (2):

(5) $TW_t = (1+r^*_t)\, TW_{t-1} + YE_t - C_t$

where r* is the implied return on *TW*. While it is tempting to construct such a measure of "total wealth", we will not pursue this avenue because we think that physical and notional wealth are very different concepts in the minds of most households. One is bequeathable, the other not. Physical wealth can be borrowed against, which is not possible for "notional wealth". We also need strict assumptions on the time evolution of the two rates of return to consistently aggregate them into *r**. Hence, combining the two will lead to an, in our view, unacceptable loss of information.

Instead, the papers in this special issue will compute a simple measure of social security wealth based on equation 3. By using equilibrium forecasts of T_t and B_t, usually provided by each country's social security administration, and assuming a zero internal rate of return, the papers will report the accumulation of claims to pension benefits up to the normal retirement age, and then show its "notional decumulation." The assumption of a zero internal rate of return is chosen mainly for convenience; it may, however, not be too bad an approximation to future returns of most pay-as-you-go pension systems due to population ageing.

Let us now return to saving in the narrower sense. Equations 1 and 2 show that, at least in principle, there are three different ways of measuring (physical) saving:

- first, by comparing asset holdings at the beginning and at the end of a period: $W_t - W_{t-1}$
- second, by adding inflows and outflows of wealth accounts during one year: $\Sigma_i(r_{it}W_{it-1}+D_{it})$
- third, by taking the residual of income minus consumption expenditures: $(Y_t+r_tW_{t-1}) - C_t$

Equality of these measurement concepts is only achieved when the variables involved – stock of wealth, flows into and out of accounts, income and expenditures – are consistently defined. Part of the exercise in this special issue is to achieve such internal consistency.

Ideally, we would like to report all three measures in order to learn how reliable actual measurements of W_t, D_{it}, Y_t and C_t are. In practice, however, the data sources available to the seven country studies are less than satisfactory. In many countries, only two measures can be computed, in some countries only one. Frequently, capital gains are not measured or have to be imputed using aggregate data on rates of return that is likely to produce major measurement errors in particular for highly localised real estate. Moreover, the distinction between discretionary and mandatory saving can only be made when we have a detailed account how total saving is split among different usages. This is obviously not possible for the

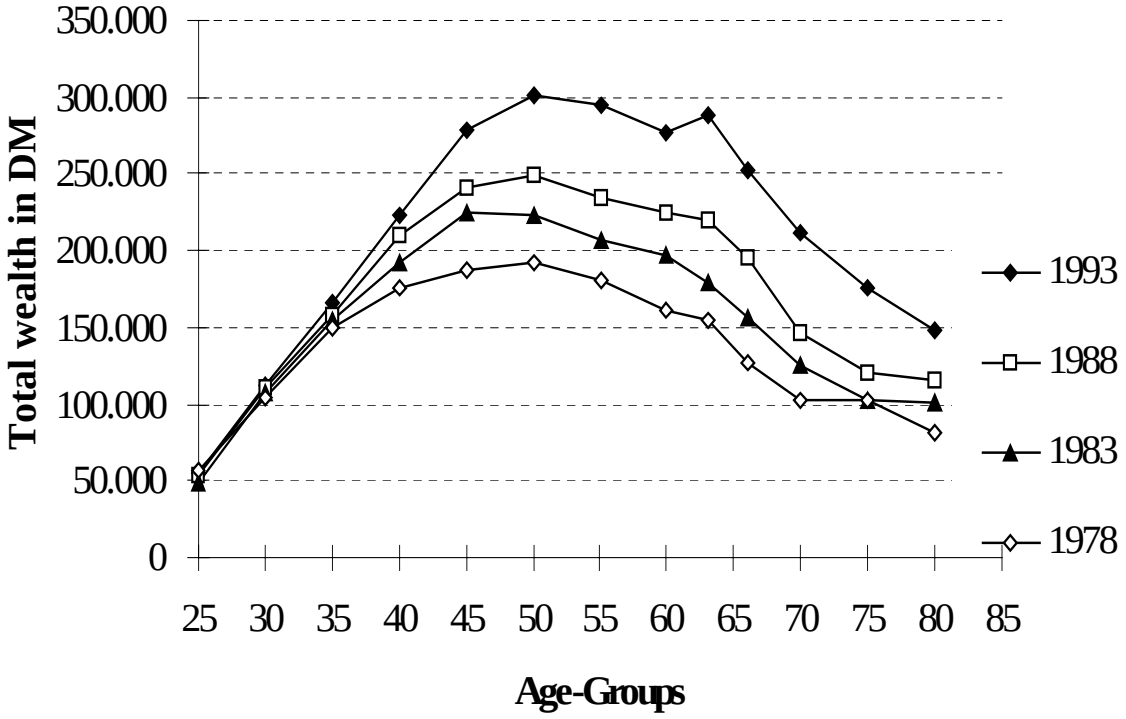
residual saving measure (when consumption is subtracted from income). One of the main lessons of this special issue is that research on saving behaviour is still severely hampered by the lack of suitable data. This is astounding since pension reform, an important policy issue in all of the seven countries studied, requires a thorough understanding of the substitutability between discretionary and mandatory saving as well as between physical and notional saving. The papers will show that we still only rudimentarily understand these substitution effects.

2.2 Construction of longitudinal data and identification

Saving behaviour will not only change by age, as the life-cycle theory predicts, but also from cohort to cohort. Younger cohorts have experienced peace and stability, while the cohorts that are now in retirement have lived through one or even two World Wars and the Great Depression. In addition, household saving will react to the business cycle and similar factors at any given point in time. In this section, we briefly discuss the simple methodology by which the papers in this special issue separate age, cohort and calendar-time effects from each other.

In cross sectional data, each age category also represents a cohort. Thus, we cannot distinguish between cohort and age effects. Moreover and trivially, a single cross section cannot identify the effects of calendar-time specific events since we only observe one single point in time. Figure 1 shows the errors one makes when ignoring this first fundamental identification problem. It is taken from the German country study. Comparing points on one of the cross sectional lines drawn in Figure 1 does not depict life-cycle changes since one compares households that are simultaneously in different age categories and cohorts. Hence, the apparent hump shape of wealth in Figure 1 is a combination of age and cohort effects, not the life cycle change created by age.

Figure 1: Wealth by Cross Section



Notes and Source: See chapter on Germany in this special issue. All amounts in 1993 DM. 1 DM in 1993 corresponds to a purchasing power of 0,57 Euro in 1999.

The main point in the analysis of this special issue is therefore to use longitudinal data to shed more light on age and cohort effects. Unfortunately, only a few countries have panel data that permit following an individual household over time. In most countries in this project, we only have several unlinked cross-sections, such as the four cross sections displayed in Figure 1. We do not even know whether a household has participated in two or more of these cross sectional surveys because the identification of this household is impossible.

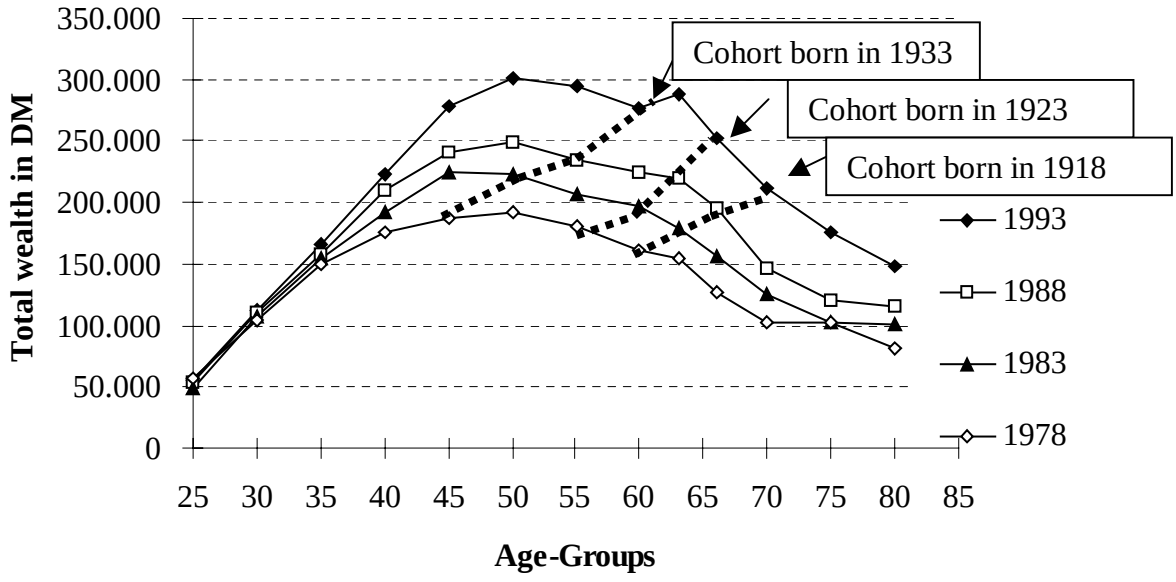
We therefore resort to the construction of synthetic panels. Households of each survey (“wave”) are divided up into as many homogenous household types ("cells") as possible. Next, these cells are identified across time. Such a panel does not consist of households but household types as survey units. On the one hand, the statistical analysis of such synthetic panels is eased by reducing the unobserved heterogeneity by taking means within household types. On the other hand, as Deaton (1985) has analysed, neglecting movements between household types across time may lead to biases. As long as there is no panel of individuals with savings data, we will have to live with a conflict between the stability and homogeneity of cells.

There are also more mundane problems with synthetic panels. In order to obtain consistent variable definitions across waves, one has to take into account the differences between surveys. Sometimes newer waves contain more detailed information than earlier ones, and frequently variable definitions change from survey to survey. The studies in this special issue must make various compromises between full comparability and best usage of available information.

While cross sectional data identify only one dimension, as shown in Figure 1, longitudinal data permit the identification of two dimensions. Since there are, however, three effects – age, cohort, and calendar-time effects – we are still stuck with a fundamental identification problem because these three effects are strictly collinear, calendar time being the sum of birth date and age.

Only strong assumptions can therefore identify life cycle saving patterns. One assumption, that is as simple as brutal, is to subsume time effects – by setting them to zero – into age and cohort effects. This is the method applied to the papers in this special issue. Departing from a set of cross sections, such as those depicted in Figure 1, we identify households in subsequent five-year age-groups with each other, i.e., by identifying the 45-49 year old persons in 1978 with the 50-54 year old persons in 1983, the 55-59 year old persons in 1988, and the 60-64 year old persons in 1993. This procedure amounts to re-connect the points of Figure 1 in a different fashion, see Figure 2:

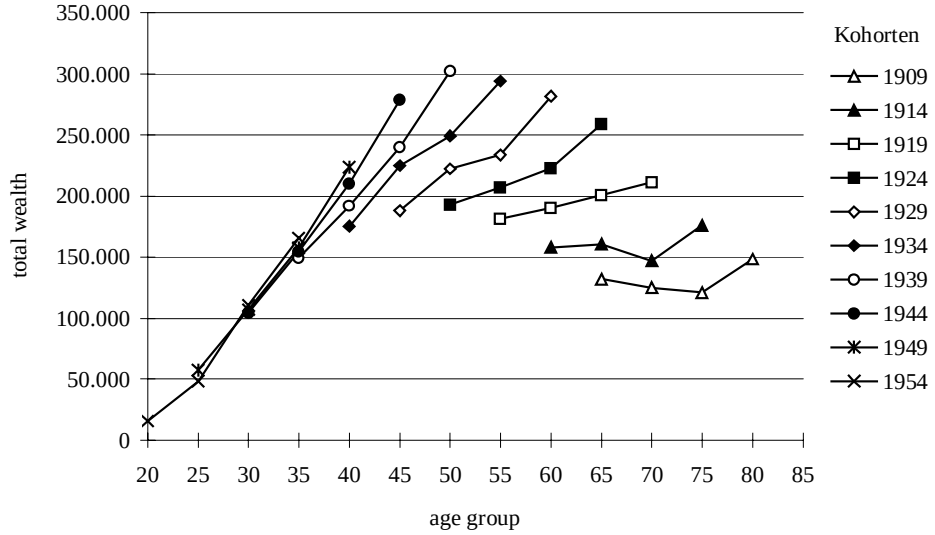
Figure 2: Age and Cohort Effects if Time Effects are Zero



Notes and Sources: See chapter on Germany in this special issue.

We then redraw the dotted lines in Figure 2 to display the age-profiles of wealth by cohort, see Figure 3, starting at the left side with the youngest cohort in our data, born between 1954 and 1958, and proceeding to the oldest cohort, born between 1909 and 1913.

Figure 3: Wealth by Cohort

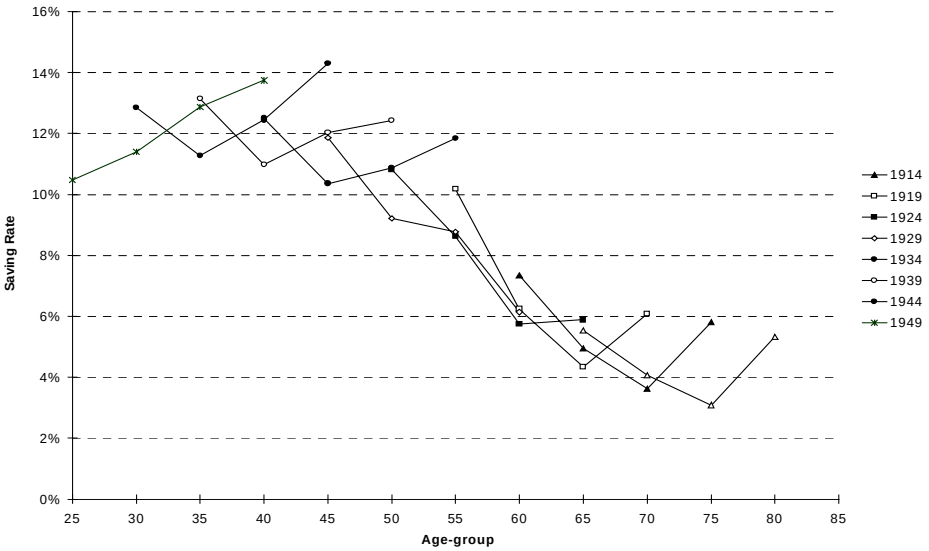


Notes and Sources: See chapter on Germany in this special issue.

Note that the cohort-corrected profiles in Figure 3 leave nothing from the apparent hump shape that was suggested by the cross sectional Figure 1: all age profiles monotonically increase with age, except a little blip among the very old.

Figure 4 applies the same technique to saving rates, the variable in the centre of our interest:

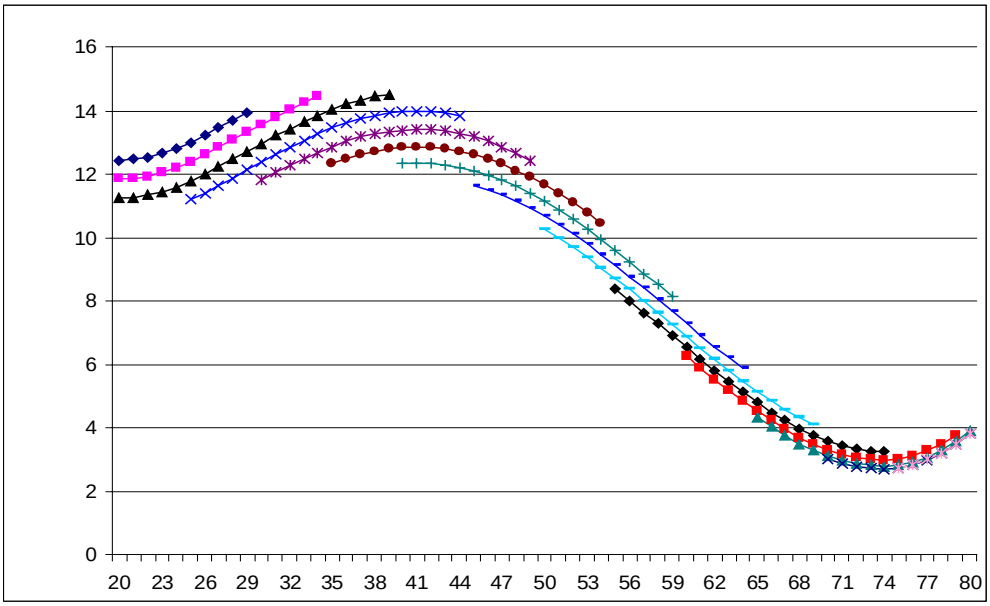
Figure 4: Median Saving Rates by Cohort



Notes and Sources: See chapter on Germany in this special issue.

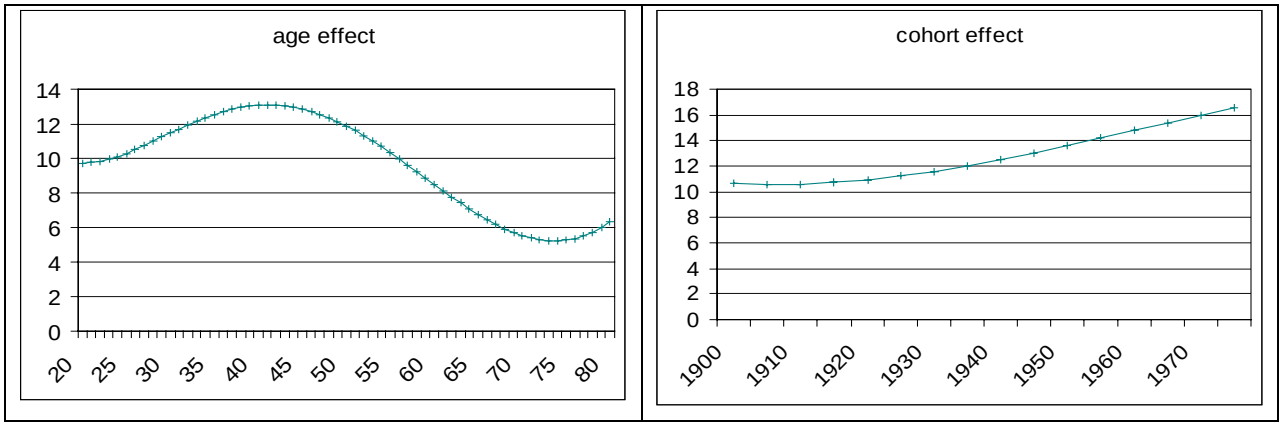
In order to smooth these ragged profiles, we regress the observed saving rates on a (fifth-order) polynomial in age and a (third-order) polynomial in cohort (alternatively: a set of cohort indicators). This leads to Figure 5. In this figure, age and cohort effects are much more clearly visible than in Figure 4. We can dissect in the profiles in Figure 5 into a "pure" age and a "pure" cohort effect, see Figure 6. Note the quotation marks: these effects are "pure" only insofar as they crucially depend on our identifying assumption of zero time effects. The left panel of Figure 6 emerges from Figure 5 when the intercepts of each segment (the "pure" cohort effects) are set to a common value – the "pure" age or life-cycle effect remains; the right panel of Figure shows the evolution of the intercepts from cohort to cohort.

Figure 5: Smoothed Saving Rates by Cohort



Source: Same data as Figure 4, see chapter on Germany in this special issue.

Figure 6: "Pure" Age and Cohort Effects



Source: Slope and intercepts from Figure 5.

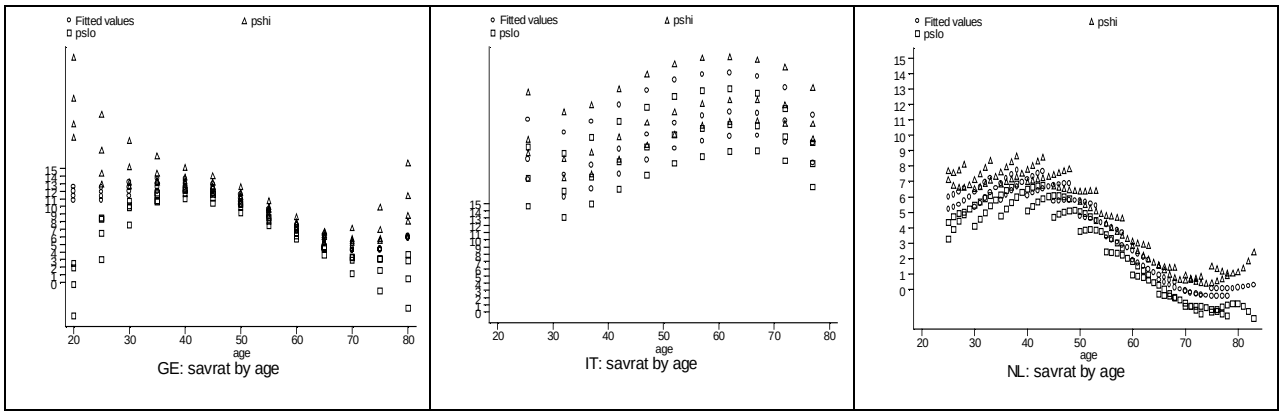
There are other and more sophisticated methods to separate age, cohort, and calendar-time specific effects. One approach is to rescue at least the essence of time effects by not setting them to zero as in the above-mentioned regression, but to include time dummies and to impose the restriction that they sum to zero and are orthogonal to a linear trend (Attanasio, 1994; Deaton and Paxson, 1994). Yet another approach is to try to break the correlation altogether by parametrizing the calendar-time specific effects. Alessie, Kapteyn and Lusardi (1998) have pursued this line of identification and used a parametric function of productivity growth and social security benefits to represent the effects of calendar time. The reader is referred to Brugiavini and Weber (2001) for a more in-depth discussion of these identification strategies and their advantages and disadvantages.

3. First results and a tempting interpretation

Figure 7 presents saving rates in three of the seven countries in this special issue: Germany, Italy, and the Netherlands. The figures show the fitted values by age in each observed year together with the upper and the lower point of a 95% confidence interval. They therefore offer a visual impression of the stability and precision of these age profiles – stability in terms of changes from year to year, and precision in terms of estimated standard deviations.

Figure 7: Cohort-corrected saving rates by age (medians)

Germany **Italy** **The Netherlands**



Sources: See country chapters in this special issue.

Figure 7 gives a good impression of the diversity of age-saving profiles. First, levels are very different: Italian households have a high saving rate that exceeds the age-specific saving rates of Dutch households at all ages, with German households in between. Second, Italian households have experienced quite different saving rates over time (and possibly cohort) while the savings behaviour of Dutch and German households was much more stable. Third, the saving rates of Dutch and Italian households can be fairly precisely measured in a statistical sense. This is also true for German households who are in the middle age groups while sampling errors are large for young and elderly households. Fourth and finally, the life-cycle patterns are rather different: In Italy, a decline in saving rates comes late (after age 60). In Germany, households save less after about age 40 but savings rates appear to slightly (not significantly) increase at old age again (see also Figures 4 through 6). The median elderly household in Germany and Italy does not dissave – in Germany, the saving rate stabilises at around 4% and in Italy it remains even higher also in old age. This is quite different in the Netherlands where the median saving rate is about zero for elderly households and slightly negative for the oldest old.

What explains these startling differences? The honest answer is that we still do not know. It is tempting, however, to consider the pension systems in those three countries as a working

explanation. Germany and Italy have pay-as-you-go financed public pensions with very high replacement rates. They generate net retirement incomes that are approximately 70% of pre-retirement net earnings in Germany and may even exceed 100% in Italy.[3] In addition, the public pension systems in Germany and Italy provide generous survivor benefits that constitute a substantial proportion of total unfunded pension wealth, and disability benefits at similar and often even higher replacement levels than old-age pensions. As a result, public pensions are by far the largest pillar of retirement income in these countries and constitute more than 80% of the income of households headed by persons aged 65 and older, while funded retirement income, such as asset income from private saving or firm pensions in which the employer saves on behalf of the worker, plays a much smaller role. This is quite different from the Netherlands which only provides a flat base pension on a pay-as-you-go basis with a replacement rate that is very low for households above median income. All other retirement income is withdrawals from mandatory occupational and individual pension accounts. Hence, a crucial difference between the three countries in Figure 7 is that saving for old age is unlikely to be the main savings motive in Germany and Italy, while it is necessary for Dutch households. The famous hump shape of savings predicted by the life-cycle hypothesis therefore applies to Dutch households, while (physical) savings are relatively flat in Germany and Italy – in turn, "notional" social security wealth increases and decreases faster in Germany and Italy than in the Netherlands, see the individual country studies.

If this explanation of the observed cross national saving differences were correct, it has important implications for the future. If indeed most of the saving patterns currently observed in Germany and Italy are caused by generous retirement benefits from their pay-as-you-go pension systems, we should expect distinct changes in saving patterns when the pension reforms in these countries will be put in place. The introduction of multi-pillar systems with a substantial portion of funded retirement income will revive the retirement motive for saving. In fact, these reformed systems will look very similar to the current Dutch system. Hence, it is likely that saving rates among the young will increase (to accumulate retirement savings), and saving rates among the elderly will decline sharply (because they will dissolve their retirement savings).

So far for succumbing to the temptations of a monocausal interpretation. Unfortunately, life is more complicated than permitting such simple inference – too many other factors, from real estate prices through the organisation of financial markets, are likely to confound this comparison. Much more research and much better data are needed to establish causality. The

3 See Gruber and Wise (1999) for a comparable description of the Dutch, German and Italian pension systems.

papers in this special issue are designed to water the readers' mouth for such research, and they should make the point that without proper longitudinal data on savings and wealth, we will keep making pension policy without understanding the most basic behavioural effects of such policy.

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International Comparison of Household Savings Behavior: A Study of Life-Cycle Savings in Seven Countries

Comment
by Tullio Jappelli

I thank Axel Borsch-Supan, Mario Padula and Luigi Pistaferri for useful discussions and insights. The usual disclaimers apply.

The readers of the papers of the *International Comparison Project of Household Savings Behavior* will immediately realize that the project addresses fundamental issues in the economics of saving. The challenge of the project is to relate the international differences in household saving to the variables that theory suggests should affect saving: demographics, lifetime income profiles, taxation, access to credit markets, pension arrangements, social insurance schemes, and other institutions affecting the decision to save. The studies focus primarily on one crucial dimension of international differences, i.e. that different pension arrangements should affect saving behavior.

The individual papers do not propose formal tests of this hypothesis. Rather, they aim at summarizing the main facts about saving in each country and at describing the institutional differences that are likely to affect household saving in each nation. In this respect, the project follows a similar approach of an NBER project conducted few years ago (Poterba, 1994). With the exception of France, that project centered on the same set of countries included in this special issue of *Research in Economics*. The conclusion of the NBER project was that it is very hard to account for differences in household saving rates across countries. Although we have made important progress in terms of quality of data and measurement issues, in summarizing the main findings of the project Borsch-Supan (2001) states that we still don't understand these international differences. It is therefore natural to ask what can we learn from comparison studies of the sort performed by the *International Project*, and what are the lessons for future research.

The life-cycle model inspires most of the country studies of this project. This model posits that the main motivation for saving is to accumulate resources to be drained down for later expenditure and in particular during retirement. According to the model, saving should be positive for households in their working span and negative for the retired ones, so that wealth should be hump-shaped (Modigliani, 1986). Mandatory contributions to pension funds and to social security reduce the need to save for retirement (Feldstein, 1974). The idea is therefore to exploit the international differences in pension arrangements to explain differences in patterns of household saving. This approach is potentially very useful and informative.

The main findings of the international project are summarized by Borsch-Supan (2001, see especially Figure 7). In Italy, Germany, and the Netherlands saving rates are positive through life. In France, the U.K. and the U.S. the qualitative pattern is similar: saving is positive even in old age, and there is little evidence that the elderly decumulate wealth. Only

in Japan there is some evidence of wealth decumulation.[4] The project therefore challenges the fundamental prediction of the life-cycle model. I will focus my comments around four main issues: (1) the definition of saving adopted in most of the country studies; (2) measurement issues; (3) the evidence; and (4) lessons for future research.

1. Saving definitions

The saving rates that are computed on microeconomic data for the 7 countries of the *International Comparison of Household Savings Behavior* are for the most part based on a concept of disposable income that does not take into account the role of mandated saving through private and public pension systems. Disposable income treats contributions to pension funds and to social security as taxes, and pension benefits as transfers. But since contributions entitle the payer to receive a pension after retirement, they should be regarded as a (compulsory) component of life cycle saving and hence added back to income. On the other hand, income from pension funds and social security benefits accruing to the retired do not represent income produced, but rather a drawing from the pension wealth accumulated up to retirement. The greater the amount of mandatory saving, the greater is the difference between earned income and disposable income.

- Jappelli and Modigliani (1998) argue that where mandatory contributions to pension funds and social security are sizable (as in all countries of the *International Project*), the age profile of saving as conventionally measured cannot be taken as evidence in favor or against the life-cycle model. To illustrate this point and the relation between discretionary saving and mandatory saving (or between discretionary wealth and pension wealth) it is useful to start from the individual dynamic budget constraint. To make the argument in the simplest possible way, assume that the real interest rate is zero and that the horizon is certain:

$$x = \alpha + p = w - c$$

[4] The conclusions of the NBER project were similar. Poterba (1994) reports that in virtually all nations the median saving rate is positive well beyond retirement, concluding that "the country studies provide very little evidence that supports the life-cycle model".

where x is total wealth, w earnings and c is consumption. Total wealth is the sum of discretionary wealth a and pension wealth p. The difference between the two is that a is bequetable while p is annuitized, and disappears when the individual dies. The right-hand-side variables indicate that total saving (or change in total wealth) is the difference between earnings and consumption.

Earned income (w) includes mandatory contributions to pension funds and social security contributions (τ) and excludes pension benefits (b). From the standpoint of the life-cycle model, this is the relevant income measure. The conventional measure of disposable income is instead $y = w - \tau + b$. According to the two income definitions, one can compute two measures of saving, discretionary and mandatory saving:

$$s_d = \alpha = w - \tau + b - c$$

$$s_m = p = \tau - b$$

The former is the conventional measure of saving, the latter is the difference between mandated pension contributions and benefits. Finally, total saving is the sum of discretionary and mandatory saving $s_T = x = s_d + s_m$.

To understand the importance of the different definitions, consider the case of a worker with a constant age-earnings profile of 15,000 euros (before contributions) who starts working at age 20, retires at age 60 and receives a pension until he or she is 75 years old. The worker contributes a constant fraction of his earnings (25 percent) to a pension fund (or to the social security administration) and receives a constant benefit of 66 percent of his pre-tax, pre-retirement income, so that the present value of benefits equals the present value of contributions (the pension is actuarially fair). In the example the replacement rate is quite close to that observed in several of the countries of the international project (such as Italy, Germany, the Netherlands). Suppose also that desired consumption is flat (at 10,900 euros), and that the interest rate and the growth rate of earnings are both equal to zero.[5]

Retirement income includes only pension benefits. So while earned income is 15,000 euros until retirement, and zero afterwards, disposable income is 11,250 before retirement and 10,000 afterwards. Given the large contributions and corresponding benefits, discretionary saving is a tiny component of income (350 euros before retirement and –900 afterwards).

[5] Miles (1999) also works out an example in which discretionary saving is positive, while mandatory saving and total saving are large and negative during retirement.

Mandatory saving before retirement is 3,750 euros, while mandatory dissaving during retirement amounts to the pension received, –10,000. Even though life-cycle savings are 4,100 before retirement and –10,900 after, in this example the large swings in life cycle saving are almost eliminated if one uses the conventional definition of income and saving. If the contribution rate is raised to 27.3 percent, discretionary saving would be zero through life. But it would be a mistake to conclude that the flat saving profile contrasts with the predictions of the life-cycle model, while the consumer in fact follows exactly that model!

In more general settings, mandated savings affect the path of discretionary saving, although the impact might not be one-for-one, as in the previous example. However, allowing for different returns on discretionary and pension wealth, individual income growth, imbalances in the social security system, and life uncertainty does not change the qualitative insight of the example: where pension wealth is a major component of total wealth, the path of discretionary saving is a very poor indicator of saving targeted for retirement.[6]

Some authors have applied this framework to microeconomic data and have adjusted age-saving profiles including back pension contributions in income and subtracting benefits (Bosworth, Burtless and Sabelhaus, 1991; Gokhale, Kotlikoff and Sabelhaus, 1996; Jappelli and Modigliani, 1998). Since a large component of wealth is annuitized, these studies show that the elderly decumulate substantial amounts of wealth during retirement.

The authors of the country-chapters recognize the importance of estimating pension wealth for the dynamics of saving. In several countries (Germany, Italy, Japan, and the Netherlands) they also include an estimate of the age-profile of pension wealth. However, with the exception of the Italian study, when it comes to saving data no paper explicitly recognizes that in order to estimate retirement saving one should subtract consumption from earned income (not from disposable income). This is a serious limitation of the project. Relying on the conventional definition of saving implicitly assumes that households are myopic, and that they do not realize that contributions during the working-span entitle them to receiving benefits when old.

2. Measurement and estimation problems

The papers are very careful in drawing attention to a variety of measurement problems and definitions. Here I just want to point out two issues that should deserve some attention in future research.

[6] This remains true not only when mandated saving is fully funded, but also when the system operates as pay-as-you-go. It poses, however, additional measurement problems. When the system is funded, the rate of return on contributions is primarily linked to market returns. In pay-as-you-go regimes, the return depends on income growth, demographic variables and expectations of future reforms and is therefore more difficult to evaluate.

2.1 The return on wealth

In reality the returns on discretionary and pension wealth are not equal to zero, as in the example above. Estimating these returns with microeconomic data poses difficult problems. As pointed out by Borsch-Supan (2001), income from real and financial wealth does not include capital gains (or losses), so saving figures computed as difference between income and consumption can differ dramatically from those based on first difference of wealth. A related problem that is often neglected is that measured disposable income includes the nominal return from financial assets, not the real return.

In time series studies of saving it is quite common to subtract from income the inflation-induced capital losses on financial assets and to adjust saving for inflation. To my knowledge, there has been no attempt to adjust nominal returns for inflation in microeconomic data. The adjustment is potentially important, because the average return on the household portfolio depends on the returns on each of the assets in the portfolio. In turn, there is ample evidence that participation in specific assets is strongly related to age (Guiso, Haliassos and Jappelli, 2001). Thus, the inflation adjustment might impact the age-profile of saving. Furthermore, the adjustment depends on the inflation rate itself. Since the latter differs widely between countries, it is potentially important to explain patterns of saving across countries.

The return on the social security component of annuitized wealth depends, to say the least, on the growth rate of the economy, survival probabilities, legislation, and inflation. If the system is balanced, the return on social security is equal to the real growth rate of the economy, while survival probabilities increase the effective rate at which people discount future wealth. If the system is not balanced, it involves intergenerational transfers. In the terminology of Gokhale et al (1996), there is an "old-age tax" that is levied on current generations that needs to be imputed. One of the major achievements of the *International Project* is to report comparable figures for social security wealth over the life-cycle that take into account some of the difficult problems in estimating internal rates of return for pension wealth.

2.2 Saving rates or saving levels?

The life-cycle model makes clear predictions about saving levels, not about saving rates as conventionally measured. In the stripped-down model with zero interest rates, income earned during retirement is zero, and the saving rate is not even defined.[7] With positive interest rate, the consumer earns capital income during retirement, and the rate should be negative, going to minus infinity at the end of life. In international comparisons there are clearly some advantages in normalizing saving to obtain saving rates. Ideally the normalization should use a variable that does not depend on age. Some authors (Attanasio, 1994) have proposed to normalize by consumption or permanent income. Even though also these variables depend on age, this alternative is more appealing.

Most of the papers of the *International Project*, however, have chosen to focus on saving rates as conventionally measured. Using repeated cross-sectional data, they decompose these rates into cohort, age and time effects. The latter are restricted to be orthogonal to a time trend and to sum to zero, and capture therefore only business cycle variations in saving rates. While for variables such as income, consumption and wealth this is a reasonable identification assumption (and very much in the spirit of the life-cycle model that assumes that productivity growth is generation-specific), it is less appealing for saving rates. Paxson (1996) shows that age effects in saving rates can differ if one uses alternative decompositions. For instance, explaining saving rates by age and unrestricted time effects, assuming no cohort effects (i.e., that cohort effects in consumption and permanent income are the same) has a dramatic impact on the age profile of US and UK saving rates. It would be very useful to complement the evidence of the country papers with a check on the sensitivity of the age-saving profile with respect to different identification assumptions.[8]

3. The evidence

The *International Project* broadly confirms the set of findings in Poterba (1994): if anything, there is little decumulation of private wealth, and discretionary saving is positive even in old age. The first column of Table 1 summarizes some of the findings of the project. It

[7] It is defined if one uses the conventional definition of saving.

[8] It should also be pointed out that the identification assumption assumes that age, cohort and time effects are additive. Several recent pension reforms, however, impact differently households of specific cohorts, so that the presence of time-age-cohort interaction terms cannot be easily dismissed, see Miniaci, Grant and Weber (2001) for an application to the Italian pension reform.

reports that in virtually all nations saving is positive well beyond retirement. In the United States, Italy, the Netherlands, and Japan saving declines with age but, with the exception of Japan, it is still positive at old ages. In other countries (France, Germany) saving actually increases with age. In some countries the pattern contrasts with the evidence on saving as measured by the first difference of wealth. For instance, there is evidence that discretionary health declines in the Netherlands, Italy, and the United States. So the picture for changes in wealth is rather different than that for saving, showing some inconsistencies between wealth and saving measures. Such inconsistencies should be resolved before one can draw firm conclusions about the shape of the age-saving profile.

The summary table also reports indication of the composition of wealth around retirement. In all countries annuitized wealth (in the form of contributions to pension funds or to social security) is quite substantial. For instance, in Japan and in Italy social security wealth is about twice as high as discretionary wealth. In the UK, Germany and the Netherlands it is about 50 percent higher; in the US, according to Gokhale et al (1996), annuitized wealth is about 40 percent of total wealth at retirement. Unfortunately, the data do not allow a complete picture, because we lack data for France and for private pension funds in several countries.

The counterpart of this is that the income of the elderly is mainly income from annuities (see in particular the careful evidence about the source of retirement income in the US, Dutch and UK studies). Thus, given the high contribution rates to pension funds and social security, in all countries the difference between earned income and disposable income is particularly large (positive during the working span and negative during retirement). And a proper account of saving would show that the elderly do decumulate assets in all countries, in that the consumption of the elderly is financed in large part by annuities. To consider just one example, let's consider the Netherlands, where median wealth at retirement is only 35,000 euros. This tiny stock of wealth is slowly depleted during retirement, but not drained down to zero, perhaps to face unanticipated health expenses, the risk of longevity and bequests. But the bulk of retirement consumption is financed by the build-up of private pension funds covering 90 percent of the workers and of a generous pension system.

We can speculate about the reasons why such a large part of wealth is annuitized, so that in modern societies a great deal of saving occurs through mandatory retirement plans, such as social security and private pension funds, while dissaving occurs mainly through annuitized wealth. But even if people cannot choose the amount of mandatory saving, they can change discretionary saving in response to changes in mandatory saving (Gale, 1998).

And after all, the existence of mandatory saving programs and the widespread implementation of retirement plans should be interpreted as the social approval of schemes designed to ensure people with adequate reserves to be spend during retirement.

The papers in this project have chosen instead to focus primarily on the age-profile of discretionary saving. The shape of this profile does not tell us if households decumulate wealth during retirement, but conveys information on a distinct issue, i.e. the importance of intergenerational transfers. Even though wealth trajectories *per se* cannot be taken as evidence in favor or against bequest motives, the age-saving profile represents therefore a useful summary statistic on the role of intergenerational transfers.

4. Agenda for the economics of saving in Europe

The *International Project* reports very important insights on saving in individual countries. It also defines an agenda for future research on the economics of saving in Europe. Without trying to be exhaustive, I would like to draw attention on three issues: (1) estimating the relation between mandatory and discretionary saving; (2) the need for panel data; (3) the role of annuitized medical expenses.

The first important topic for research is that we need comparable estimates for mandatory saving across countries. But most importantly, accounting definitions of the sort that I discussed in Section 2 *do not tell us anything about the relation between discretionary and mandatory saving* (*or discretionary wealth and pension wealth*). This impact is crucial to understanding the effect of current pension reforms that reduce mandatory saving and increase discretionary saving. In principle, an increase in contributions and benefits should tend to be offset by a reduction in discretionary saving, leaving total saving unaffected (the Feldstein replacement effect). In practice, social security systems encourage early retirement, which would tend to increase discretionary saving (Feldstein's and Munnel's induced retirement effect). Furthermore, pension wealth is illiquid and the social security component of that wealth is subject to political risk. So even though by definition total saving is the sum of discretionary and mandatory saving, it is not true that an increase in mandatory saving will necessarily reduce discretionary saving in proportion. Having comparable European figures for the relation between mandatory saving and discretionary saving would represent a major improvement of what we know about intertemporal choices.

The second issue on the agenda is that we need to go beyond the use of repeated cross-sectional data to analyze wealth and saving trajectories. If we want to estimate the relation between discretionary and mandatory wealth, we need to impute pension wealth. But the latter

depends heavily on family composition and labor market histories. While discretionary wealth is a well-defined concept (as are household consumption and household income) that can be easily aggregated in cohort data with standard assumptions, pension wealth refers to individuals, not households. Several country-studies show that pension wealth is affected by the labor supply of the household (for instance, one vs. two-income earners), the age-gap between spouses, their expected retirement age, their employment status (employed vs. self-employed) and so on. Only panel data with information on retirement transitions and labor market histories of individual household members are able to measure the substitution between mandatory and discretionary saving. The need for panel data is particularly important at a time when the distribution of retirement ages and pension benefits is changing due to ongoing reforms.

Finally, annuitization of future medical expenses is not included in any measure of saving of the sort that I have discussed. The presence of a national health system in each of the countries analyzed poses important definition and economic issues. As with pension contributions, payments to health insurance are also a form of mandatory saving and National Health Systems, as any pay-as-you-go system, transfer resources from the young to the old generations. As noted in the UK study, it is hard to impute these transfers to households (or individuals), because contributions are often paid out the general income tax and benefits are provided in-kind. Still, this is an exercise that is worth attempting, because differences in health insurance arrangements could explain different patterns of consumption by the elderly across Europe. As with the *International Project*, this is an area where collaboration between experts of different countries will help us making progress in understanding saving behavior.

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International Comparison of Household Savings Behavior: A Study of Life-Cycle Savings in Seven Countries

Rejoinder to Tullio Jappelli's Comments

Axel Börsch-Supan

Tullio Jappelli's thoughtful comments very much enrich the set of the seven country studies in the International Savings Comparison Project (ISCP). Let me focus this brief rejoinder on two points: Our disagreement over the most appropriate saving definition, and our agreement on the urgent need for better data to make progress.

Jappelli's comments reveal a rather deep rift in what economists should define as "saving": Should it include mandatory contributions to unfunded pension schemes as Jappelli urges, or should saving be defined narrower without these contributions as it is done conventionally and by the ISCP. I personally think that this rift is more semantics and taste than substance, but it sheds a very illuminating light on the center piece of this project.

There are many reasons to save. These days, it is fashionable to distinguish between low and high frequency saving and their underlying long and short run motives. Very low frequency saving is for retirement. In many countries, unfunded pension schemes (almost) completely take care of retirement income. Hence, sticking with the conventional definition of saving, there is no need for retirement saving and only higher frequency saving motives remain. The data collected in the ISCP show that some of these motives persist after retirement since we observe little or no dissaving in old age. More general, an important – maybe the most important – insight from the papers in the ISCP is the significance of saving motives other than retirement saving. Adding contributions to unfunded pension schemes to discretionary saving dilutes this insight, and the only gain is a reconstruction of the textbook life-cycle asset profile by a now tautological accumulation and decumulation of unfunded wealth.

Of course and as always, how one defines a measure depends on the purpose. If one wants to show the validity of Modigliani's honored life-cycle hypothesis of saving and consumption, one needs to include contributions to unfunded pension schemes because doing otherwise would leave out the main mechanism to smooth consumption between work and retirement. This is Jappelli's well-taken point. But we are beyond this point. Quibbling about the validity

of the life-cycle hypothesis using narrow saving definitions is a waste of time. We rather need to understand (at least) two fundamental questions: Is the replacement between funded and unfunded saving mechanisms one to one? And how do we explain the importance of high frequency saving? Neither of these questions will be answered by including contributions to unfunded pension schemes in saving. Hence, the narrow definition of saving employed by the ISCP is not a "shortcoming" of the project, as Jappelli puts it, but a prerequisite to understand these two important questions.

The importance of, and the interaction between, these two questions leads me to this rejoinder's second point in which I fully agree with Jappelli: we need more work to make progress, and this progress requires more data. The ISCP has to do more work on the first question by being more precise on the measures of pension generosity and taking care of all the other determinants of saving – in order to establish a ceteris paribus comparison between unfunded pensions and funded saving. This requires a large set of comparable covariates which the current country data sets are short of. And while the second question has already found many answers – precautionary saving, buffer-stocks, behavioral aspects –we step into subtle terrain requiring better data in order to assign each motive its correct weight in total saving.

From physics, we know that entering subtle terrain requires more precise observations. Physicists need large machines to find small particles. Physicists are fairly successful in finding funds to pay for these machines, and they have delivered impressive insights in the make-up of matter. They were able to distinguish between ever more subtle alternative explanations how matter is made up.

In economics, we are far behind. Economists, who want to gain insights in the make-up of human behavior, at least an important aspect of it, need more (and more costly) data if they want to get beyond answering simple questions. If we want to distinguish between saving motives which are just a bit more subtle than the retirement saving motive (and even there if we want to understand the substitution quantitatively), we need longitudinal data. If we want to understand saving in old age, we need to have data on health along with more precise measurements of asset decumulation. If we want to understand the precautionary savings motive, we need to collect data on perceived risks. If we want to understand the transfer motive of saving, we need data on the family network. If we want to understand the influence of capital gains on saving, we need data on the individual portfolio, including housing appreciation. And since not a single of these questions can be answered in isolation because of potential substitution, we need data that shed light on all these aspects jointly.

Thus, an important lesson of both the Poterba exercise and the ISCP is that economists need to join forces and put more effort into data collection. The American Health and Retirement Survey is a great first step in this direction. Europe is much behind. I appreciate that Tullio Jappelli's comments have put a finger into this open sore of economic science.

Table 1

Findings of the International Project

Except where indicated, the data are taken from the papers of the International Project. All values are expressed in euros.

Country	Discretionary saving during retirement	Evidence on decumulation of discretionary wealth	Real plus financial wealth around retirement	Pension wealth around retirement	Social security wealth around retirement
France	Increasing with age (between 3,000 and 4,000)	No evidence of decumulation (age profile of wealth is rather flat after age 70)	200,000	n.a.	n.a.
Germany	Mean saving is about 3,500, median is 1,000 and both are rather flat after age 65	No evidence of wealth decumulation (profile is flat after age 60)	150,000	n.a. but modest; pension funds finance only 6% of retirement income	225,000
Italy	Declining from about 2,000 but still positive in old age	Evidence of wealth decumulation (Modigliani and Jappelli, 1998)	90,000	n.a. but modest given limited role of pension funds	180,000 (including the severance pay fund)
Japan	Negative saving rates after age 60 or 70, depending on definitions	n.a.	128,000	n.a.	Between 215,000 to 320,000, depending on assumptions about the internal rate of return
Netherlands	Low and declining, but still positive in old age	Evidence of wealth decumulation	Average wealth at age 60-64 is 83,000, median is 35,000	n.a. but very important (90% of the workers are covered)	Between 100,000 and 177,000, depending on household composition
United Kingdom	Median saving after age 65 is about 1,000	n.a.	n.a.	n.a. but very important (87% of the workers are covered)	109,200 (about as important as social security)
United States	Median saving declines with age but remains positive	Financial wealth declines with age	According to Gokhale at al (1996), for males in the 60-69 age-group 41 percent of total wealth is annuitized; for females in the same age-group 46 percent of wealth is annuitized		

The German Savings Puzzle

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Abstract

Germany has one of the most generous public pension and health insurance systems of the world, yet private savings are high until old age. Savings remain positive in old age, even for most low income households. How can we explain what we might want to term the "German savings puzzle"?

We provide a complicated answer that combines historical facts with capital market imperfections, housing, tax and pension policies. The first part of the paper describes how German households save, based on a synthetic panel of four cross sections of the German Income and Expenditure Survey ("Einkommens- und Verbrauchsstichproben") collected between 1978 and 1993. The second part links saving behavior with public policy, notably tax and pension policy.

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The German Savings Puzzle

by Axel Börsch-Supan, Anette Reil-Held, Ralf Rodepeter, Reinhold Schnabel, and Joachim Winter

- Introduction

This paper describes how German households save and why the observed savings patterns might have emerged. In the descriptive part of the paper, we present cross sectional and longitudinal patterns of household saving. We then explain why these saving patterns have likely been strongly influenced by public policies. These policies include capital taxation and subsidies to specific forms of saving, and, most notably, pension policies.

We face a "German savings puzzle": Germany has one of the most generous public pension and health insurance systems of the world, yet private savings are high until old age.[9] We provide a complicated answer to the questions raised by that puzzle, combining historical facts with capital market imperfections, housing, tax and pension policies.

The paper is a brief version of the German country chapter in Börsch-Supan (2001). The reader is referred to this volume for details on methodology and results. This summary paper is set up as follows: Section 1 briefly describes our data sources. Section 2 presents cross-sectional and longitudinal profiles of various saving measures by age and birth cohort. Section 3 looks at financial, real and pension wealth. Section 4 links the observed saving and wealth patterns to public policy, and Section 5 concludes.

- 1. Data

We base our description of savings behavior in Germany on four cross sections of the German Income and Expenditure Survey ("Einkommens- und Verbrauchsstichproben," EVS). The EVS is collected every five years by the German Bureau of the Census.10 The design roughly

[9] A survey of the German pension system is provided by Börsch-Supan and Schnabel (1998).

[10] Descriptive analyses of household wealth have been carried out by the German Bureau of the Census (Euler, 1985, 1990; Guttmann, 1995). The 1978-1988 surveys have been analyzed with respect to household savings by Börsch-Supan and Stahl (1991), Velling (1991), Lang (1998), and Börsch-Supan (1992, 1994).

corresponds to that of the U.S. Consumer Expenditure Survey. The surveys include a very detailed account of income by source, consumption by type, saving flows, and asset stocks by portfolio category. As opposed to earlier waves, the 1993 wave also includes households in East Germany, and foreign residents in West Germany. For comparability reasons, we will restrict our analysis to the subsample of West Germans.

The surveys are representative of all households with annual gross incomes below DM 300,000.[11] They include about 45,000 households in each wave. These large sample sizes provide sufficiently large cell sizes in each age category, even for old ages. The data exclude the very wealthy households and the institutionalized population. The former represent about two percent of households. For this reason, the data cannot be expected to add up to national accounting figures. For example, aggregating household savings in the EVS 1983 yields a net private saving rate of 12.3 percent while the corresponding figure reported by the Deutsche Bundesbank is 13.6 percent.[12] Omission of the institutionalized is serious only among the very old. Although less than four percent of all persons aged 65 and more in Germany are institutionalized, this percentage increases rapidly with age and is estimated to be about 9.3 percent of all persons aged 80 and more. Elderly in institutions are more likely to have few assets and no savings, hence, we probably overestimate the assets of elderly persons.

Households in the quinquennial EVS cross sections are not necessarily the same and cannot be matched. It is therefore impossible to construct a panel of individuals. This would be most desirable for the identification of life-cycle saving behavior and the separation of age and cohort effects. Lacking longitudinal data on savings behavior in Germany, we resort to the construction of a synthetic panel. We aggregate the cross sectional data into age categories and identify adjacent age groups across waves. The large sample sizes are of considerable help for the synthetic cohort approach because aggregation units can be defined sufficiently narrow to assure homogeneity without a major loss of statistical precision.

[11] More details of the multi-stage quota sample design can be found in the full version of this paper (Börsch-Supan, Reil-Held, Rodepeter, Schnabel and Winter, 2001). It also contains a more detailed comparison between aggregate and survey based saving measures.

[12] This divergence is due to two differences in the base: The EVS omit the upper 2 percent of the income distribution while the Bundesbank also includes non-profit organizations.

- 2. Saving by age and birth cohorts

The data permit two measurements of savings.[13] The first measure is computed as the sum of purchases of assets minus sales of assets. Changes in financial assets reported in the EVS are deposits to and withdrawals from the various kinds of savings accounts; purchases and sales of stocks and bonds; deposits to and withdrawals from dedicated savings accounts at building societies ("Bausparkassen") which are an important savings component in Germany; and contributions to life insurances and private pension plans minus payments received. New loans are subtracted and repayments are added to net savings. Not reported are changes in cash and checking accounts. Changes in real assets reported in the EVS are purchases and sales of real estate and business partnerships. Not reliably reported are changes in durables (other than real estate). Unrealized capital gains are unreported. To arrive at saving rates, household saving is divided by disposable household income, consisting of labor, asset, and transfer income minus taxes and social security contributions.

The second definition of saving is the residual of income minus consumption. We will show that both definitions are very close on average although there is substantial discrepancy for some households. A third definition, the difference between initial and end of period stocks of wealth, cannot be computed from the data since stocks are measured only once in each wave. Following the definitions in the introductory paper of this journal issue (Börsch-Supan, 2001), we distinguish among discretionary saving, composed of real and financial saving, mandatory saving to funded pension plans, and "notional saving", the mandatory contributions to unfunded social security systems.

- *Discretionary Saving*

Figure 1 shows mean total discretionary saving by age in the four cross sections 1978-1993. On the vertical axis, amounts are given are in real terms, converted to 1999 Euro.[14] On the horizontal axis, we have age, generally in five year intervals. Each age category also represents a cohort,

[13] See the full version of this paper (Börsch-Supan, Reil-Held, Rodepeter, Schnabel and Winter, 2001) for details on data sources, definitions for the variables used in this paper, and a discussion of measurement problems together with our preferred solutions. All measures have been defined to be strictly comparable across waves. Börsch-Supan (2001) also provides an electronic appendix with all data in spreadsheet form.

[14] All amounts were deflated using the German consumer price index.

and following points on one of the cross sectional lines drawn in Figure 1 compares households that are simultaneously in different age categories and cohorts.

The shapes are roughly similar. Changes across years are far from a simple shift of each profile: for the younger age groups, 1978 and 1993 were the years with the highest saving, while there is less of a clear picture for the older ones. There are two main features. First, saving exhibits a hump shape, reaching a peak at the age/cohort group around age 45. Second, saving remains positive, even in old age.

Figure 1: Mean Discretionary Saving in 1978-1993

These features are astoundingly similar for all income groups except the lower income quarter of the German households, see Figure 2. Median and mean saving have the same hump shape as Figure 1, and remain positive for all age groups, except for the lower quartile.

Figure 2: Mean and Median Discretionary Saving in 1993

While Figures 1 and 2 were calculated as purchases minus sales of assets during one calendar year, the EVS also permits the computation of a second savings measure, namely the residual from subtracting all consumption expenditures from disposable income.[15] Figure 3 depicts the comparison of both measures and shows that our saving measure is robust. The figure also gives an impression of the sampling error of our saving measure which is relatively small due to the large cell sizes.

Figure 3: Mean Discretionary Saving by Two Different Definitions, 1993

The first measure is almost always within the 2σ-confidence bands of the second measure.[16] Using confidence bands for both measures, the difference is not significant. This is an important result as it strengthens the belief in the internal consistency of the data, even though there are some large deviations between the two measures for a few households which are masked by the averages depicted in Figure 3.

[15] Disposable income is gross income minus direct taxes and contributions to mandatory social security systems. Consumption expenditures are reported very detailed in the EVS, based on weekly diaries. For precise definitions see Börsch-Supan, Reil-Held, Rodepeter, Schnabel and Winter (2001).

Figures 1-3 display cross-sectional variation across age/cohort-groups and do not identify life-cycle changes. In order to do understand life-cycle behavior, we need to follow households over time. As pointed out in Section 1, we lack longitudinal data on savings in Germany and therefore combine the data of the available four EVS cross-sections from 1978 to 1993 to a synthetic panel of household groups. Figure 4 displays cohort-specific age savings profiles from this synthetic panel under the identifying assumption that time effects are zero, starting on the left with the youngest cohort in our data, born between 1954 and 1958, and proceeding to the oldest cohort, born between 1909 and 1913.[17] Saving increases until it reaches a peak in the age range 45-49, then declines until the age group of the 65-69 old. It then remains essentially flat. As pointed out before, saving remains positive even in old age.

Figure 4: Mean Discretionary Saving by Cohort

The life-cycle pattern in saving visible in Figure 4 has two components: the hump-shaped pattern of disposable household income,[18] and the relatively flat pattern of saving rates to which we turn now.

Saving Rates

Because mean saving rates are very sensitive to changes in nominator and denominator, we focus on the median and quartile saving rates in each age category. We only show the 1993 cross section since the others have a very similar shape. Figure 5 shows that the age/cohort pattern is rather stable across income quartiles. The differences (pronounced hump shape for the richer, fairly flat for the poorer households) are thus mainly due to differences in income profiles. The increase in saving rates in very old age is interesting. Remember, however, that the data only covers households, not elderly in institutions. Thus, the sample selects those who are less likely to dissave. A back-on-the-envelope calculation (Börsch-Supan, 1992) shows that this selection effect by itself is unlikely to explain the high saving rates in old age, although a precise analysis cannot be done without genuine longitudinal data.

Figure 5: Median Saving Rates, 1993 Cross Section

[16] The bands are computed under the assumption that the quota sample can be treated as a random sample.
[17] Identifying assumptions in genuine and synthetic panels (Deaton, 1985) are discussed by Brugiavini and Weber (2001).
[18] Displayed in Börsch-Supan, Reil-Held, Rodepeter, Schnabel and Winter (2001).

If we combine the data visible in Figure 5 with the other waves and disentangle age and cohort effects, we obtain the life-cycle profiles of Figure 6. Saving rates are fairly stable and around 12% for all young and middle-aged groups until around age 45-49. They then decline and stabilize around age 65-69, when they remain at about 4%.[19]

Figure 6: Median Saving Rates by Cohort

Composition of Saving: Real and Financial Saving

Real estate saving, depicted in Figure 7, mainly consists of purchases minus sales of owner-occupied housing, including a correction for upkeep and depreciation, and subtracting applicable mortgage payments.[20] Figure 7 shows the four cross sections of real saving, 1978-1993. Because homeownership in Germany is only about 40 percent, much lower than in most other countries, the median is mostly zero and not shown. The means depicted in Figure 7 quickly reach a sizable magnitude for the age/cohort groups around age 35 and then decline. Mean real estate saving for the older age groups has a very large variance – it is mainly imputed depreciation and ill-measured upkeep – and is omitted from Figure 7.

Figure 7: Mean Real Saving, 1978-1993

Financial saving is relatively flat between age 30 and 40, then reaches a peak between age 40 and 45.[21] Figure 8 shows the median for all four cross sections, Figure 9 mean and medium for 1993. The flat part is most likely be due to the slow build-up or even withdrawal of financial assets during the ages when many households purchase a house.

Figure 8: Median Financial Saving, 1978-1993

Mean and median financial saving are very close. This is visible in Figure 9 which shows details of financial saving in the 1993 wave. As mentioned in Section 1, our data excludes the upper two

[19] The data suggests an increase for the 1988 wave for all older cohorts. We have no satisfactory explanation for this effect, particularly, because the pension level decreased between 1983 and 1988.

[20] Other real wealth is not well measured. For example, the EVS data do not permit a sensible measurement of changes in wealth that is invested in business partnerships. This does affect only a few households significantly but not the average. See Börsch-Supan, Reil-Held, Rodepeter, Schnabel and Winter (2001). We also do not have the regional information necessary to impute capital gains in housing which were large in some places such as Munich.

[21] Our measure of financial saving includes the conventional financial saving categories, includes consumer loans, but excludes mortgages as well as capital gains or losses. Capital gains to the consumer have been small in Germany

percent of the income distribution and thus misses households that deviate considerably from the mean. It is noteworthy that financial saving remains positive even for those households that are age 70 and older.

Figure 9: Mean and Median Financial Saving in 1993

Mandatory Saving

Mandatory contributions to public funded pension plans are negligible in Germany. Only a minority of civil servants are required to contribute a small percentage of their salary increases to funds that are effectively invested in government bonds. The contributions amount to roughly 0.5% of salary.

Contributions to private pension plans are not negligible in Germany, but they are much smaller than, e.g., in the Netherlands or in the Anglo-Saxon countries. Slightly more than 50% of workers are covered by a firm pension at least part of their career, but these pensions are small and provide only about 6 percent of total average retirement income. In many cases, these pension plans are mandatory in the sense that they come as a package deal with the employment contract and offer no opting-out possibility.

Because mandatory occupational pensions play such a small role in Germany, the related saving flows have been subsumed in the discretionary saving category discussed earlier.

"Notional saving:" Mandatory contributions to pay-as-you-go systems

Germany has very large pay-as-you-go systems that finance old age and health care. Almost all dependent employees and their employers must contribute to the German public retirement insurance. As pointed out in the introductory paper (Börsch-Supan, 2001), these contributions are not saving in a narrow sense. However, they are a functional equivalent of saving and thus a potentially important determinant for discretionary saving. We will discuss this extensively in Section 4.

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relative to the UK and the US, see Börsch-Supan and Eymann (2000).

The contribution rate to the public retirement insurance is 19.3% of gross earnings during the year 2000.[22] In addition, an estimated 8.5% of gross earnings is levied indirectly via other taxes, mainly V.A.T. and the new ecology tax. The contribution base for public pension contributions is capped at about 1.8 times the average earnings. Opting out is impossible. High wage earners therefore pay a lower percentage of their income into the pay-as-you-go system and receive a correspondingly lower replacement rate. The contributions add up to a claim on public pensions that is substantial when compared to actual financial and real wealth. We turn to this point in the following section on wealth.

Other branches of the German social insurance system include health, long-term care, and unemployment insurance. For the average worker, the contributions to these branches add up to another 21 percent of gross income.[23] For the public health and long-term care insurance, the tax base is capped at about 1.6 times the average earnings. Workers above this threshold can opt out. The contribution base for the unemployment insurance is capped at about 1.8 times the average earnings. Opting out is impossible.

In sum, these social insurance contributions by far exceed discretionary savings for all dependent employees below the earnings cap – about 85 percent of all workers.

- 3. Wealth by age and birth cohort

The EVS also provide data on the stocks of financial, real and total discretionary wealth in a separate interview at the end of each survey year. We use these data to cross-check our findings on saving flows and to obtain a picture of total resources at the disposal of a household when the household reaches retirement.

Discretionary real and financial wealth

Figure 10 depicts total discretionary wealth, defined in accordance to the flow measure of discretionary saving in Section 2, and arranged by cohorts using the synthetic panel approach described earlier. It consists of gross financial and real wealth, minus outstanding consumer loans

[22] More precisely: Gross earnings include net earnings, income taxes and the employee's share (one half) of social security contributions. Total labor compensation includes gross earnings as defined plus the second half of social security contributions, the so-called employer's share.

and mortgages.

We see that total discretionary wealth increases until late in life, and there is only a brief (and statistically insignificant) indication of a flat episode for the 1909 and 1914 cohorts, and even there the change between the first and the last observation is positive.

Figure 10: Mean Total Discretionary Wealth by Cohort

West German private households possessed an average total wealth of DM 245,000 (€ 122,000). At the time of the head's retirement an average German household owned around DM 275,000 (€ 138,000) of total wealth in 1993. This is 12.5 times the annual public pension of an average employee with 45 years of service in 1993 (net DM 22,000, € 11,000). The median wealth at that age is DM 200,000, (€ 100,000) which is lower than the mean but still relatively high. Thus, drawing down wealth could quite substantially contribute to consumption (Schnabel, 1999). Nevertheless, accumulation of even more wealth in the form of financial wealth takes place on average in old age, as was illustrated in the savings profiles presented earlier. This is a surprising departure from the life-cycle hypothesis.

The largest part of total discretionary wealth is real estate, in particular owner-occupied housing, compare Figures 11 and 12. For the group aged 30 to 59, real wealth amounts to 80 to 90 percent of total wealth. Mean gross real wealth increased substantially from 1978 to 1993. A more detailed analysis shows that this is mainly caused by an increase in homeownership from cohort to cohort, while ownership rates remained essentially constant with increasing age after age 60 for any given cohort (Schnabel, 1999).

Figure 11: Mean Gross Real Estate Wealth, 1978–1993

Financial wealth increased by 38 percent between 1978 and 1993. This increase was mainly caused by a wealth expansion of middle age classes. The expansion of financial wealth is striking between 1988 and 1993. The reason is a large increase in securities ownership for all age classes.

Figure 12: Mean Gross Financial Wealth, 1978–1993

[23] See previous footnote.

Pension wealth

The life-cycle pattern of discretionary wealth in Germany – almost always increasing, at most flat – is in contrast to the hump shaped pattern of unfunded ("notional") pension wealth that trivially emerges from the sequence of first paying pension contributions and then receiving pension benefits. Figure 13 shows how notional pension wealth builds up and is drawn down in a synthetic life cycle. The representative worker underlying this simulation has an earnings history of the average age-specific wage between ages 20 and 60, then retires at the average retirement age and draws the statutory pension benefits. Notional pension wealth *SSW* at time *t* is then computed as[24]

$$SSW(t) = (1+rho)*SSW(t-1) + contributions(t) - benefits(t)$$

where *rho* is the internal rate of return that equalizes the present value of contributions and benefits for the above 40-year contribution history and a duration of benefits corresponding to average life expectancy. At retirement, notional pension wealth of the representative worker is about DM 400,000, 30 percent more than the sum of average financial and real wealth shown in Figure 11. By definition, notional pension wealth is drawn down after age 60 and becomes negative after age 78, average life expectancy, see Figure 13. In contrast, financial and real wealth increases until age 70 for the 1919 cohort (see Figure 10), and increases between age 60 (65) and age 75 (80) for the 1914 (1909) cohort. This contrast is not by chance. Rather, it reflects the influence of pension policies on discretionary saving. This is the main argument of the following section.

Figure 13: Life-Cycle Build-up of Notional Pension Wealth

4. Saving Patterns and Public Policy

We can summarize the observed saving patterns of German households in the following three points:

- Saving rates are high and stable until around age 45-49.

[24] See Brugiavini and Weber (2001) for a discussion of this measure.

♦ Saving is lower but still positive even in old age. There is depreciation drawing down real wealth, but virtually no signs of drawing down financial wealth.

♦ Until age 35, saving is mainly invested in owner-occupied housing, while it is mainly financial saving at older ages.

These observations pose a host of questions: How can we explain a life-cycle profile of discretionary household saving in Germany which is much flatter than, e.g., in the US? Specifically: Why does saving remain positive in old age, even for most low income households? And what explains the "German savings puzzle", the puzzling fact that pensions and health insurance are generous and likely to have large crowding out effects, yet German households accumulate so much real and financial wealth and do not appear to draw it down?

We need a complicated answer to resolve this puzzle. We obviously need to distinguish between the older and the younger generation because they appear to save for different purposes. Moreover, our data on the flat and positive savings in old age only pertain to the cohorts born before the 1930s; we do not yet know whether that pattern will also hold for the younger generation.[25] We then distinguish among three effects of public policies: effects on the level of savings, essentially by crowding-out mechanisms mainly through social insurance; effects on the life-cycle pattern of savings, flattening the age-savings profile; and effects on the portfolio composition of savings, mainly through differential taxation.

Crowding-out effects of public pensions

We start with an analysis of the older generation in our data. Their members were born between 1910 and 1930 and they retired until about 1995 – this is today's generation of German retirees. Their current income is dominated by public pension income, much more so than in many other countries, see Table 1:

Table 1: Retirement Income by Pillar (Percentages)

About 85% of retirement income stems from the public mandatory retirement insurance, and only 15% come from private sources such as funded firm pensions, individual retirement accounts and

[25] We refer to the generation now aged between about age 30 and 50. There is also a third generation, the "really young", but we have little data on their saving and consumption habits.

other asset income, only a little remaining labor income and family transfers.

The international comparison in Table 1 suggests a strong substitution between the provision of pay-as-you-go pensions and other income sources in old age. This crowding-out result is in line with a careful time-series analysis of Kim (1992). He links changes in the retirement system to the savings rate and shows that the German pay-as-you-go system has crowded out saving to a significant extent. Cigno and Rosati (1996) confirm these findings but explain the crowding-out effect unconventionally by repercussions on fertility rather than through the familiar channels stressed by Feldstein (1974).

The crowding-out result as it pertains to current retirement income is also at odds with the fact that Germany has such a high saving rate, and in particular, that German elderly have on average real and financial wealth levels that suffice for about 10 years of their retirement income (cf. Figure 10). This is of course the core of the "German savings puzzle". We need three elements to explain it.

First, a part of the apparent contradiction between stocks of wealth (almost equally divided between notional pension wealth and tangible real and financial wealth) on the one hand and current income (85% pensions, 15% other income) on the other hand is resolved by realizing that Table 1 only reports current money income, not the imputed rent from homeownership, and that most wealth held by the elderly is owner-occupied housing (cf. Figures 11 and 12). Hence, Table 1 exaggerates potential crowding-out effects. However, the omission of imputed rent cannot fully explain the puzzle. The German homeownership rate is much lower than in the Netherlands, the UK, and the US. For the generation born between 1910 and 1930, it is just above 50 percent. [26] Moreover, flat and positive saving rates in old age are also prevalent among elderly German renters (cf. Figure 2).

Schnabel (1999) provides the second element of our explanation. It is a story of ex ante versus ex post savings plans. He shows that the growth of income during the German economic miracle years and up to the seventies was so large and unprecedented that the elderly could just not have anticipated it. Hence, they saved more than if they had known how miraculous a growth rate they would experience.

Figure 14 displays the growth of earnings during the work history of a typical worker who retired in 1970, the drop due to the 70% replacement rate after retirement, and then the subsequent increase in pension income due to gross indication. All numbers are in real terms. After less than 10 years into retirement, the average worker had essentially recouped the former income level. The process was only stopped in the early eighties, when economic growth slowed down to normal also in Germany. Since such an income path could hardly be anticipated, workers consumed too little and ended up with too large a stock of wealth around retirement.

[26] This lower homeownership rate is only partially offset by the fact that the average home in Germany is more expensive than in the Netherlands, the UK, and the US, see below.

Figure 14: Life-Cycle Income Path of the 1910 Cohort

While Schnabel's (1999) story is plausible, it does not explain why this wealth has not been spent at higher rates in old age. This is the third element of our explanation of the "German savings puzzle." First, habit formation may play a role. The elderly do not want to change the accustomed level of consumption which they have learned some 50 years ago, not even increase it in the face of accumulated financial wealth. There is some new evidence on the importance of habit formation (Dynan, 2000). Second, Börsch-Supan and Stahl (1991) provide a complementary explanation. They argue that due to deteriorating health conditions, the elderly are less able to spend as much as they would need to make saving negative. Both lines of argument are strengthened by capital market imperfections since annuitized pension income cannot be borrowed against. Hence, even if the current generation of elderly had anticipated their unwillingness or inability to draw down wealth at later ages, they could not have responded by dissaving faster as long as their annuity income exceeds the planned consumption level. Evidence for this effect is provided by Börsch-Supan (1992).[27]

Life-cycle saving patterns

While the older generation may have had a retirement savings motive, but was surprised by the high retirement income and could not draw the accumulated wealth down, the younger generation – now aged between about 30 and 50 years – has learned that retirement will not be a time of scarce resources. For them, the high replacement rates of the German public pension system have made additional private retirement provision largely unnecessary. Saving for retirement, the only motive under the pure life-cycle hypothesis, is of secondary importance. Other saving motives dominate, most importantly saving for homeownership, as Figures 7 and 8 have shown. In addition, there are motives such as high frequency precautionary saving, high frequency saving for durables such as cars, and saving for intergenerational transfers. In fact, inter vivos transfers are high in Germany and survey questions on savings motives show an almost equal spread between the aforementioned saving motives (DIA, 1999).

[27] We know very little about bequests which may, in theory, contribute to the observed flat age-saving profiles in old age. Cross-section regressions of wealth levels on number of children do not produce significant results. This finding, however, does not necessarily rule out an operative bequest motive. Only longitudinal data will clarify this matter.

The mechanisms pertaining to both generations generate much flatter age-saving profiles than under the retirement-saving oriented life-cycle hypothesis. The older generation still has positive saving rates because of the unwillingness or inability to draw down wealth at later ages which they have accumulated in lack of anticipation of the spectacular economic growth. The young generation has a flat saving profile because the slow process of owning a home and short-frequency saving motives generate a flat saving rate over a long period.[28]

Hence, the generous public pension system in Germany appears to be the main cause for a relatively flat age-saving profile. It has made the retirement savings motive relatively irrelevant for the younger generation, and it has led to overannuitization among the elderly. We are aware that this line of argument is vulnerable because it lacks a counterfactual. The international comparisons in this journal issue do help in this respect. For instance, among the countries represented, the hump-shaped life-cycle savings pattern is most pronounced in the U.S. where the replacement rate of the public pension systems is lower – and thus the retirement savings motive is more important – than in continental Europe.

If a substantial portion of the saving patterns currently observed in Germany is caused by the public pension system, we should expect substantial changes in saving patterns in the future. Growth rates have declined and the dependency ratio is deteriorating rapidly. The current generosity of the social insurance system is unlikely to prevail. A major pension reform is under way which will cut benefits substantially and, in effect, introduces more prefunding. This will revive the retirement motive for saving. Hence, saving rates among the young are likely to increase, and saving rates among the elderly are likely to decline sharply because the have to rely more on their retirement savings to fiance consumption. We will have to wait for this counterfactual to obtain a clearer explanation of what caused the puzzling German savings behavior.

Portfolio composition

Public policies appear also to have shaped the composition of tangible household wealth.[29] As pointed out in Section 3, the largest part is real estate, mainly owner-occupied housing. For the group aged 30 to 59 this makes 80 to 90 percent of total wealth. While ownership rates are lower

[28] Conventional mortgages in Germany have a term of 30 years.

than in most other European countries, the US and Japan, both land and housing construction is relatively expensive in Germany. This paper is not the place to analyze why this is the case, but there is some evidence pointing towards restrictive land regulation.[30] In addition, saving for down payment in building societies ("Bausparkassen") is tax privileged.

Tax policy appears to have shaped the composition of financial wealth, displayed in Table 2.[31]

Table 2: Composition of Financial Household Wealth, 1978–1993

The most important component is whole life insurance, about a third of gross financial wealth. The central reason for the important role of whole life insurance in German households life-cycle savings decisions is its favorable tax treatment, as shown by Brunsbach and Lang (1998) and Walliser and Winter (1999). Stocks and bonds are the second most important category. Bonds make up the lions' share in this category, while stocks are less than 10 percent of the average household portfolio. This fact is also significant for financial markets, as life-insurance companies have not been allowed to invest significantly in stocks in the past, which in turn is one of the main reasons for thin capital markets in Germany. Stocks and bonds are tax privileged in so far as capital gains are tax exempt if the underlying asset has been held for longer than one year.[32] The lenient taxation of capital income may be another explanation for the high saving rate in Germany, but we are not aware of a reliable time series analysis that links the level of tax relief to the aggregate household saving rate.

It is highly speculative how the portfolio composition in Table 2 would change in the wake of a major change of the German social insurance system, notably a partial transition to prefunding pensions. If there were no substitution between new retirement saving and current saving, the household saving rate would increase by between 2 and 4 percent, see Birg and Börsch-Supan (1999). If these new savings were channeled into pension funds, which only recently have been introduced in Germany and still do not receive preferential tax treatment similar to whole life

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[29] For a detailed study of German household portfolio choice, see Börsch-Supan and Eymann (2000).
[30] Börsch-Supan, Kanemoto and Stahl (2001) claim that housing policies explain a significant share of the price differences among Germany, Japan and the US, such as restrictive land development by local governments, excessive building codes and insufficient legislation to avoid monopolization of the construction industry.
[31] A survey of tax policy in Germany is provided in the companion paper Börsch-Supan, Reil-Held, Rodepeter, Schnabel and Winter (2001).

insurance, pension funds would amount to between 15 and 18 percent of households' portfolios, comparable to the United Kingdom, the U.S., the Netherlands and Switzerland. Substitution between new retirement saving and current saving would increase this share, but part of new retirement saving may also be done as whole life insurance. Households' direct and indirect exposure to stock markets then depends on future investment decisions of life insurance companies who only recently began to increase their portfolio share of stocks. Judging from the international experience in countries as diverse as the United Kingdom, the U.S., the Netherlands and Switzerland, a more prominent role of equities seems very likely when more of the German retirement income is prefunded.

5. Conclusions

The case of Germany presents an interesting "savings puzzle." One the one hand, saving rates are high and stable until around age 45-49, and remain positive even in old age. While depreciation draws down real wealth among elderly homeowners, we find virtually no signs of drawing down financial wealth. One the other hand, Germany has a very generous public pension system. "Notional pension wealth" provided by the pay-as-you-go social insurance system is larger than real wealth and much larger than financial wealth.

Our explanation is cohort-specific. Our data on the flat and positive savings in old age only pertain to the cohorts born before the 1930s; we do not yet know whether that pattern will also hold for the younger generation. The older generation was surprised by an unprecedented income growth in the 1960s and 70s. Households born between 1910 and 1930 were saving for retirement but ended up being over-annuitized. Habit formation and ill health then prevented the older generation from spending their unexpected wealth down.

What will happen, when younger cohorts reach retirement, is likely to depend on future pension policy. Pension reform is under way in Germany. It will shift a significant share – between a quarter and a third – of retirement income from the pay-as-you-go pillar to a funded pillar. Most likely, this will increase saving in younger ages, and induce dissaving among the elderly. We will have to wait for this "experiment" to obtain a clearer explanation of what had caused the puzzling German savings behavior.

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[32] This has recently been changed to two years.

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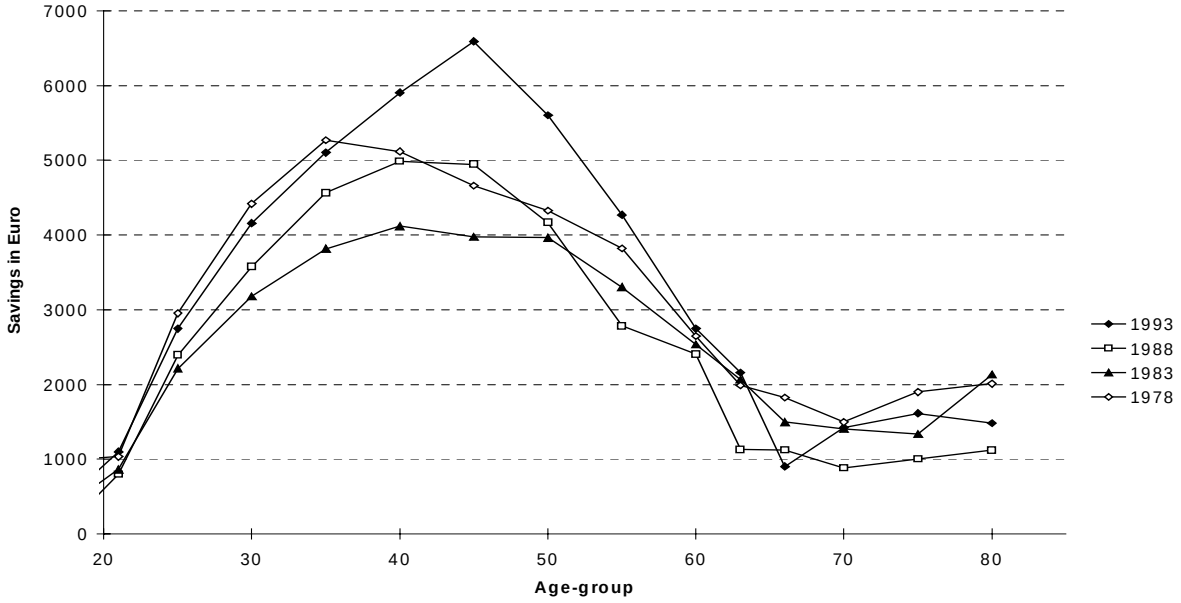
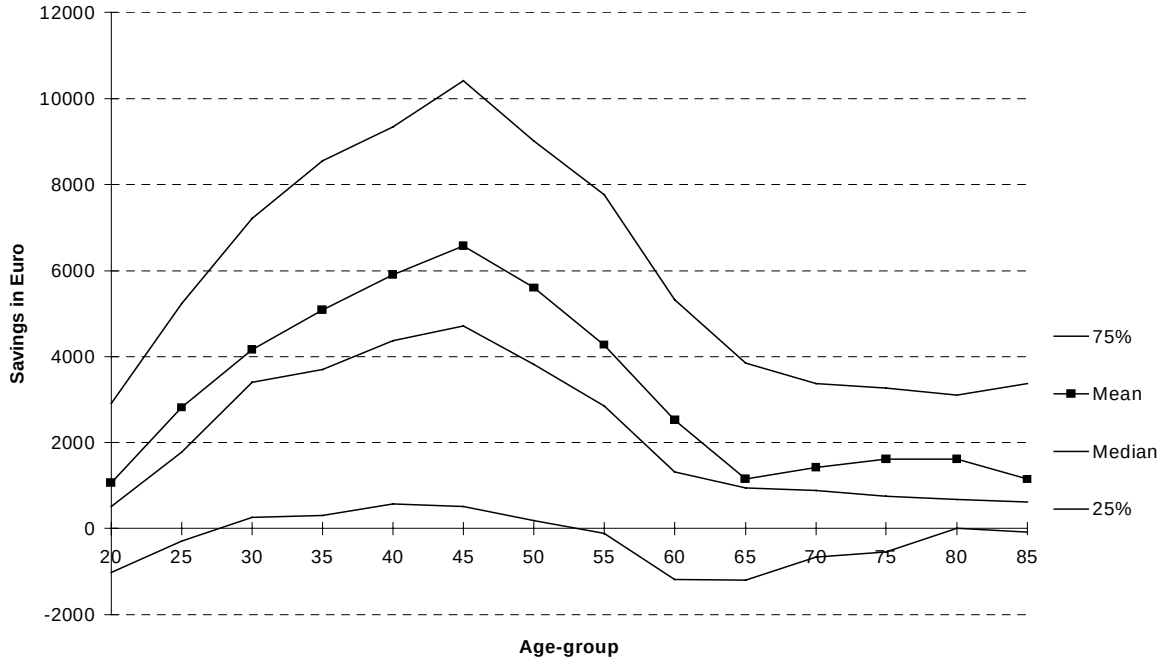
Figure 1: Mean Discretionary Saving in 1978-1993



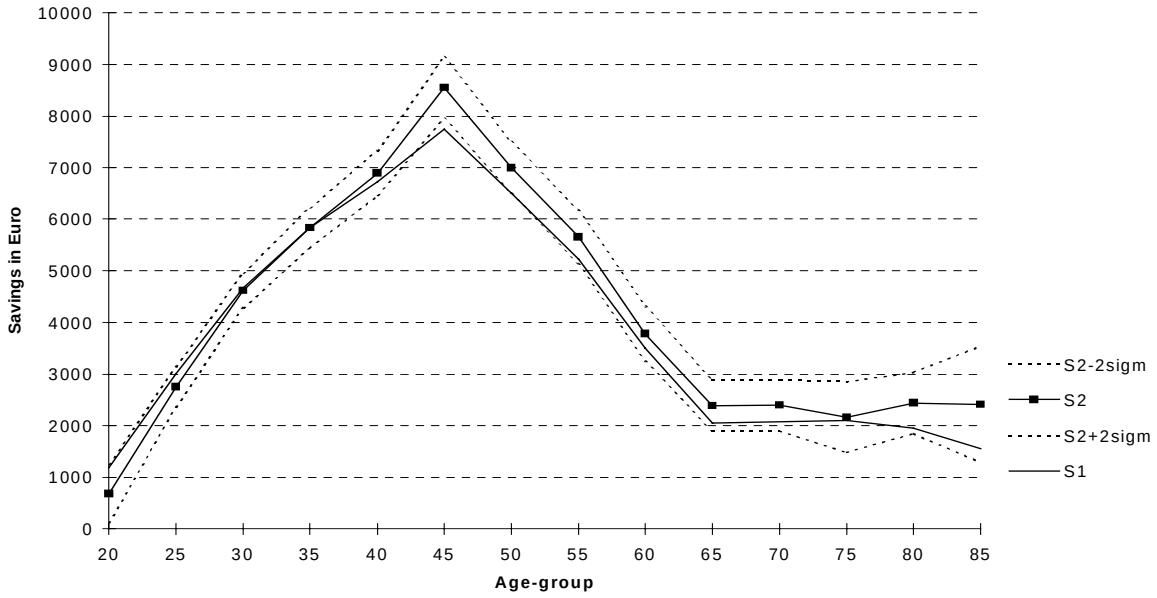
Note: All data in prices of 1993 and weighted. Age/Cohort-groups denoted by *begin* of 5-year interval.
Source: Own calculations on the basis of the EVS 1978–1993.

Figure 2: Mean and Median Discretionary Saving in 1993



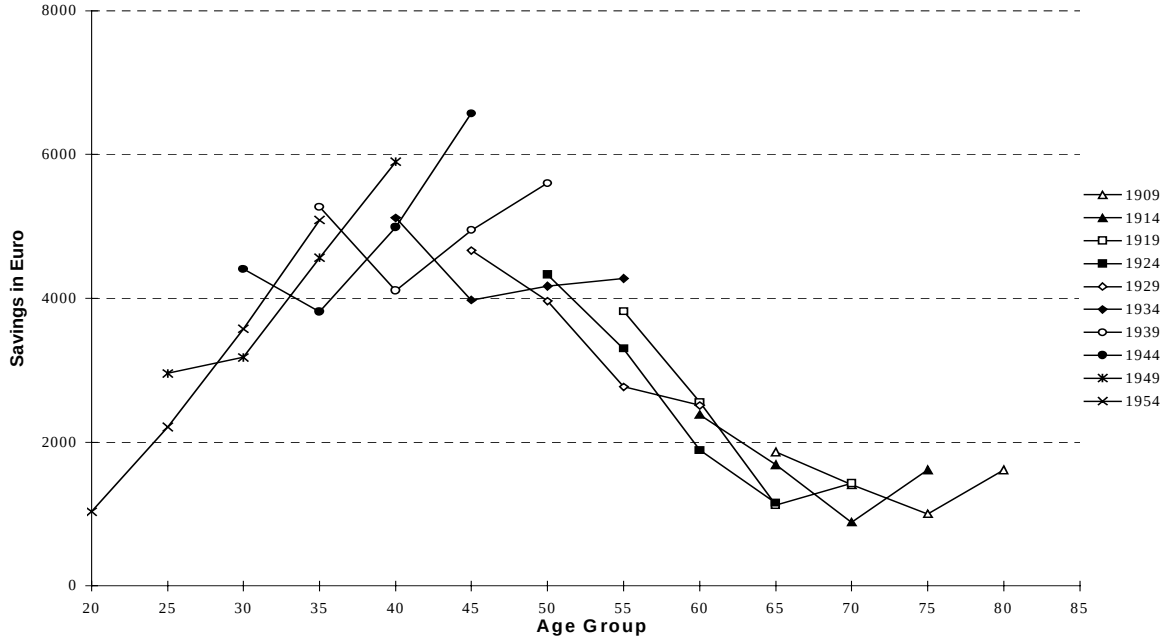
Note: All data in prices of 1993 and weighted. Age/Cohort-groups denoted by *begin* of 5-year interval.
Source: Own calculations on the basis of the EVS 1978–1993.

Figure 3: Mean Discretionary Saving by Two Different Definitions, 1993



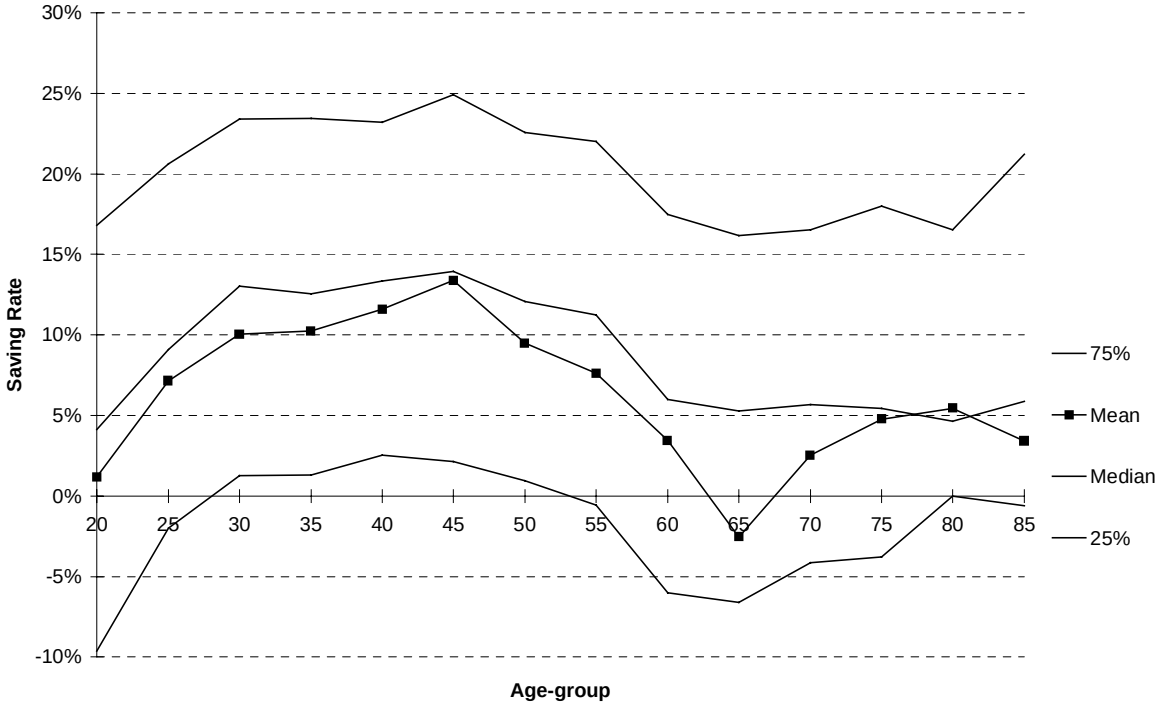
Note: S1 is the first measure (purchases minus sales of assets), shown with the 95%-confidence bands (S2±2σ). S2 is the second measure (residual of income minus consumption). All data in prices of 1993. Age/Cohort-groups denoted by *begin* of 5-year interval. *Source:* Own calculations on the basis of the EVS 1978–1993.

Figure 4: Mean Discretionary Saving by Cohort



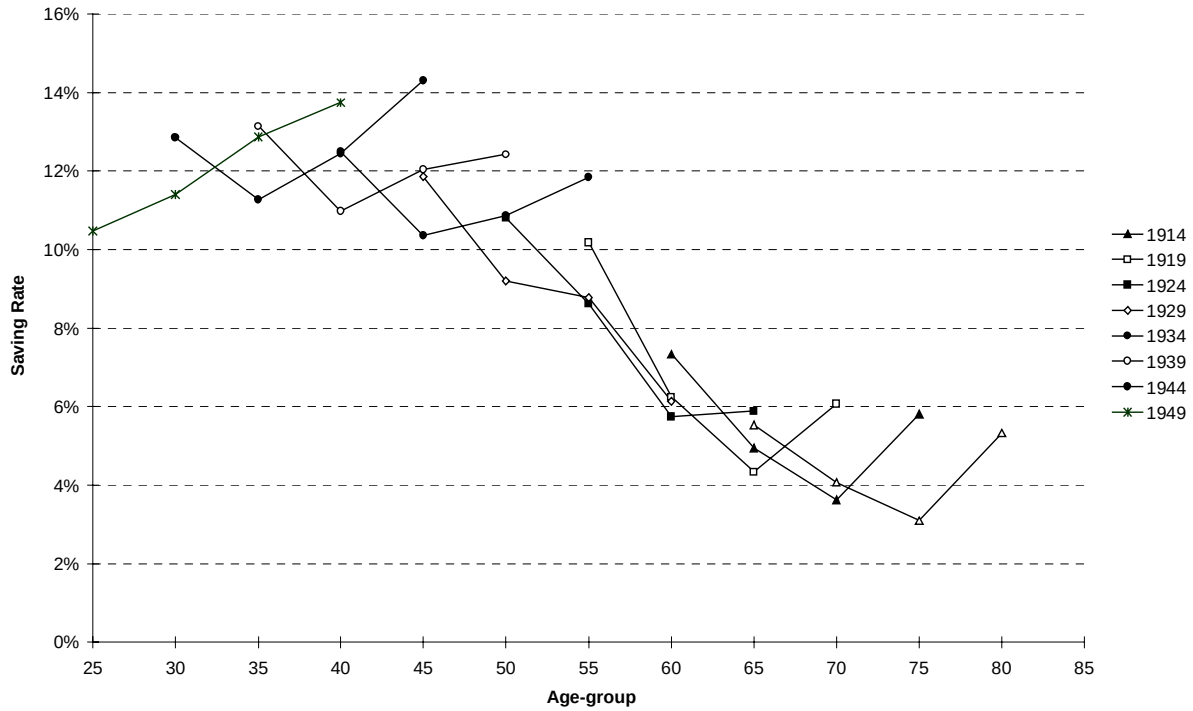
Note: All data in prices of 1993. Age-groups denoted by *begin* of 5-year interval. *Source*: Schnabel (1999)

Figure 5: Median Saving Rates, 1993 Cross Section



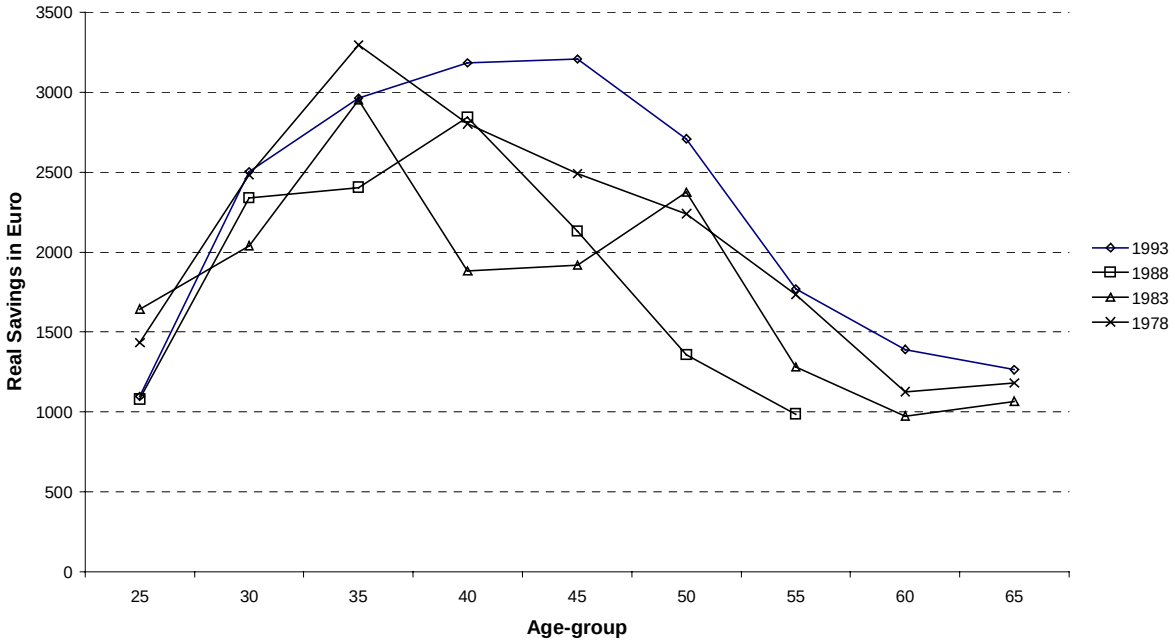
Note: All data in prices of 1993. Saving is defined as purchases minus sales of assets. Age/Cohort-groups denoted by *begin* of 5-year interval. *Source*: Own calculations on the basis of the EVS 1978–1993.

Figure 6: Median Saving Rates by Cohort



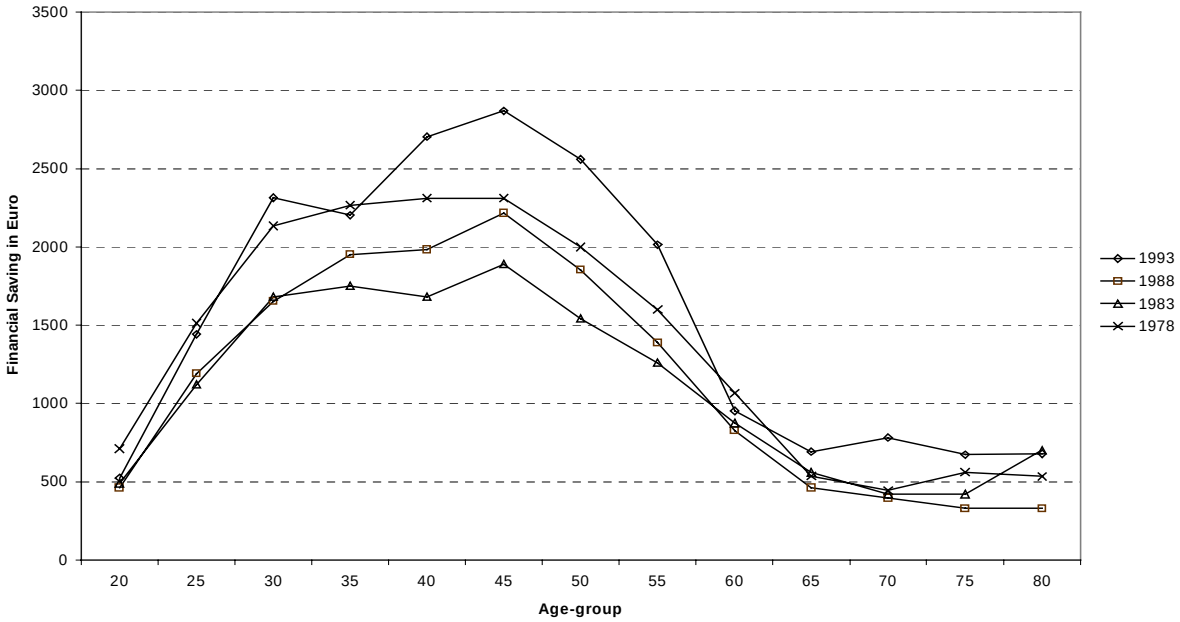
Note: All data in prices of 1993. Age-groups denoted by begin of 5-year interval. *Source*: Schnabel (1999)

Figure 7: Mean Real Saving, 1978-1993



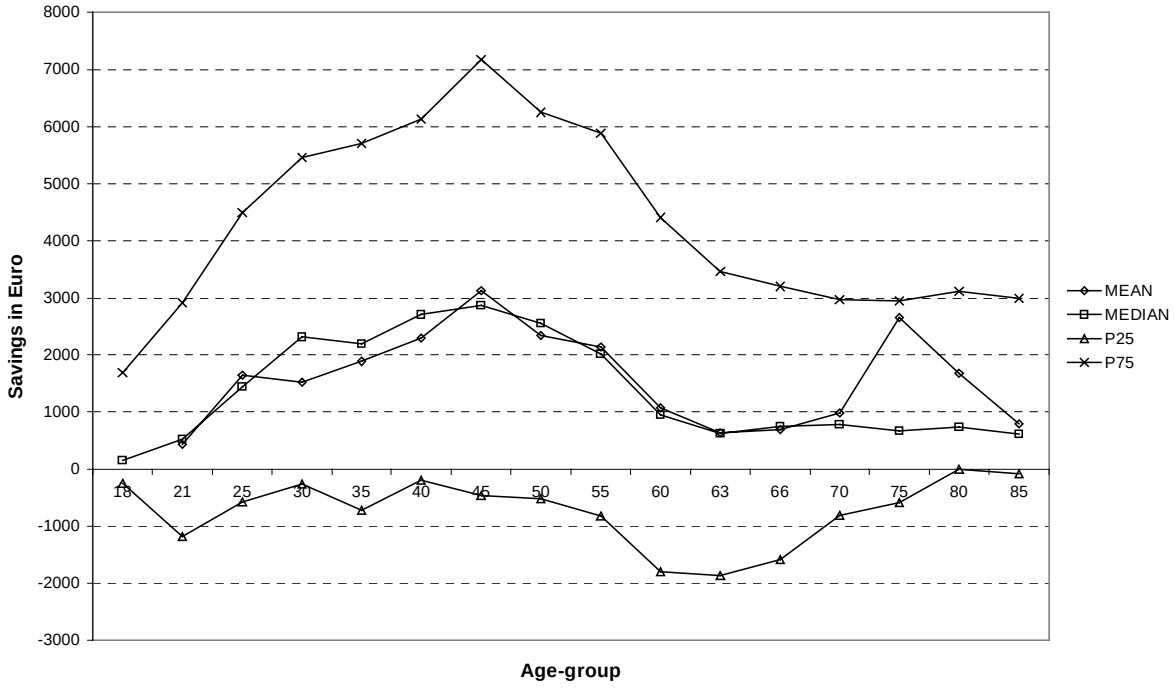
Note: All data in prices of 1993 and weighted. *Source*: Own calculations on the basis of the EVS 1978–1993.

Figure 8: Median Financial Saving, 1978-1993



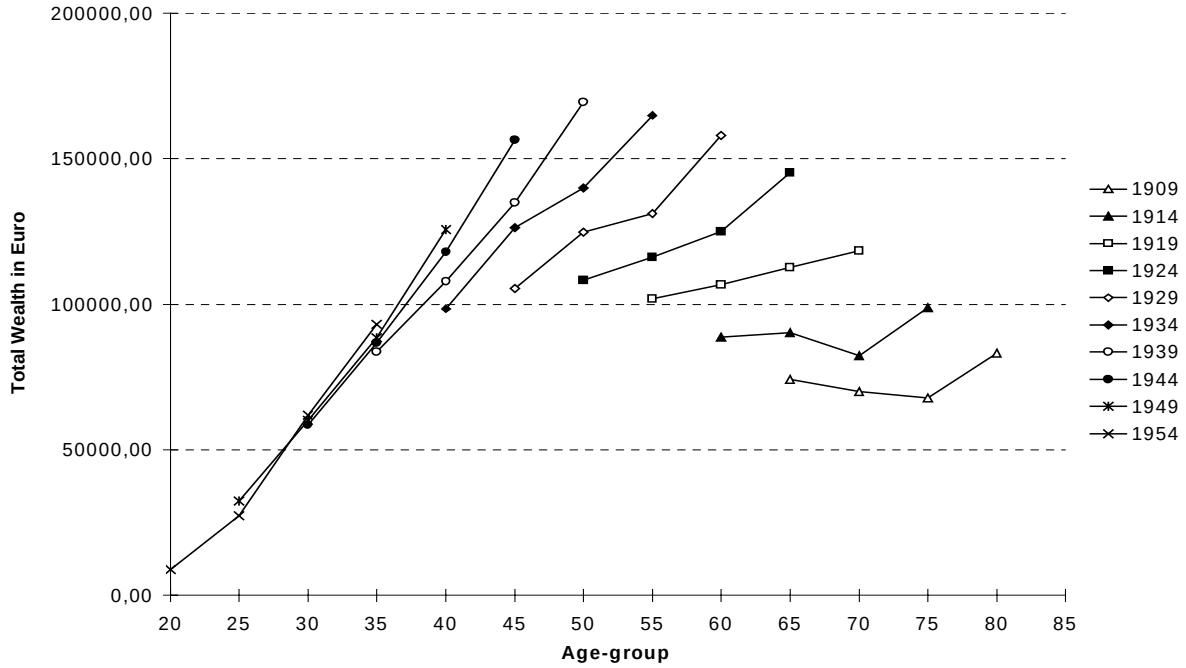
Note: All data in prices of 1993 and weighted. Age/Cohort-groups denoted by *begin* of 5-year interval.
Source: Own calculations on the basis of the EVS 1978–1993.

Figure 9: Mean and Median Financial Saving in 1993



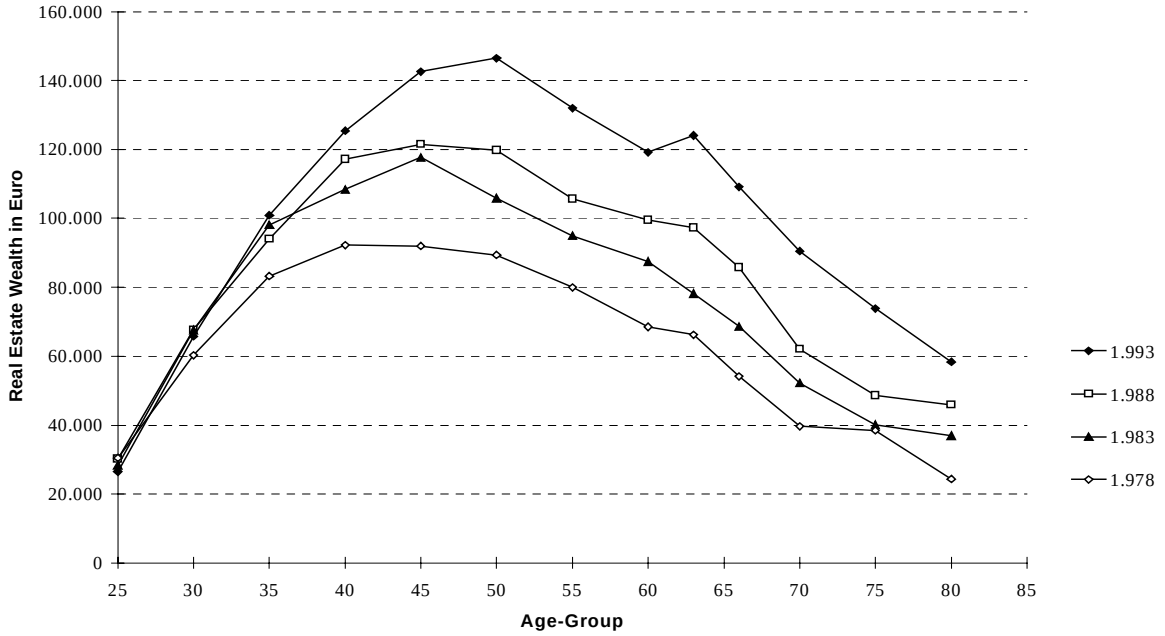
Note: All data in prices of 1993 and weighted. Age/Cohort-groups denoted by *begin* of 5-year interval.
Source: Own calculations on the basis of the EVS 1978–1993.

Figure 10: Mean Total Discretionary Wealth by Cohort



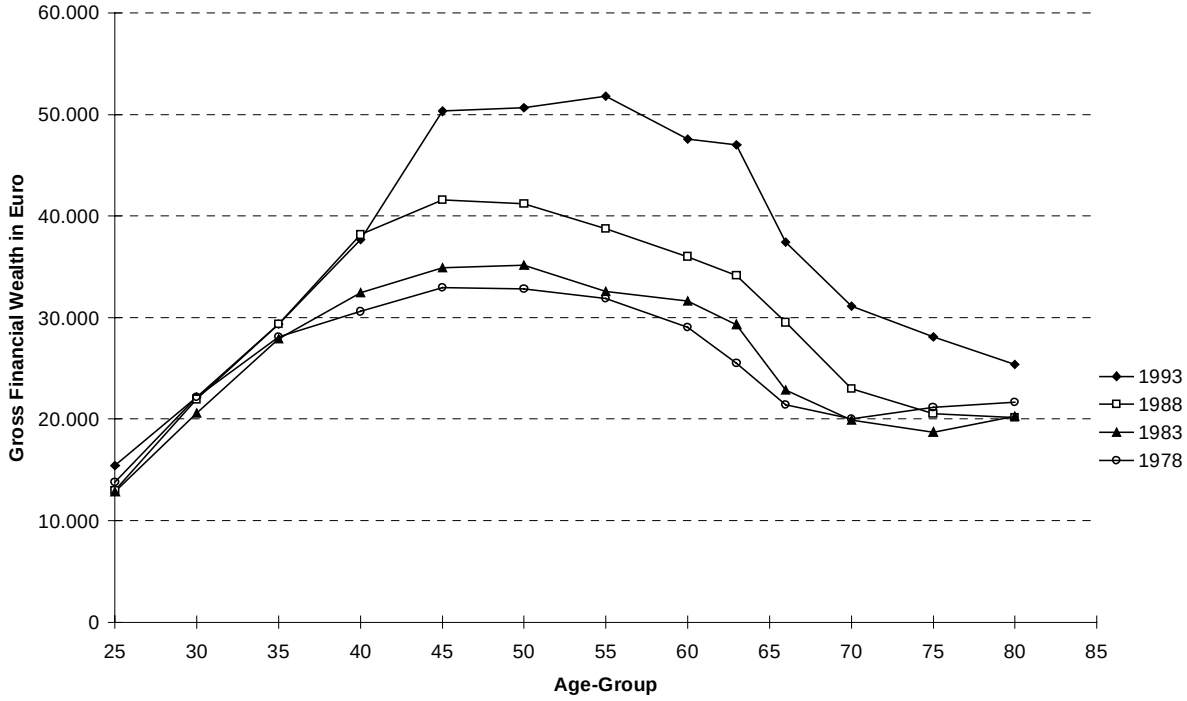
Note: All data in prices of 1993. Age-groups denoted by *begin* of 5-year interval. *Source*: Schnabel (1999)

Figure 11: Mean Gross Real Estate Wealth, 1978–1993



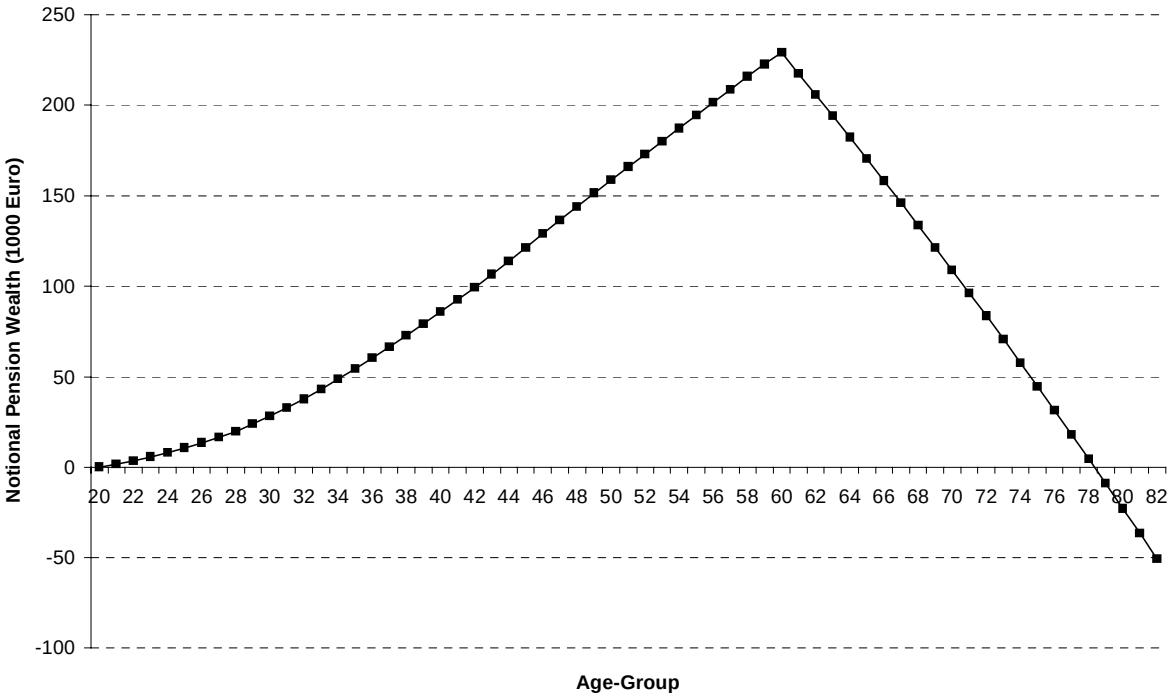
Note: All data in prices of 1993 and weighted. Age/Cohort-groups denoted by *begin* of 5-year interval. *Source*: Own calculations on the basis of the EVS 1978–1993.

Figure 12: Mean Gross Financial Wealth, 1978–1993



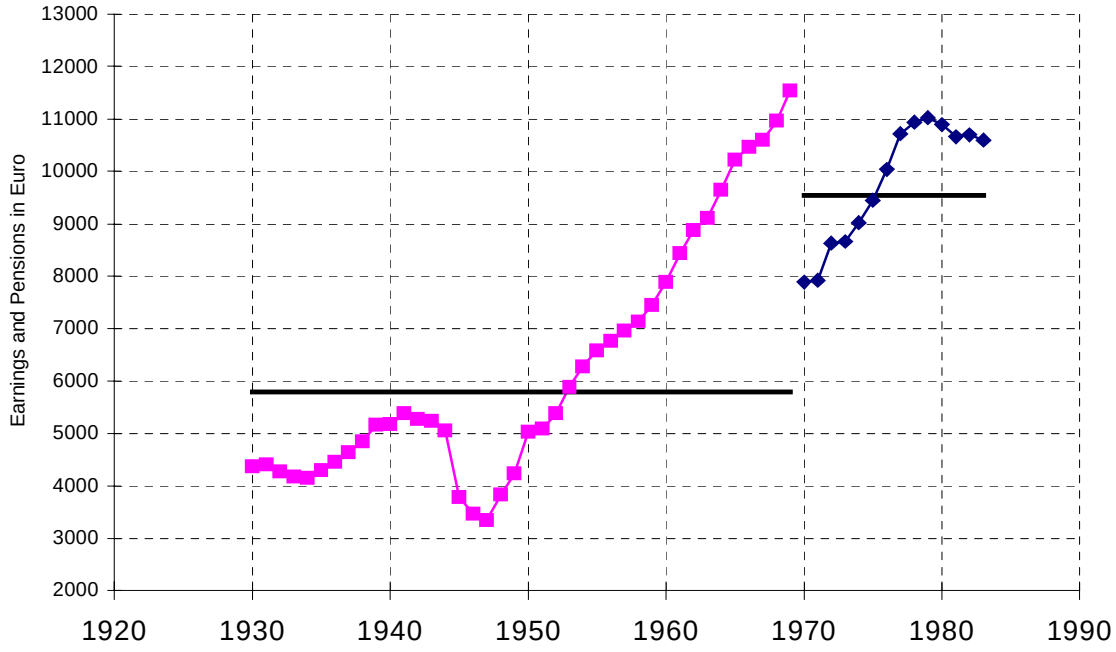
Note: All data in prices of 1993. Age/Cohort-groups denoted by *begin* of 5-year interval. *Source*: Own calculations on the basis of the EVS 1978–1993.

Figure 13: Life-Cycle Build-up of Notional Pension Wealth



Note: All data in prices of 1993. *Source*: Own calculations, based on the average earner in the EVS 1993.

Figure 14: Life-Cycle Income Path of the 1910 Cohort



Source: Schnabel (1999)

Figure 15: Household Saving Rates in Germany

Source: Deutsche Bundesbank (1998).

Table 1: Retirement Income by Pillar (Percentages)

	Germany	The Netherlands	Switzerland	UK	US
State	85%	50%	42%	65%	45%
Employer	5%	40%	32%	25%	13%
Individual	10%	10%	26%	10%	42%

Notes: Income composition of two-person households with at least one retired person. UK: „State“ includes SERPS. US: „Individual“ includes 25% earnings, much less in the other countries.
Source: Börsch-Supan and Reil-Held (1998) and Disney, d'Ercole and Scherer (1998).

Table 2: Composition of Financial Household Wealth, 1978–1993

	1978	1983	1988	1993	Share in 1993
Savings accounts	8.721	6.863	7.459	6.243	17.5%
Building societies	3.495	3.344	2.806	2.663	7.5%
Bonds and stocks[a]	4.171	5.028	5.828	11.199	31.4%
Life insurance (cash value)	9.386	9.443	12.564	11.869	33.3%
Other financial wealth	-	1.017	1.002	3.713	10.4%
Gross financial wealth	25.773	25.695	29.659	35.687	100.0%
./. Loans	12.936	16	16.991	19.680	
Net financial wealth	12.837	9.494	12.667	16.007	

Note: Household data from the Einkommens- and Verbrauchsstichprobe (EVS). All figures in DM and in 1993 prices. a) About 70% bonds and 30% stocks. For details see Börsch-Supan, Reil-Held, Rodepeter, Schnabel and Winter (2001).