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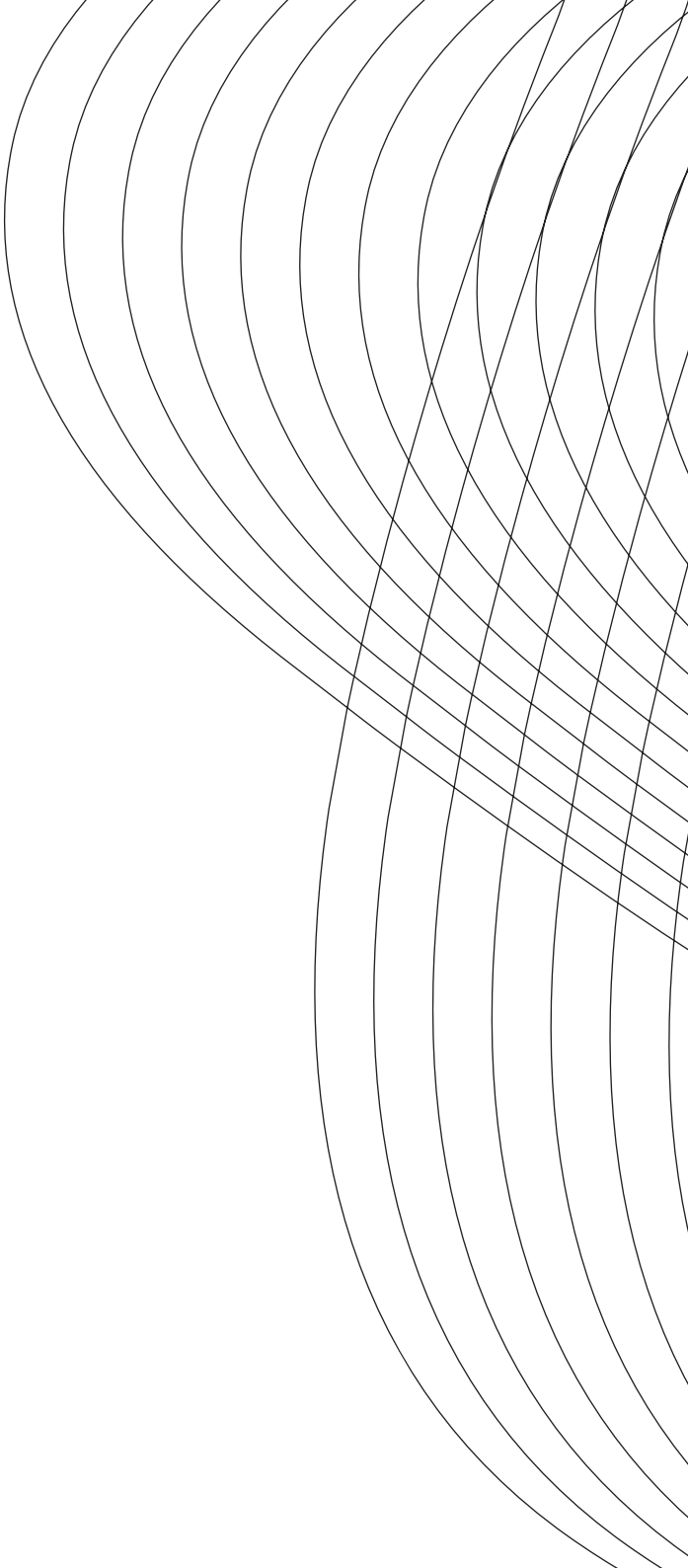
Matthijs Kalmijn and Rob Alessie

Life course changes in income: An exploration of age- and stage effects in a 15-year panel in the Netherlands



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PREFACE

Netspar stimulates debate and fundamental research in the field of pensions, aging and retirement. The aging of the population is front-page news, as many baby boomers are now moving into retirement. More generally, people live longer and in better health while at the same time families choose to have fewer children. Although the aging of the population often gets negative attention, with bleak pictures painted of the doubling of the ratio of the number of people aged 65 and older to the number of the working population during the next decades, it must, at the same time, be a boon to society that so many people are living longer and healthier lives. Can the falling number of working young afford to pay the pensions for a growing number of pensioners? Do people have to work a longer working week and postpone retirement? Or should the pensions be cut or the premiums paid by the working population be raised to afford social security for a growing group of pensioners? Should people be encouraged to take more responsibility for their own pension? What is the changing role of employers associations and trade unions in the organization of pensions? Can and are people prepared to undertake investment for their own pension, or are they happy to leave this to the pension funds? Who takes responsibility for the pension funds? How can a transparent and level playing field for pension funds and insurance companies be ensured? How should an acceptable trade-off be struck between social goals such as solidarity between young and old, or rich and poor, and individual freedom? But most important of all: how can the benefits of living longer and healthier be harnessed for a happier and more prosperous society?

The Netspar Panel Papers aim to meet the demand for understanding the ever-expanding academic literature on the consequences of aging populations. They also aim to help give a better scientific underpinning of policy advice. They attempt to provide a survey of the latest and most relevant research, try to explain this in a non-technical manner and outline the implications for policy questions faced by Netspar's partners. Let there be no mistake. In many ways, formulating such a position paper

is a tougher task than writing an academic paper or an op-ed piece. The authors have benefitted from the comments of the Editorial Board on various drafts and also from the discussions during the presentation of their paper at a Netspar Panel Meeting.

I hope the result helps reaching Netspar's aim to stimulate social innovation in addressing the challenges and opportunities raised by aging in an efficient and equitable manner and in an international setting.

Henk Don
Chairman of the Netspar Editorial Board

ABSTRACT

This paper describes life course changes in income in the Netherlands. Life course changes are distinguished in 'age' effects and 'stage' effects. Age effects are the changes in income that occur when people grow older. Stage effects are changes in income that people experience after demographic events such as entering marriage, having children and getting divorced. Previous analyses of such effects were often based on cross-sectional data. This paper uses new panel data to analyze income dynamics. The panel consists of annual tax records for a large sample of individuals over a 15-year period (1989-2004). Tax records were matched with individual information from the (municipal) registers on respondents' ages and living arrangements. Using age-cohort analyses as well as fixed-effects regression models, we observe that the age-income pattern is less pronounced when it is analyzed in a real dynamic perspective. There is indeed an income increase during the early adulthood stage, but the subsequent 'child valley' or life cycle squeeze is less pronounced than has been believed. Moreover, the decline in income during old age is less pronounced than cross-sectional studies have suggested. We also see, however, that the form of the age patterns is sensitive to the way in which period effects are taken into account. We further observe positive effects on income of marriage, and negative effects of children and divorce— but these effects are to a large extent due to the economies of scale of living together and to the (assumed) costs of children, and less to real changes in income. There is also no real increase in income after the children leave home, only the costs of a household decline. We end with a critical discussion of the role of equivalence scales in income dynamics, and argue that more research is needed on the consumption side of household income dynamics.

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LIFE COURSE CHANGES IN INCOME: AN EXPLORATION OF AGE- AND STAGE EFFECTS IN A 15-YEAR PANEL IN THE NETHERLANDS

1. Introduction

How does an individual's income position change over the life course? To answer this question, this paper presents a dynamic view of the income position of individuals in the Netherlands in the period between 1989 and 2004. When we speak of life course changes, we make a distinction between 'age' effects and 'stage' effects (Kalmijn 2002). Age effects are the changes in income that occur as people grow older. Although these changes are often gradual (due to rising wages), they can also be more discrete at certain ages (after leaving school, after leaving the labor market). With 'stage' effects, we refer to the changes in income that people experience after demographic events. Such events are changes in household composition, and these bring people from one stage in life to another stage. Each stage is connected to a certain 'role' that has its specific societal expectations and rules of behavior. We focus on relationship transitions and parenthood transitions. Relationship transitions include entering cohabitation and marriage, experiencing a divorce, becoming widowed, and entering a new marriage. Parenthood transitions include becoming a parent, having second and subsequent children, and entering the empty-nest stage (i.e., children leaving home).

We examine life course changes in both the means and the variance. Changes in mean income have often been studied. Important issues in this literature are the income decline when people have children, the income decline for women after divorce, and the possible financial advantages of living together. Age effects on income have also been studied. These changes are related both to household changes and to the shape of the occupational and employment career. Changes in the variance of income are studied less often, but it is interesting to

restate the questions that can be asked about means as questions about variances. Variances tell us something about uncertainty and inequality in the income distribution over the life course. For example, does the variance in income decline when people become settled in life? Similarly, do certain demographic transitions increase the variance in the income position of individuals?

To summarize, the questions we answer are formulated as follows:

1. How does age affect the mean income position of individuals?
2. How do demographic transitions affect the mean income position of individuals?
3. How does age affect the variance of the income position of individuals?
4. How do demographic transitions affect the variance of the income position of individuals?

At the outset, we emphasize that the focus of this paper is on the income position of *individuals*. This does not by any means imply that we ignore the household. Because household income is pooled and consumption is shared, an individual's income position depends in part on the composition of the household and the income of his or her household members. We therefore look at so-called 'standardized' income. Standardized income is equal to household income divided by what is referred to as an equivalence scale, which is the number of household members corrected for economies of scale and for the needs of the household members. This income measure is normally used for welfare comparisons instead of per capita household income. A discussion of such standardizations will be presented in a separate section.

Studying the influence of the life course on income is important for several reasons. First, the life course perspective raises new questions about inequality. For example, with regard to poverty, a shift from a static to a dynamic perspective means a change from analyzing who is poor and who is not, to analyzing *how long* people have been poor and *in what stage* of their life people are most likely to be poor. This also has implications for the way in which we should measure inequality. If income changes considerably over the life course, then lifetime measures

of income would be a better basis for measuring inequality at the societal level than would be income measures at a specific point in time.[1]

Second, there is a sociological relevance to life course effects. If effects of life course transitions on income exist, then this shows that an individual's income position depends not only on his or her individual investments in human capital and his or her achievements in the labor market, but also on the household in which he or she lives and the characteristics of the persons who are in that household. In a sense, life course effects point to the *social* determinants of income inequality in a society.

Third, the dynamic analysis of income is relevant for our understanding of consumption and saving behavior. The economic literature has often assumed that the age earnings profile is hump shaped. Given this profile, the life cycle model predicts that people save for retirement when they are young, and dis-save when they are retired. In order to understand savings behavior, it is important to know what the shape of the age earnings profile looks like and how income is affected by discrete life course changes such as divorce. People save more and consume less because of uncertainty about future income and wages, *ceteris paribus* (Bovenberg, Koijen, Nijman and Teulings 2007). Unanticipated income shocks should therefore be directly related to the way that people save, and such income shocks can be dependent on individual life course transitions.

Fourth, demographic transitions have received considerable attention in policy debates. One example is the often-presumed negative effect of children on income. When a couple has children, their income often declines, due to the wife's retreat from the labor market, whereas the costs of the household increase. This so-called life cycle squeeze is an important factor in the debate about childcare, the employment of married women, and child allowances. Another example is divorce. A

1 Blundell and Preston (1998) analyze the distribution of consumption instead that of income. Consumption might indeed be a better proxy for lifetime resources than annual income. According to a simple version of the life cycle model, consumption is a function of (among other things) permanent income, which in turn is linearly related to lifetime income (Flavin 1981). Note, however, that due to the existence of (binding) liquidity constraints, the link between consumption and lifetime income is broken. No information on consumption is available in our dataset, unfortunately, and the sample size of the Dutch consumer budget survey is simply too small to analyze detailed age and stage changes.

divorce has often been found to have negative effects on the income situation of women, especially when there are children. This divorce effect has played an important role in debates about alimony, on the one hand, and about the welfare dependency of single mothers, on the other hand.

The study of life course effects on income is part of a broader emerging perspective in the social sciences in which a variety of economic, social, and cultural phenomena are studied from a life course perspective (Kalmijn 2002). Examples are studies of life course effects on social integration and loneliness (Peters and Liefbroer 1997), on health, well-being and happiness (Mroczek and Kolarz 1998), on housing and residential migration (Mulder and Wagner 1998), and on the norms and values that people have (Stolzenberg, Blair-Loy and Waite 1995). These studies have shown that there are both age and stage effects. As we will see, such effects are also present on income changes.

Statistics Netherlands has assembled a large longitudinal dataset called the Income Panel Survey (in Dutch, Inkomens Panel Onderzoek or IPO). The IPO consists of a large sample of individuals who were followed over a 15-year period (1989-2004). This paper compares individuals before and after a certain age transition or life course transition. We present information on individual change over a 15-year period, and do so for several (partly overlapping) birth cohorts. This allows us to look at cohort- and age effects simultaneously. The panel design we use is an important improvement over cross-sectional results in which different age groups are compared at a single point in time. Comparisons carried out in such cross-sectional designs are biased by the fact that older birth cohorts have different labor market qualities than younger birth cohorts. Older cohorts, for example, are less educated than younger cohorts. We show empirically that the type of design makes an important difference.

Although this paper presents a new and comprehensive analysis of the Dutch Income Panel (IPO), we are not the first to analyze these data. Earlier analyses have explored the effects of children (Bos and Hooghiemstra 2004), of divorce (Bouman 2004), of union formation (Hooimeijer and Klaus 1996), and of multiple transitions (Kalmijn and Vries 2008).

2. Data and methods[2]

The Income Panel Survey (IPO) that is used in this study was collected by Statistics Netherlands. The IPO contains longitudinal information about households and their income— and the type of income. Information on household composition and demographic characteristics stems from both tax information and the population register (GBA), which was matched to the fiscal data. Waves from 1989 to 2004 were available, which implies data for 16 years. Each year, new sample members were added to the panel. Although income information is available for all individuals within the household, only so-called key persons are followed over time (i.e. the 16 waves can be merged only by using the identification number of the key person). Key persons are randomly drawn from the Dutch population. Attrition occurs only as a result of emigration or death. In that case, births and immigrants are added to the sample to keep the sample representative.

The advantage of the panel is that income measures are presumably measured with less error (assuming people are accurate in reporting incomes in their tax returns), that the sample is large, and that attrition from the sample is low. A disadvantage is that little background information is available. For example, we cannot use the IPO data to present life course patterns for different educational groups, which is one of the more important sources of variation in income patterns. Another disadvantage is that no information is available on hours worked. This complicates the analyses of labor income changes. At the moment, we therefore abstain from analyzing labor income separately.

In the year 2000, Statistics Netherlands revised the data collection effort. For instance, new and better data sources were used to collect data on capital income. Statistics Netherlands also changed slightly the income definition. Knoef, Alessie and Kalwij (2008) provide more details on this revision. As a result of this revision, the data before 2000 are not directly comparable with those after 2000. Fortunately, Statistics Netherlands compiled two different datasets for the year 2000: one with the methods before revision and one with the methods after revision. Due to the availability of those two datasets, Knoef, Alessie and Kalwij (2008) could make an effort to harmonize the definitions in the years before revision

2 We present theoretical arguments and reviews of the literature in each section separately, rather than in one long paragraph in the beginning.

and after revision as much as possible. This study uses the dataset compiled by Knoef et al. (2008).

In this study we selected only those households whose key persons satisfy the following criteria: (1) they are older than 18; (2) they live in a single-person household or they are either "husband" or "wife" (not a "child") in a multi-person household; (3) they need to have positive household income. This last stipulation is necessary because we like to analyze logged household income, for reasons explained below. It should be stressed that only a few observations were dropped because of zero or negative household income. After these selections, we were left with a sample of 63,000 to 72,000 observations per wave (Table 1). For more specific analyses of stage effects we made further sample selections, but these are explained below in the section discussing these effects.

In most of our analyses we focus on *standardized income*, which is the household income divided by what is known as an equivalence scale (i.e. the number of household members, adjusted for economies of scale and adjusted for the age of the household member (adult versus child)). Although this measure is based on household income, it is an individual measure that most closely reflects the standard of living of an individual. In most of the analyses, we use the "modified" OECD equivalence scale, which divides household income by 1 for a single adult, and adds to the denominator 0.5 for each additional adult and 0.3 for each additional child (depending on the age and birth order of the child). In the first set of analyses, where we focus on age (see Section 3), we use the CBS equivalence scale to measure standardized income (see also section 5). All equivalence scales used in this study make the assumption that within households resources are equally distributed among its members. We return to this issue in section 5, where we review in greater detail the literature on equivalence scales.

Two additional income measures help us to assess the relative importance of the equivalence scale. First, we analyze household income *per capita* (for adult members of the household), and compare changes in standardized income to changes in household income per capita. This comparison tells us which parts of the changes that we see are due to the economies of scale that are built into the equivalence scale. Second, we analyze standardized income *without incorporating the costs of children*. By comparing changes in standardized income to changes in this latter

income, we can see how much of the changes are driven by the assumed costs of children in the equivalence scale.

All incomes are after taxes, exclude capital income, and are adjusted for the CPI (see also below). We also take the natural logarithm of (standardized) income. The use of logarithms allows us easily to infer how (standardized) income changes in percentage terms as a result of aging (the change in logged income is approximately equal to the relative change in the income level).

Table 1 reports some statistics of both standardized and non-standardized real disposable household income (in logarithm). The table shows that on average standardized household income grew by 0.95% per year between 1989 and 2004. This change is on top of inflation, since incomes are adjusted for the CPI (see also Statistics Netherlands 2008). Such an upward trend is not observable for the variance of log (standardized) income. In other words, income inequality did not change much between 1989 and 2004 (Knoef, Alessie and Kalwij 2008). Note that contrary to the Netherlands, the US and the UK witnessed a rise in household earnings and inequality between households from 1990 onwards (Lise and Seitz 2007; Pencavel 2006). Lise and Seitz report for the UK a rise in consumption inequality between households and a fall in inequality in the earnings inequality *within* households because the correlation between husband and wives has grown over time, due to the increased female labor force participation and the decreasing gender wage gap.

We use fixed-effects regression models (Petersen 2004). The starting point is a dataset in which each record contains an observation for a specific individual for a specific year. If an individual is observed for T years, then he or she contributes T observations to the data. It is not necessary that every individual contribute the same number of years. This so-called unbalanced person-year dataset contains variation among persons and variation among years within persons. The fixed-effects regression models that we apply to the data focus only on the latter variation—i.e., they model differences among years *within* individuals. The model could be regarded as a regression model that contains a dummy-variable that adjusts the overall mean for each person. For example, the effect of marriage in this model then measures to what extent the transition to the married state leads to a deviation from the overall mean *of that person*.

The fixed-effects models basically boil down to the following comparison. We calculate the income change that people experience after they make a certain transition, and we compare it to the change experienced by people who did not go through the transition. The difference between these two changes is the effect of a life course transition. A complication of the analyses is that incomes apply to calendar years, whereas household status can change at any point in a calendar year. We therefore make a distinction between the 'transition year' (the calendar year in which the household status of a person changes) and the calendar years that follow the transition year.[3] Both the old and the new status will affect the transition year, whereas the year after the transition year will fully reflect the new status. The most important comparison therefore, is between the pre-transition period and the first year after the transition year. We also look at each separate year after the transition, which allows us to examine both long-term and short-term effects of transitions. To do this, we include a dummy variable for experiencing the transition and being in the transition year, a dummy variable for experiencing the transition and being in the year after the transition year, a dummy variable for experiencing the transition and being in the second year after the transition year, and so forth, up to 13 years after the transition year. To ease the interpretation of the regression models, all regression results are presented graphically. Significance tests are less useful, given the large sample size.

The fixed-effects models are used for examining changes in the mean (logged) income. To examine changes in the variance of (logged) income, we also use regression models. More specifically, we take the squared individual residual from the fixed-effects regression models, and use this as a dependent variable in a random-effects regression model that has the exact same set of independent variables as the original fixed-effects model. Effects of dummy variables in this model can be interpreted as effects on the income variance.

As people experience life course transitions, they also grow older. Hence, we need to control for age when estimating stage. Age and stage are not perfectly correlated because people can experience transitions at different ages. We also look at models *without* age to see how much the stage effects depend on correlated age effects. In a similar vein, we look

3 In the figures, the transition year is year 1; year 0 is the period before the transition.

at effects of age while controlling for stage, and compare these estimates with estimates from a model for age without controls for stage.[4] This allows us to examine to what extent the age-income pattern actually depends on underlying demographic stage effects. If we control for age effects, this means that we included dummy variables for each single year of age.

In modeling income dynamics over the life course, it is important to control for period and cohort effects. Cohort effects are already taken into account because we use a panel design. Age effects are thus not correlated with birth cohort. However, in a panel study we still need to control for period effects (i.e., the effects of calendar year). Income might be affected by contemporaneous macroeconomic conditions such as inflation and (unanticipated) business cycle shocks, and by economic growth. Moreover, some increases in the employment of women in the 1990s were not fully due to cohort effects. These changes are most likely due to changes in the public provision of day care, a period change that presumably affected all birth cohorts. In order to capture simultaneously age and period effects, a naïve researcher would specify a fixed-effects model that includes a full set of age- and calendar year dummies. Such a model, however, suffers from a perfect collinearity problem, which stems from the identity between period and age: in a within-person comparison, the effect of becoming one year older is the same as the effect of changing to the next calendar year.

One way to handle this identification problem is to explicitly *model* time effects. Instead of using time dummies, one incorporates in the model variables that depict the current macroeconomic situation (*e.g.*, economic growth, inflation). This is essentially a nonlinear transformation of the period variable, which makes the model identifiable. Another approach to deal with the identification problem is to impose restrictions on the time dummies. The leading approach is the one of Deaton and Paxson (Deaton and Paxson 1994), who assume that the coefficients corresponding to the time dummies add up to zero and are orthogonal to a time trend. One possible justification for this assumption is that time effects are due only to unanticipated macro-shocks, which should average out over time. Alternatively, one could drop the time dummies altogether. Such a procedure can be justified in the same way as the

4 See below for an explanation of how we incorporate stage in these models.

Deaton and Paxson method because the time effects, due to their unanticipated nature, should be orthogonal to the other right-hand variables of the fixed-effect income model. Obviously, period effects do not stem only from unanticipated shocks. We therefore take period effects into account by deflating incomes using the Consumer Price Index (CPI).[5] In a sensitivity analysis we adjust incomes not by CPI but by a ratio $M(Y_{2004}) / M(Y_t)$, where Y_t denotes the observed average net household income in the population at large (see below).

5 Notice that we do not (and cannot) include time dummies in our model.

3. Age effects on income

Prior considerations

How can we expect incomes to change when people grow older? To answer this question, we need to consider changes in household composition and changes in individual income. Both will affect a person's income position.

With regard to household changes, authors usually point to a series of income gains and losses. When young, people gain income because they start living together and enjoy economies of scale. At later ages, they lose income because they have children, which cost money. After that stage, people move into the empty nest, which would in turn increase income. Next to household changes, there are other age-related changes in income. Under conditions of sharply divided gender roles, women's income will decline when there are children and will rise modestly again when the children leave home. Men's income will increase continuously due to wage increases, but high levels of disability and unemployment at older ages will also lead to a decline in total income at later ages. Retirement will further contribute to the decline.

Together, these changes lead to the traditional life cycle pattern of income: a peak, a valley, another peak, and then downhill. Does this pattern still hold nowadays (assuming it did exist in the past in The Netherlands)? First, the decline of gender role specialization in marriage has made the pattern probably more linear— after all, women's employment careers have become more similar to those of men (Kalmijn and Luijkx 2003). Second, demographic changes may have blurred the average age pattern. The rise in divorce and remarriage rates has made the life course more complex. Moreover, with the postponement of marriage and fertility, there has also been increasing variance in the ages at which people experience life course transitions (Liefbroer and De Jong-Gierveld 1993; Liefbroer and Dykstra 2000). There is also increasing heterogeneity in the life course, due to the fact that large segments of the population do not make the 'standard' life course transitions. For example, more than a third of higher educated women in recent cohorts (will) remain childless (Statistics Netherlands 1999). In sum, increased diversity in the occurrence and timing of life events may have blurred the traditional life cycle pattern of income.

It is also interesting to analyze how income inequality within a cohort changes as a generation becomes older. We use the variance of income as a measure for income inequality.[6] Income changes could be either permanent or transitory. It is therefore important to disentangle the within-cohort income variance into a permanent and transitory component in order to understand the changes in (lifetime) income inequality and its consequences for (lifetime) income mobility (Kalwij and Alessie 2007). Disentangling these effects – charting, in particular, the persistence of income shocks – is also of key importance for understanding the life cycle consumption patterns of individuals. In the literature on consumption and saving, a great deal of attention has been paid to the importance of the precautionary saving motive: People save more and consume less because of more uncertainty (variability) about future income and wages, *ceteris paribus* (Browning and Lusardi 1996). If consumers expect that future income shocks are mainly persistent and not transitory, then the precautionary saving motive becomes more important. Abowd and Card (1989) present evidence that income shocks are very persistent: log wages in the US are close to a random walk, where income shocks are completely persistent. If Dutch standardized household income also behaves as a random walk, one would expect that the within-cohort variance of income is an increasing function of age.[7] In order to infer the extent of persistency of the income shocks, we will also look at the autocorrelation structure of standardized income. Apart from precautionary savings, higher levels of income uncertainty are important in other respects. For example, one would expect that the chances of making important life course transitions, such as starting a family or buying one's own home, are reduced by uncertainty. People tend to postpone such transitions when they are in an uncertain income situation (Oppenheimer 1988).

6 When we use the term 'income' to describe findings, we always mean the natural logarithm of income.

7 It should be realized that IPO is a large-scale panel dataset with a very low attrition and refreshment rate. Consequently, within-cohort changes in the standard deviation of income over time cannot be attributed to changes in the composition of the sample.

Analyses

To explore the age-income pattern, we first present a cross-sectional analysis and compare this with a dynamic analysis. The cross-sectional analysis is based on the IPO data for 2000, and simply presents the mean of the standardized income for each age. The dynamic analysis is based on the fixed-effects regression model for the 1989-2004 panel. These numbers are based on individual changes that occur when people grow older. The fixed-effects predictions tell us what a given individual would experience, if he or she would go through the same age-specific changes as the members of the IPO panel did. These are predictions from the fixed-effects regression models with dummy variables for each age. It is important to realize that this is an accumulation of what different birth cohorts experienced.

Figure 1 first shows that the cross-sectional pattern— the pattern that is also known from the literature— confirms in broad lines the expectations. Income first increases until age 30, and then declines by 10% between the ages of 30 and 38. In the early forties, income starts to increase again, and peaks for the second time during the middle 50s (at age 53, income is more than 20% higher than it is at age 38). After that age, a strong decline occurs, to levels that are lower than they were at the start of the adult life course. The cross-sectional pattern thus displays the peak-valley-peak-downhill pattern.

The findings from the fixed-effects model, also presented in Figure 1, are different. One important difference lies in the second half of the life course. The second income peak is located in the same age range (the middle 50s), and we also see a decline in income after that age. However, the decline is weaker than what the cross-sectional pattern shows. This is an interesting difference between the two perspectives. Clearly, the cross-sectional pattern overstates the decline during old age. Most likely, this stems partly from the lower education of older cohorts.[8]

Another important difference is that the peak and decline during the early life course are less dramatic than what the cross-sectional picture suggests. According to the dynamic estimates, income also increases in the early stage of life and comes to a halt during the 30s, but there is

8 While this seems an advantage of panel data to cross-sectional data, this would not be a fair conclusion, since most cross-sectional data also contain measures of education and other aspects of human capital that can be used to control for cohort effects.

no decline after that phase. During the forties, income increases again, which is most likely due to increases in wages with age. Why is the early life course dip not visible in the dynamic data? Cohort effects may play a role here as well. Older cohorts of women who participate less in the child-rearing years bias the cross-sectional estimates— the cohort increase in women's labor force participation is substantial (e.g., Kalmijn and Luijkx 2003). The dynamic estimates are not affected by these cohort differences.

Another way of looking at the income-age patterns is to present them separately for each birth cohort. Figure 2 presents the 15-year change for 11 different 5-year birth cohorts. The 16 points for each cohort are interconnected and form a 'cohort curve'. It shows how average income evolves as a particular cohort ages. Movements along the cohort curves represent a combination of age- and period effects. We also see that each younger birth cohort is lying 'on top' of the next older birth cohort. Hence, at a given age, the younger cohorts have higher incomes than the older cohorts. This might be attributed to cohort effects (due to productivity growth and/or a higher education level for the younger cohorts than for the older ones) and/or uncontrolled period effects (the correction we applied for the CPI is not enough to rule-out period effects). Notice that most cohort curves move in parallel, which indicates that interactions between cohort- and age effects do not seem to be important. In other words, the movements along the curve are in line with the average pattern shown in Figure 1. Age effects are strongest in the early life course, and become flatter during the thirties. In the forties, age effects increase again, and in the fifties, the increase reverses, decreasing with increasing age.

Figure 3 allows us to zoom-in on the age-income patterns of the elderly cohorts. These graphs show that incomes decline for most cohorts before age 65. After age 65, incomes are relatively stable. These declines are probably due to disability and early retirement. The youngest elderly cohort— born in 1940-1944—seems to have the most favorable position. Its decline starts late and seems rather modest. One also observes that average income *increases* with age for the oldest cohorts. This result might be an artifact that can be ascribed to differential mortality. Richer people have a higher probability to live longer (Attanasio and Hoynes 2000; Mackenbach 1992) and therefore have a lower likelihood to leave the IPO sample.

The age-income patterns just shown all refer to total effects of age. These changes can thus be explained in terms of stage effects *and* pure age effects. To assess pure age effects, we estimate a model for age that includes stage variables.[9] We compare these results with the total age effects of the fixed-effects model in Figure 4. When comparing these graphs, we see that the slowing down of the income growth in the 'child valley' disappears, as one would expect. However, we do not see that the initial increase at younger ages disappears. Hence, this early increase with age is probably due more to people's career development than to possible marriage gains. This does not mean that there are no marriage gains— the diversity in the age of individuals at the time of marriage may blur these effects, and marriage may thus not be able to explain this part of the age effect. The income decline during the older ages remains visible when we control for stage. Hence, the transition to the empty nest stage probably plays a minor role in the age-income profile at older ages.

The question of residual period effects remains to be addressed. What does the age-income profile look like when account is taken of the fact that household incomes have increased beyond the level that can be attributed to the effect of inflation? We have controlled for CPI, but household incomes in the 1990s have increased faster than inflation, resulting in real changes in income (see also Table 1). To rule out these additional period effects, we can adjust incomes by a ratio $M(Y_{2004})$ / $M(Y_t)$, where averages pertain to the average net household income in the population at large in a given year (as observed in the IPO data). Figure 5 compares the results from two fixed-effects models, one with income corrected with CPI and the other with income corrected with average modal income (both without controlling for stage effects). Figure 5 shows, first of all, that the decline in income during old age is steeper when we adjust for average annual income levels. Hence, the decline in income during old age has been counteracted by the positive economic climate in the last decades. We also see that the increase in income during the late thirties and forties is weaker in the new adjustment. This is also consistent with the interpretation just given. Rising incomes over time have made positive age effects more positive, and this is corrected when stronger period adjustments are used.

9 This model contains the following variables: married/cohabiting, widowed, separated/divorced, having children, and the number of children. Results of these adjustments may be different for men and women.

Figure 6 presents the variance in logged income by age for each different birth cohort. These variances measure how within-cohort income inequality evolves as a generation ages. At first glance, the figure shows that the variance of income decreases dramatically between the ages of 20 and 30. This coincides with a period of school-to-work transitions and a period of career settlement (people becoming more stable in their career and finding their 'ultimate' occupation). The role of education is also important here, since the higher educated start to earn a wage at a higher age than the lower educated, which explains the decline of the variance in income in early adulthood.[10]

Between the ages of 30 and 50 the variance is low and stable. If (standardized) household income would behave as a random walk, one would expect that the within-cohort variance of log(income) of the middle-aged (such as the 1955-1959 generation) is an increasing function of age.[11] The fact that the within-cohort income variances remain fairly constant does not seem to provide support for the random-walk hypothesis. However, this conclusion critically hinges on the assumption that for each cohort the first moment of the subjective income distribution can be effectively modeled as a function of age. This assumption is presumably too restrictive, since expected income may also depend on other demographic variables. Further research is thus needed if we want to say more about the validity of the random-walk hypothesis.

After age 50, the within-cohort variances increase again up to age 62. This is probably due to the diversity of retirement routes that people follow: some retire early, some late, some leave through disability, others

10 The cohort curves of the two youngest generations should be interpreted with some care. As we said before, our sample only consists of key persons who live either in a single person household or are either "husband" or "wife" in a multi-person household. This selection rule implies that we have removed children from the sample. Since Dutch children typically leave their parental household in their (early) twenties, the number of observations of, say, the 1970-1974 birth cohort rises quickly and its composition changes dramatically as this generation ages. However, Statistics Netherlands (2008), which also uses the income panel survey and does not apply the selection mentioned above, also reports that income inequality as measured by the Gini coefficient decreases dramatically between age 20 and 30.

11 It should be realized that IPO is a large-scale panel dataset with a very low attrition and refreshment rate. Consequently, within-cohort changes in the standard deviation of log(income) over time cannot be attributed to changes in the composition of the sample.

through unemployment. These different routes may have very different income consequences. After age 65–67, it seems that the variance in income declines again. Among persons aged 80, the variance in income is at its lowest level. In other words, old age is a homogenizing phase in life, at least in economic terms. We also observe cohort effects. Old cohorts (such as those born between 1920 and 1924, or before) face higher income inequality than those born at a later date. This cohort effect can presumably be attributed to the fact that younger generations more often receive occupational pension benefits than the older ones (Knoef, Alessie and Kalwij 2008).

It is also interesting to see how the correlation of income changes over the life course. Figure 7 presents the correlation between income in year *t* and income in year *t–2*. The (second-order) autocorrelation is quite high—around r = .80. More importantly, we see that during early adulthood the autocorrelation increases considerably with age. This mirrors the result for the variance and is further evidence that income shocks are more transitory when people are young than when they are old. Income changes become more persistent during an individual's thirties and early forties. In midlife, the autocorrelation is stable. Interesting is the sharp decline in the autocorrelation around age 65. Most employees in the Netherlands start to receive old-age occupational pension benefits at age 65 or before, and almost never after 65. It should be realized that there is a lot of heterogeneity in the occupational pension arrangements. Most pension arrangements are of the defined-benefit type, which implies that most pension benefits depend on the labor market history of the participant of the pension fund. It should therefore be expected that the correlation between income at age 64 and income at 65 is relatively low. After age 65, the autocorrelation increases again — to levels higher than before. This confirms what we saw earlier: old age is a stable income period, during which income shocks are likely to be rather small (low variance at high ages) but very persistent (the high auto-correlation coefficient). In other words, it is very difficult for the elderly to overcome negative income shocks (e.g., due to widowhood), which then implies that poverty among the elderly could be more permanent than it is for other groups in society.

4. Stage effects on income

4.1 Union formation

Prior considerations
It has been argued that living together is economically beneficial because of economies of scale. Partners pool their income and consume many goods jointly. For some goods, consumption cannot be shared. For example, partners will eat the same amount of bread when they live apart as when they live together. Many other goods can be shared, however. Examples include the house, the television set, the microwave, and the lighting and heating of rooms. Moreover, some non-durable items are cheaper per unit when they are bought in larger quantities, which suggests yet another reason why it might be advantageous financially to live together.

The effects of union formation are believed to be asymmetric. Because single men have a higher income, on average, than single women, women would benefit more from pooling than men would— although this also depends on assortative mating patterns. There is typically positive assortative mating on education and occupational status, and therefore also on income (Kalmijn 1998), which will have the effect of reducing the gap between male and female gains of marriage (Lise and Seitz 2007).

There are also reasons to expect changes in *actual* household income after union formation. Although traditional gender roles in marriage have changed considerably over time, union formation still leads to some degree of specialization within the household, with men investing more in paid labor and women investing more in domestic labor and child rearing. This will lead to a decline in the wife's labor force income during the course of marriage. Recent studies show the way in which the income dynamics of couples change over the course of marriage. Kalmijn, Loeve and Manting (2007), for example, distinguish between equality (the wife earns about 40-60% of the total income), husband dominance (the wife earns nothing or less than 40%), and wife dominance (the wife earns more than 60%). In the first ten years of marriage, the condition of equality declined from 40% to 20%, the condition of wife dominance declined from 10% to almost zero, and the condition of husband dominance increased from 50% to 80%. Cohabiting couples are more

egalitarian, but they too reveal a strong decline in the wife's income share during the union.

Several authors have argued that men's careers are fostered by specialization during marriage as well. For example, in the US, positive effects of marriage have been found on men's wages (Korenman and Neumark 1991). Whether such positive effects are enough to compensate for the decline in the wife's income is not clear, however. There is also the problem here of selection bias, which may arise as a result of women selecting spouses on the basis of certain characteristics that are not observable for the researcher— ambition and intelligence, for example, and favorable personality characteristics. Employers may use the same characteristics to select and reward their (new) employees. In other words, the measured marriage premium may also reflect the returns to these characteristics. Like Korenman and Neuman (1991), Ginther and Zavodny (2001) examined this selection hypothesis by focusing on so-called shotgun weddings (i.e., marriages that occurred after the conception of the first child). They assume that non-marital conceptions followed by marriage make marriage a random event. If this is true— and one can argue about the validity of this assumption, then shotgun weddings allow researchers to assume away the selection issues associated with the traditional estimates of the male marriage premium. Ginther and Zavodny find that the return to marriage differs little for married men with a premarital conception and other married men. In other words, the selection effect does not seem to be important.

Analyses

To examine empirically the effect of union formation, we focus on men and women who reported being unmarried and had no children in the beginning of the panel. The unmarried category in the IPO refers to those who have *never* been married, since the divorced and widowed are in a separate category. Using this selection, we exclude second marriages from this particular analysis. We examine what happens when a person changes his status from being unmarried in one year to being married in the next year(s). We treat unmarried cohabitation as equivalent to marriage.[12] We include a time-varying independent variable indicating

12 With one difference: we cannot detect breakups of cohabiting relationships before the panel period.

the presence of children (with separate dummy variables for one child, two children, and so forth).[13] Observations are truncated when the marriage ends.

Figure 8 shows that that union formation leads to a sharp increase in standardized income. For women, standardized income increases by about 50% in the first two years (exp(.41)−1). Figure 8 also shows that for men, the increase is smaller, about 25% in the first two years (exp(.22)−1). We further see that the effects of marriage, although initially positive, decline as the marriage progresses. This cannot be due to the cost of children, since the presence and number of children are controlled for in the fixed-effects regression model. This pattern must therefore be due to specialization during marriage, which leads to a gradual withdrawal of married women from the labor market (regardless of whether or not the couple has children). Interesting to observe is that after 10–15 years of marriage, the gain compared to the situation of single persons is no longer present. In the end, married people may therefore not be financially better off than single people.

The effects just discussed are controlled for age. The top line in Figure 8 shows how the effect would look like had we not controlled for age. We see that the increase in income is larger without age, while the decline in income is weaker. These results are consistent with the positive age effects. The gain after marriage is to some extent due to becoming a year older, and the decline in the gain after marriage is counteracted by a positive wage growth due to age (or experience).

In order to assess how much of the marriage effect is due to the (assumed) economies of scale, we examine effects of union formation on income per capita (that is, household income divided by the number of adults, i.e., 2). Children are treated in the same way in both standardizations (they are counted in the denominator as 0.3 for each child).[14] The results are presented as dotted lines in Figure 8. For women, we see an increase in the range of 22% in income per capita in the first years. This suggests that economies of scale are driving more than half of the effect. For men, there is no longer an increase in income

13 We excluded households where there were other adults living in the home besides the respondent and his or her partner. This is a small group, but it greatly simplifies the models and the interpretation of the income variables.

14 Strictly speaking, our use of the term 'income per capita' refers to 'adult' capita. Hence, only the economies of scale of the couple are excluded from this measure.

when we exclude economies of scale; there even seems to be a slight decline in income. The explanation for the gender difference is that men marry women who earn somewhat less then they do, whereas women marry men who earn more.[15] Assuming equal sharing of income (and consumption), marriage is then clearly more beneficial financially to women than it is to men. It should be stressed, however, that the assumption of equal sharing might be troublesome. In section 5 we pay more attention to the issue of intra-household allocation of resources.

Are there also effects of union formation on the variance in income? We see a decline (about -0.07) in the variance two years after union formation. This seems to suggest that people become economically more stable when they enter marriage (Figure 9). The variance increases again after the fourth year, however, which may be due to the behavior of women, who may choose to either leave the labor market or remain. The number of hours that women work may also become more diverse during marriage. Note that the effect of children is taken into account; these arguments therefore apply to differences in the labor force participation of women during marriage, independent of the effect of children. Perhaps there is more of a choice element in the labor force behavior of women after they enter marriage, and this could lead to the incomes of married couple households becoming more diverse. Note, however, that the changes in the variance are not so large.

4.2 Parenthood

Prior considerations

Theoretically, several effects of children may operate. First, the costs of children may reduce (standardized) income— even if all else remains constant. Consumer research has shown that costs also depend on the ages of the children (but these effects are quite small; Siermann, Teeffelen and Urlings 2004). Whereas people in the Netherlands receive child support, the amounts received are modest. The question is how much extra household income a childless couple needs to get after the birth of their first child in order to remain at the same standardized income level. A couple with a household income of 30,000 euro has an

15 The fact that the negative effect for men is not equal to the positive effect for women must be due to the relative nature of these measures.

equivalence scale of 1.5 before birth and 1.8 after birth. Hence, we need to equate 30,000 / 1.5 and X / 1.8, where X is the new household income. This means that a couple needs to receive 6,000 euro extra for their household after the birth of their first child in order to stay at the same income level. This amount is higher than what couples receive in terms of child support (about 1,000 euro per year for a single child).

The way child costs are measured in the equivalence scale has a number of limitations. First, the empirical evidence on which the costs of children in the equivalence scale are based is limited. There are few studies that systematically have examined the costs of children in different national and different family contexts. Moreover, the equivalence scale only refers to the amount of consumption of market goods required by a child. Apps and Rees (2002) correctly point out that the equivalence scale does not take into account the following items: (a) The value of the parental time required for child care. Part of this will be the foregone earnings from any reduction in market labour supply, probably of the mother. Using data from three countries (Australia, Germany and UK) Apps and Rees (2005) show considerable reductions in both parents' leisure during the pre-school phase. (b) The value of children's consumption of other goods and services produced within the household.

A second, potentially important effect is the decline in women's earnings after the birth of a child. This effect may operate through either a decline in the hours worked (or a full withdrawal from the labor market) or a decline in wages. Hypotheses have been suggested for both effects, and research has been done. The decline in labor supply after birth is well documented. In the Netherlands, this effect has declined over time— in line, however, with the general erosion of gender role specialization (Kalmijn and Luijkx 2003). The effect also appears to be less negative in countries with better public childcare facilities such as Sweden (Uunk, Kalmijn and Muffels 2005). The second effect of becoming a parent— a negative effect on wages for mothers who work for pay— has also been documented (Mertens, Van Doorne-Huiskes, Schippers and Siegers 1998; Waldfogel 1997). Although the effect can be attributed in part to the decline in labor market experience that is associated with childbirth, this does not explain the full effect. The remaining negative effect on wages is due partly to the greater prevalence among mothers of part-time work,

which tends to pay less and which reduces career opportunities (Budig and England 2001; Waldfogel 1997).

For men, contrasting hypotheses have been suggested (Kaufman and Uhlenberg 2000). Under conditions of traditional gender roles, it can be argued that having children would benefit men's career. As the breadwinners, men would feel more responsible for the household income when there are children living at home and the wife would be fully supportive in the domestic sphere, making it easier for the husband to spend more (and possibly extra) time at work. Under conditions of liberal gender roles, a different expectation can be formulated. Men are expected to contribute to domestic labor, which means that they are able to work fewer hours after the birth of a child. Although some believe that this latter situation may sometimes be compensated by the fact that the wife can remain in the labor force, it is also clear that a husband working fewer hours leads to a greater income loss than a (similar) decline in the wife's hours of work.

Analyses

To assess the effect of children, we look at persons who had no child in the beginning of the panel period.[16] Single-person households and couples are both included, but are not analyzed separately (a more detailed analysis of single women who become mothers is available in a previous paper on the IPO data (Kalmijn, Monden and De Vries 2007)). We exclude households with other adults besides the respondent and the partner (if present). The transition to parenthood occurs when a baby (a 0-year old child) enters the household in a given year and there was no child living in the household in the year before.[17] We include a time-varying independent variable indicating whether or not the person was married. The data allow us to look at fourteen years after the first birth. Subsequent children may have been born, but this is not included in the initial models. In a second set of models, we look at effects of family size in a dynamic fashion.

Figure 10 shows first a decline in standardized income. Focusing on the effect while controlling for age (the bottom curve), we see that the drop

16 The first time they appear in the panel selection, which is not necessarily 1989.

17 This selection implies that we look mainly at biological children. Older children who enter the household are also interesting, but their relation to the household head is not so clear from the data. We therefore leave these children out of the analysis.

is about 25% in the first full year after the birth (exp(−.29)−1), and that this increases to about 37% in the seventh year after the first birth (exp (−.46)−1). The negative effect of a first birth thus increases over time, but this is probably due to second- and third births (this will be discussed shortly). To what extent is this decline due to the costs of children, and to what extent is it due to a real change in income after the birth of the first child? To answer this question, we calculate standardized incomes, where children are not included in the equivalence scales. This means that the income denominator refers to the couple only, and not to the children. In other words, we estimate what would be the income situation of the husband and wife had they not needed to care for the child(ren). We see that the decline in this alternative standardized income is about 12% (exp (−.13)−1) in the first full post-birth year, and that this increases to 18% in the seventh year. Hence, more than half of the decline in standardized income is due to the costs of children. However, the decline in real income that remains is not trivial in magnitude. This estimate is similar to the child valley reported by Apps and Rees (2005) for the UK.

What are the effects of subsequent children? Figure 11 presents estimates from a fixed-effects model that includes dummy variables for each family size.[18] The results are presented for incomes including and omitting the costs of children. We first see the cumulative impact of having additional children on standardized income. If we exclude the costs of children, we see an income decline after the first child, but no subsequent effects. The cumulative impact therefore has to do with the increasing costs of children and not with a real decline in household income due to the wife's further retreat from the labor market after the second- and later births.[19]

A logical next question is whether income increases again after the children leave home. The wife may reenter the labor force and the costs of children disappear. In Figure 11b, we show the effects of entering the empty nest stage on income. The results clearly show an increase in income after the children have left home. The increase is about 24% in the first year and becomes somewhat smaller after that. When we look at the income measure that excludes the costs of children, we see that there is no effect of the transition to an empty nest stage. There even is a small

18 We abstain here from making distinctions between short- and long-term effects.

19 The effect of the each child is assumed to be the same in each year; hence, we make no distinction between short- and long-term effects in this specific analysis.

decline in income in later years of the empty nest stage. In combination, these findings clearly show that the income increase after the transition to the empty nest stage is only related to the costs that parents no longer have to cover, and not to a change in (women's) labor force participation. This is in line with survey research in the Netherlands, which has shown that there is little return to the labor market for women when the children leave home (Kalmijn & Luijkx 2003).

The analysis thus far has focused on all cohorts. Are there also cohort differences in the effect of children? Figure 12 presents the birth effect for three different periods of birth (1989–1994, 1995–1999, 2000–2004).[20] Although each period is relatively short, a decline is clearly visible in the child effect. The effect in the oldest period is –.52, for the middle period it is –.41, and for the most recent period it is –.36. The lines in Figure 12 are more or less parallel. It may thus be concluded that the negative child effect on income is declining over time. This is consistent with the recent improvements in the public childcare sector, which have facilitated the labor force participation of young mothers.

The variance in income also can change after the birth of the first child. Figure 13 shows that the variance slightly increases during the child stage. This can be understood in terms of the heterogeneity that exists in how women respond to childbirth. Some women remain in the labor force, whereas others do not. Variations in hours worked will also increase.

4.3 Divorce and separation

Prior considerations

The socioeconomic consequences of divorce have been studied extensively, not only in the US (Smock 1993), but also in Europe, including the Netherlands (Poortman 2000). Most of the research has focused on women, although it has increasingly been recognized that divorce may also have consequences for men, particularly when married women work for pay (McManus and DiPrete 2001). Several effects are believed to be operating (Holden and Smock 1991). First, partners lose the economies of scale when they dissolve their marriage. This is something that affects

20 This was done by including three sets of transition-duration variables in one model (one set for each period of childbirth).

both divorced men and women. Second, many married women have invested in domestic labor during marriage, especially when there were children, and this limits their career opportunities after divorce. Alimony payments are supposed to solve this problem, but such payments are often insufficient and of too-short duration to fully compensate the loss. Third, a divorce is an emotionally traumatic event that can have negative spillover effects in other domains. Research has demonstrated the negative effects of divorce on mental health (Barrett 2000), and it is plausible that a deterioration in one's mental health can have negative effects on the occupational career (Kalmijn 2005; Kraft 2001).

An important question in the literature has been how divorced women respond to the loss in income. Remarriage is one way to solve economic problems, but an increase in labor supply is an alternative. Studies in the US suggest that when there are children, divorced women remain on welfare for long periods of time (Harris 1996). In the Netherlands, the welfare dependency of single (mostly divorced) mothers has also been of considerable concern to policymakers. Regulations about the need for single mothers to (look for) work have varied over time. The emphasis at times has been on the risk of human capital depreciation and the need for economic independence, which has resulted in more stringent regulations. The emphasis in other times has been on the obstacles that single mothers face in combining care and employment, and this has resulted in more relaxed regulations. American policy research has shown that more stringent welfare regulations help single mothers to go back to work, but such effects turn out to be temporary– there is considerable movement back to welfare again in states with more stringent measures (Hofferth, Stanhope and Harris 2002; Hofferth, Stanhope and Harris 2005).

Analyses

The analyses of divorce are based on men and women who were married in the beginning of the panel *or* who became married during the panel. Persons who were or became a widower are excluded. A divorce occurs when a person is (formally) married in a given year and is divorced or separated in the next year. This paper looks at the first fourteen years after the divorce, noting that a person can remarry or start living together after divorce. Part of the duration effect will therefore be affected by remarriage. In a subsequent analysis, we look at the role of remarriage on the income development after divorce. Detailed controls for age and

for having children are included. In the analyses, cohabiting unions (and their split-ups) are excluded from the sample. Married couples are more specialized, so the effects of divorce are probably greater. Cohabitation after divorce is included as remarriage.[21]

For women, Figure 14 shows a clear negative effect of divorce on standardized income. The effect is 39% in the transition year and 24% in the second year. The effects clearly decline over time, and there is almost a full recovery in ten years' time (5% lower income). For men, we see little change in income due to divorce.

The role of remarriage is important here. Figure 15 shows how many divorced men and women remarry after divorce (including cohabitation after divorce or separation). In the first full post-divorce year, 17% of the men and 12% of the women are living with a (new) partner. This increases quickly, especially for men, to almost 70% for men and to about 60% for women. This finding is consistent with earlier studies showing that men remarry more often and that remarriage and recohabitation are quite common (De Graaf and Kalmijn 2003).

Our analyses show that remarriage increases divorced women's income by 38% (exp .32), which is a considerable effect (not reported in the figures).[22] Moreover, the duration pattern looks different when we make a distinction between women who remarry and those who do not. Figure 16 shows that divorced women who remarry do not suffer any income loss after divorce— they may even gain slightly in income compared to their situation before the divorce (suggesting that their second husband is richer than their first). Divorced women who remain single, however, suffer a serious income loss. They experience a 38% decline in income in the first full post-divorce year, and although there is some recovery over time, it is not to the levels prior to the divorce. After ten years, single divorced women still have 18% lower income than they had before the divorce.

Unfortunately, the IPO does not include information on (paid or received) alimony payments. This may lead to an overstatement of the income decline for women. To get an impression of the degree to which this biases our findings, we analyzed data from the survey Divorce in the

21 Cohabiting unions that turn into marriage are included. We analyze the difference between cohabiting and marital break-ups in a separate paper.

22 This is based on a dummy variable for remarriage (or 'recohabitation') in the fixed-effects regression model, which includes dummy variables for divorce.

Netherlands 1998 (Kalmijn, De Graaf, Broese van Groenou and Dykstra 2001). This is a nationally representative survey among ever-divorced men and women in the Netherlands in 1998. The data show that in the year after divorce, 19% of the women received alimony for themselves, which is quite low. Moreover, the median duration was short: four years. For divorced women who were custodial parents, only 55% received alimony for the children. The median duration was six years. These results do not suggest that alimony payments will be enough to compensate for the experienced decline in income.

What is the role of lost economies of scale in the effects of divorce? In other words, what would have happened if the pre-divorce household income were simply divided equally between the former partners? To assess this, we look at the second income measure, which assumes no economies of scale (presented as dotted lines in Figure 14). According to this measure, the income of women would decline by 22% (versus 39%) and by 6% (versus 24%) in the second year. This shows that lost economies of scale explain a large part of the income decline after divorce. For men, we see that without economies of scale, they would actually have experienced an increase in income. Since they too lose economies of scale, their (standardized) income actually remains stable.

Due to specialization during marriage, it is often difficult for married women to enter or re-enter the labor market after divorce. In fact, cross-national research shows that the increase in paid labor after divorce is small (Van Damme, Kalmijn and Uunk 2008). Given that alimony is often not a sufficient source of income, many women will thus become dependent on the state after divorce. Figure 17 shows the percentages of women who are on welfare after divorce.[23] About one-fifth of divorced (single) women without children and almost half of divorced (single) women with children are receiving welfare, which is quite high. The levels remain high in the years after divorce and do not seem to decline over time. Remarried women are less often on welfare, which is plausible, given that the woman's right to welfare typically disappears when she marries a husband with his own income.

23 Unlike the previous graphs, this graph is based not on a fixed-effects regression model, but simply on the observed percentages.

Does a divorce also affect the variance in income? For women and men, Figure 18 shows a temporary increase in the variance— which increases in the transition year but then returns to the old level. This may be due to differences in the adjustment process immediately after divorce, as some will have arranged their financial position sooner than others. After the transition year, the variance is again what it was before the transition year.

4.4 Widowhood

Prior considerations
There are no clear prior hypotheses for the possible effects of widowhood. Although quite some diversity existed in survivor pensions arrangements in 1989–2004, the rules of major pension funds (such as ABP and PGGM) typically stipulated that surviving spouses receive about 70% of the occupational pension that the partner has accumulated. Although the partner pension benefit that people receive is usually lower than the amount the partner earned while still alive, the costs of living are also lower. The percentage of 70% is reasonably in line with the level implied by the modified OECD equivalence scale (1/1.5=2/3), but this does not necessarily imply stability, since the widow will not receive 70% of the husband's last wage. Moreover, in 2003 and in later years, pension funds have adjusted this replacement rate downwards. Although there is also a collective insurance (de Algemene Nabestaandenwet) that women can receive before they reach the age of 65, the standard amounts of the ANW are typically low (equal to 70% of the minimum wage), and not related with the previous wage of the husband. Finally, there are many possible private insurance arrangements that can protect people from income losses after the death of their spouse (e.g., life insurance), but it is difficult to ascertain how often couples make use of such arrangements.

Analyses
To analyze the effects of widowhood, we look at women who were married in the beginning of the panel or who married during the panel. Women who experienced a divorce are excluded. There were too few women who were divorced and then became widowed. We make a distinction between early and late widowhood (i.e., losing a partner at age 65 or older (of the partner), which is the normal way of experiencing

this event, and losing a partner through death at a younger age, when this event is more rare (partner younger than 65)). There were 2,869 events of widowhood, 28% of which when the partner was younger than 65. We truncate the observations if the woman remarries or starts living with a partner again. We control again for age and the presence and number of children. In the analyses, cohabiting unions are excluded from the sample (except when cohabitation occurs after widowhood). Remarriage after widowhood is not common, although among the 'young' widows, about 20% still remarry or 'recohabit' within ten years (compared with 2% for 'old' widows).

Figure 19 shows that apart from the transition year, there is virtually no effect of widowhood on income. The effect is negative but very small. For young widows there is even a slightly positive effect on standardized income. No differences can be observed for the 'young' and 'old' widows. Moreover, we also see no clear effects on the variance after widowhood (Figure 20). We conclude that there is no negative effect of widowhood for women. Although household income will surely decline, this decline is apparently offset by the declining costs of living.

5. Equivalence scales reconsidered

Prior considerations

The preceding analyses have shown that changes in household composition are driving much of the discrete changes in income. Economies of scale are an important factor in interpreting income changes, and the costs of children play a role in the income decline after the first birth. We have shown this empirically above, by presenting life course changes with and without controlling for economies of scale, and life course changes including and omitting the costs (needs) of children. The differences we observe in these comparisons suggest that income needs are essential for understanding life course changes in (standardized) income levels. For that reason, we now turn to a discussion of equivalence scales.

Equivalence scales are needed to convert household income (or expenditures) into individual (standardized) income. Many kinds of equivalence scales have been proposed in the literature. Normative scales (the first type) are typically devised by experts. The best-known scale of this type is the OECD scale, which implies that for every additional adult and for every person younger than 14 a household needs 0.7 and 0.5 times the resources of the first adult, respectively, to remain on the same welfare level. This scale is often considered to underestimate the economies of scale and, consequently, to overestimate the needs of large households. De Vos and Zaidi (1997) therefore proposed a 'modified' OECD equivalence scale that gives a weight of 0.5 to every additional adult and 0.3 for every extra child.

Statistics Netherlands has determined another equivalence scale by using the so-called 'budget allocation method.' Statistics Netherlands uses their budget survey data to assess, for every consumption good, how families, on average, allocate their expenditures over their different household members. A problem in this method is that most budget items are observed at the household level and not at the individual level (e.g., food is usually measured at the household level).[24] For that reason, regression analysis is done to predict which part of a particular consumption good is consumed by specific household members, such

24 Statistics Netherlands uses data from the food consumption survey of 1998 conducted by TNO. In this unique dataset food consumption of every household member is observed.

as the household head or a child (Siermann, Van Teeffelen and Urlings 2004).

As mentioned before, the economic well being (or welfare) of individuals is the object of this study, which means that we need to do our analyses at the individual level (recognizing, of course, that people live in households). Next to economies of scale, the step from households to individuals also requires assumptions about the intra-household allocation of resources, and about preferences. The traditional equivalence scales (such as the OECD scales presented above) implicitly assume that resources are *divided equally* between husband and wife. Consider, for example, a female who plans to live together with a male. If there would be no economies of scale (all consumption goods are privately consumed), and if all resources would be divided equally within the newly formed couple, then the resources of the couple should be two times higher than the income of the single female in order to keep her equally well off.[25] The modified OECD equivalence scale states that the new couple needs only 1.5 times the amount of resources used by the female in her previous state in order to keep her at the same welfare level. According to the measure of Browning, Chiappori and Lewbel (BCL from now on) (2006), the modified OECD scale implies an economy of scale of e=1/3 (=2/1.5-1). As we discuss below, the literature on intra-household allocation convincingly demonstrates that resources are not divided equally within couples.

A second problem with the traditional literature on equivalence scales is that it seeks to answer the following question: *how much money does a household need to spend in order to be as well off as a single person living alone*? This question is almost impossible to answer because it involves a comparison of interpersonal utility. As Blundell and Lewbel (1991) and many others have argued, one cannot identify from budget survey data personal utilities such as the "joy of having children" and, consequently, the equivalence scale. This identification problem can be solved by combining subjective data on satisfaction and well-being (proxies for utility) with budget survey data in order to identify equivalence scales fully (Blundell and Lewbel 1991; BCL).

25 Suppose that the female would only get 25 percent of the resources when she would marry. Then the income of the couple should be 4 (=1/0.25) times higher than the income of the single female in order to keep her equally well off.

According to BCL, the question "how much money does a household need to spend to be as well off as a single person living alone?" is poorly posed, for two reasons. First, as mentioned before, any comparison between two decision units entails interpersonal utility comparison. Second, the notion of household utility is flawed: individuals, not households, have utility. According to BCL, the appropriate question to ask is: "How much income would an individual living alone need to have in order to attain the same standard of living that/she would have had if he/she were member of a household?" A so-called *indifference scale* can be determined by answering this question, which does not involve interpersonal comparability of utility functions and hence can be answered from budget survey data alone. In order to answer this question, BCL propose a 'collective' model that is defined in terms of individual preferences, a (linear) household consumption technology (that captures the economies of scale of living in a couple – e.g., due to publicly consumed commodities like renting or heating) and an intra-household allocation mechanism, the so-called sharing rule, which summarizes how the household's resources are distributed between husband and wife. Under the (strong) assumption that individuals' preferences with regard to goods do not change when they marry or live together, BCL show that all model parameters (i.e., the parameters of the individual utility functions, the household consumption technology and the sharing rule) can be identified from budget survey data. Once the model is estimated, indifference scales can be computed.

A recent paper estimates the parameters of the BCL model on a sample of Dutch elderly couples and widow(er)s (Cherchye, De Rock and Vermeulen 2008). They first find that the average economies of scale of living in a couple are equal to 0.32. This value almost coincides with that of the modified OECD scale (1/3, see above). Secondly, elderly couples, on average, share their resources almost equally (the average value of the wife's share is 0.49). As mentioned before, the modified OECD scale also makes this assumption. In other words, the results of Cherchye et al. (2008) imply that the average value of the indifference scales is rather similar to the modified OECD equivalence scale. This share appears to be strongly increasing in total expenditures, however, so that in poorer households the wife's share is much lower. This result implies that the value of the indifference scale depends strongly on total, real expenditures. Take, for instance, a woman who lives with someone as

a couple and has a low household expenditure level (i.e., in the first quartile of the expenditure distribution of couples). Suppose that such a woman becomes a widow. In order to maintain her standard of living, she needs 49% of the expenditures of the household in which she lived before. The corresponding figure for men in couples is equal to 81%. If we consider married women (men) in the highest quartile of the expenditure distribution of couples, the pattern is reversed: women (men) in couples need 82% (50%) of the couples' expenditures if they become a widow(er).

An interesting implication of this research lies in poverty rates. Cherchye et al. (2008) calculated poverty rates by means of their collective consumption model, and compare these rates with 'traditional' poverty statistics, which are based on the modified OECD scale and, consequently, ignore intra-household allocation of resources. The authors find that the poverty rates of women in couples are considerably higher than those of men in couples because, in low-income families, the husband typically claims a large part of the household resources. These findings have an interesting parallel in historical research on poverty in which authors have found that men consumed a larger share of the household income than women in very poor urban families in London during the early stage of the industrialization process (Young 1952). It should be kept in mind, however, that the contemporary Dutch results apply to the elderly. We know little about the degree of sharing among young singles and couples. Such a study is relevant in order to construct an indifference scale, which can be used to analyze the economic consequences of union formation.

Alessie, Crossley and Hildenbrand (2006) used the European Community Household Panel (ECHP) data, which (among other things) includes subjective data on financial satisfaction for every household member. Alessie et al. (2006) use only data pertaining to all singles and couples without children to estimate a collective household model. Their estimates suggest that cohabitating individuals enjoy returns to scale in consumption that are somewhat larger than the ones obtained by e.g., Cherchye et al. (2008) and BCL, and the one implied by the modified OECD scale (about 33%).[26] This similarity of estimates of the economies of scale in the consumption of households is rather comforting. Alessie's

26 The estimates for the Netherlands imply, however, extreme economies of scale (around 100 percent).

estimates also suggest that, in many countries, the share of household income provided by the female partner is strongly and positively related with her share in household consumption.[27] The way in which things are divided up, however, does not depend on household income itself. The results of Alessie et al. (2006) are thus different from the ones obtained by BCL and Cherchye et al. (2008), who find a positive impact of total expenditures (income) on the female share.

Most of the literature uses traditional equivalence scales and, consequently, ignores the evidence that resources are unequally divided within households. Lise and Seitz (2007), objecting to this practice, estimate a collective household model that is somewhat similar to that of BCL. In line with many other studies, they find that the female's share in household earnings positively affects her share in household consumption. From this finding, Lise and Seitz argue that it is inappropriate to use traditional equivalence scales in the analysis of consumption inequality. Instead, one should take into account inequality among adults within the household. Lise and Seitz use their estimates of the sharing rule parameters to construct a new measure of consumption inequality across individuals. Their findings can be summarized as follows. First, ignoring the potential for intra-household inequality leads to considerable underestimation of individual-level consumption inequality, as differences in earnings across husbands and wives generate substantial within-household inequality. Second, the reported rise in consumption inequality between 1970 and 2000 is overstated in the literature by almost two-thirds. This result is due to the fact that within-household inequality has fallen over time as female wages and labor supply have increased. Lise and Seitz stress the increasing importance of the phenomenon 'marital sorting': during the last decades, the distribution of marriages shifted from one-earner families, to a distribution with a larger proportion of both high-earning couples and low-earning couples. They find that the increase in marital sorting is the main explanation for the rise in consumption inequality between households and the fall in inequality within them.

The methodology of BCL has, regrettably, not been developed further so that it can be used to estimate the costs of children. This is rather

27 BCL did not find any impact of the female share in household income. The result is not in line with many earlier studies that find a positive impact of the female income share (see e.g., Browning, Bourguignon, Chiappori and Lechene (1994)).

unfortunate because the traditional economic approach for estimating equivalence scales suffers from a fundamental identification problem (i.e. the "joy of having children" cannot be estimated from budget survey data). Since one of the main life course transitions – becoming a parent – depends to a large extent on the assumed costs of children, it becomes all the more important to apply the utility approach to equivalence scales that include measures for children of different ages. Given the fact that the indifference scales of e.g. Cherchye et al. (2008) are not informative about the costs of children, we have decided not to use them in this paper.

Analyses

We end this section by showing to what extent the age-income profiles are sensitive to the type of equivalence scores used. Does the shape of the age pattern look different when various versions of the equivalence scale are used? To answer this question, we use the following (often-used) equivalence scores: (a) the CBS budget-based method, (b) the OECD equivalence scale, (c) the modified OECD equivalence scale, and (d) the traditional square-root scale (the square root of household size). The estimates are based on fixed-effects regression models, including dummy variables for each age and omitting controls for stage.

Figure 21 shows that OECD and modified OECD are parallel, although the former yields lower incomes than the latter because both adults and children are weighted more heavily in the original OECD scale. With regard to the pattern, it doesn't matter which one is used. We also see that the most complex method—the CBS method—yields almost exactly the same pattern as the simplest method (square root of household size). Interesting also is that the latter two measures yield more income declines at older ages, and a lower 'dip' during the early thirties. Hence, it is clear that the age pattern is sensitive to the standardization chosen. We do not use the same comparisons for the effect of discrete life course transitions, since these can be seen directly from the definition of the scale. The marriage gain is 18% in the OECD scale, 33% in the modified OECD scale, and 41% in the square-root scale. The child penalty is 19% in the OECD scale, 17% in the modified OECD scale, and 18% in the square root scale. Clearly, the benefit of marriage varies more across scales than the penalty of having children. In the CBS budget method, the child penalty also depends on the age and birth order.

6. Conclusion

The typical age-income pattern that has often been believed to apply to modern western societies seems less pronounced when it is analyzed in a real dynamic perspective. Although there is indeed an increase in income during the early adulthood stage, the subsequent 'child valley' or life cycle squeeze is less noticeable than was expected. The child valley observed in the dynamic model is actually not a valley, but an end of the income increase during early adulthood. Moreover, the decline in income during old age is also less pronounced. Previous analyses, which were based on cross-sections, have overestimated these dynamics by mixing up cohort- and age effects. While cohort effects do not affect the analysis in this paper, period effects do pose some problems. We have seen that the income dynamics become stronger (again), the more strongly we control for period effects. The increasing incomes during the 1989-2004 period apparently worked against the child valley and made people's early career development more pronounced. In the same way, the positive economic climate has softened the income decline during old age.

The income dynamics due to age that we observe are not very spectacular in magnitude, it seems. One of the reasons for this may lie in demographic change. There has been increasing heterogeneity in both the timing and occurrence of demographic events such as marriage formation and child rearing. Moreover, many new sequences have arisen, such as divorce, remarriage, having children before marriage, and so forth. The standard demographic life course has, in a sense, disappeared, and this may have resulted in a less pronounced age-income pattern. Comparable data on past age-income trends are needed to confirm this hypothesis.

Demographic transitions continue to be an important source of income dynamics. With regard to union formation, we find that although marriage brings economic gains, these are for a considerable part due to the economies of scale. Moreover, the gains are higher for women than for men because there still is a difference in earnings between single men and single women. Hence, women increase their income per capita more than men do, when they marry, because women marry men who earn more than they themselves do. Of course this will also depend on how consumption is divided within the household but evidence from

other studies so far does not suggest that wives get a smaller share of household consumption than husbands. The share that wives receive may also depend on income, however, so it remains to be seen whether the larger economic marriage gains of wives are also valid for poor households. The marriage gains are to some extent reduced again by the fact that income declines during marriage, probably as a result of the wife's gradual withdrawal from the labor market during marriage.

Having children also results in a decline in income. Most of this decline is due to the costs of children. A smaller but still substantial part is due to the decline in income which results from the wife working fewer hours or leaving the labor market altogether. For the short historical time span available for our analysis, we also found a decline in the negative effect of children over time. The child penalty is weaker for recent births than for older births. This is probably due to the improvements that have been made in the public childcare sector. When the children leave home, income increases, but this is entirely due to the fact that couples no longer have to cover the costs of children, and not to a real income increase.

Just as entering marriage brings gains, leaving marriage through divorce or separation leads to income losses. Divorce and separation have negative effects on the income position of women, while the income position of men remains unaffected. Remarriage allows women to compensate considerably for this income decline, however, and when they do not remarry, they gradually increase their income over time. However, we also see that a substantial minority of women becomes highly dependent on welfare, especially when they remain single and have children, suggesting that for *some* women, there are clear negative divorce effects. We can conclude that women follow alternative strategies after divorce that lead to different types of income trajectories. Finally, we found that there were no effects of widowhood on income.

This study has analyzed not only mean incomes but also the variance in incomes. The age–income variance pattern is clear. With age, the variance in income declines rapidly. We have argued that because age groups serve as social and cultural reference groups, the high levels of variance during early adulthood coincide with high levels of uncertainty that people experience. The income variance also increases during old age, especially up to the retirement age. This is probably the result of the heterogeneity in the retirement routes that people follow (early

retirement, disability, unemployment, normal retirement). Hence, the stage before age 65 is a stage of increasing income inequality. After age 65, the variance in income declines again. Although we find clear effects of demographic transitions on the mean income levels, there were only small effects on the variance in income.

The income measure we used is standardized income (i.e., income divided by the number of household members, adjusted for the economies of scale and the needs of the household members). We have found that both the age pattern and the estimates of stage effects are sensitive to the type of standardization chosen. While the current assumption about economies of scale is not implausible (given recent research that incorporates measures of well-being in developing equivalence scales), we end by making a plea for more empirical research to measure the needs and costs of households empirically. In this research, special attention should be devoted to issues around intra-household allocation. We have seen that the assumption of equal sharing of resources within households is not tenable. Moreover, more research is needed on the costs of children, since the empirical base for these costs in the equivalence scales is not as solid as one would like it to be. More generally, we argue that for a better understanding of how an individual's economic well being changes over the life course, the research attention on income differences should be augmented by new attention devoted to differences and dynamics in consumption.

7. Some recommendations

From our analyses of changes in overall income, it is not possible to derive direct implications for policy. This would require a more detailed look at the income components and a more direct research design for analyzing effects of policy changes. Nonetheless, we can address some of the general concerns that have been raised in the 'Bakker committee' report (Advies Arbeidsparticipatie 2008). This report states that, due to population aging, the size of the labor force will decrease from 2010 onwards. At the same time, labor demand will continue to grow, especially in the education and care sector. It is therefore important to increase the labor force participation of men and women. The decline in the child valley that we have observed is comforting in this respect. However, it is also true that many women still work part-time, and more so in the Netherlands than in other countries (Blossfeld and Hakim 1997). Whether improvements in the public childcare sector will change this situation is unclear. Part-time work is also driven by preferences of couples to spend time with the children (Portegijs, Cloïn, Ooms and Eggink 2006). Moreover, there is a call on fathers to spend more time with their children, too, and this will be achieved at the cost of reducing their working hours. Time investments in children by parents contribute to the well-being of the children (McLanahan 2000; Sayer, Bianchi and Robinson 2004) so that for future generations, the opportunity to work part-time by parents is a positive feature of the Dutch economy. One would therefore not want to recommend that more women should work full-time when they become mothers, or discourage men from working part-time when they become fathers.

However, it has also been observed that many women work part-time even if their children are older and there is little (full) return to the labor market when the children leave home (Kalmijn and Luijkx 2003; Román, Schippers and Vlasblom 2007).[28] We therefore think that less attention should be paid to the immediate income loss due to the initial decline in labor force participation after parenthood—we doubt that many Dutch mothers will ever work full-time in the first years after the birth of their child(ren). More attention should be paid to the potential long-term

28 Of course, such findings are still based on somewhat older cohorts, we have to wait and see what happens with the *current* young parents after their children leave home.

consequences of the reduction in labor supply after birth for women's (and households') income situation. In relation to this, more attention should be paid to what happens when the children become older, when they go to elementary school, to secondary school, and when they leave home. During the school stage of the children, women can move from small part-time jobs to larger part-time jobs, and during the empty nest stage, women can switch from part-time work to full-time work. There seems to be room to increase labor force participation in this stage of the life course.

To facilitate such 'later' transitions back to work, it is likely that institutional revisions in society are needed. Currently, the social security system is closely tied to the employment of the traditional male breadwinner, whose stable career and insider's status is well protected through employment legislation. Moreover, almost all collective labor agreements assume a wage floor that is higher than the statutory minimum wage. High job protection and high wage floors depress unskilled employment and crowd out a low-wage service sector. Moreover, they curtail the possibilities of women with children to re-enter the labor market. In order to get a more inclusive labor market, the Bakker committee has made relevant proposals to revise the labor market institutions (which we will not discuss here). The basic point is that labor markets should become more flexible so that temporary departures (by women or men) are not penalized, changes in working hours are easy, and human capital can be maintained throughout the life course (Bovenberg 2005). Taking such policy measures will allow women to plan their working career in a more flexible way, and this provides them with the chance to work fewer hours temporarily without hurting their long-term career perspectives.[29] It should also facilitate changes between small- and large part-time jobs and between part-time and full-time jobs. In line with this, we also agree with the Bakker committee that employers should offer jobs that allow for more flexible workplace cultures (e.g., teleworking), and for working-time arrangements that take account of school times.

More flexible labor markets and a less traditional social security system might also improve the labor position of other vulnerable groups, like

29 It may already be the case, however, that part-time work is less harmful for women's wages in the Netherlands, where part-time work is common, than in countries where part-time work is less common.

divorcees and single parents with children. In a more flexible system, divorced women would find it easier to re-enter the labor market after divorce, and they would presumably not be penalized for an earlier career interruption during marriage. It should also be acknowledged here, however, that single women with very young children at home want and need to spend time with their children, and therefore cannot be expected to work full time. Given the negative effects of parental divorce on the well-being of children (Fischer and De Graaf 2001; Spruijt and De Goede 1996), it is clear that caring time is important in such families, and that work time can compete with this. The problem of the welfare dependency of many divorced women is obviously the other side of this coin, and it should be emphasized that the duration of welfare dependency is rather high— once on welfare, always on welfare, it seems (at least as long as the divorced women remain single). Although this is a complex problem, it has been recognized that the roots of part of the problem can be found in the welfare trap— the loss of other government benefits (e.g., rent subsidy) after entering employment. Policies can address this problem. The solution may also include making welfare policies duration-specific. Welfare arrangements may be generous in the early years after divorce— which should help the children of divorced women— but this does not mean that they should remain generous after the children are older or have left the home of the divorced mother. But again, this also requires a labor market that has moved away from penalizing old age and career interruptions.

There are also financial issues involved that call for our attention. One problem is that the marginal tax rate that is levied on the earnings of the secondary earner (i.e. the wife) is rather high (frequently more than 60%, and in some cases more than 80%). Measures should be taken to alleviate the marginal tax rate of the secondary earner. We agree with the Bakker committee recommendation to abolish the rule that the "general levy rebate" (algemene heffingskorting) of the female partner is transferable to the husband in case she does not work, even if she has young children. In addition, the amount of childcare refund (kinderopvangtoeslag) should depend on the taxable income of the spouse who earns the most and not on total household income. Obviously, other measures to lower the marginal tax rate of the secondary earner are possible.

Concerning the replacement rate of survivor pension arrangements, one could consider providing participants of pension funds with more choice options. Nowadays, participants can already choose to abstain from a survivor pension arrangement. In return, they receive a higher old-age pension benefit. In the case that the participant prefers to retain his/her (future) survivor pension entitlements, the major pension funds typically offer a surviving pension benefit that is equal to about 70 percent of the old-age pension. The replacement rate of 70 percent is reasonably in line with the one implied by the modified OECD equivalence scale (1/1.5=2/3). The study of Cherchye, de Rock and Vermeulen (2008) also indicates that 70 percent is a reasonable replacement rate for the average elderly couple that distributes their resources equally. At the same time, Cherchye et al. (2008) find that in the case of rich (poor) elderly couples, the wife gets a higher (lower) share of the household's resources than the husband. Consider a rich couple of which only the husband has built up pensions rights. If one takes the results of Cherchye et al. (2008) seriously, it would be optimal that in the former case the husband's pension fund would offer a higher replacement rate than 70 percent in exchange for a lower old-age pension benefit. At the minimum, one would like to offer participants of pension funds more freedom to trade off between the level of survivor pensions and old-age pensions (keeping pension wealth constant).[30]

30 We realize that problems of adverse selection may arise if one allows for more freedom in choosing the replacement rate. Less healthy participants of pension funds may opt for a high replacement rate so that the surviving spouse will receive a relatively high pension. Notice, however, that pension funds already provide degrees of freedom in choosing the retirement date. This choice may also cause problems of adverse selection.

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TABLES AND FIGURES

Table 1.- Means and standard deviations of income by year							
Year		Household income			Standardized income		
		mean	s.d.		mean	sd	n
1989		10.035	0.611		9.605	0.494	69066
1990		10.049	0.640		9.635	0.519	70880
1991		10.045	0.640		9.632	0.522	68583
1992		10.046	0.634		9.635	0.518	69068
1993		10.045	0.635		9.637	0.519	69613
1994		10.040	0.638		9.634	0.525	70175
1995		10.051	0.642		9.649	0.526	70670
1996		10.056	0.649		9.657	0.538	70707
1997		10.068	0.640		9.673	0.527	71022
1998		10.101	0.632		9.710	0.520	71337
1999		10.113	0.637		9.723	0.527	71972
2000		10.135	0.629		9.747	0.518	72755
2001		10.114	0.618		9.743	0.506	64720
2002		10.118	0.622		9.749	0.510	64882
2003		10.108	0.626		9.744	0.517	64409
2004		10.108	0.632		9.748	0.522	63821
Source: IPO panel (see text). Incomes adjusted for CPI and logged (natural logarithm).							

Figure 1.- Mean standardized income (logged) by age according to cross-sectional analyses (ols) and fixed-effects analyses (fe)

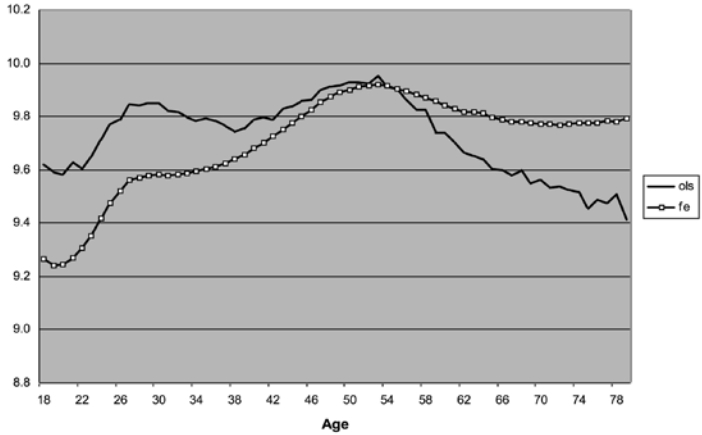


Figure 2.– Mean standardized income by age for 5-year birth cohorts

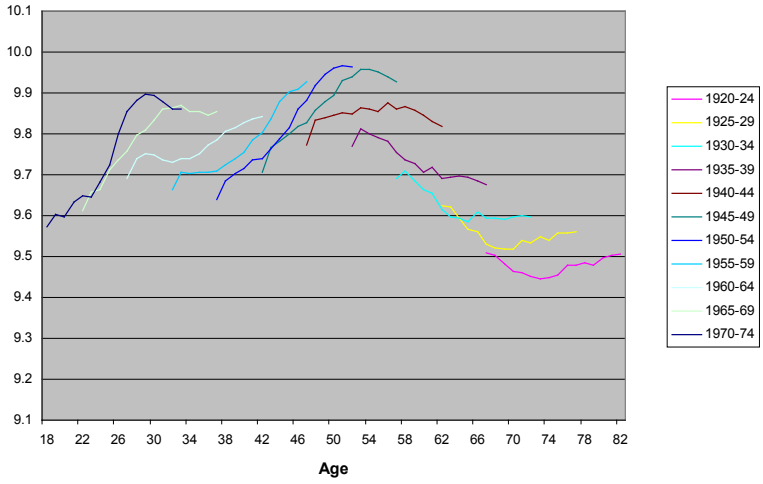


Figure 3.– Mean standardized income (logged) by age for 5-year birth cohorts: Zooming in at the older ages

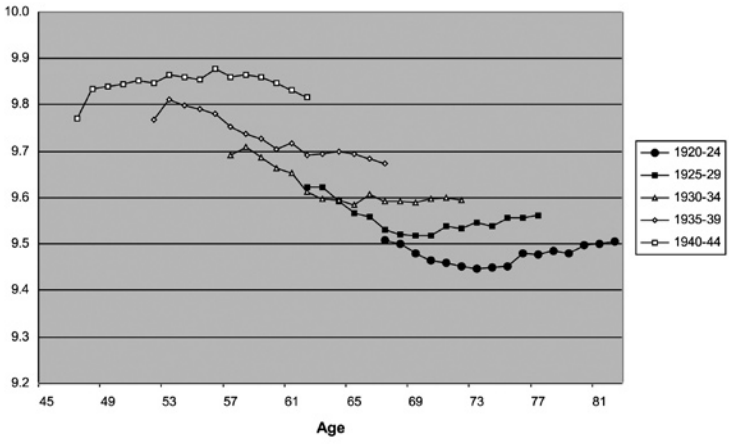


Figure 4.- Mean standardized income (logged) according to fixed-effects models with and without controlling for the influence of demographic stage effects

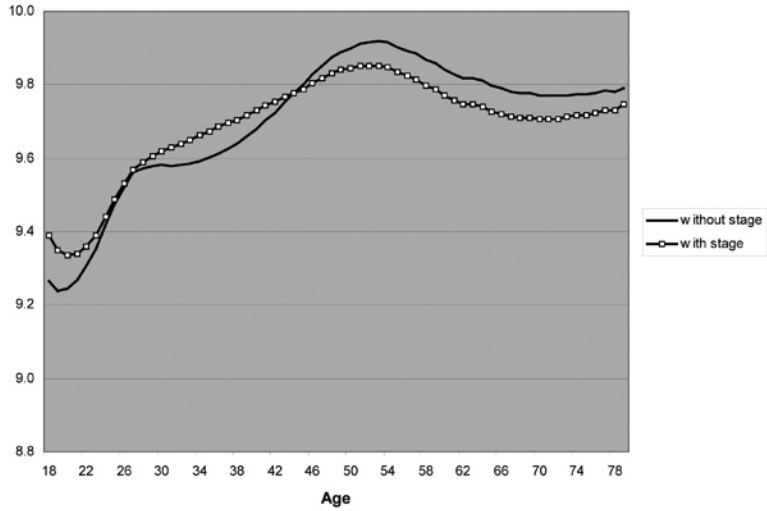


Figure 5.- Mean standardized income (logged) according to fixed-effects models with two types of period adjustments

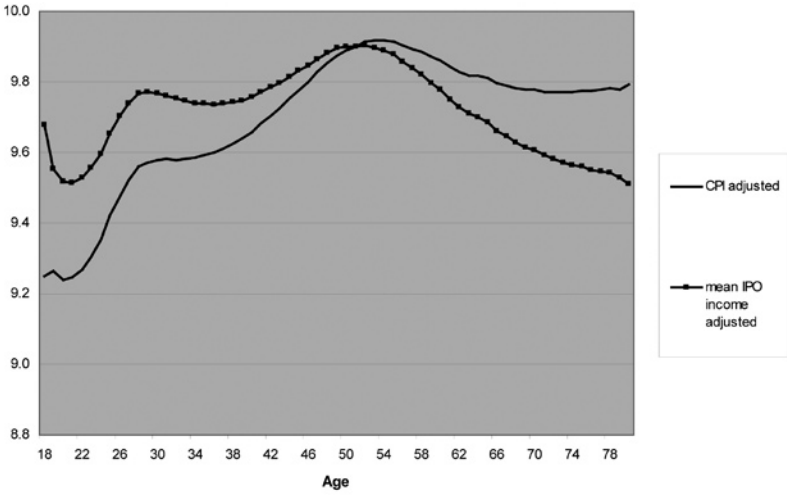


Figure 6.- The variance of standardized income (logged) by age for different 5-year birth cohorts

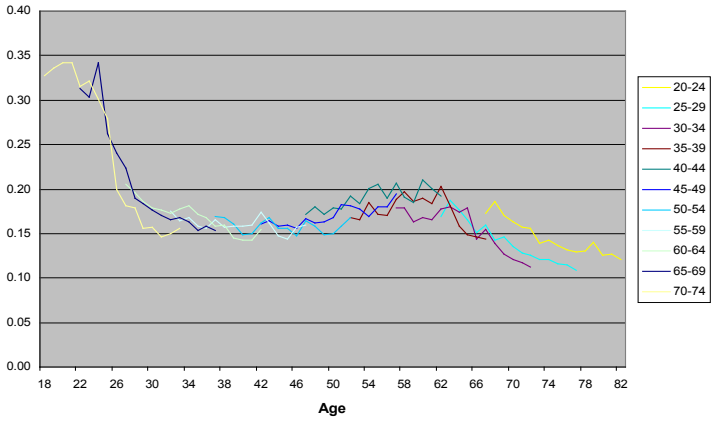


Figure 7.- The 2-year autocorrelation of standardized income (logged) by age for different 5-year birth cohorts

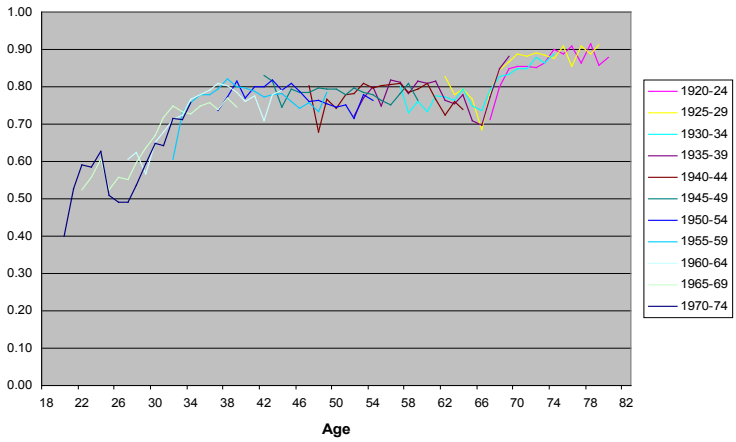


Figure 8.– The effects of union formation on standardized income (logged) for men and women and by duration of the union (estimates from fixed-effects models)

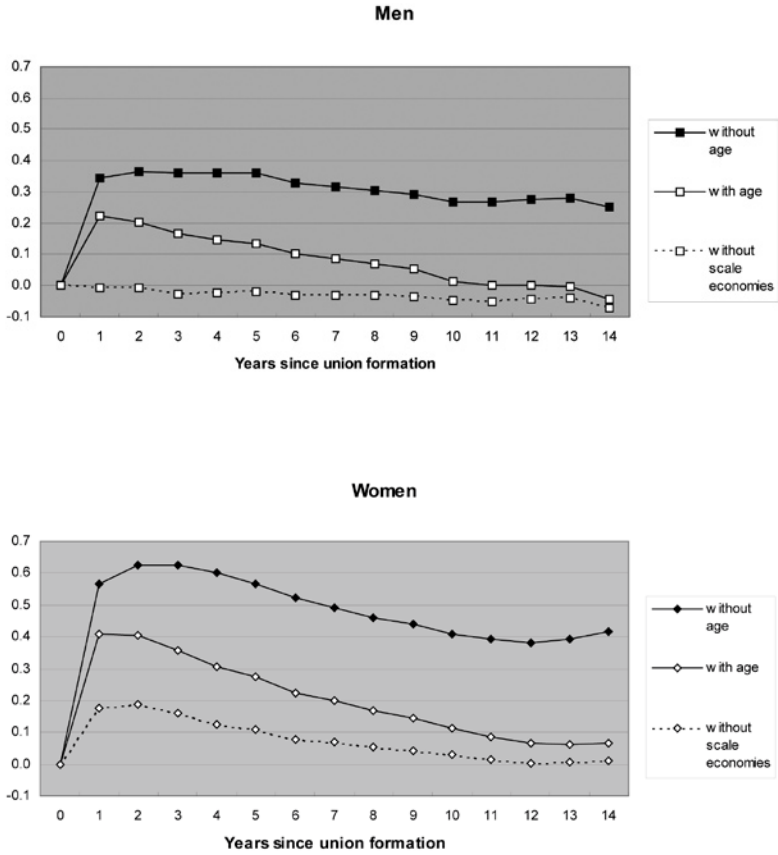


Figure 9. – The effects of union formation on the variance of standardized income (logged) for men and women by duration of the union (estimates from random effects models)

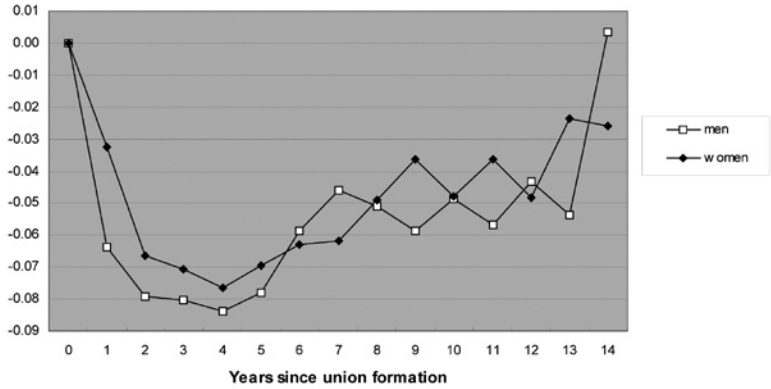


Figure 10. – The effects of parenthood on standardized income (logged) by years since parenthood (estimates from fixed-effects models)

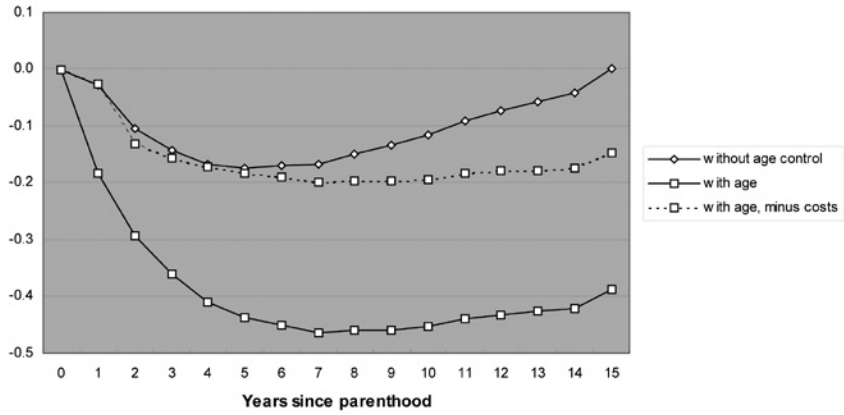


Figure 11. – Effects of the number of children on standardized income (logged) (estimates from fixed-effects models)

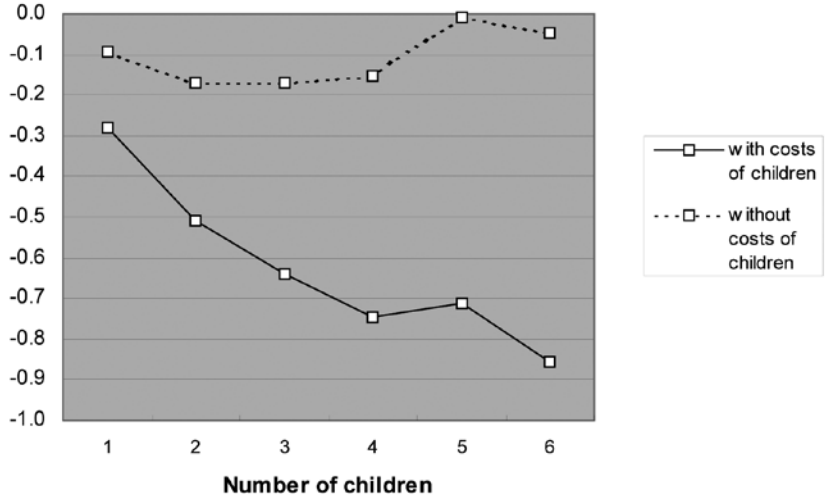


Figure 11a. – Effects of the children leaving home on standardized income (logged) (estimates from fixed-effects models)

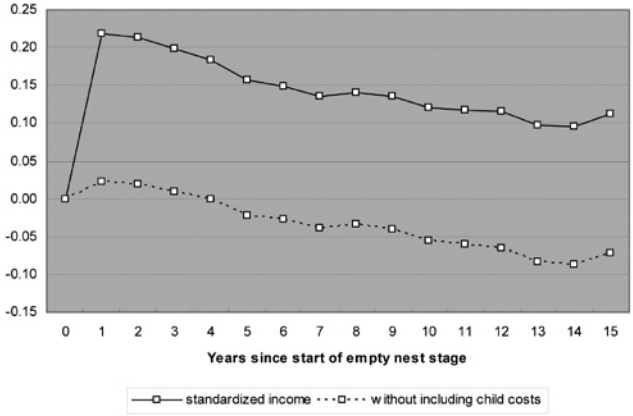


Figure 12. – The effects of parenthood for different periods of birth of the child by duration since parenthood (estimates from fixed-effects models)

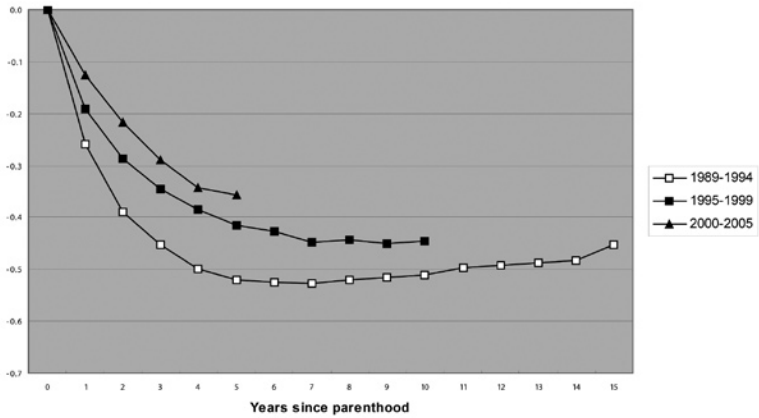


Figure 13. – The effects of parenthood on the variance of standardized income (logged) by duration of parenthood (estimates from random-effects models)

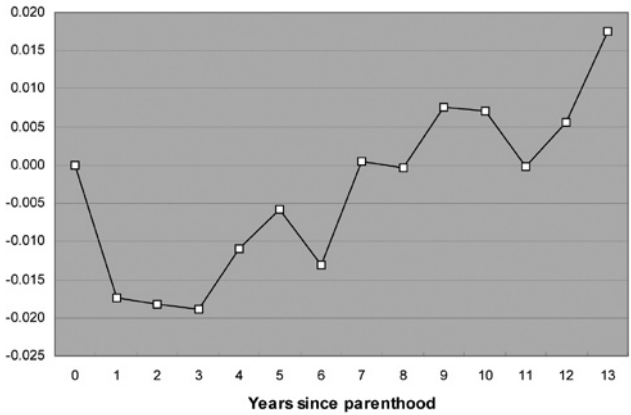


Figure 14. – The effects of divorce/separation on standardized income (logged) for men and women by years since the divorce (estimates from fixed-effects models)

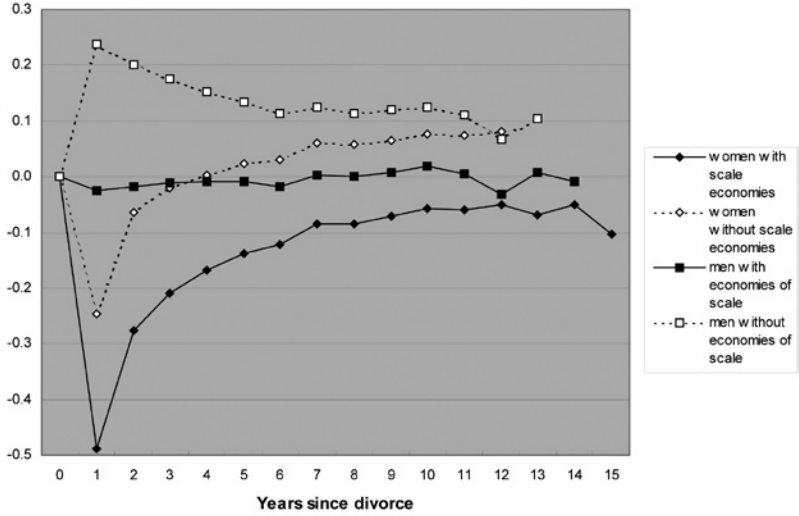


Figure 15. – Proportion of men and women who remarry after separation

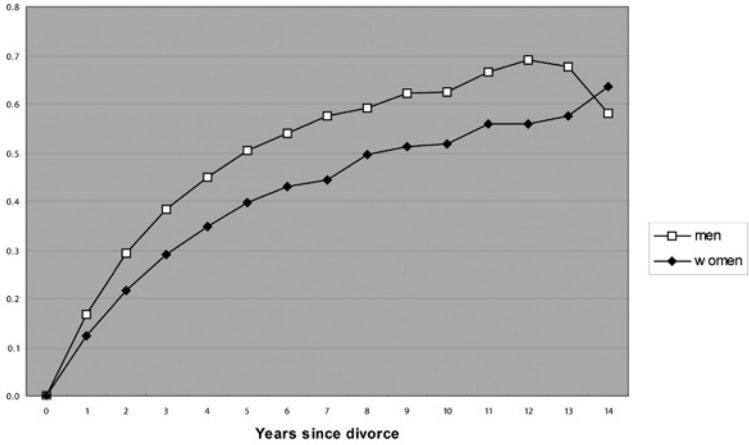


Figure 16. – Effects of separation on standardized income of women by whether or not the woman remarries (estimates from fixed-effects models)

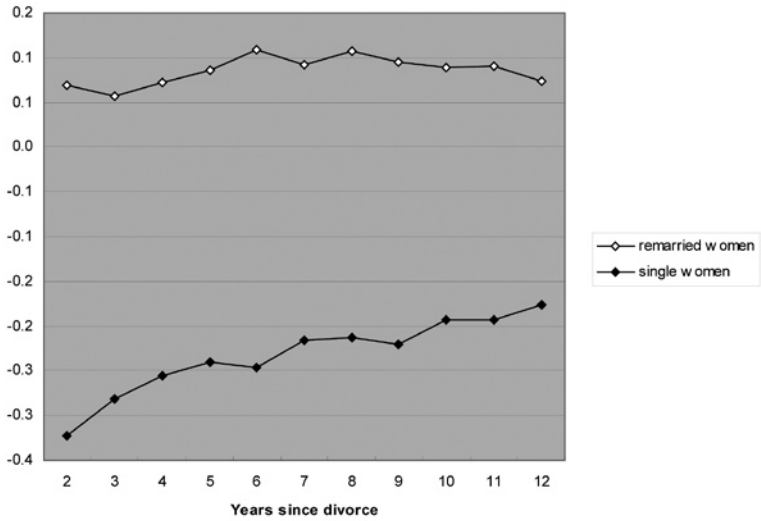


Figure 17. – Proportion of separated women on welfare by years since the separation and post-divorce household situation

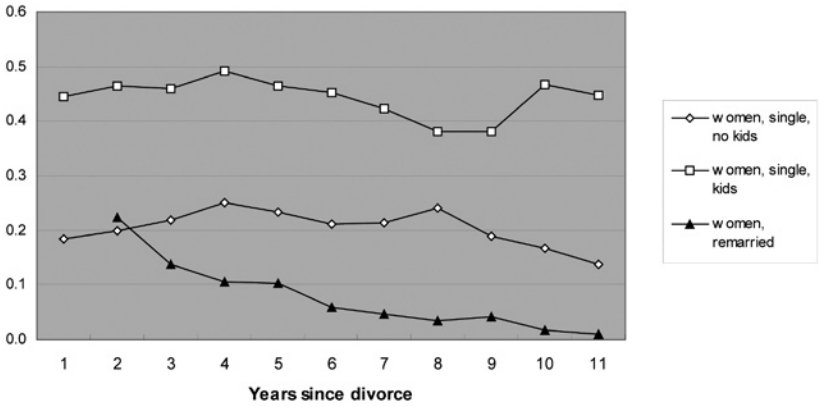


Figure 18. – The effect of separation on the variance of standardized income (logged) by years since the divorce for men and women (estimates from random-effects models)

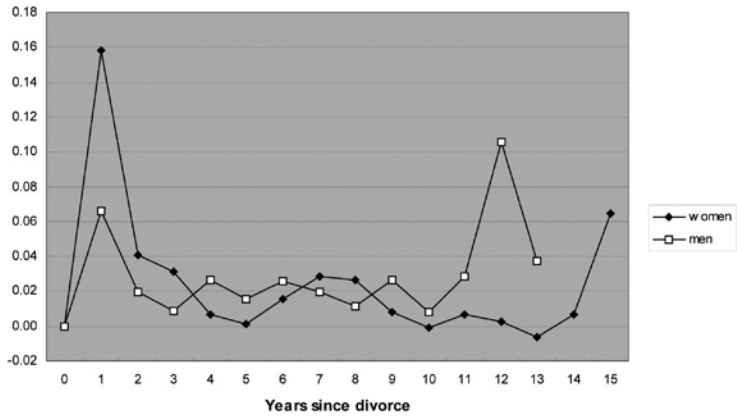


Figure 19. – The effects of widowhood on women's standardized income (logged) by years since widowhood and age of death of the partner (estimates from fixed-effects models)

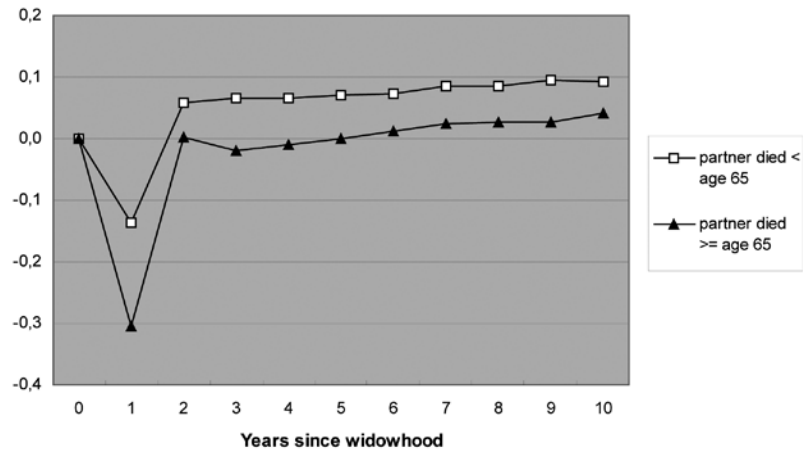


Figure 20. – The effects of widowhood on the variance of women's standardized income (logged) by years since widowhood and age of death of the partner (estimates from random-effects models)

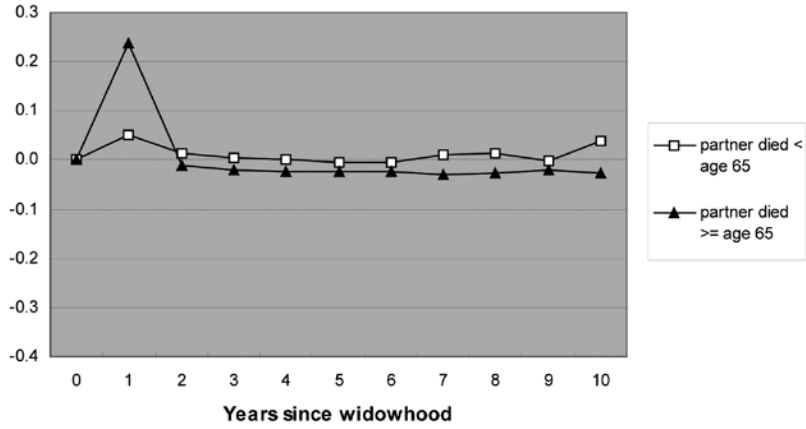
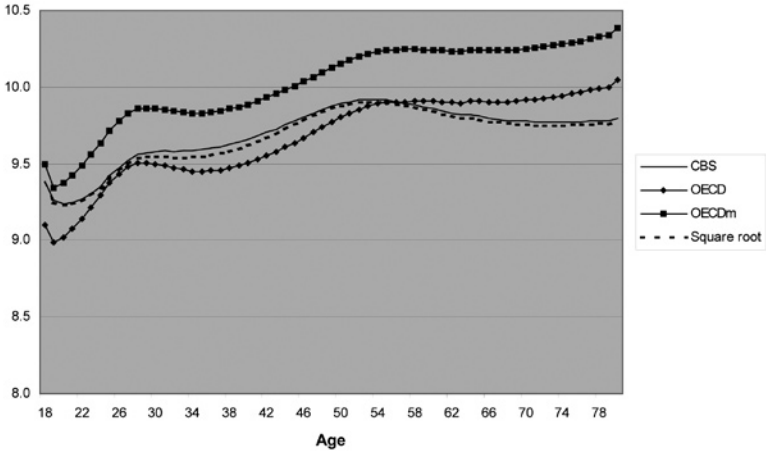


Figure 21. – The effects of age on standardized income (logged) with different standardizations (estimates from fixed-effects models)



SUMMARY OF DISCUSSION

By Marike Knoef

Life course changes in income: An exploration of age- and stage effects in a 15-year panel in the Netherlands
by Matthijs Kalmijn and Rob Alessie

Chairman: Henk Don (Erasmus University Rotterdam)
Discussants: Jan van Ours (Tilburg University), Arthur van Soest (Tilburg University) and Ray Rees (University of Munich)

Netspar Panel: October 16, 2008

The discussion

Jan van Ours opened the discussion by noting the advantage of panel data compared to cross-sectional data. He illustrated this by referring to figure 1 of the paper, where a cross-sectional analysis is compared with a fixed-effects analysis. After the age of 55, income is downward sloping in the cross-sectional analysis; in the fixed-effects analysis, however, there seems to be only a very small decrease in income.

Van Ours liked how the paper provides a nice overview of life cycle events and the evolution of income. Although age is an important variable, you cannot do anything about age. Economics has to do with choices, but age is not a choice. Stages, on the other hand, are discrete events with a clear interpretation. Contrary to age, a given stage *does* affect income. Stage effects are problematic, however, because they are not always observed. For example, when children leave the household, standardized household income increases. This is because household size decreases. This does not mean, however, that transfers from parents to children no longer occur. Although parents and children are no longer in the same household, the transfer of money from parents to their children may persist, or may even be higher than before (consider, for example, children who continue their education and live away from home).

The Kalmijn-Alessie paper focuses on standardized household income, which is household income divided by the equivalence scale. It appears

that changes in standardized household income are due mainly to changes in the denominator (the equivalence scale), rather than to changes in the numerator (household income).

The dataset used in the paper is the Dutch Income panel (IPO). While an interesting dataset, it contains few personal characteristics. An example of an important characteristic that is missing is education. Drawing strong conclusions is consequently problematic.

Van Ours ended his discussion by indicating what may be learned from this paper and what could be improved. One thing that might be learned is that there is no "child valley". Furthermore, at old age there is only a mild decline in income (instead of the steep decline found by studies that use cross-sectional data). Van Ours made three suggestions to improve the paper: (1) Provide the definition of "birth" in section 2. (2) The "naïve researcher" in section 2 must be extremely naïve. (3) The paper refers to situations in which couples live together as "union formation". This creates some confusion with labor unions.

Van Ours also made some general suggestions. The first is to improve the motivation for the life-course perspective. The paper mentions four motivations. Van Ours believes that there is only one real motivation: that the dynamic analysis of income is relevant for our understanding of consumption and saving behavior. His second suggestion concerns figure 1. Figure 1 shows averages, but these are unimportant, he maintained, without stage effects. More interesting, for example, is to consider divorced persons at age 30, and to explore what happens to the income of these persons during the rest of their lives. Finally, while Van Ours liked the policy recommendations, he noted that some of the conclusions in that section are not based on the analysis.

Arthur van Soest continued the discussion. He discussed his reactions, and those of **Ray Rees**, to the paper. Van Soest and Rees found the paper interesting and valuable. They appreciated the identification of cohort and age effects, and mentioned the advantages of panel data, compared to cross-sectional data. They emphasized the careful discussion of the role of household equivalence scales in the paper. Furthermore, they mentioned that the authors seem to be aware of the limitations of their data and their study and describe this well.

Van Soest addressed the question of whether income variations are indicative of changes in welfare. In order to answer this question, data

on consumption and time allocation are needed. Unfortunately, they are not available in the dataset. The paper assumes an equal distribution of income within the household. While this is, generally speaking, a good assumption, it does not hold for specific groups of people. Inequality at the individual level is therefore most likely to be underestimated. The paper checks the sensitivity for the choice of the equivalence scale. According to Rees and Van Soest, this may be the best thing that could be done with this data. The data also misses individual characteristics such as education and health .

The paper distinguishes age, period and cohort effects. Period effects are taken into account by taking out inflation. This is quite a strong assumption. Without strong assumptions, age, period, and cohort effects could never be identified.

Van Soest and Rees noted that the paper of Apps and Rees (2002) could be added to the literature of this paper. The latter paper, which carries out similar analyses with cross-sectional data of the UK, the US, Germany and Australia, finds very sharp child valleys. The child valleys in the current paper are somewhat smaller, probably because cohort effects are taken into account. It might be interesting to compute the child valleys with cross-sectional data in the Netherlands and to compare them with the child valleys found in the other countries, to find out whether the Netherlands is different. Should the child valley in the Netherlands prove to be smaller, an interesting extension might involve relating this to institutional differences (consider, for example, childcare facilities in the Netherlands, compared to other countries). A fair comparison between studies can occur only if the "cost of children" is incorporated in the same way. A discussion point is what should be included in the cost of children (e.g. childcare costs, including foregone labor supply and leisure; the value of children's consumption; increases in household public goods). In the Kalmijn-Alessie paper, the "cost of children" stems from the equivalence scale.

The conclusions with regard to the effects of household formation are sensitive to the assumptions that are made. The extent to which a woman benefits from marrying depends on how income is distributed within the household. In addition, one should take into account the substitution between formal and informal work. A redistribution of income from husband to wife can be a compensation for the household production of the wife.

When children leave the household, female labor supply does not rise appreciably. While this may be due to preferences, it may also be caused by specialization in household production and a loss of human capital due to career interruption. If the latter is the case, then the policy conclusion "less attention should be paid to the initial decline in labor force participation after parenthood" is not valid, as this decline has persistent consequences.

Next, Van Soest and Rees made two remarks with regard to the variance in income. The results on the variance in income in the Kalmijn-Alessie paper seem to be driven mainly by labor force participation. For international comparability, it might be interesting to look also at the Gini coefficient. Furthermore, with respect to policy purposes, poverty rates may be relevant.

The policy discussion in the paper focuses mainly on (female) labor force participation. Van Soest and Rees did not disagree with the policy implications, but mentioned that these do not follow directly from the analysis of the data. More emphasis could probably be placed on the role of marginal taxes for (female) labor supply. Van Soest could not ascertain whether the income from life insurance policies was included. It appears that several sources of income are observable in the data. It might therefore be interesting to distinguish between these sources of income and to investigate the role of pensions, early retirement arrangements and survivor pensions.

With regard to future research, van Soest suggested making comparisons with other countries and linking the data to other data. If possible, the inclusion of information on wealth and retirement entitlements would be interesting. Another point to consider is whether stage changes, such as having children, are really exogenous.

Authors' reply

For some people age *is* a choice. Kalmijn told an anecdote about soccer players in Africa. Their age is uncertain. Since talent spotters cannot select boys who are too young, these boys choose their own age (e.g. 17 instead of 14), and this has a long-term effect on their income. More seriously, manipulation of biological age is possible— for example, by choosing your behavior such that you have a high probability of remaining healthy.

Kalmijn and Alessie emphasized that changes in standardized household income are due mainly to changes in the denominator (the

equivalence scale). This was also emphasized in the paper. The authors underlined the fact that the distribution of income within households is an important issue to study, and could be pursued by analyzing consumption and behavior within households.

The data are indeed not optimal. IPO has some advantages— namely, that income is measured very accurately and that it is quite a long panel. Kalmijn and Alessie expressed the hope that in the future it will be possible to merge IPO with other data. This would lead to the availability of more information.

The paper took period effects into account by deflating the incomes. It would also be possible to correct for period effects on top of this. The authors said they were compelled to make assumptions in this regard.

The child valley they found in the analysis is lower than that in most of the other literature. This may be due to the cohort effects that are taken into account in the paper. What also may play a role is the fact that the age at which the first child is born is more varied in younger cohorts. In older cohorts people got their first child around the same age. Nowadays, age patterns are more blurred by the variety of ages at which people get their first child.

General discussion

Peter Kooreman (Tilburg University) mentioned that income is intermediary. Why should we care about income, when leisure and consumption are the inputs entering the utility function? Kooreman proposed the idea of examining the amount of taxes people pay over the life cycle. With the current dataset it is possible to investigate how much people contribute to the society.

Arthur Giesberts (Statistics Netherlands) questioned why the authors looked at 'years after transition' instead of age. Kalmijn and Alessie answered that this allowed them to look at the effects of the transition *on top of* the age effects.

Mauro Mastrogiacomo (Netherlands Bureau for Economic Policy Analysis) had a comment with regard to the child valley. He suggested that people might accumulate extra wealth in anticipation of the birth of their children. Kalmijn responded that they did not find exceptionally higher incomes before the birth of a child. Alessie added that they might be able to investigate the question further using the dataset, which contains some wealth information.

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