Aging Societies: Individual and Societal Plasticity

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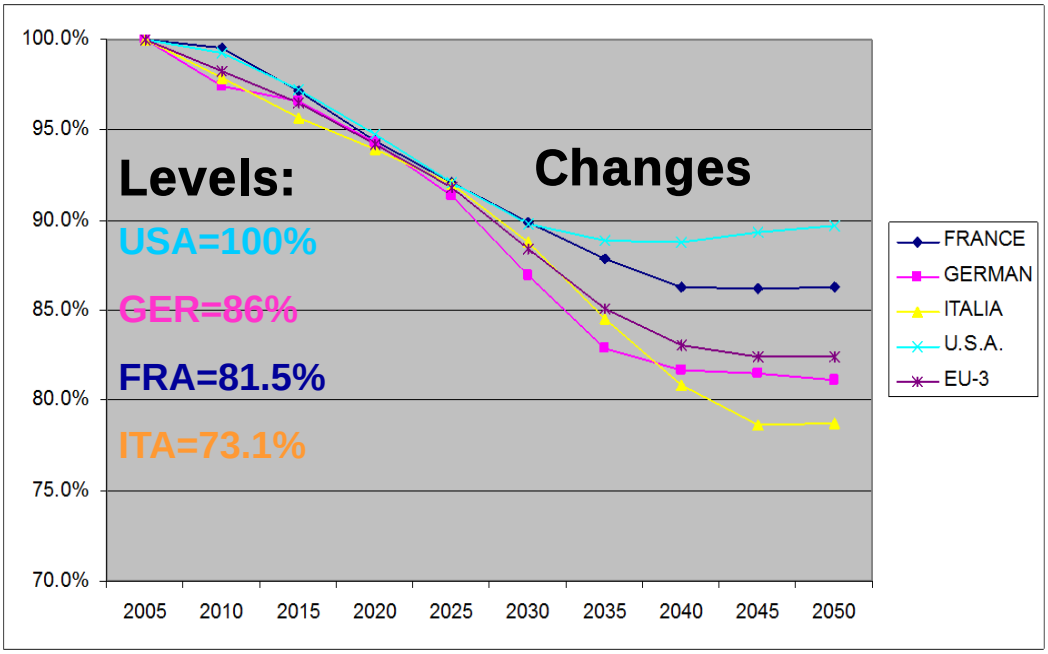
1. At a glance

Population aging occurs in almost all industrialized societies and is caused by low fertility, in particular the rapid transition from baby boom to baby bust, and an unbroken increase of longevity. We speak about aging societies – rather than populations – to highlight the economic, social and political challenges which societies as a whole, old and young, have to cope with when their populations age. Will they experience economic stagnation or even decline in terms of living standards? Will tensions between generations shatter the political systems? None of this will necessarily be the case. Rather, the key conclusion is that the main danger of population aging is the lack of adaptation to a new demographic situation. While modern psychology has shown the plasticity of individuals after health and personal shocks, it is less clear how plastic entire societies will be to the demographic shock. The analysis of individual behavioral reactions and of the social and political plasticity is therefore a primary object of research on aging societies. This article reviews the state of the art and necessities for future research from an economist's point of view. See Börsch-Supan (2013) for a more comprehensive survey.

2. Societal challenges

The key macroeconomic challenge of population aging is the decline of the share of working-age individuals in the population, see Figure 1 for three largest Continental European countries and the US, here defined as the share of individuals between age 20 and 65, normalized to 100% in 2005. The decline is large and shows dramatic differences across countries: it is more than twice as large in Italy as in the United States. Also France will experience a decline in its working age population, but much less so than Germany or Italy.

Figure 1: Working age population



Source: Own projection. Mortality based on a Lee-Carter decomposition using past mortality rate changes derived from the Human Mortality Database (2012); constant fertility rates (France: 1.89, Germany: 1.34, Italy: 1.29); and constant migration flows, based on the UN (2010) projection (France 100,000, Germany 150,000, Italy 135,000 net migrants p.a.).

Since labor is the most important factor of production, the force of population aging on economic growth is in first approximation proportional to the decline of the working age population. This is the main rationale for a bleak outlook on economic living standards, especially in rapidly aging countries like Italy and Germany.

On second view, however, the many versions of exhibits like Figure 1 which are shown in scientific publications as well as in the popular press exemplify the lack of plasticity of an aging society rather than the likely outcome of the aging process. They symbolize the misconception that aging necessarily implies declining living standards by falsely equating demography with economics. The quick conclusions drawn from Figure 1 and its siblings presuppose a fixed labor supply and unchanged institutions, such as labor markets and pension systems. The behavioral reactions to aging, however, are only very partially understood and require more research.

In theory, it is not that difficult to compensate for population aging since humans do not only have a much higher life expectancy than 50 years ago, they are also much healthier than in the 50s and 60s. Room to maneuver can be achieved by structural reforms which change the economic and social equations in an aging society. Pension and labor market reforms can lift current labor supply restrictions; they permit, e.g., later retirement by

actuarially designed pension systems (e.g., Börsch-Supan and Schnabel 1998, Gruber and Wise 2004), make more female labor force participation possible by providing better day care facilities (e.g., Sundström and Stafford 1992, Spiess 2011), or enable students to enter the labor market earlier by better organized education systems. On a purely numerical basis, a combination of the following four policies

(a) students start working two years earlier;

(b) women participate in the labor force as much as men;

(c) workers exit the labor force two years later;

(d) public pensions are organized on a defined contribution basis rather than as defined benefits;

would fully offset the above mentioned macroeconomic implications of population aging for Europe (Börsch-Supan, Härtl and Ludwig, 2014).

What may work numerically in theory, however, may not work as a political program in an aging society. The plasticity of a society is limited for a multitude of reasons. Understanding these reasons is the main opportunity and the challenge for research on aging societies. Human behavior is complex and innovative political actions may turn out with unexpected results. On a technical level, ill-designed part-time retirement opportunities have led in some countries (e.g., Finland and Germany) to the perverse result that in some sectors hours retirement age actually decreased (Börsch-Supan 2005, Hakola 2003). On the macroeconomic level, the long-term interactions between adaptions in the labor market, the health sector and education are not well understood (Krebs 2003, Bloom et al. 2004, Acemoglu and Johnson 2009, Hall and Jones 2007, Weil 2007, Caucutt and Lochner 2012, Vogel et al. 2012) because the intergenerational transmission of knowledge, skills, and health across generations in terms of habits, genes, family and social environments creates a positive but complex feedback loop involving all ages (Storesletten et al. 2004). On a political level, misconceptions about the short-term costs and the long-term benefits of structural reforms may lead to reform unwillingness or even backlash. Moreover, virtually all structural reforms have winners and losers and imply redistribution not only between the rich and the poor, but often also between the young and the old, creating veto groups which undermine or weaken societal plasticity.

3. Opportunities and challenges for the research on aging societies

This long list of unanswered questions reveals one hallmark of research on aging societies: almost every research question involves combinations of economics, health, sociology and highly political decisions. The necessary interdisciplinarity of research and the requirements of multi-disciplinary data sets is both an opportunity and a challenge. We select four exemplary research areas which are important for an assessment how adaptive a society can be in response to population aging.

3a. Age and health

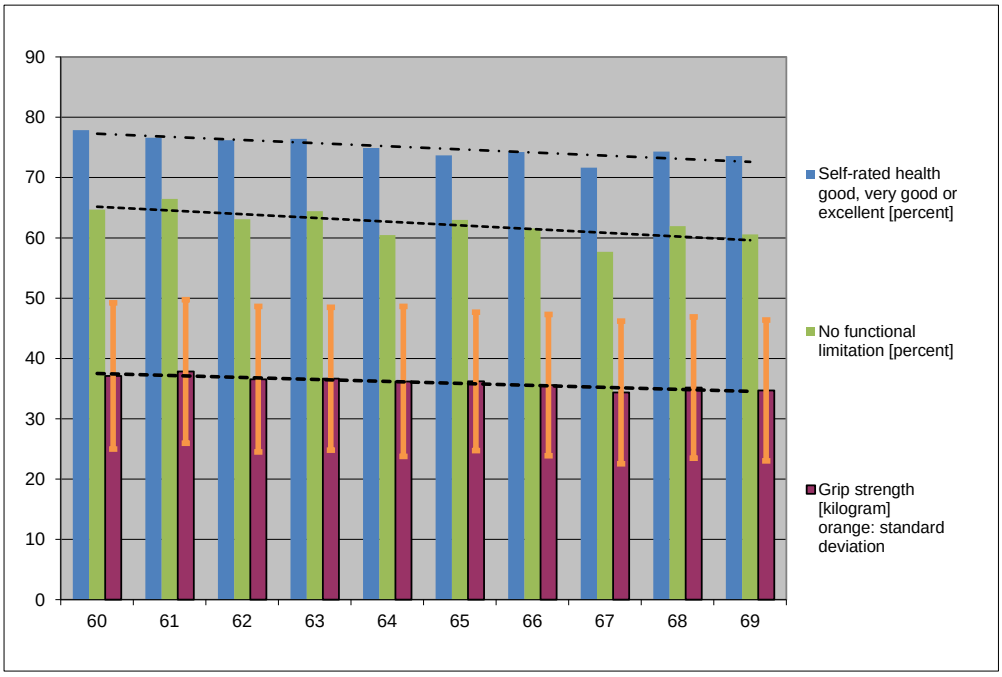
Adapting the institutional setting for retirement to the extended life expectancy is a particular salient example. This institutional setting ranges from the statutory retirement age with mandatory retirement to the eligibility details for early retirement, the actuarial adjustments to later pension receipt, the criteria for disability insurance, etc. There is ample evidence that changing this institutional setting is very effective in changing labor supply at older ages (Börsch-Supan 2000, Gruber and Wise 2004). The primary problem is therefore not the economic transmission of institutional changes into actual behavior, but the subtleties of the unequal distribution of health and the not so subtle political resistance against institutional changes.

Starting with the latter, it is not true that most workers are too sick to continue work until or after current statutory retirement ages, mostly 65. While there is no doubt that normal human aging is associated with progressive reductions in the function of many organs from their peak in early adulthood, the impact of these physiological changes on the capacity of individuals to function in society is quite modest (Rowe et al., 2009). The common exaggeration of the diminished function of older persons is due in part to archaic views of the elderly which overlook the significant compression of morbidity that has occurred over the past decades (Freedman et al. 2004).

Figure 2 is based on the Survey of Health, Aging and Retirement in Europe (SHARE, Börsch-Supan et al. 2013) and gives a detailed picture of health by age where health is measured in three degrees of subjectivity: self-assessed health (in 5 categories from excellent to poor); self-reported limitations in 10 different daily activities; and grip strength measured in kilogram. Older people in Europe perceive themselves as relatively healthy and perform well on the basis of both objective and subjective measurements. Although there is a decline in health between ages 60 and 69, it is much

smaller than the variation within each age group (shown as error bars for the grip strength measure). At age 69, there are about 7 percentage points more individuals affected by activity limitations than at age 60; shifting the retirement age from 65 to 67 years would therefore imply that only about 1.5 percentage points more workers have at least one activity limitation.

Figure 2: Subjective and objective health measures in Europe, age 60-69



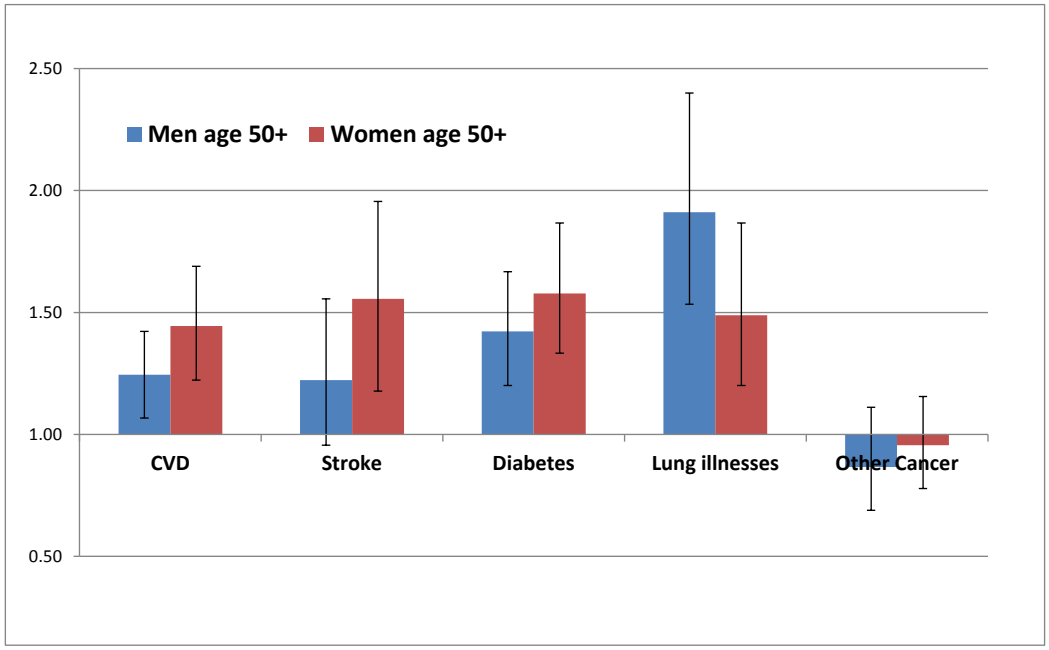
Source: Adapted from Börsch-Supan (2013), based on SHARE data.

More research is needed especially in two directions. First, the development of health at older ages appears to be different in the US and Europe (Hank 2011, Brandt, Deindl and Hank 2012). The optimistic view of Freedman et al. (2004) has given way to a more skeptical assessment in Freedman et al. (2013) which shows stagnation of health improvements in the US and warns that the past trends cannot be simply projected into the future. Similar signs are not apparent in Europe as the disability-free life expectancy has still increased between 2008 and 2011 (Eurostat 2013). What is different between the US and Europe causing this divergence?

One point of departure to explain this is the second dimension, visible in the large variation of functional and subjective health at any given age in Figure 2. Some of this variation is clearly related to socio-economic status. Figure 3, again based on SHARE data, shows the log-odds of certain diseases by education, separately for male and female. The red and blue bars indicate the difference between individuals who have no high-school degree versus those with at least a high-school degree (with the statistical

confidence indicated by the slim error bars). While the existence of a socio-economic gradient is clearly visible, the causal pathways behind this gradient are complex and controversial. It is noteworthy that illnesses associated with health behaviors (diabetes and lung cancer in Figure 3) exhibit particularly large gradients, while other cancers show none.

Figure 3: Relative frequencies of illnesses by education in Europe



Source: Avendano et al. (2005)

We know that health behavior is strongly correlated with education (Miguel and Kremer 2004, Fogel et al. 2011). This finding thus mirrors the role education plays in other social contexts, e.g., that the economic returns from education in the labor market and the health benefits associated with additional years of schooling have both expanded sharply over time. Another pathway is related to the work environment and work stress (Siegrist et al. 2005, Bryson and Ilmakunnas 2012). Both pathways show how important a life-course approach is to understand the variation of health at older ages. There is a large body of micro evidence from long panel data which shows how important the accumulation of skills and health is over extended time periods: better educated young and healthier middle-aged individuals attain higher life-time earnings (c.f. the articles in Börsch-Supan et al. 2011).

Research is difficult not only because of many other possible pathways; not even the direction of causality is clear. While early socio-economic differences have been found to influence later health outcomes, the reverse direction is also plausible. Healthy

children have better school grades and obtain better paying jobs, and a robust health helps adults to a steeper career (Case et al. 2005, Almond 2006, Black et al. 2007, Currie 2009, Kestenich et al. 2013). Main task for future research is to establish the weight of each of these coexisting pathways, better understand how social policies from income support to health care systems affect these pathways, and where the intervention points are in the course of life that could change health outcomes.

3b. Age and productivity

There is a widespread impression that older workers are less productive than younger workers. It even appears in popular economic textbooks (Lazear 1995, p. 40, figure 4.1). Often regarded as an established fact, it has profound implications for personnel policies by employers and retirement choices made by employees. It is used as a motivation for early retirement policies in many countries. Moreover, if the impression were true, population aging would have negative effects on overall productivity as the share of older workers is increasing, making population aging even more of a threat to living standards than already by a decreasing share of individuals in working age. The plasticity of an aging society to maintain living standards depends on its ability to keep older workers not only healthy, but also productive.

Estimating age-productivity profiles has been on the agenda of labor economists for a long time, see the reviews by Skirbekk 2004, Gelderblom 2006, and *Labour Economics'* recent "Special Issue: Ageing and Productivity" (Vol. 22, June 2013). It encounters fundamental challenges: measurement, selectivity/endogeneity, and aggregation. These methodological challenges have made it hard to distinguish fact from fiction and are a challenge for future research.

First, productivity is hard to measure directly. While it is well documented by occupational medicine, cognitive psychology, and gerontology that muscle strength, sight, lung, kidney, and heart functioning, and many other biometric indicators deteriorate from early age onwards, experience and the ability to deal with human nature appear to increase with age. Since the latter characteristics are hard to measure, there is a bias towards direct measures that decline early in life. This may have contributed to the above-mentioned impression. Some early studies use individual's wages as a productivity measure (e.g., Kotlikoff and Wise 1989, Kotlikoff and Gokhale 1992). Wages, however, often increase with age and/or seniority independently of

productivity, and wage *de*creases are extremely rare. Another method relies on managers' subjective evaluations of their employees' performance (e.g., Medoff and Abraham 1980, Salthouse and Maurer 1996). These supervisors' assessments are problematic because they may reflect prejudices about age-productivity profiles.

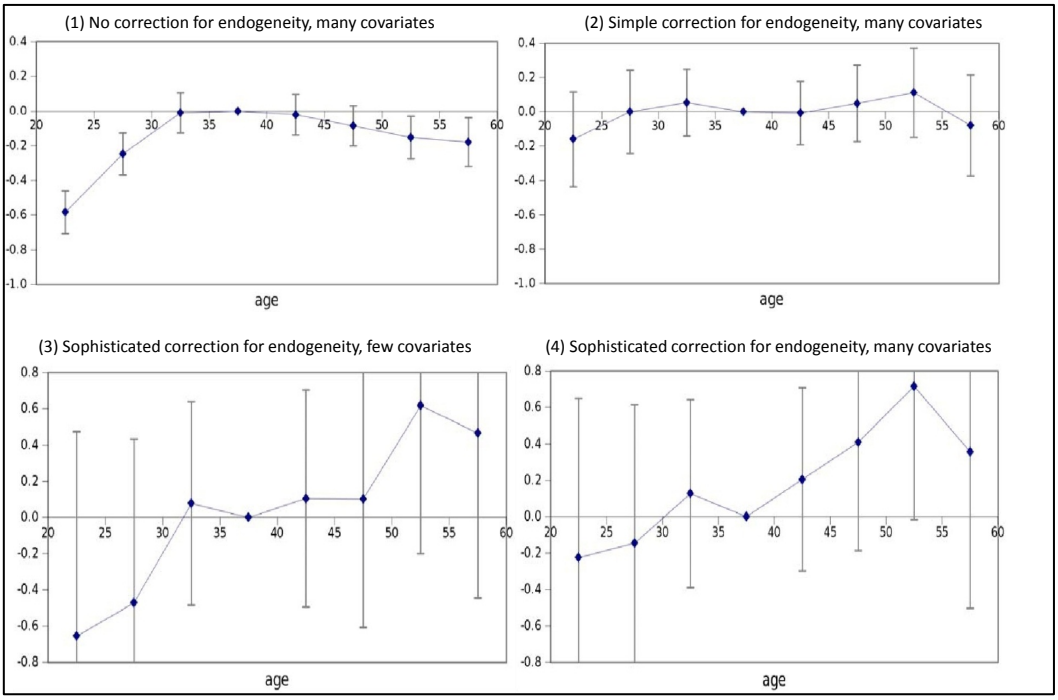
A second challenge is the potential endogeneity of the age composition through various selection processes. Being in the labor force is endogenous since employers are more likely to hold on to productive than unproductive workers. Hence plant closures and early retirement tend to create a positive selection of productive workers. A related endogeneity problem exists for the age-structure on the company level. Since more productive firms are usually more profitable, they expand and increase their workforce. This leads to a rejuvenation of their workforce because new hires are more likely to be young. Relating productivity to the age of the workforce in this case results in a spurious negative correlation between productivity and age.

Finding the right level of aggregation is the third challenge. An individualistic view fails to take into account that workers often work in teams and thereby affect one another's productivity. Older workers may devote some of their working time to helping younger workers or vice versa. In this case, an individualistic approach will underestimate older workers' and overestimate younger workers' productivity. Related aspects are workers' contributions to their team's work climate and how teams deal with emergency situations. A company view, on the other hand, obscures job heterogeneity and its interaction with motivation and thus productivity. One would expect, e.g., that the productivity effect of older workers on the shop floor whose careers have peaked is quite different from the productivity effect of equally old managers who still might have ambitions for a position at the company's top or a realistic chance to move to another company. Company-view regressions that average over different non-linear age-productivity profiles might therefore create misinterpretations.

Most studies which invest the age-productivity nexus therefore relate plant level productivity to the age of the plants' employees. Plant level productivity can be measured easily and reliably, and the level of aggregation is a compromise between individuals and companies. Nevertheless, the age structure of plans is probably not exogenous as pointed out before. Sophisticated econometric studies overcome the largest methodological problems at the expense of precision. The methodologically most convincing papers (Aubert 2003, Aubert und Crépon 2007, Malmberg et al 2008, Göbel

und Zwick 2009) estimate age-productivity profiles which increase up to the age of 50-55 years and then stay flat, contradicting the common perception. It is noteworthy that the relative productivity of older workers becomes higher when more sophisticated methodology is applied. At the same time, however, confidence bands get wider, see Figure 4.

Figure 4: Age-productivity profile for different econometric specifications



Source: Göbel und Zwick (2009)

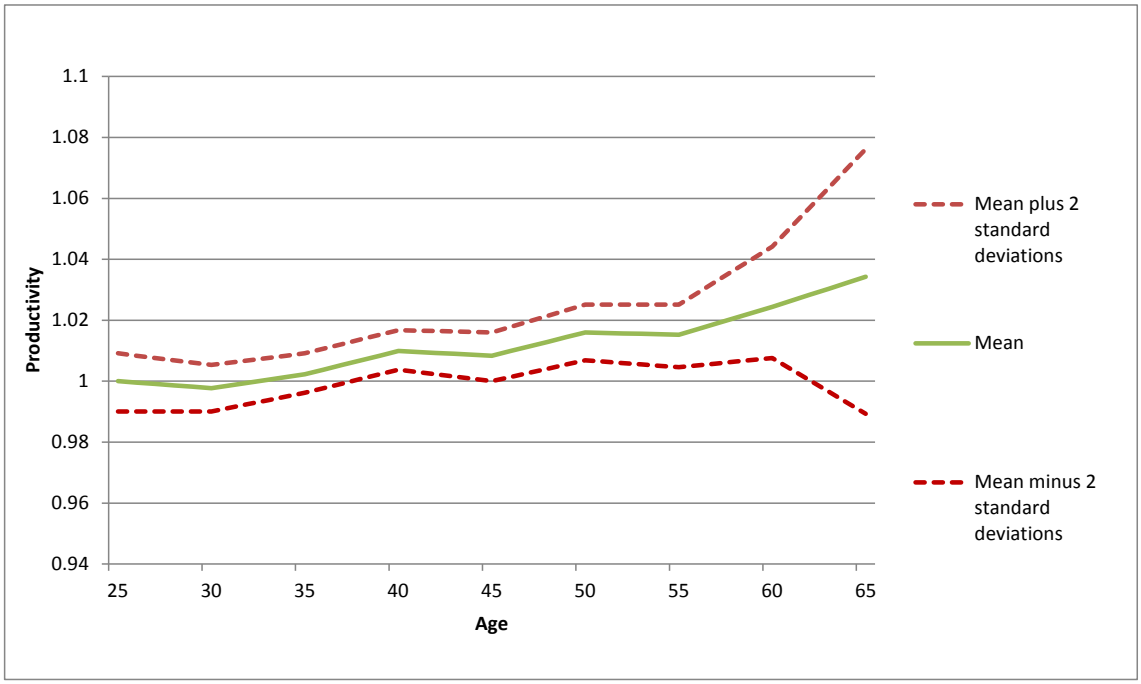
There are finally studies which employ direct measures of individual productivity like, e.g., the number and quality of publications in academic research, Nobel prizes, the value of artists' paintings, or performance in sports and chess. These studies are able to measure productivity quite precisely but the range of occupations, where this approach is feasible, is small. Moreover, these studies usually refer to top performance. In everyday work life, however, the workflow is customized to average rather than to top performance.

The study by Börsch-Supan, Düzgün and Weiss (2006) measures average performance of small working teams in a German truck assembly plant. This plant follows a highly taylorized production process typical for the manufacturing industry. Productivity can be nicely measured as the inverse number of mistakes made in assembling a standardized product in a fixed time. Compared to many service-sector jobs, productivity in this plant requires more physical strength, dexterity, agility etc. (which tend to

decline with age) than experience and knowledge of the human nature (which tend to increase with age). Hence, this setting is most likely to confirm the hypothesis of declining productivity with age.

It does not, however. Figure 5 shows the age-productivity profiles measured in this plant, based on more than 1.2 million observations. Due to the very large number of observations, a sophisticated identification strategy based on fixed effects and a two-sided selectivity correction is possible without losing as much precision as the plant-based studies. The estimates do not show a decline in the relevant age range. On the individual workers' level, productivity actually increases slightly up to the mandatory retirement age of 65 years, although the last years are subject an increasingly large measurement uncertainty.

Figure 5: Age and productivity on the assembly line



Source: Adapted from Börsch-Supan and Weiss (2010)

More research is needed to establish that this type of finding is not an outlier of a single case study but does indeed represent the findings by Göbel and Zwick (2009).

3c. Effects of retirement on health and well-being

In spite of better health and little signs of deteriorating productivity, early retirement is still widespread across Europe, and the reasons are obvious: an immediate benefit from early retirement is the receipt of income support without the necessity to continue working, enabling individuals to enjoy more leisure. Moreover, early retirement relieves

workers who feel constrained in their place of work, whether due to stressful job conditions or to work-impeding health problems. For such individuals, early retirement should manifest itself in an improvement of well-being and, potentially, also health. On the other hand, however, research has uncovered less pleasant side effects. Early retirement might be harmful because individuals who stop working may lose a purpose in life. This might, in turn, decrease subjective well-being and mental health. Charles (2002) studied the effect of retirement on depression, and Lindeboom et al. (2002) studied the effect of retirement and other factors (a significant decrease in income, death of the spouse, disability, and a move to a nursing home) on the mental health of elderly individuals, using data from the Longitudinal Aging Study Amsterdam (LASA). Moreover, recent biological and psychological research has shown that an active life better maintains the brain and slows down cognitive decline (e.g.: Voelcker-Rehage, Godde and Staudinger, 2010; Mühlig-Versen and Staudinger, 2012; Nyberg et al. 2012). Research on these issues is important because the willingness to change retirement institutions depends on a generally accepted assessment how much retirement adds to the well-being of retirees.

Such research is complicated by the fact that the measures of well-being and health which are commonly available in surveys may suffer from justification bias (Bound, 1991). That is, early retirees may report worse health in order to justify their early exit from the workforce. Moreover, early retirement is not an exogenous outcome, but is likely to be related to ill health and lower cognitive abilities. For example, persons in bad health are likely to retire earlier but also to report worse life satisfaction. Finally, those that hope or believe that life satisfaction will increase after retirement are more likely to retire at any age. Cause and effect are entangled in many ways.

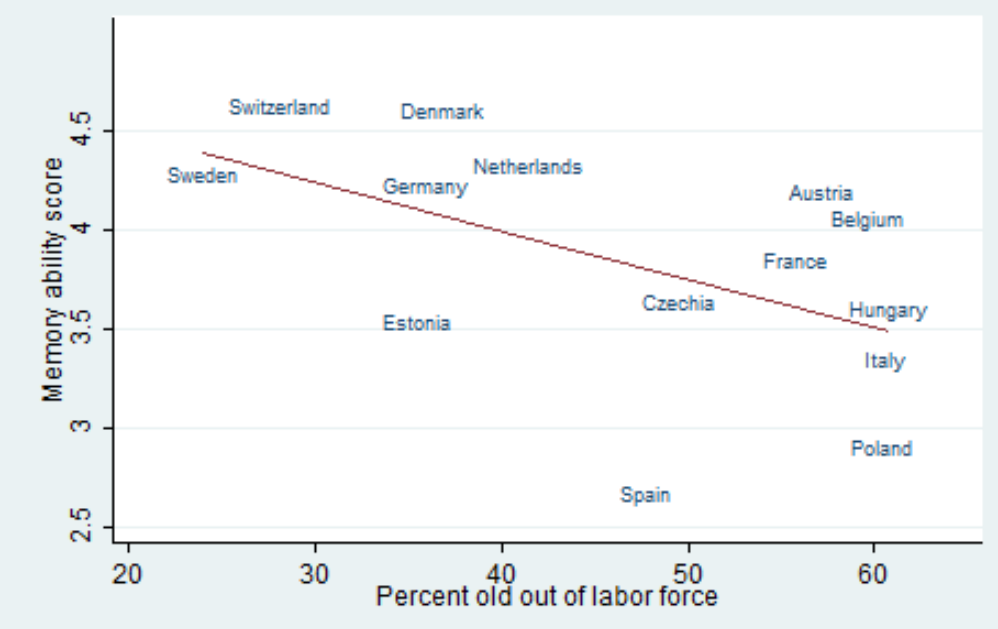
The separation of selection effects and reverse causality from the genuine impacts of early retirement on well-being and health requires advanced econometric techniques which tend to make results controversial. The econometric problem is to find a counterfactual value for well-being and health had a person not taken early retirement. The usual instruments for identifying such a counterfactual are policy changes in early retirement rules, such as changes in the pensionable age or changes in the actuarial adjustments. Internationally comparable data are useful in this respect, as they provide institutional variation across countries and the necessary counterfactuals. Moreover, panels which include data on health and well-being in earlier stages of life are important

because such information can be used in conditioning variables which reduce selectivity bias.

Börsch-Supan and Jürges (2006), using the German Socio-Economic Panel data, found that individuals were less happy in the year of early retirement than in the years before and after retirement. This holds after purging selection effects thanks to a large set of conditioning variables measured before retirement. Moreover, individuals generally attained their pre-retirement satisfaction levels relatively soon after retirement. Hence, the early retirement effect on well-being appears to be negative and short-lived rather than positive and long-lasting, similar to what occurs in the set point model of happiness by Clark et al. (2003).

A seminal paper by Adam, Bonsang, Perelman et al. (2007) based on SHARE found that cognition—measured mainly by memory abilities such as delayed word recall—declined during retirement. Figure 6 shows an updated version of the aggregate correlation, using data from all available SHARE waves.

Figure 6: Cognition and early retirement



Source: Own computation based on SHARE wave 4. The R-squared of the correlation is 28%.

This controversial finding has sparked an entire new strand of literature. While there are a few papers with the opposite result (e.g. Coe et al. 2008, 2012), most studies confirm the early findings (e.g. Rohwedder and Willis, 2010; Bonsang, Perelman et al. 2010, Mazzonna and Peracchi, 2012). They also show that the negative effect on cognition increases with the time in retirement. For a given age, early retirees suffer more from

cognitive decline than later retirees, even after correcting for selection and reverse causality effects. An internationally comparable data set such as SHARE is essential for this research because it contains instruments such as the eligibility age for early and normal retirement or similar institutional characteristics that contain individual variation.

Research is now proceeding to look for the deeper reasons behind these findings. One causal pathway is a direct one: skills must be used, otherwise they get lost (Rowe and Kahn 1998, Schooler et al. 1999). Another pathway hinges on the anchoring function of employment. Work, even if unpleasant and arduous, provides social contacts. Even disliked colleagues or a bad boss appear to be better than social isolation because they provide cognitive challenges which keep the mind active and healthy (Börsch-Supan and Schuth 2013, Wrzus et al. 2013).

3d. Intergenerational cohesion

Possible intergenerational conflict in an aging society has very much occupied the popular press, particularly in the US (Peterson 1999), but also in Europe (ZDF 2007). It presumes that elders will be voting exclusively on the basis of their material self-interests in augmenting public expenditures on pensions and other old-age entitlements, thereby simultaneously eroding support for educational and other programs that are critical to the future of younger generations. Those who adhere to this scenario also posit that young and middle-aged voters will act politically to reduce their support of elders. This belief is damaging because it creates a blockage of economic policy reforms and thus the plasticity of an aging population.

This line of reasoning is also pursued by some US and European political economist. Thurow (1996) depicted American aging boomers as a dominant bloc of voters whose self-interested pursuit of old-age entitlement benefits will pose a fundamental threat to democracy. Sinn and Übelmesser (2002), among others in Germany, warned of missing the last chance for pension reform as the median's voter age is changing rapidly. Less alarmistically, Kohli (2005) conjectured that future distributive conflicts over public resources will be played out less along lines of class, skill, or ideology, but more between generations. Italian economists have developed an entire strand of models that link the median voter's age to politically feasible pension designs (e.g., Galasso and Profeta 2004, Galasso 2006).

There are good reasons to be doubtful that these views are correct. For the US, Binstock (2010) points out that Thurow's statement, that "the elderly" will be approaching a voting majority in the US, is a considerable distortion of the facts. Even when all US boomers are age 65 and older in 2030, that age group will still be only about 23 percent of voting-age Americans, and it will not exceed 25% until 2050. This is, however, about the share of elder individuals prevalent in Europe these days. The Italian median voter is 49 years old, eight years younger than the average age of retirement in Italy. In Germany, less extreme, the median voter is two years younger and the retirement age 4 years later than in Italy, but most likely more concerned with pensions than child support. And Europe is continuing to age, even at a faster pace than the US. Hence, the current European societies can serve as example of what could happen in the US.

Börsch-Supan, Heller and Reil-Held (2011) exploit the variation in the age structure of European regions to test whether the vision of "generational warfare" with a breakdown of intergenerational cohesion has some truth in "Old Europe". Their approach was to link a large set of dimensions of intergenerational cohesion (e.g., strength of family relations, non-family ties, values, and political preferences) to the old-age dependency ratio. If the gerontocracy hypothesis were true, intergenerational cohesion should be negatively related to the old-age dependency ratio. Of the 22 dimensions analyzed, only 8 were in line with the hypothesis (and only 5 of those significantly). In 16 dimensions, the opposite was the case (8 significantly): the older a region, the more intense were the respective dimensions of intergenerational cohesion.

These findings suggest that intergenerational cohesion is not systematically related to the age structure of European regions. Some aspects of intergenerational cohesion fare better in older societies, like trust to older and younger family members or that fewer people experience age discrimination. On the other hand, there are fewer people having young friends or meeting socially in older regions. The basic premise of those who think that reforms are impossible in an aged society – namely purely selfish political preferences – is specifically rejected as it was in earlier studies by Boeri, Börsch-Supan and Tabellini (2001, 2002).

In fact, family ties are still very strong all over Europe (Kohli, Künemund and Vogel, 2005, Hank 2007). Children are still the most important source of support in old age, especially when there is no partner (Brandt, Haberkern and Szydlik 2009, Deindl and Brandt 2011). A lot is known about intergenerational transfers by now, with much focus

on variation by country and social policy regime (Brandt 2013, Brandt and Deindl 2013). Surprisingly little research, however, has addressed the support network of the elderly with no or distant children. Given the challenges from rising childlessness (Rowland 2007), this is an important opportunity for future research, in particular the trade-off between public and private care for families with few potential care-givers (Albertini and Mencarini 2012).

4. Conclusions

The main danger of population aging is the lack of adaptation to a new demographic situation. The analysis of individual behavioral reactions and of the social and political plasticity should therefore be the primary objects of research on aging societies.

Evidence is needed to show that structural reforms have paid off. The subject of aging is particularly loaded with highly emotional prejudices and myths, and evidence is needed to disprove them.

International evidence is valuable because it provides variation in the age structure from which we can learn what happens when societies age. The variation is large between, e.g., the US on the one hand and Germany, Italy, and Japan on the other hand. But there is useful variation even across regions within European countries.

Detailed life-course data is especially helpful because individual characteristics at older ages arise from the cumulated influences over the entire life and many simultaneous causal pathways are possible. The emergence of very long panel and life history data is very promising in teasing out specific pathways for a better understanding of the long-term mechanisms in an aging society.

References

Acemoglu, D. and S. Johnson (2009): Disease and Development - The Effect of Life Expectancy on Economic Growth. *Journal of Political Economy* 115(6): 925-985

Adam, Stéphane, Bonsang, Eric, Germain, Sophie, Perelman, Sergio (2007): "Retirement and cognitive reserve: a stochastic frontier approach applied to survey data". In: *CREPP working papers* 2007/04, HEC-ULg.

Albertini, M. and L. Mencarini (2012) Childlessness and Support Networks in Later Life: New Pressures on Familistic Welfare States? *Journal of Family Issues*. Published online November.

Almond, D. (2006): Is the 1918 Influenza Pandemic Over? Long-Term Effects of In Utero Influenza Exposure in the Post-1940 U.S. Population, *Journal of Political Economy,* Vol. 114, No. 4 (August 2006), pp. 672-7.

Attanasio, O.P., Kitao, S. and G.L. Violante (2007): Global Demographic Trends and Social Security Reform, *Journal of Monetary Economics*, 57(1), 144-198.

Aubert, P. (2003): "Productivity, wage and demand for elder workers; an examination on French matched employer-employee data," Working Paper INSEE, Paris.

Aubert, P., and B. Crépon (2007): "Are Older Workers Less Productive? Firm-Level Evidence on Age-Productivity and Age-Wage Profiles," mimeo.

Avendano, M., A. R. Aro, and J. Mackenbach (2005): Socio-Economic Disparities in Physical Health in 10 European Countries, in: Börsch-Supan, A., Brugiavini, A., Jürges, H., Mackenbach, J., Siegrist, J. und G. Weber (eds.), *Health, Ageing and Retirement in Europe - First Results from the Survey of Health, Ageing, and Retirement in Europe*, MEA, Mannheim.

Binstock, R. H. (2010): From Compassionate Ageism to Intergenerational Conflict? *The Gerontologist,* Vol. 50, No. 5, 574–585.

Black, S.E., P.J. Devereux and K.G. Salvanes (2007): From the Cradle to the Labor Market? The Effect of Birth Weight on Adult Outcomes, *The Quarterly Journal of Economics* 122 (1): 409-439

Bloom, D.E., D. Canning And J. Sevilla (2004): The Effect Of Health On Economic Growth: A Production Function Approach, *World Development* Vol. 32, No. 1, Pp. 1–13

Boeri, T., A. Börsch-Supan and G. Tabellini, 2001, Would you like to shrink the Welfare State? A Survey of European Citizens, *Economic Policy*, Vol. 32, 7-50.

Boeri, T., A. Börsch-Supan and G. Tabellini, 2002, Pension Reforms and the Opinions of European Citizens, *American Economic Review*, Vol. 92, No. 2, 396-401.

Bonsang, Eric, Adam, Stéphane, Perelman, Sergio (2010): "Does retirement affect cognitive functioning?". In: *ROA Research Memorandum* 2010/1, Maastricht University.

Börsch-Supan, A., and R. Schnabel (1998): Social Security and Declining Labor-Force Participation in Germany. *American Economic Review 88*, 173-178.

Börsch-Supan, A. (2000): Incentive Effects of Social Security on Labor Force Participation: Evidence in Germany and Across Europe. *Journal of Public Economics*, Vol. 78, 25-49.

Börsch-Supan, A. (2005): The Finnish 2005 Pension Reform (Suomen vuoden 2005 eläkeuudistus), *The Finnish Economic Journal,* Vol. 1/2005, 101.vsk, 52-71.

Börsch-Supan, A., Düzgün, I. und M. Weiss (2006): Age and Productivity: Evidence from the Assembly Line, *Demographie - Mitteilungen der Deutschen Gesellschaft für Demographie e.V.*, Vol. 5, No. 9, 9.

Börsch-Supan, A. und M. Weiss (2010): Erfahrungswissen in der Arbeitswelt, In: Kruse, A. (Hrsg.), *Potenziale im Altern. Chancen und Aufgaben für Individuum und Gesellschaft*, AKA, Heidelberg, 221-234.

Börsch-Supan, A., and H. Jürges, (2006): "Early Retirement, Social Security and Well-Being in Germany". In: *NBER Working Paper* 12303.

Börsch-Supan, A., G. Heller and A. Reil-Held (2011): Is Intergenerational Cohesion Falling Apart in Old Europe? *Public Policy and Aging Report*, 21, 4, 17-21.

Börsch-Supan, A., Brandt, M., Hank, K. und M. Schröder (eds., 2011): *The Individual and the Welfare State: Life Histories in Europe*. Springer, Heidelberg.

Börsch-Supan, A., and M. Schuth (2013): Early retirement, mental health, and social networks, in: Börsch-Supan, A., M. Brandt, K. Andersen-Ranberg, H. Litwin, and G. Weber (eds.), *Active Ageing and Solidarity between Generations in Europe: First Results from SHARE after the Economic Crisis*, De Gruyter, Berlin

Börsch-Supan, Axel; Brandt, Martina; Hunkler, Christian; Kneip, Thorsten; Korbmacher, Julie; Malter, Frederic; Schaan, Barbara; Stuck, Stephanie; Zuber, Sabrina (2013): *Data Resource Profile: The Survey of Health, Ageing and Retirement in Europe (SHARE)*, International Journal of Epidemiology, doi: 10.1093/ije/dyt088.

Börsch-Supan, A. (2013): Myths, Scientific Evidence and Economic Policy in an Aging World, *Journal of the Economics of Ageing* 1:1.

Börsch-Supan, A., K. Härtl and A. Ludwig (2014): Aging in Europe: Reforms, international diversification and behavioral reactions, *American Economic Review*, forthcoming in May 2014.

Bound, J. (1991): "Self-Reported Versus Objective Measures of Health in Retirement Models". In: *Journal of Human Resources* 26, p. 106-138.

Brandt, Martina; Deindl, Christian; Hank, Karsten (2012): *Tracing the Origins of Successful Aging: The Role of Childhood Conditions and Societal Context*, Social Science and Medicine, 74, 9 1418-1425

Brandt, M. (2013) Intergenerational help and public assistance in Europe: a case of specialization? *European Societies*. 15(1), p. 26-56.

Brandt, M. and C. Deindl (2013) Intergenerational Transfers to Adult Children in Europe: Do Social Policies Matter? *Journal of Marriage and Family*. 75(1), p. 235-251.

Brandt, M., K. Haberkern, and M. Szydlik (2009) Intergenerational help and care in Europe. *European Sociological Review*. 25(5), p. 585-601.

Brooks, R. (2003): Population aging and global capital flows in a parallel universe. *IMF Staff Papers*, International Monetary Fund, Washington, D.C.

Bryson, A., and P. Ilmakunnas (2012): Wellbeing in the workplace: the impact of modern management, Centre for Economic Performance, London School of Economics.

Case, A., A. Fertig, and C. Paxson (2005), The lasting impact of childhood health and circumstance, *Journal of Health Economics*, Vol 24, p. 365–389;

Caucutt, E. and L. Lochner (2012). Early and Late Human Capital Investments, Borrowing Constraints, and the Family. University of Western Ontario Working Paper

Charles, Kerwin Kofi (2002): "Is retirement depressing? Labor force inactivity and psychological well-being in later life". In: *NBER Working Paper* 9033.

Clark, Andrew E., Diener, Ed, Georgellis, Yannis, Lucas, Richard E. (2003): "Lags and leads in life satisfaction. A test of the baseline hypothesis". In: *DIW Discussion Paper* 37.

Coe, Norma B., Lindeboom, Maarten (2008): "Does retirement kill you? Evidence from early retirement windows". In: *CentER Discussion Paper Series* 2008-93.

Coe, Norma B., von Gaudecker, Hans-Martin, Lindeboom, Maarten, Maurer, Jürgen (2012): "The effect of retirement on cognitive functioning". In: *Health Economics* 21(8), p. 913-927.

Currie, J. (2009): Healthy, Wealthy, and Wise: Socioeconomic Status, Poor Health in Childhood, and HumanCapital Development, *Journal of Economic Literature*, Vol. 47, No. 1, pp. 87-122

Deindl, C. and M. Brandt (2011) Financial support and practical help between older parents and their middle-aged children in Europe. *Ageing and Society*. 31(4), p. 645.

Eurostat (2013): http://ec.europa.eu/eurostat/. (online data code: hlth_hlye).

Fogel, Robert W., Roderick Floud, Bernard Harris, and Sok Chul Hong (2011): *The Changing Body: Health, Nutrition, and Human Development in the Western World since 1700*. Cambridge University Press.

Freedman, V.A., Crimmins, E.M., Schoeni, R.F., Spillman, B., Aykan, H., Kramarow, E., Land, K., Manton, K., Martin, L.G., Shinberg, D., and Waidmann, T. (2004): Resolving inconsistencies in old-age disability trends: Report from a technical working group. *Demography*, 41(3), 417-441.

Freedman, Vicki, Brenda Spillman, Patti Andreski, Jennifer C. Cornman, Eileen Crimmins, Ellen Kramarow, James Lubitz, Linda Martin, Sharon Merkin, Robert F. Schoeni, Teresa Seeman, and Timothy Waidmann. (2013): Trends in Late-Life Activity Limitations: An Update from 5 National Surveys. *Demography*. NIHMSID: NIHMS365791.

Galasso, V. & P. Profeta (2004): Lessons for an Aging Society: the Political Sustainability of Social Security Systems, *Economic Policy*: 63-115

Galasso, V. (2006): *The Political Future of Social Security in Aging Societies*, The MIT Press.

Gelderblom, A. (2006): "The Relationship of Age with Productivity and Wages", Chapter 6 in: *Ageing and Employment: Identification of Good Practice to Increase Job Opportunities and Maintain Older Workers in Employment*, Final Report to the European Commission, DG Employment, http://ec.europa.eu/social/BlobServlet?docId=2073&langId=en

Göbel, C. and T. Zwick (2009): "Age and Productivity – Evidence from Linked Employer Employee Data," ZEW Discussion Paper No. 09-020, Zentrum für Europäische Wirtschaftsforschung.

Gruber, J., and D.A. Wise (Eds., 2004): *Social Security Programs and Retirement around the World: Micro Estimation*, The University of Chicago Press, Chicago.

Hakola, T. (2003): Economic Incentives and Labour Market Transitions of the Aged Finnish Workforce, Government Institute for Economic Research, http://www.vatt.fi/publications/research.

Hank, K. (2007): Proximity and Contacts Between Older Parents and Their Children: A European Comparison, Journal of Marriage and Family, 69 (1), 157-173.

Hank, K. (2011): How "Successful" Do Older Europeans Age? Findings From SHARE, *Journal of Gerontology: Social Sciences*, 66B (2), 230-236.

Hall, R., and C. Jones (2007): The Value of Life and the Rise in Health Spending, *The Quarterly Journal of Economics*, 122(1): 39–72.

Human Mortality Database (2012): http://www.mortality.org.

Kesternich**,** I., B. Siflinger, J.P. Smith and J. Winter (2013): The Effects of World War II on Economic and Health Outcomes across Europe, *The Review of Econonmics and Statistics*, fortcoming.

Kohli, M. (2005): Ageing and Justice. In: R. Binstock and L. George (eds): *Handbook of aging and the social sciences* (5th ed.). Academic Press, San Diego.

Kohli, M., H. Künemund and C. Vogel (2005): Shrinking Families? Marital Status, Childlessness, and Intergenerational Relationships, In: Börsch-Supan, A., Brugiavini, A., Jürges, H., Mackenbach, J., Siegrist, J. und G. Weber (eds.), *Health, Ageing and Retirement in Europe - First Results from SHARE*, Mannheim Research Institute for the Economics of Aging, Mannheim.

Kotlikoff, L. and D. Wise (1989): Employee Retirement and a Firm's Pension Plan, in D.A. Wise, ed., *The Economics of Aging*, Chicago: University of Chicago Press, 279-334.

Kotlikoff, L. J., and J. Gokhale (1992): "Estimating a Firm's Age-Productivity Profile Using the Present Value of Workers' Earnings," *Quarterly Journal of Economics*, 107(4), 1215 — 1242.

Krebs, T. (2003): Human Capital Risk and Economic Growth. *Quarterly Journal of Economics* 118: 709–745.

Lazear, E. (1995): *Personnel Economics*, MIT-Press: Cambridge, Mass.

Lindeboom, Maarten, Portrait, France, van den Berg, Gerard J. (2002): "An Econometric Analysis of the Mental-Health Effects of Major Events in the Life of Elderly Individuals". In: *Health Economics* 11, p. 505-520.

Malmberg, B., T. Lindh, and M. Halvarsson (2008): "Productivity Consequences at the Plant Level of Work-Force Ageing: Stagnation or a Horndal Effect?," *Population and Development Review*, 34, 238 – 256.

Mazzonna, Fabrizio, Peracchi, Franco (2012): "Aging, cognitive abilities and retirement". In: *European Economic Review* 56(4), p. 691–710.

Medoff, J. L., and K. G. Abraham (1980): "Experience, Performance, and Earnings," *Quarterly Journal of Economics*, 95(4), 703-736.

Miguel, E. and M. Kremer (2004). Worms: Identifying Impacts on Education and Health in the Presence of Treatment Externalities. *Econometrica* (72): 159-217

Mühlig-Versen, A., Bowen, C. E., and Staudinger, U. M. (2012): Personality plasticity in later adulthood: Contextual and personal resources are needed to increase openness to new experiences. *Psychology and Aging*, 27(4), 855-866.

Nyberg, L., Lövdén, M., Riklund, K., Lindenberger, U., and Bäckman, L. (2012). Memory aging and brain maintenance. *Trends in Cognitive Sciences*, 16, 292-305

Peterson, P.G. (1999): *Gray dawn: How the coming age wave will transform America and the world.* New York: Times Books.

Rohwedder, Susann, Willis, Robert J. (2010): "Mental retirement". In: *Journal of Economic Perspectives* 24(1), p. 119-138.

Rowe, J. W., & Kahn, R. L. (1998). *Successful aging.* New York: Pantheon Books.

Rowe, J. W., Berkman, L. F., Binstock, R., Börsch-Supan, A., Cacioppo, J., Carstensen, L., Goldman, D., Fried, L., Jackson, J., Kohli, M., Olshansky, J. and J. Rother, (2009): Facts and Fictions about an Aging America, *Contexts*, Vol. 8, No. 4, 16–21.

Rowland, D.T. (2007) Historical Trends in Childlessness. *Journal of Family Issues*. 28(10), p. 1311-1337.

Salthouse, T. A., and T. J. Maurer (1996): "Aging, Job Performance, and Career Development," in *Handbook of the Psychology of Aging*, 4th Edition, ed. by J. E. Birren, and K. W. Schaie, pp. 353 — 364. Kluwer Academic Publishers, New York.

Schooler, C., Mulatu, M. S., & Oates, G. (1999): The continuing effects of substantively complex work on the intellectual functioning of older workers. *Psychology and Aging, 14,* 483–506.

Siegrist, J., O. von dem Knesebeck, and M. Wahrendorf (2005): Quality of Employment and Well-Being, in: Börsch-Supan, A., Brugiavini, A., Jürges, H., Mackenbach, J., Siegrist, J. und G. Weber (eds.), *Health, Ageing and Retirement in Europe - First Results form the Survey of Health, Ageing, and Retirement in Europe*, MEA, Mannheim.

Sinn, H.W., and S. Übelmesser (2002): Pensions and the Path to Gerontocracy in Germany. *European Journal of Political Economy* 19: 153-58.

Skirbekk, V. (2004): "Age and Individual Productivity: A Literature Survey," in *Vienna Yearbook of Population Research*, ed. by G. Feichtinger, Vienna. Verlag der Österreichischen Akademie der Wissenschaften, Vienna.

Spiess, K. (2011): Vereinbarkeit von Familie und Beruf – wir wirksam sind deutsche "Care Policies"?, in: *Perspektiven der Wirtschaftspolitik*, Special Issue 12, 4-27.

Storesletten, K., C. Telmer, and A. Yaron (2004): Consumption and risk sharing over the life cycle, *Journal of Monetary Economics* 51(3), 609-633

Sundström, M., and F.P. Stafford (1992): Female labour force articipation, fertility and public policy in Sweden, *European Journal of Population* 8, 199-215.

Thurow, L.C. (1996): The birth of a revolutionary class. *New York Times Magazine*, May 19, 46-47.

Vogel, E., Ludwig, A. and A. Börsch-Supan (2012): Aging and Pension Reform. Extending the Retirement Age and Human Capital Formation. *European Central Bank, Working Paper Series* 1476.

Voelcker-Rehage, C., B. Godde und U.M. Staudinger (2010): Physical and motor fitness are both related to cognition in old age. *European Journal of Neuroscience* 31, 167–176.

Weil, David N. (2007): Accounting for The Effect of Health on Economic Growth, *Quarterly Journal of Economics*, 122(3): 1265-1306

Wrzus, C., M. Hänel, J. Wagner, and F. J. Neyer (2013): Social Network Changes and Life Events Across the Life Span: A Meta-Analysis, *Psychological Bulletin* 139, 1, 53–80

Zweites Deutsches Fernsehen (2007): *Aufstand der Alten (Rebellion of the Elderly*), Television Series.