Institut für Volkswirtschaftslehre und Statistik

No. 595-00

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

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Beiträge zur angewandten Wirtschaftsforschung

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[DRAFT 12. DEC. 2000]

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Introduction

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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

[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".

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

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) $YE_t = Y_t + T_t - B_t$

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.

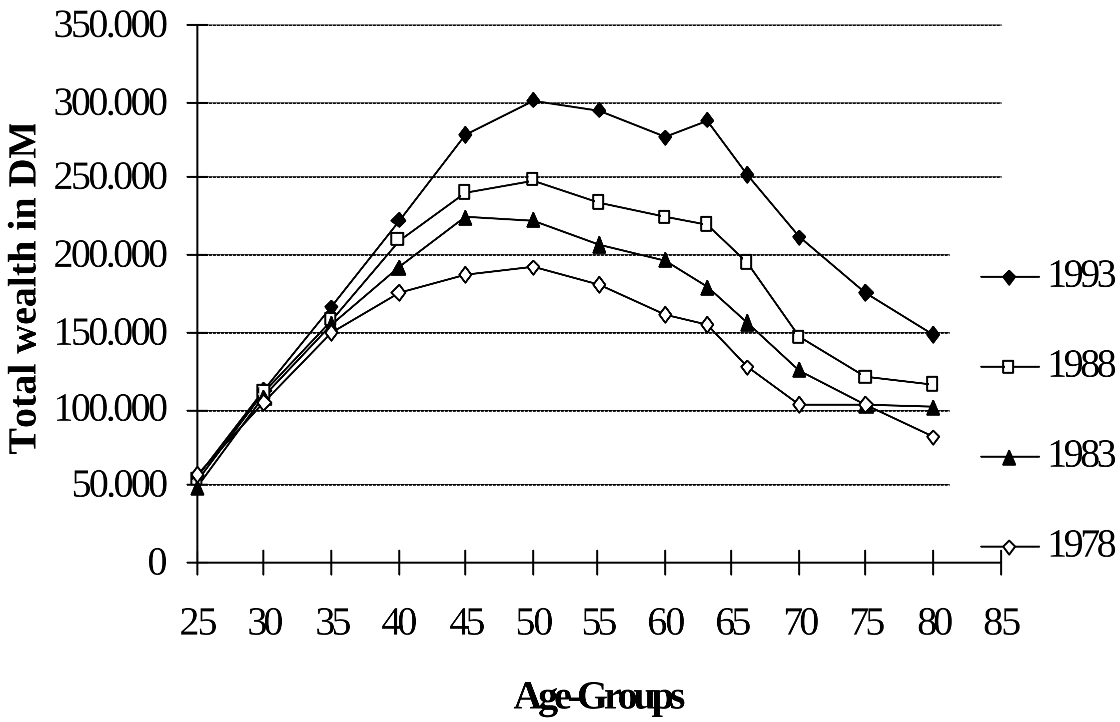
Ideally, we would like to report all three measures in order to learn how reliable actual measurements of W_t, D_{it}, Y_t and C_t are. In practice, however, the data sources available to the seven country studies are less than satisfactory. In many countries, only two measures can be computed, in some 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.

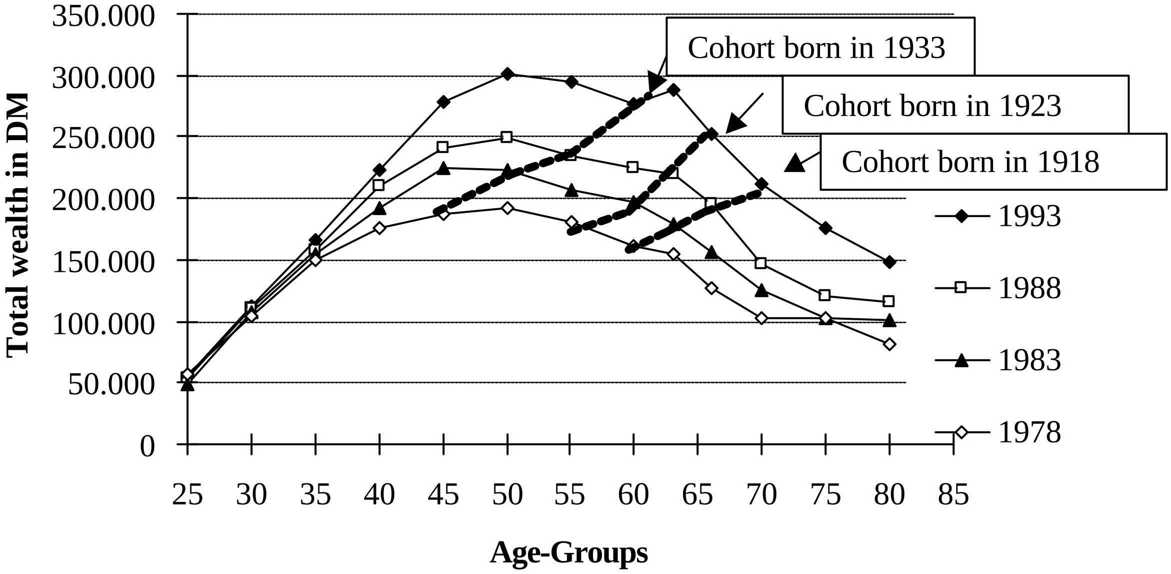
We therefore resort to the construction of synthetic panels. Households of each survey ("wave") are divided up into as many homogenous household types ("cells") as possible. Next, these cells are identified across time. Such a panel does not consist of households but household types as survey units. 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:

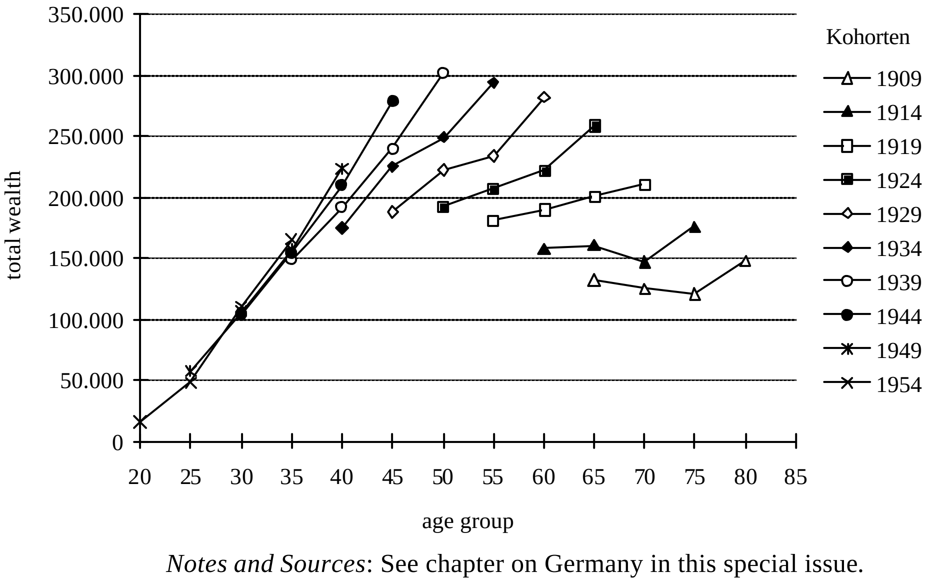
Figure 2: Age and Cohort Effects if Time Effects are Zero



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

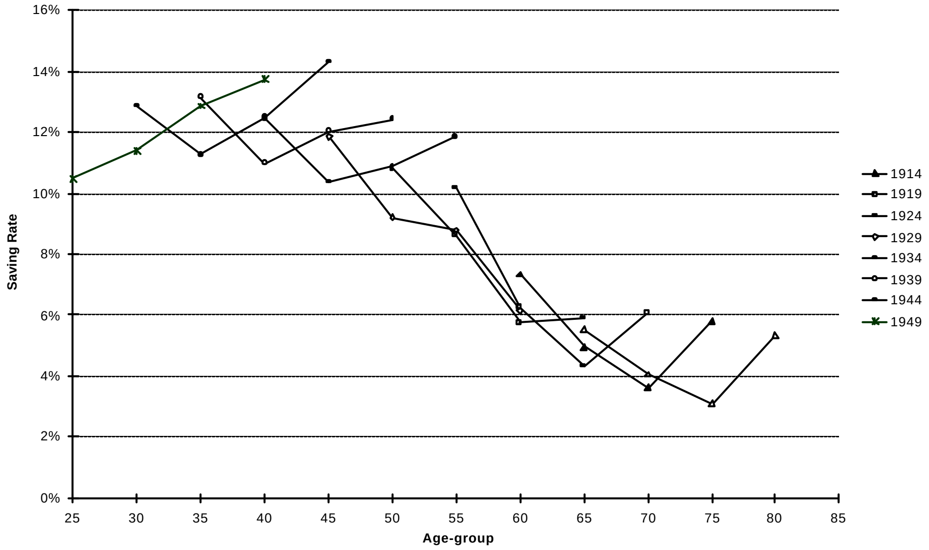


Notes and Sources: See chapter on Germany in this special issue.

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:

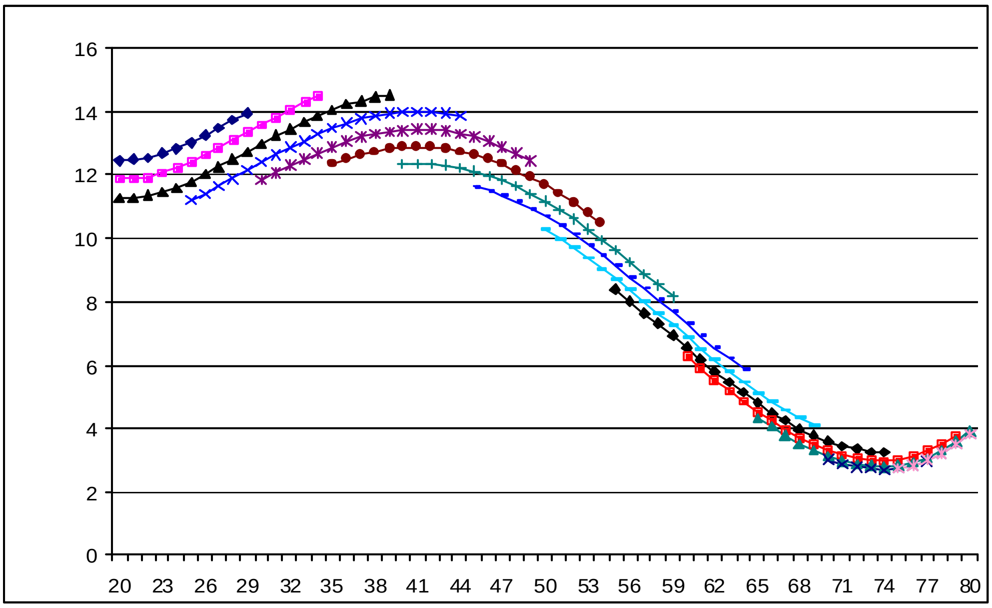
Figure 4: Median Saving Rates by Cohort



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

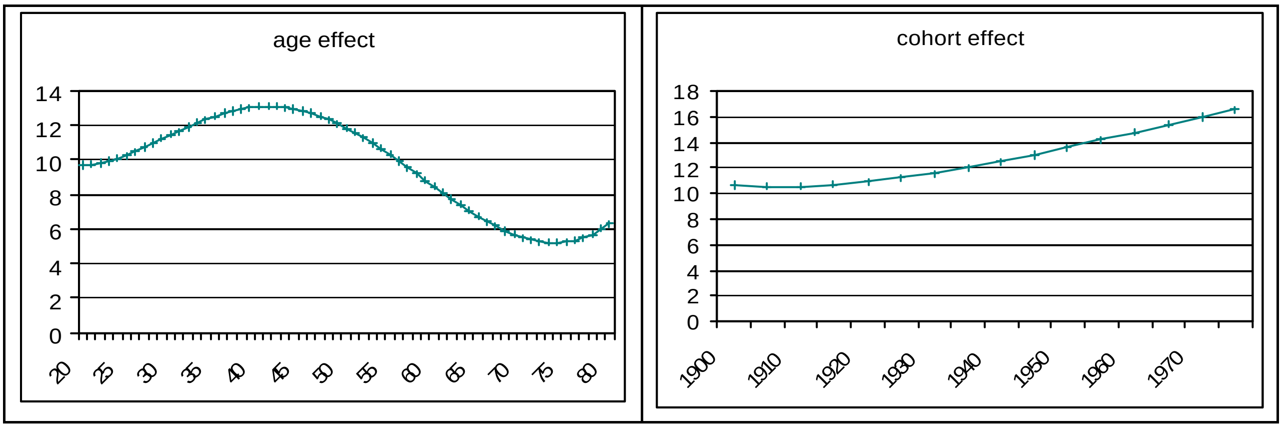
In order to smooth these ragged profiles, we regress the observed saving rates on a (fifth-order) polynomial in age and a (third-order) polynomial in cohort (alternatively: a set of cohort indicators). This leads to Figure 5. In this figure, age and cohort effects are much more clearly visible than in 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



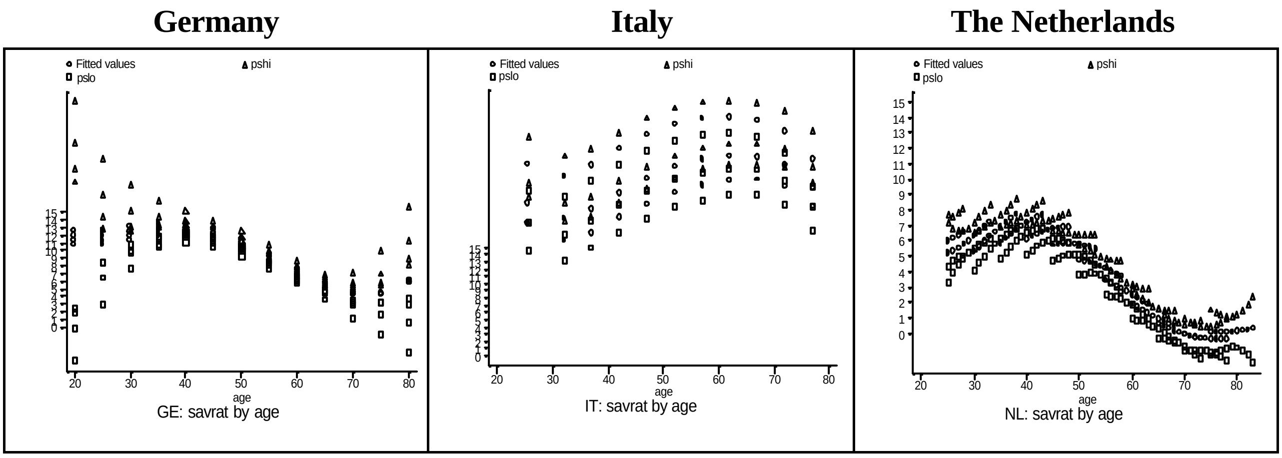
Source: Slope and intercepts from Figure 5.

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)



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

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

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 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.

References:

Alessie R.J.M., A. Kapteyn, and A. Lusardi (1998), Explaining the Wealth Holdings of Different Cohorts: Productivity Growth and Social Security, CentER Discussion Paper, Tilburg University.

Attanasio, O.P. (1994), Personal Saving in the United States, in: J. Poterba (ed.), *International Comparisons of Household Savings*, Chicago, London: University of Chicago Press, 57-124.

Börsch-Supan, A. (ed.) (2001), *International Comparisons of Household Saving,* New York: Academic Press.

Brugiavini, A., and G. Weber (2001), Household Savings: Concepts and Measurement. In: Börsch-Supan, A. (ed.*), International Comparisons of Household Saving*, New York: Academic Press.

Deaton, A. (1985), Panel data from time-series of cross-sections. *Journal of Econometrics,* 30, 109-124.

Deaton, A. and C. Paxson (1994), Saving, Aging and Growth in Taiwan, in: D. Wise (ed), *Studies in the Economics of Aging*, Chicago: The University of Chicago Press.

Gruber, J., and D. Wise (1999), *Social Security and Retirement Around the World*, Chicago: The University of Chicago Press.

Jappelli, T., and F. Modigliani (1998), The Age-Saving Profile and the Life-Cycle Hypothesis, CSEF Working Paper No. 4, University of Salerno.

Poterba, J. (ed.) (1994), *International Comparisons of Household Savings,* Chicago, London: University of Chicago Press.