Precautionary Saving and the Influence of Unemployment Insurance on Saving Behaviour

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vorgelegt von
Alexander Ahrens

Gutachter:
Prof. Dr. Dr. h.c. Dieter Sadowski
Prof. Dr. Georg Müller-Fürstenberger

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Chapter 1

Introduction

Intertemporal decision making depends upon beliefs about the future. When thinking about consuming or saving income today, individuals take into account what they expect to earn in the future, or more generally speaking, what their expected consumption possibilities will be in the future. This basic idea of how individuals allocate their earnings over time can already be found in the biblical story of Joseph. Joseph was sold by his brothers to Egypt and held as a captive in prison. One day, the Pharaoh had a dream that he was not able to interpret. He dreamed that seven ugly and gaunt cows came up out of the river Nile and ate up seven sleek, fat cows. Moreover, he saw seven ears of healthy and good corn in his dream which were swallowed up by seven thin ears. Because Joseph had correctly interpreted a dream of the chief cupbearer two years before, the Pharaoh asked him to interpret his dream as well. The solution to the puzzling dream was that the cows and the ears of corn both stood for years. Seven years with a good harvest would be followed by seven years of famine. Consequently, Joseph advised the Pharaoh to save a fifth of the harvest in the good years to be kept as a reserve for the years of famine. This story illustrates what is nowadays called consumption smoothing over time, long before Hermann Heinrich Gossen wrote down his 'first law' of diminishing marginal utility. This 'law' represents the crucial property of an individual's utility function to base the savings of today on the on the expected consumption of tomorrow. The intertemporal smoothing of marginal utility of consumption became one of the major building blocks of the permanent income/life-cycle hypothesis (Friedman [1957], Modigliani and Ando [1963] and Hall [1978] among others). In its early version, this model assumes certainty equivalence by referring to quadratic preferences. Under these kind of preferences current saving depends only on the first moment of the expected future income distribution.

Precautionary saving

Leland [1968] and Sandmo [1970] supplemented the theory of the allocation

of consumption over time by suggesting that the actual saving behaviour of an individual does not only depend on the expected *level* of future consumption or income, but also on the *variance* of the future income distribution. This innovation opened the door for the analysis of a variety of interesting topics. First and foremost, it allows one to examine how the saving behaviour of individuals and households is influenced by future income uncertainty and variance shocks to their expected future income distribution. A necessary condition for such a precautionary motive for saving is a positive third derivative of an individual's period utility function (i.e. $u''' > 0$). This characteristic of the utility function was labelled 'prudence' by Kimball [1990]. The idea of saving for precautionary reasons can be illustrated with the help of a simple two period model. Basically, the convex marginal utility of consumption implies that even in the case of a mean preserving spread of the income in the second period, an individual increases savings in the first period. Following Ljunqvist and Sargent [2004, 599f], this can easily be seen by looking at the Euler equation under the assumption that there is an interior solution regarding consumption but no initial wealth. The Euler equation can then generally be depicted as follows

$$u'(Y_1 - A) = \beta R \cdot E u'(R \cdot A + Y_2) \tag{1.1}$$

with R representing the gross interest rate, β is the rate at which the individual discounts future utility and Y_t is the labour income in period $t = 1, 2$. Finally, A stands for the assets that are transferred from the first to the second period, i.e. the optimal savings. That a higher variance of the income in the second period leads to higher savings in the first period under the assumption of $u''' > 0$ can now be clarified by comparing optimal savings in the case of a deterministic second period income ($Y_2 = \bar{Y_2}$) with the case of a stochastic income with an expected value of the same amount ($E(\widetilde{Y_2}) = \bar{Y_2}$). So, in the deterministic case, the Euler equation

becomes

$$u'(Y_1 - A_d) = \beta R \cdot u'(R \cdot A_d + \bar{Y_2}) \tag{1.2}$$

where A_d denotes the optimal savings in the deterministic case. In the stochastic case, the Euler equation reads as follows

$$u'(Y_1 - A_s) = \beta R \cdot Eu'(R \cdot A_s + \widetilde{Y_2}) \tag{1.3}$$

with A_s representing optimal savings in the stochastic case. According to Jensen's inequality, the following relation holds under the assumption of a positive third derivative of the period utility function.

$$\beta R \cdot Eu'(R \cdot A_s + \widetilde{Y_2}) > \beta R \cdot u'(R \cdot A_s + \bar{Y_2})$$

and equation (1.3) can be rewritten as

$$u'(Y_1 - A_s) = \beta R \cdot Eu'(R \cdot A_s + \widetilde{Y_2}) > \beta R \cdot u'(R \cdot A_s + \bar{Y_2}) \tag{1.4}$$

By comparing equations (1.2) and (1.4), it can easily be seen that $A_s > A_d$, i.e. optimal savings are higher when the income in the second period is stochastic. Or, to put it another way, a higher expected variance of the future income distribution induces prudent individuals to accumulate higher savings today as a buffer stock.

Prudence as a property of the utility function that induces individuals to save for precautionary reasons is at the core of the following chapters of this dissertation. Each chapter, however, is self-contained and focuses on slightly different issues. In the second chapter, emphasis is placed on the assessment of how important precautionary savings are in relation to the total wealth of a household. This is done by evaluating data at household level from the Netherlands. By showing the instabil-

ity of expected income risks, the chapter further points to the difficulty of exactly quantifying the extent of the buffer stock. Moreover, the findings suggest that the saving behaviour for precautionary reasons varies considerably across the income distribution. By linking saving behaviour with unemployment insurance, chapters 3 and 4 shed some light on an issue that has largely been neglected in the literature so far. Whereas the third chapter models the relevance of unemployment insurance for income uncertainty and intertemporal decision making during institutional reform processes, chapter 4 seeks to establish empirically a relationship between saving behaviour and unemployment insurance.

In sum, this dissertation supplements the empirical literature on precautionary saving and adds to the understanding of how unemployment benefits affect economic decision making. Both from a micro and macroeconomic perspective it is important to understand the accumulation of capital as well as consumption as its counterpart, since the latter accounts for a large part of the GDP and substantially determines utility and welfare (Attanasio [1999, 743] and Deaton [1992, vii]). On the other hand, filling the gaps in our knowledge of the different ways through which institutions affect the economy may help to improve the design of institutions and to better assess the consequences of reforms (Cahuc and Zylberberg [2004, 782]). The remainder of this first chapter introduces and summarises the basic ideas, approaches and the most important results of each of the following parts of this dissertation as well as their respective contributions to the literature.

Precautionary saving and the (in)stability of subjective earnings uncertainty

In the past two decades, a number of authors made efforts in testing the relevance of the precautionary saving motive against (uninsurable) income risk using microdata. Generally, they confirm the existence of a precautionary motive to explain wealth accumulation and consumption behaviour, but the literature does not give a clear picture of the extent of the buffer stock held by households to self-insure

against a volatile income. Estimations cover the range from about 50% of a household's total assets (Carroll and Samwick [1998]) to more modest levels between 2% (Guiso et al. [1992]) and about 20% (Lusardi [1997])[1]. The empirical strategy is almost the same in the majority of the papers: the log of a household's wealth is regressed on a measure of income uncertainty, permanent income and a variety of variables which control other saving motives during the life-cycle (see e.g. Carroll and Samwick [1997], Lusardi [1997], Arrondel [2002] and Bartzsch [2008]). The most difficult part in those studies is the choice of a good measure for income uncertainty (Lusardi [1998]). As will be pointed out in chapter 2, two basic approaches can be found in the literature. Firstly, some authors use the observed income history of survey respondents to elicit earnings variance as a measure of risk (Carroll and Samwick [1997], Bartzsch [2008], Ventura and Eisenhauer [2005]). Others use observable characteristics of the household head like occupation to infer on the income uncertainty (e.g. Skinner [1988], Benito [2006]). A second class of literature uses subjective measures for income risk such as the subjective distribution function of future income (e.g. Guiso et al. [1992], Arrondel [2002]). Chapter 2 contributes to this literature in two aspects. Firstly, it is argued that, although preferable for a variety of reasons, one potential problem in using subjective income distributions in cross-section analyses is their instability. In this case, subjective expectations of the future income variance which are used as a proxy for an individual's income uncertainty, but are observed only at one point in time, may give rise to biased estimates for precautionary wealth. The Dutch DNB Household Survey allows one to estimate the moments of the subjectively expected distribution function of income one year ahead.[2] Chapter 2 applies this dataset to demonstrate that there is indeed considerable instability of the expected income variation over the medium term. On account of this, I compare and contrast estimates of precau-

[1] A more detailed survey of existing studies can be found in Kennickell and Lusardi [2006].

[2] As argued in chapter 2, this approach allows to obtain a measure of future income risk that is based on less assumptions and provides better interpersonal comparability than the one used in the studies of Hochguertel [2003] and Alessi and Mastrogiacomo [2010], which are derived from a different set of questions from the same dataset.

tionary wealth based on a one-time observed measure for income uncertainty with those on the basis of a simple average. Depending on the measure of wealth, the estimates of precautionary wealth based on the average are about 40% to 80% higher than the estimates using the variation coefficient observed only once. Overall, the estimates of the share of wealth held by households for precautionary reasons in the Netherlands accounts for up to 15.39% to 24.25% of total assets, again depending on the definition of the variable measuring wealth. Although the mid-term average of the subjective coefficient of variation is far from being a 'perfect' measure for the subjective future income uncertainty of a household, the difference in estimates indicates that the results of cross-section studies with subjective uncertainty measures observed at one point in time should be treated with caution.

As a second contribution to the literature, chapter 2 analyses precautionary saving for different parts of the income distribution separately. The theoretical and empirical literature so far rather disregards the aspect of possibly differing saving behaviour with regard to precautionary motives between socio-economic groups. However, it seems to be quite plausible that, for example, households at the bottom of the income distribution either do not have the financial scope for significant precautionary wealth accumulation after having paid for basic necessities or have less incentives to save than other income groups because they may be more likely to claim means-tested social assistance (Hubbard et al. [1995]). The findings suggest that the fraction of assets accumulated for precautionary reasons follows a hump-shaped pattern over the income distribution. Estimates of precautionary wealth are found to be highest in the middle of the income distribution, whereas income uncertainty is not found to significantly influence saving behaviour at the bottom of the distribution. This result indicates that a more differentiated analysis of precautionary saving by socio-economic groups is needed in order to obtain a more complete picture of how the perceived future income uncertainty impacts saving behaviour.

To summarise, chapter 2, which is based on household data from the Netherlands,

confirms on the one hand the finding in the literature that a household's saving behaviour is partly driven by precautionary motives. On the other hand, it suggests that a quantitative assessment of the share of assets held for precautionary reasons based on subjective measures of income uncertainty observed only at one point in time should be treated with caution if these measures are not stable over time. Additionally, chapter 2 indicates that the influence of perceived future income uncertainty on saving behaviour is quite different across the income distribution. The finding that especially households at the bottom of the income distribution do not have either the means or the incentives to accumulate assets to self-insure against expected income variation may in turn have implications for the design of systems of income support based on solidarity like unemployment benefits or social assistance.

Reform of unemployment insurance, income uncertainty and precautionary saving

Job loss is one of the most important reasons for a drop in a household's income since labour income generally represents a household's major source of earnings. The risk of job loss in turn is regarded as a significant determinant of household income uncertainty as it is applied by some authors as a proxy for income uncertainty itself (Benito [2006], Lusardi [1998]). As with other risks, risk-averse individuals deal with income risks by searching for possibilities to generally avoid this risk or at least to insure themselves against the consequences of an (unexpected) adverse event like unemployment. The welfare state has its origins partly in this quest for insurance against the risk of not being able to earn a living through employment on the labour market (Agell [2002]).[3] One important feature of labour market insti-

[3]Rodrik's observation of a positive correlation between a country's exposure to foreign trade and the size of its government points into the same direction. His explanation basically is that "societies seem to demand (and receive) an expanded government role as the price for accepting larger doses of external risk" (Rodrik [1998, 998]). Although private insurance could generally serve the same purpose, it is argued e.g. by Gruber [1997], Chiu and Karni [1998] or Agell [1999] that private insurance for the risk of unemployment may not exist mainly because of the

tutions in modern welfare states is to provide cash transfers as income replacement in case of unemployment. Unemployment benefits therefore represent a (partial) insurance of households against a potential loss of labour income and hence might reduce expected income uncertainty. Once such institutions are established, they tend to influence an individual's decision making. In this sense, unemployment insurance is regarded as an institution that forms a part of the total institutional set-up that "forms the incentive structure of a society" (North [1994, 359]). According to North, a crucial function of institutions is to "reduce uncertainty by providing structure to everyday life" (North [1990, 3]). In case of the unemployment insurance this quote of Douglass North can be taken literally: unemployment benefits are supposed to reduce income uncertainty. Recent work based on subjective assessments of job insecurity in surveys indeed suggests that unemployment benefits have a positive impact on perceived income certainty of employees (Lollivier and Rioux [2006] and Clark and Postel-Vinay [2009]). Given that a household's perceived income uncertainty influences its saving behaviour as pointed out in chapter 2, and unemployment benefits reduce it, unemployment insurance is hypothesised to lower the incentive to save for precautionary reasons. Concerning the influence of labour market institutions on economic behaviour, the focus in the literature so far has primarily been concentrated on the link between institutions and labour market performance, especially unemployment (see e.g. the contributions of Nickell and Layard [1999], Blanchard and Wolfers [2000] and Nickell et al. [2005] or textbook discussions on labour market institutions as e.g. in Cahuc and Zylberberg [2004]). By looking at the relationship between unemployment benefits and saving behaviour, chapter 3 and chapter 4 expand this focus and add to our

presence of asymmetric information. In the absence of complete insurance markets the provision of public unemployment insurance could therefore raise welfare. The issue of private vs. public unemployment insurance is not adressed here at length, because this thesis primarily focuses on the influence of unemployment insurance on saving behaviour and the private sector simply offers no insurance against job loss. Households are thus regarded to be liquidity constraint in the absence of public insurance schemes. As pointed out by Deaton [1991] borrowing constraints in the face of uncertain income may result in buffer-stock saving.

understanding of how labour market institutions affect intertemporal decision making. Although both chapters may be subsumed under this common heading, their approaches and thematic orientations are different.

Chapter 3 basically focuses on the effects of uncertainty on saving induced by reforms of the unemployment insurance system. The first part of the chapter uses the example of Germany to briefly discuss the role of unemployment benefits as an important insurance mechanism within the social welfare state. Additionally, there is some evidence that over time individuals get used to the role of the state as an insurer and a 'guardian of welfare'. Following the idea mentioned above that institutions represent the rules of the game or the constraints under which individuals make their decisions, reform processes that change unemployment insurance are likely to bring about changes in saving behaviour. Moreover, it is argued that given the employees' reliance on state insurance, reforms aiming at a restriction of benefit generosity generate additional uncertainty.

Generous unemployment insurance and other labour market institutions have been criticised in the past for having detrimental effects on unemployment and the flexibility of the labour market by increasing moral hazard. At least since the publication of the influential OECD Jobs Study in 1994 (OECD [1994]), the deregulation of labour markets and the limitation of the welfare state generosity has attracted the attention of both policy makers and economists. A number of countries have already conducted reforms in line with measures suggested by this study to combat moral hazard. Among others, such policies include the extension of active labour market policies but also stricter entitlement rules and sanctions or even cut-backs of social benefits like a reduction of income replacement in the case of unemployment. Because the main objectives of the institutional changes concern unemployment and the behaviour of the unemployed, almost all studies evaluating such reform processes concentrate on how the persons concerned react to changed incentive structures, on the development of the unemployment rate or on other closely related issues like the

compression of the income distribution (for Germany, see e.g. Hagen and Steiner [2000], Steiner [2004], Arntz et al. [2007] or Pannenberg [2007]). However, modifiying the unemployment insurance schemes is not only supposed to affect the unemployed but also the employed. This is because some of the reform measures such as reducing the replacement rate may be considered as (partial) privatisation of social risks for which there is no alternative insurance on the market.[4]

From the perspective of the addressees of a reform, there are two important sources of uncertainty that may appear during a reform process. Firstly, at the beginning of the process the level of state insurance on which the individuals can finally count on may be unclear. This in turn may increase future income uncertainty. Secondly, the specific date within this period at which the reform addressee will receive precise information about the measures that will become effective in the end may be uncertain as well. Moreover, the risk of becoming unemployed might lead to the addressee being adversely affected by the reform measures immediately after their implementation. As a result, individuals may withhold consumption and increase saving for precautionary reasons in the face of an expected reduction of state insurance and increased expected future income uncertainty. Anecdotal evidence from Germany during the reform of the unemployment insurance system (the so-called 'Hartz reform') seems to support this kind of reaction during reform processes. In chapter 3, a simple three-period model is outlined to illustrate the link between the different forms of uncertainty and saving behaviour during a reform process from a theoretical point of view. To this end, I adapt the model of Eeckhoudt et al. [2005] to the context of a reform that cuts back the generosity of benefits.

In sum, changes in the generosity of the unemployment benefits let a prudent agent reduce his consumption to build up a buffer stock. This is the result of an increased motivation for self-insurance when the state insurance is cut down to a lower level. Furthermore, the model demonstrates that not only the dimension of the reform

[4]Stricter entitlement rules may also contibute to a higher income uncertainty as they force an unemployed person to accept a job at a lower wage than before a reform.

concerning the unemployment benefits affects saving, but also the timing of information during the reform process. An early resolution of uncertainty with regard to measures that will become effective in the end, increases the agent's welfare. This is because he is able to time-diversify the future income risk. In other words, early information allows the agent to optimally adjust his buffer stock to the new circumstances and therefore to reduce suboptimal over or undersaving from an ex-post perspective. An implication of the model is that policy makers should take the effects of reduced consumption and lower individual welfare into account when they consider reducing the generosity of insurance to fight moral hazard. As discussed in chapter 3, withholding consumption and saving for precautionary reasons may likewise occur if the reform addressees are 'pessimistic' concerning the overall reform objective of a reduction in unemployment. That means that they do not believe in the success of the reform measures but primarily perceive the cut in the insurance benefits. As a result, the point in time at which the reform measures materialise with the goal of reducing unemployment may be delayed if the uncertainty and pessimism with regard to the reform result in a drop in consumption. The literature does not rule out that 'animal spirits' which result in a sharp drop in consumption may be a possible explanation for cyclical downturns (Blanchard [1993], Akerlof and Shiller [2009]) or weak economic growth (Tichy [2005]). This discussion, however, goes beyond the model of an individual intertemporal consumption decision as outlined in chapter 3. To combine the different impacts of a reform on aggregate demand and unemployment in a more comprehensive (general equilibrium-type) model represents an interesting topic for further research.

Do labour market institutions influence consumers' saving intentions?

The final chapter builds on the basic results of the previous ones. Based on microdata, the estimates in chapter 2 indicate that the precautionary motive is an empirically relevant determinant of a household's saving behaviour. The discussion

in chapter 3 suggests that unemployment benefits reduce the (perceived) income uncertainty of households and therefore the incentive to save for precautionary reasons. Taken these results as given, it is hypothesised in chapter 4 that in the case of imperfect private insurance markets or liquidity constraints, institutions such as unemployment benefits affect the saving behaviour of households.

Assessing the influence of the unemployment insurance system on the saving behaviour of private households has largely been ignored in the literature. However, gaining more insight into this topic may on the one hand improve our understanding of how the provision of unemployment benefits affects the economy, besides its direct impact on labour market variables such as wages, labour supply or unemployment. From the point of view of the literature on consumption on the other hand, this kind of analysis may help to complete the picture of what determines consumption (and saving, respectively). To the best of my knowledge, the only study which empirically examines the impact of unemployment benefits on wealth accumulation is that of Engen and Gruber [2001]. Their results can be read as evidence that social insurance is at least an imperfect substitute for private insurance in the form of a buffer stock. Chapter 4 represents another stone to complete the mosaic. Based on aggregate data from the European Commission's Consumer Survey, the chapter basically focuses on three issues. Firstly, the hypothesis that the generosity of unemployment benefits has a negative impact on saving intentions is tested empirically. Next, an interaction effect is included in the estimations that may capture a second, more indirect effect of unemployment insurance on the incentive to accumulate a buffer-stock wealth: unemployment benefits may mitigate the responsiveness of saving to an increased probability of job loss. Finally, the dataset provides aggregate responses on saving intentions by income quartiles. Therefore it is possible to check whether the findings of chapter 2, namely that saving behaviour with regard to precautionary motives varies along the income distribution, can be proved with aggregate data on saving intentions.

The major findings are the following. Firstly, the empirical evidence suggests that

the generosity of unemployment insurance affects the households' saving behaviour. The income replacement rate in case of unemployment is found to significantly reduce the aggregate propensity to save. Moreover, unemployment benefits seem to counterbalance a negative expected income effect from high unemployment rates, and therefore contribute to a stabilisation of expectations. Although significant, the overall effect of a change in unemployment benefits by 10 percentage points amounts to about one half of the average standard deviation in saving intentions. This effect seems to be small, but it is consistent with the literature which attaches only small to medium importance to the precautionary motive as a determinant of overall savings of a household. Lastly, the estimations by income quartiles partially corroborate the findings in chapter 2 based on household data. The saving behaviour of households at the bottom of the income distribution in particular is also not significantly influenced by the replacement rate.

Besides saving for precautionary reasons, there are obviously other plausible reactions of individuals to changes in the generosity of the unemployment insurance or, put more generally, to income uncertainty. Whereas a buffer stock serves as a direct mechanism to self-insure against the expected variation of future income and to alleviate adverse monetary consequences of unemployment, the individual may instead try to reduce the underlying source of uncertainty and increase his efforts to lower the probability of unemployment as such. Employees for example can increase their private investment in advanced training. Moreover, an employee may increase his current working time as a reaction to increased expected uncertainty in the future.[5] Alternatively, increasing the working time of other members of the household may not only raise the household's income, but also diversifies the income risk. The reactions just mentioned, however, can be regarded as rather long-term strategies in

[5] Pijoan-Mas [2005] und Low [2005] think about working time as an instrument to self-insure against future income shocks in the context of a life-cycle model. Based on data from the Panel Survey of Income Dynamics (PSID) in the United States, they argue that both higher savings and increased working time early in life may serve as a buffer stock for shocks in the future.

the light of increased expected uncertainty if, for example, working hours cannot arbitrarily be expanded by the individual employee in the short term. An examination of such rather long-term behavioural changes of participants on more flexible and deregulated labour markets from a theoretical and empirical point of view is another interesting issue for future reasearch that can help to complete the knowledge about the impact of income uncertainty on economic decision making.

Last but not least, it will not have escaped the attentive reader that the terms 'uncertainty' and 'risk' are used interchangeably in this work. In general, the term 'risk' is used to denote quantifiable lotteries, i.e. the individual can attribute a certain probability to each possible outcome of a lottery. 'Uncertainty' in turn is characterised by unknown probabilities.[6] In this work, the exact distinction of uncertainty and risk does not play a crucial role and is therefore neglected. Strictly speaking, the analysis in chapter 2 is based on expected income risks of survey respondents rather than their income uncertainty. Concerning the discussion in chapter 3 and the general mechanism that links unemployment benefits and consumption behaviour, it seems to be irrelevant whether it is increased uncertainty or increased risk that induces individuals to withhold consumption when lowering unemployment benefits. Alternative approaches that are able to capture uncertainties more precisely are discussed in that chapter. Finally, in the empirical analysis of the last chapter, income risk or uncertainty do not enter any of the regressions directly.

[6] Additional information about the differentiation of both concepts can be found e.g. in KNIGHT [1971].

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Chapter 2

Precautionary saving and the (in)stability of subjective earnings uncertainty

Abstract

Numerous cross-section studies on precautionary saving use subjective expectations regarding the income variance one year ahead as a proxy for income uncertainty. Using such proxies observed only at one point in time, however, may give rise to biased estimates for precautionary wealth if expectations are not stable over time. Survey data from the Dutch DNB Household Survey suggest that subjective future income distributions are not stable over the mid-term. Moreover, in this study I contrast estimates of precautionary wealth using the variation coefficient observed at one point in time with those using a simple mid-term average. Estimates of precautionary wealth based on the average are about 40% to 80% higher than the estimates using the variation coefficient observed only once. In addition to that, wealth accumulation for precautionary reasons is estimated for different parts of the income distribution. The share of precautionary wealth is highest for households at the center of the income distribution.

JEL classification: D12, D91

Keywords: Precautionary saving, Wealth accumulation, Subjective income uncertainty

2.1 Introduction

Intertemporal decision making depends on beliefs about the future. The theoretical work on precautionary saving dating back to Leland [1968], Sandmo [1970] and Kimball [1990] suggests that actual saving behaviour of households does not only depend on the expected level of income, but also on future income uncertainty.[1] A higher variance of income leads prudent households to accumulate higher assets in order to insure against income risk and therefore to smooth consumption. Furthermore, a household is supposed to adjust its (target) buffer stock by increased saving (or dissaving) if the income uncertainty of a household increases (decreases). A necessary condition for a precautionary saving motive today is convex marginal utility ($u''' > 0$) of the utility function in the second period. The traditional life-cycle model assumes certainty equivalence and suggests age and permanent income as important determinants of a household's wealth holdings. Precautionary saving extends this standard set of variables by the variance of income.

In the past two decades a number of authors used microdata to test the relevance of the precautionary saving motive against (uninsurable) income risk. Generally, they confirm the existence of a precautionary motive to explain wealth accumulation, but the literature does not give a clear picture of the extent of the buffer stock held by households to self-insure against a volatile income. Estimations cover the range from about 50% of a household's total assets (Carroll and Samwick [1998]) to more modest levels between 2% (Guiso et al. [1992]) and about 20% (Lusardi [1997])[2]. The empirical strategy is almost the same in the majority of the papers: the log of a household's wealth is regressed on a measure of income uncertainty, permanent income and a variety of variables controlling for other saving motives during the life-cycle (see e.g. Carroll and Samwick [1997], Lusardi [1997], Arrondel [2002] and Bartzsch [2008]). As a rule, wealth is measured either

[1] The terms 'uncertainty' and 'risk' are used synonymically in this study. 'Risk' is more precise, because I will use a subjective future income distribution to obtain a measure of income variance of a household.

[2] A more detailed survey of existing studies can be found in Kennickell and Lusardi [2006].

by the total net wealth or the net financial assets of the household. Only recently, Kennickell and Lusardi [2006] pursued a more direct approach in using a question in the Survey of Consumer Finances which has been designed to directly elicit the amount of desired precautionary wealth.

Choosing a good measure for income uncertainty seems to be much more difficult (Lusardi [1998]). Two basically different approaches can be found in the literature. Firstly, some authors use the observed income history of survey respondents to elicit earnings variance as a measure of risk (Carroll and Samwick [1997], Bartzsch [2008], Ventura and Eisenhauer [2005]) or other observable characteristics of the household head like occupation (Skinner [1988]). Probably the most important problem of the latter is that individuals may self-select into occupations according to their degree of risk aversion. With regard to the former, it is obviously a difficult task to distinguish transitory and permanent income shocks from measurement error. In addition, it is implicitly assumed that the econometrician knows the income process just as well as the household head. But the individual might be much better informed, for example about the current situation at the workplace or personal chances to find a new job if he becomes unemployed (Dominitz [2001, 177ff]). The individual might also have already taken measures to insure against the estimated variance of earnings (Kennickell and Lusardi [2006]).

Therefore a second class of literature uses subjective measures for income risk such as the subjective distribution function of future income (e.g. Guiso et al. [1992], Arrondel [2002]). This approach includes the possibility that the same objective circumstances may be interpreted differently by each household and result in diverging expectations that in turn affect decision making (Simon [1986]). One potential problem, however, in using those subjective distributions in cross-section analyses is that such estimates implicitly assume that wealth and uncertainty are in equilibrium at the time of observation, i.e. there are no ongoing adjustment processes to a new target buffer stock. This assumption is likely to be violated if the subjective measure of future income risk is not stable over time. Assuming

that the current subjective assessment is indeed relevant for the decision to save for precautionary reasons, then households with unstable subjective income distributions are in a permanent adjustment process to a new desired buffer-stock wealth. Estimates of precautionary wealth based on unstable subjective risk measures are therefore likely to be biased. Alternatively, one might argue that income risk and precautionary wealth are in equilibrium rather in the mid-term and that the subjective future income distribution observed at one point in time is only a proxy for the underlying mid-term level of a household's income uncertainty. Following this, such a proxy could be regarded as a bad one if it turns out to be unstable over time. Using the DNB Household Survey and the method of Das and Donkers [1999] to estimate a subjective future income distribution, I demonstrate in section 3 that subjective income uncertainty indeed shows considerable instability over the mid-term. Moreover, instability seems to be positively correlated with the average mid-term level of subjective income uncertainty. On account of this, I compare and contrast estimates of precautionary wealth based on a one-time observed measure for income uncertainty with those based on a simple average. Far from being the perfect measure for income uncertainty, this procedure seems to be built on a less restrictive assumption and to give a more precise estimate of the underlying actual income uncertainty of households.[3]

As a second contribution to the literature, I estimate precautionary wealth for different parts of the income distribution. Even though the theory makes no clear difference in this respect and suggests that precautionary saving generally appears over the whole range of the income distribution, it is plausible that households at the bottom of the income distribution either do not have the financial scope for significant precautionary accumulation or have less incentives to save because they may be more likely to claim means-tested social assistance. On the other hand, households at the top may already possess an adequate buffer stock and therefore

[3] 'Perfect' here means that the measure of choice is able to capture human wealth uncertainty or to represent lifetime earnings variance (Lusardi [1997]).

show a less pronounced reaction to income uncertainty.

This chapter is organized as follows: in section 2, I present the empirical strategy as well as the data set and the methodology to elicit a subjective measure for income uncertainty. As far as I know there is only the work of Hochguertel [2003] and Alessi and Mastrogiacomo [2010] who use the same data set but a different measure for subjective uncertainty to estimate precautionary saving. For the Netherlands, Hochguertel [2003] finds a statistically significant but economically small effect of subjective income uncertainty on portfolio decisions, Alessi and Mastrogiacomo [2010] estimate that precautionary savings account for about 30% of household wealth. In section 3, the stability of the subjective measures for income uncertainty is analysed. The results for precautionary accumulation based on the one-time observed uncertainty measure as well as a simple mid-term average and estimations for different thirds of the income distribution are given in sections 4 and 5 respectively. The last section summarises the main findings.

2.2 Estimation strategy

In this chapter, I use Dutch panel data (DNB Household Survey) from CentERdata, Tilburg (NL). It is an annual survey launched in 1993 and contains about 1500 households in each wave. The survey offers a rich set of variables on household finances (including income and assets) as well as questions which allow an estimation of a subjective future income distribution over the next twelve months (see below). The survey is an internet based survey, households without their own internet access are provided with internet access via television by CentERdata. Compared to national accounts data and microdata on household wealth of Statistics Netherlands, Alessi et al. [2002] figure out that it is generally representative of Dutch households.

To evaluate the mid-term stability of subjective expectations I exploit the panel structure of the survey. Using the waves 2000 to 2009, all households are generally included in the sample which participate in at least four waves within a five year

interval. In addition to that, households whose main wage earner is younger than 18 and older than 65 are excluded as well as (early) retired respondents. This procedure results in 1550 different households for the analysis. To check if this pooling of observations from different waves gives rise to some kind of sampling bias compared to the single waves of the DNB survey, table 2.8 in the appendix compares descriptive statistics of the main wage earner and household composition of different waves of the survey with those observations in the sample.[4] The statistics do not suggest any significant bias. Only the share of main wage earners under the age of 25 is slightly lower than in the single waves, the share of divorced is somewhat higher. Furthermore, I only keep households which remain intact over the sample period (i.e. without changes in the family status of the main wage earner and where the main wage earner remains the same) to eliminate volatility in household income and expectations which are due to those changes. To make sure that results are not influenced by outliers with regard to asset holdings, the first and 99th percentile of the distribution of net financial wealth are removed from the sample. Finally, households are excluded which only gave the information needed to estimate the subjective distribution of future income less than three times, so that simple averages of the uncertainty measure are based on at least three observations. After excluding those observations which have missing values in key variables for the estimation described below, 526 households are left for the analysis.[5]

Model

To assess the influence of income uncertainty on wealth accumulation, I refer to the literature and estimate the following reduced-form cross-section equation (see e.g.

[4] Ventura and Eisenhauer [2005] also pool observations from the 1995 and 2000 waves of the biannual Italian SHIW survey.

[5] To control for potential sample selection bias because of dropping those observations with missing values, I additionally estimated the specifications in section 2.4 using probability weights. Sampling weights are calculated via a simple probit estimation. The dependent variable indicates whether the household is part of the final sample. Independent variables include age, family status, education, sex as well as number of children and household members. However, the results do not change substantially and are not reported here.

Carroll and Samwick [1998], Lusardi [1998]):

$$log(W_i) = \alpha_0 + \alpha_1\omega_i + \alpha_2 log(P_i) + \beta' Z_i + u_i \tag{2.1}$$

where W_i is a measure of a household's wealth, P_i proxies permanent income and ω_i represents the uncertainty measure. As proxies for wealth, I use two often used classifications of wealth in the literature. The first is *net financial assets* which include financial assets minus debts (without mortgages). Financial assets are aggregated on the household level and comprise checking and savings accounts, savings certificates, deposit books, mutual funds, cash value of life insurance, employer sponsored savings plans as well as stocks and shares (excluding shares of substantial holdings). As a second proxy for wealth I use the somewhat wider classification of *total net wealth*. Total net wealth includes net financial assets plus housing wealth and business equity (for self-employed or professionals) minus mortgages.

Permanent income of the household refers to the aggregate non-capital income of the household and is calculated for each household using income data within the five year sample period according to the method suggested by Fuchs-Schündeln and Schündeln [2005].[6] Because the measure of permanent income is based on a maximum of five observations, there is likely to be measurement error in that variable. In some specifications I apply the instrumental variable (IV) approach by using dummy variables indicating unemployment experience during the sample period, experience in the current job (in years), levels of education as exogenous instruments to identify the model. Household assets and permanent income are calculated in 2005 euros for avoiding volatility due to inflation.

The coefficient of variation σ/μ of the subjective future income distribution is used as uncertainty measure ω_i. The estimation of this widely used measure is explained

[6] Permanent income is calculated as follows: total non capital household income is first detrended by dividing it through the average income of all households in the corresponding survey year. In the next step, the average detrended household income for every household over all available years is calculated. Finally, permanent income equals the product of this average detrended household income with the average income of all households within each survey year (Fuchs-Schündeln and Schündeln [2005, 1098]).

in more detail in the following section.

Other variables that may also determine wealth accumulation during the life cycle are summarised in Z_i. So, standard household characteristics like age, age squared, gender and family status of the household head are included as well as the number of adults and children living in the household and a dummy for home ownership[7]. I also include a subjective measure for risk aversion following Bartzsch [2008], who shows for Germany that estimates of precautionary saving may be overestimated if risk aversion is not controlled for.[8] The time preference for consumption as well as the planning horizon concerning financial matters may also influence a household's saving behaviour (see e.g. Lusardi [1998] or Finke and Huston [2003]). Three additional variables are used to capture those effects. Firstly, I use a self-reported measure of what the respondent does with money which is left over after having paid for basic necessities as a direct measure of impatience. Answers have to be given on a seven-point scale, reaching from (1) ('I like to spend my money immediately') to (7) ('I want to save as much as possible'). Secondly, I control whether the household head is a smoker or not. DellaVigna and Paserman [2005] use this item as an

[7]That the ownership of real estate influences a household's saving behaviour is for example documented in Schunk [2009] for Germany and Suruga and Tachibanaki [1991] for Japan. By definition, home ownership is supposed to make up an important part of a household's total net wealth.

[8]This contradicts the findings of Fuchs-Schündeln and Schündeln [2005] who suggest an underestimation due to a selection effect of more risk-averse individuals in safer jobs.
In this study the risk aversion is measured by the response to the following question:
Suppose the two following pension arrangements exist:

A: your income out of pension is guaranteed 70% of your last-earned wages

B: your income out of pension is:

a chance of 1 out of 10 that it will be 50% of your last-earned wages

a chance of 2 out of 10 that it will be 60% of your last-earned wages

a chance of 4 out of 10 that it will be 70% of your last-earned wages

a chance of 2 out of 10 that it will be 80% of your last-earned wages

a chance of 1 out of 10 that it will be 90% of your last-earned wages

Now suppose you will receive pension arrangement B as a rule. How much extra pension premium are you willing to pay on a monthly basis to ensure you will receive pension arrangement A? (1 'none' to 8 'more than 2% of my gross wages').

indirect measure for general impatience. Lastly, I take into account differences in the planning horizon in financial matters. Dummies controlling for potential differences in wealth over the several waves are included in each specification. Descriptive statistics for the variables are given in table 2.9 in the appendix.[9]
Before showing the results for the different specifications, the estimation of the subjective future income distribution will be explained next.

Estimation of subjective income uncertainty

In this study, I follow the procedure suggested by Das and Donkers [1999] who use the same data set. They estimate the moments of the subjective income distribution of the household one year ahead based on six self-reported points on the cumulative distribution function. To elicit those points, respondents are first asked about the interval into which their household income will fall in the next twelve months. The wording of the questions is as follows:

What do you expect to be the LOWEST total net monthly income your household may realise in the next 12 months?

and

What do you expect to be the HIGHEST total net income your household may realise in the next 12 months?

Afterwards, respondents are asked to assess the probability that their household income will fall below a certain level. Four such questions are asked and the probabilities are given in percent. Those levels are evenly distributed over the interval ['Lowest possible income', 'Highest possible income'] given by the respondent and are calculated in the following way: $Level_i =$ 'Lowest income' + (('Highest income' − 'Lowest income') $* i$)/10 with $i = (2, 4, 6, 8)$. The question reads as follows:

[9] Furthermore, Kennickell and Lusardi [2006] suggest additional controls, e.g. whether the household is liquidity constraint or it is already insured against income risk by its social network. Unfortunately, the data to control all those issues are not available in the dataset.

What do you think is the probability that the total net income of your household will be less than $\{Level_i\}$ euros in the next 12 months?

Together with the information on the highest and lowest possible income and by putting all the probability mass on that interval, there are six points of the subjective distribution function which can be used to estimate the parameters of that distribution. Descriptive statistics for the answers to the question in the sample are given in table 2.10 in the appendix. Before the estimation, observations with unreasonably high answers for the highest possible income have been removed from the sample (>1 million.) as well as those that give inconsistent information.[10] In this study, I assume that the subjective income distribution follows a Beta distribution.[11] The estimation procedure basically comprises two steps. Firstly, the parameters of a beta distribution that best fits the observed points on the cumulative distribution function are estimated for each respondent by non-linear least squares. The individual parameters are then used to calculate the moments of the expected income distribution for each household. As a robustness check, I compare the estimates based on a beta distribution with those obtained by assuming a simple piecewise uniform distribution over the intervals. Estimation of the moments of the subjective income distribution is somewhat more straightforward in this case. They are obtained by weighting the moments of each interval by the probability mass on that interval. Instead of the procedure just described, Hochguertel [2003] and Alessi and Mastrogiacomo [2010] use answers from a somewhat different set of questions to elicit subjective earnings variance. Respondents are asked to indicate the probability of seven different relative income changes in the next twelve months ('rise in income of more than 15%' to 'drop in income of more than 15%'). Answers are to be given on a seven point scale ('highly unlikely' to 'highly likely'). Besides the possible disadvantage that respondents have to evaluate the

[10] i.e. 'Highest possible income'<'Lowest possible income' and not ascending percentage probabilities with regard to the different $Level_i$.

[11] Compared to a lognormal distribution this does not result in expected values or medians outside the interval ['Lowest possible income', 'Highest possible income'] (see Das [1997]).

probability of percentage growth rates with regard to their current income instead of a (nominal) income level, a number of assumptions have to be made to estimate subjective earnings variance, for example equal spacing of differences between the response categories. Furthermore, as HURD [2009] argues, interpersonal comparisons of micro-data observations based on this kind of questions are more questionable than using responses in percentage terms.

2.3 Stability of subjective income uncertainty

Table 2.1 reports the frequency distribution of the coefficient of variation of the expected income distribution for the cross-section observations in the sample.

Table 2.1: Frequency distribution of the variation coefficient of future income (σ/μ)

	Beta	**Interpolated**
CoV = 0.000	6.84	6.84
CoV $\leq$ 0.005	17.68	13.69
CoV $\leq$ 0.015	32.13	29.09
CoV $\leq$ 0.025	44.49	43.54
CoV $\leq$ 0.035	53.80	52.85
CoV $\leq$ 0.045	61.41	60.27
CoV $\leq$ 0.065	72.43	73.19
CoV $\leq$ 0.100	86.69	86.50
CoV $\leq$ 0.150	93.35	93.35
CoV $\leq$ 0.200	97.53	97.72
CoV $\leq$ 0.300	99.24	99.43
CoV $\leq$ 0.400	99.62	99.62
CoV $\leq$ 0.500	99.81	99.81
CoV $\leq$ 1.000	100.00	100.00
Mean	0.051	0.050
Std. deviation	0.063	0.059
No. of households	526	526

Remarks:
Source: DNB Household Survey; waves 2004-2009. 'Beta' refers to estimation assuming a Beta distribution, 'Interpolated' assuming a (piecewise) uniform distribution.

It shows the variation coefficients based on both assuming a Beta distribution and a linear (piecewise) uniform distribution ('Interpolated'). There are no substantial differences in the frequency distribution of the earnings variance between both estimation approaches. About 7% of all households seem to be sure about their future income. 13.3% of all observations, however, have standard deviations of more than 10% of the expected income in the next twelve months. Based on the 1995 wave of the survey, Das and Donkers [1999, 336] find slightly different numbers suggesting a somewhat lower level of uncertainty. Households with no uncertainty amount to 18% in their study, and only 9% are found to have a variation coefficient of greater than 0.1.

Next, I take advantage of the panel dimension of the sample to evaluate the stability of the households' variation coefficient concerning its future income distribution. As argued above, instability may give rise to biased results in the estimation of precautionary wealth. The standard deviation of the variation coefficient over the sample period is used to evaluate the instability of a household's subjective expectation. Table 2.2 shows the distribution of the standard deviation for the households in the sample. The data suggest considerable instability of the subjective measure of future income variance over the mid-term. Only 1.71% of the observed households exhibit no instability of expecations, whereas around 20% show a standard deviation higher than 0.05, which corresponds to the sample mean of the variation coefficient. In addition to that, there is a high and positive correlation between the average level of income uncertainty (calculated as simple average of the variation coefficient over the sample period) and the standard deviation. Rank correlation between those parameters is 0.83 for the Beta distribution and 0.82 for the linear uniform distribution. The instability of expected income variation seems to rise with the average level of income uncertainty.

Table 2.2: Stability of the variation coefficient: frequency distribution of standard deviation

	Beta	**Interpolated**
0.000	1.71	1.71
≤ 0.005	8.37	7.79
≤ 0.010	18.82	18.44
≤ 0.015	30.42	30.61
≤ 0.020	39.54	41.25
≤ 0.030	57.41	60.46
≤ 0.040	69.96	73.95
≤ 0.050	79.47	81.37
≤ 0.060	83.46	86.69
≤ 0.100	94.11	94.49
> 0.100	100.00	100.00
Mean	0.037	0.035
No. of households	526	526

Remarks:
Source: DNB Household Survey; waves 2000-2009. 'Beta' refers to estimation assuming a Beta distribution, 'Interpolated' assuming a (piecewise) uniform distribution.

In the evaluation of the share of wealth held for precautionary reasons in the following section, I therefore contrast estimates including only the variation coefficient observed at one point in time as it is done in previous studies with regressions including the mid-term average level of uncertainty.

2.4 Precautionary saving

In this section, the share of wealth held by households in the sample for precautionary reasons is evaluated based on equation (2.1). Tables 2.3 and 2.4 report the basic OLS estimates for the two alternative classifications for wealth, net financial assets and total net wealth respectively. For each dependent variable, I estimate the model both with only the standard set of regressors used in the literature and the full set of controls described above. Dummies for the different waves of the survey are included in each of the regressions reported in this and the next section.

Table 2.3: Precautionary accumulation: Net financial assets (OLS)

Variables	(1)		(2)		(3)		(4)	
Constant	-6.970***	(2.008)	-6.962***	(2.014)	-5.588***	(1.959)	-5.573***	(1.963)
Age	0.064	(0.066)	0.069	(0.067)	0.033	(0.061)	0.037	(0.062)
Age^2	-0.0004	(0.001)	-0.001	(0.001)	-0.0002	(0.001)	-0.0002	(0.001)
Sex (1=male)	-0.052	(0.170)	-0.063	(0.169)	-0.024	(0.163)	-0.033	(0.162)
Married	-0.180	(0.229)	-0.187	(0.228)	-0.260	(0.215)	-0.265	(0.214)
Divorced	-0.399	(0.280)	-0.390	(0.278)	-0.573**	(0.276)	-0.566**	(0.274)
No. of adults	0.346	(0.244)	0.364	(0.243)	0.378	(0.236)	0.391*	(0.234)
No. of children	-0.142**	(0.070)	-0.151**	(0.070)	-0.102*	(0.061)	-0.109*	(0.061)
Permanent income	1.354***	(0.156)	1.337***	(0.155)	1.215***	(0.161)	1.202***	(0.159)
Risk aversion	0.071	(0.037)	0.073	(0.037)	0.041	(0.035)	0.043	(0.035)
Home owner					0.049	(0.165)	0.050	(0.164)
Spending vs. saving†					0.803***	(0.136)	0.799***	(0.137)
Smoker					-0.265**	(0.130)	-0.264**	(0.130)
Time horizon for financial planning‡								
Next year					0.438**	(0.162)	0.435***	(0.162)
Next couple of years					0.515***	(0.159)	0.512***	(0.158)
Next 5 to 10 years					0.767***	(0.200)	0.775***	(0.200)
>10 years					1.058*	(0.373)	1.057***	(0.373)
Income uncertainty (σ/μ)	2.358***	(0.878)			1.758**	(0.847)		
Av. income uncertainty (σ/μ)			3.452***	(1.288)			2.619**	(1.226)
R^2	0.205		0.206		0.309		0.310	
No. of observations	526		526		526		526	

Remarks:*,**,*** indicate significance at 10, 5 and 1 per cent respectively. Heteroscedasticity robust standard errors are in parentheses. Dummies for the waves 2004-2009 are included.

† Question: Some people spend all their income immediately. Others save some money in order to have something to fall back on. Please indicate what you do with money that is left over after having paid for food, rent, and other necessities – on a scale from 1 to 7, where 1 means 'I like to spend all my money immediately' and 7 means ' I want to save as much as possible'; Median answer: 5. Dummy=1 if answer$\geq$ 5; Results do qualitatively not change by introducing dummies for each category.

‡ Time horizon for financial planning; reference category: 'the next couple of month'

To compare precautionary wealth accumulation based on the coefficient of variation observed at one point in time with the results based on the mid-term average, each of the specifications is run for both uncertainty measures.[12]

The coefficients of the expected earnings variance all have positive signs and are significantly different from zero (at least at a 95% significance level) except in specification (3) in table 2.4. The data therefore suggest that the hypothesis of precautionary saving against future income variance can not be rejected. The subjectively perceived income uncertainty positively influences the savings of the households.[13] Evaluated at sample means, the share of precautionary wealth is in the range between 8.49% (i.e. 3389.05 euros, spec. (3)) and 15.39% (i.e. 6137.75 euros spec. (2)) for net financial assets and between 9.32% (15610.24 euros, spec. (3)) and 24.25% (40636.72 euros, spec. (2)) with regard to total net wealth.[14] As expected, estimates are at the lower range when additional variables influencing the saving behaviour of the household are included in the regressions. In addition, comparing estimates with the same set of regressors, estimates including the average subjective earnings variance are somewhat higher both in absolute terms and evaluated at sample means than estimates using the variation coefficient observed only at one point in time. Thus, the data suggest an underestimation of precautionary wealth when using subjective income uncertainty evaluated at only one point in time.

In general, the other variables also show the expected signs. Net financial assets as well as total net wealth rise with age and permanent income. The number of children seems to reduce significantly the net financial assets of a household. Smoking comes along with less net financial assets, may it be due to the costs of smoking or the general impatience as suggested by DellaVigna and Paserman [2005].

[12] Results do not change substantially in estimations using simple probability weights to account for potential sampling bias.

[13] Tables 2.11 and 2.12 in the appendix show median estimates which generally support this finding. Median regressions, where the objective is to estimate the median of the dependent variable, are run due to the skewness of the wealth distribution.

[14] According to equation (2.1), the percentage contribution of precautionary wealth is calculated as follows: $1 - 1/exp(\alpha_1 * (\sigma/\mu))$.

Table 2.4: Precautionary accumulation: Total net wealth (OLS)

Variable	(1)		(2)		(3)		(4)	
Constant	-10.455***	(2.339)	-10.761***	(2.281)	-3.869*	(2.127)	-4.184**	(2.072)
Age	0.125	(0.076)	0.135	(0.074)	0.097	(0.068)	0.103	(0.064)
Age^2	-0.001	(0.001)	-0.001	(0.001)	-0.001	(0.001)	-0.001	(0.001)
Sex (1=male)	0.031	(0.188)	-0.057	(0.184)	0.082	(0.169)	0.056	(0.167)
Married	0.286	(0.256)	0.263	(0.253)	0.102	(0.261)	0.086	(0.259)
Divorced	-0.340	(0.319)	-0.321	(0.318)	-0.516*	(0.288)	-0.494*	(0.285)
No. of adults	0.318	(0.261)	0.345	(0.258)	0.116	(0.259)	0.135	(0.257)
No. of children	-0.050	(0.075)	-0.063	(0.075)	-0.056	(0.068)	-0.066	(0.069)
Permanent income	1.629***	(0.187)	1.621***	(0.182)	0.912***	(0.154)	0.914***	(0.153)
Risk aversion	0.061	(0.037)	0.066*	(0.037)	0.029	(0.032)	0.034	(0.031)
Home owner					1.863***	(0.173)	1.859***	(0.171)
Spending vs. saving					0.637***	(0.144)	0.624***	(0.142)
Smoker					-0.012	(0.127)	-0.0002	(0.126)
Time horizon for financial planning								
Next year					0.260*	(0.158)	0.254	(0.156)
Next couple of years					0.290*	(0.157)	0.281*	(0.155)
Next 5 to 10 years					0.290	(0.197)	0.306	(0.197)
>10 years					0.610*	(0.360)	0.594	(0.363)
Income uncertainty (σ/μ)	2.935**	(1.297)			1.974	(1.227)		
Av. income uncertainty (σ/μ)			5.854***	(1.423)			4.659***	(1.317)
R^2	0.313		0.324		0.515		0.524	
No. of observations	515		515		515		515	

Remarks: see table 2.3.

Home ownership is a significant explanator for total net wealth but not for net financial assets, which is not surprising because housing wealth makes up the main difference between both classifications. Furthermore, the results here suggest that the degree of risk aversion is positively linked to a household's assets, but this effect is not significantly different from zero in almost all specifications. The estimated coefficients on the subjective statements concerning the time preference of the households also show the expected signs. Some of them are found to be highly significant. Households whose main wage earner indicates a high preference for saving, have ceteris paribus more assets than those prefering to spend their available resources after having paid for basic necessities. More impatient households are therefore found to possess less assets. Additionally, the more farsighted a household is in financial planning, the higher is its accumulated wealth. All else being equal, a household with a planning horizon of 'the next couple of years' possesses about 1.67 times the net financial assets (1.34 times the total net wealth) of a household merely overlooking the 'next couple of month'. Overall, subjective survey measures seem to capture preferences which are supposed to be relevant for actual saving behaviour quite well in this sample.

Because the measure of permanent income is at the most based on five self-reported income observations it might suffer from measurement error. In this case OLS estimations of precautionary saving may be misleading. Therefore permanent income must be instrumented to obtain consistent estimates. I exclude dummy variables indicating (1) unemployment experience during the sample period and (2) levels of education as well as experience in the current job (in years) to identify the model. These instruments are supposed to be correlated with permanent income and not to have an impact on the dependent variables over and above the endogenous regressor, uncertainty and the other controls. Table 2.13 in the appendix reports the results for the specifications with the full set of controls. The overidentifying restrictions tests do not allow me to reject instrument exogeneity. Precautionary wealth is between 9.51% and 12.03% with regard to net financial assets and 9.48%

and 20.49% for total net wealth. The coefficients for permanent income are slightly larger than those in the OLS estimations indicating indeed a small measurement error. However, first-stage F-statistics are significant, but quite low (between 6.50 and 6.60). Stock and Yogo [2005] provide a formal test for weak instruments. I cannot reject the null that the bias of the IV estimator is at most 20% of the bias of OLS estimator. Because instruments are supposed to be weak and the coefficients of interest do not change substantially when applying IV estimation techniques, OLS estimates have been held.[15]

Robustness checks

To evaluate the stability of the basic results that (1) households hold wealth to insure against expected income variance and (2) using a mid-term average of the subjective uncertainty measure leads to higher estimates of precautionary wealth, I run four kinds of robustness checks. Firstly, estimates of expected earnings variance based on a piecewise uniform distribution over the intervals given by the respondents as described in section 2.2 are used instead of those assuming a Beta distribution. Secondly, the ratio of the interquartile range to the median instead of the variation coefficient is applied as an alternative uncertainty measure. Next, I exclude self-employed persons, freelancer and free professionals from the sample. Only those households with main income earners employed on a contractual basis remain in the sample. Finally, it is checked if the exclusion of the first and 99th percentile of the wealth distribution changes the results. Table 2.5 reports the estimated coefficients, the labels refer to the specifications in table 2.3 and 2.4 above. All regressions include the corresponding set of control variables.

[15] Following Arrondel [2002], I also performed IV estimations with the same set of instruments (plus a dummy for a permanent work contract) with regard to the uncertainty measures, although it is not entirely clear why there should be pure measurement error in case of subjective variables. Endogeneity tests do not let me reject the null of exogeneity of the uncertainty measures. In addition to that, first-stage F-statistics are in the interval between 3.64 and 9.90 and Stock-Yogo tests indicate weak instruments. Therefore only the OLS estimations have been held.

Table 2.5: Robustness checks (OLS)

	Net financial assets		Total net wealth	
Linear interpolation				
(1) Income uncertainty (σ/μ)	2.489***	(0.933)	3.116**	(1.379)
(2) Av. income uncertainty (σ/μ)	3.719***	(1.312)	6.163***	(1.493)
(3) Income uncertainty (σ/μ)	1.969**	(0.918)	2.164*	(1.308)
(4) Av. income uncertainty (σ/μ)	2.949**	(1.277)	5.054***	(1.402)
Alternative uncertainty measures				
(1) IQR/Median	1.435***	(0.488)	1.857**	(0.769)
(2) Av. (IQR/Median)	1.954***	(0.751)	3.351***	(0.831)
(3) IQR/Median	1.191**	(0.480)	1.381*	(0.743)
(4) Av. (IQR/Median)	1.608**	(0.713)	2.758***	(0.773)
Without self-employed†				
(1)	1.962**	(0.969)	2.278*	(1.279)
	(503 obs.)		(494 obs.)	
(2)	2.925	(1.787)	4.414***	(1.662)
	(503 obs.)		(494 obs.)	
(3)	1.422	(0.936)	1.546	(1.264)
	(503 obs.)		(494 obs.)	
(4)	2.532	(1.683)	3.689**	(1.553)
	(503 obs.)		(494 obs.)	
Unrestricted sample‡				
(1)	2.437**	(0.976)	2.647**	(1.267)
	(533 obs.)		(522 obs.)	
(2)	3.399**	(1.532)	4.835***	(1.671)
	(533 obs.)		(522 obs.)	
(3)	1.839**	(0.936)	1.867	(1.213)
	(533 obs.)		(522 obs.)	
(4)	2.528*	(1.405)	3.939***	(1.439)
	(533 obs.)		(522 obs.)	

Remarks:*,**,*** indicate significance at 10, 5 and 1 per cent respectively. Heteroscedasticity robust standard errors are in parentheses. All estimations include the set of control variables from tables 2.3 and 2.4.

† Self-employed persons, freelancer and free professionals are excluded.

‡ Unrestricted sample refers to the sample without p1/p99-trimming of the observations regarding net financial assets/total net wealth.

Assuming a simple piecewise linear distribution for the expected earnings variance gives slightly higher point estimations both in absolute terms and evaluated at the sample mean, thus confirming the results using the Beta distribution. Using the ratio of the interquartile range to the median of the subjective income distribution to measure future income uncertainty suggests a precautionary wealth between 8.62% and 13.32% of net financial assets and between 9.76% and 25.47% with regard to total net wealth. These estimates again largely coincide with those using

the variation coefficient. Moreover, not trimming the sample to control for outliers does not seem to produce estimates that conflict those of the more restricted sample. If the self-employed, free-lancer and professionals are excluded from the sample, the coefficients become smaller and are less precisely estimated. Whereas the coefficients indicating the effect of uncertainty on total net wealth are still significant compared to the results in table 2.4, the estimates in most specifications using net financial assets as the dependent variable are no longer significant at common levels.[16] Concerning the absolute values of the coefficients, the differences to those obtained in the basic OLS regressions are, however, not statistically significant. But as Carroll and Samwick [1998] remark upon their sample, these groups seem to provide valuable variation in the independent variable to identify the coefficient on uncertainty and should therefore remain in the sample. This seems to apply as well to the sample analysed in this study.

2.5 Precautionary saving across the income distribution

The regressions above (as it is done in the literature so far) assume implicitly that the self-insurance against future income uncertainty is similar in different parts of the income distribution. In this last section of the chapter, differences in precautionary wealth accumulation across the income distribution are analysed. It is hypothesised that households at the bottom of the income distribution are less prone to save for precautionary reasons for at least two reasons. Firstly, although they might face high income uncertainty due to lower education and higher probability of job loss, they simply do not possess the financial means to build up a buffer stock for consumption smoothing in bad times. Secondly, as Hubbard et al. [1995] show, households at the bottom of the wealth distribution may not have an incentive to save because

[16]The p-values for the estimated coefficients in specifications (2)-(4) regarding net financial assets are 0.102, 0.129 and 0.133 respectively.

Table 2.6: Precautionary accumulation: Bottom, middle and upper third of the income distribution

Model	Bottom third		Middle third		Upper third	
Net financial assets						
Income Uncertainty	0.446	(1.181)	4.519**	(1.749)	1.885	(2.146)
Av. Income Uncertainty	0.936	(1.971)	6.484**	(3.227)	1.948	(1.749)
Total net wealth						
Income Uncertainty	-0.179	(1.695)	6.449***	(1.667)	1.443	(2.740)
Av. Income Uncertainty	2.332	(2.350)	9.823***	(2.379)	2.959	(1.998)

Remarks:*,**,*** indicate significance at 10, 5 and 1 per cent respectively. OLS estimations. Heteroscedasticity robust standard errors are in parentheses. Specifications are the same as in table 1, spec. (3) and (4) for net financial assets and table 2, spec. (3) and (4) for total net wealth. The table only reports the coefficients of interest. Full results are available upon request.

they have a high probability to be dependent on means-tested social insurance.[17] On the other hand, households at the top of the income distribution are likely to have the means to save for precautionary reasons but may be less exposed to income risk due to unemployment. These households also may have already accumulated a substantial amount of assets, so precautionary wealth makes up a smaller part of it than in the middle of the income distribution. Following Guiso et al. [1992, 325f] this can also be regarded as an indirect test for decreasing prudence, i.e., prudence declines with wealth.[18] To summarise, the coefficients on future expected income uncertainty may be smaller both at the top and at the bottom of the income distribution. Therefore equation (2.1) is estimated separately for the bottom, middle and upper third of the income distribution.

Table 2.6 seems to support the presumed pattern. The estimated coefficients on income uncertainty at the top and bottom of the income distribution are smaller than those at the center of the distribution.[19] Furthermore, households in the mid-

[17] In the Netherlands the basic social insurance (*Wet werk en bijstand*) is means-tested.

[18] Kimball [1990] defines prudence as the ratio between the third and second derivative of the within-period utility function. Intuitively, prudence indicates the responsiveness of saving behaviour to future income variance.

[19] Simple Chow-tests indicate that the coefficients estimated for the middle group significantly differ from the estimates for the other two groups. With regard to total net wealth, the null of equality of the coefficients can be rejected at least at a 10% level. For net financial assets, only a

Table 2.7: Descriptive statistics (means) for different parts of the income distribution

	Lower third	Middle third	Upper third
Permanent income (in 2005 euros)	20198.70	30570.76	48928.01
Subj. prob. of unemployment (in %; employed persons only)	18.90	12.55	11.41
Financial freedom	50.06	68.26	73.68
Saving in the past 12 month	66.87	75.45	81.58
Net financial assets (in 2005 euros)	21931.29	38592.39	59054.39
Total net wealth (in 2005 euros)	89174.31	160826.80	252806.20
Highest level of education: VMBO or less (in %)	41.28	21.79	12.07
Highest level of education: University degree (in %)	30.23	45.81	60.92
Income uncertainty (σ/μ)	0.058	0.046	0.048
Av. Income uncertainty	0.049	0.049	0.048

Remarks: VMBO (*voorbereidend middelbaar beroepsonderwijs*) is a form of pre-vocational education in the Netherlands that generally does not qualify for higher education.

dle of the income distribution hold a larger share of their assets for precautionary reasons compared to the average reported in the previous section. Evaluated at sample means, precautionary wealth amounts up to 27.08% of net financial assets and 47.42% of total net wealth. Households at the top and bottom of the income distribution hold shares of assets for precautionary reasons which are below average, although the mean variation coefficient of the subjective future income distribution is similar across groups.

The descriptive statistics for the different parts of the income distribution shown in table 2.7 may provide some explanation for this finding. Firstly, subjective probability of unemployment is highest at the bottom of the income distribution. Although the numbers for all groups seem to be quite high compared to the actual unemployment rate in the Netherlands (5.3% on average in the years 2004-2009), households with higher income seem to fear unemployment less. Moreover, the share of those who report a level of education of equal or less VMBO (pre-vocational education) decreases with the income class, whereas the share of those with university degree increases. Secondly, 'financial freedom' gives the fraction of those who report that they possess financial scope to save some money and not have to draw upon savings or even make debts given their income. In combination with the share of those who

significant difference between the bottom and middle third of the distribution is found.

report that they were generally able to save some money, the data suggest that financial stress may be a reason, why those households with a low permanent income do not build up a substantial buffer stock given their future income uncertainty.
On the other hand, subjective unemployment probability at the top is smaller than in the other groups. Mean wealth is about 1.5 times higher than in the middle income group, so decreasing prudence possibly explains the smaller coefficient estimates. Although the descriptive statistics presented here give only some rough explanations for the results in table 2.6, they may show a direction to refine theoretical models of saving behaviour especially at the bottom of the income distribution, for example by introducing an additional constraint that controls for the basic needs which have to be satisfied before a household may save to self-insure against future income risk.
Finally, there is one important qualifier regarding the findings in this section. One has to keep in mind that households with negative net financial assets (or total net wealth) are excluded from the sample because the log of wealth is used as the dependent variable. This group is supposed to be even more financially constrained with regard to precautionary wealth accumulation than those at the bottom of the income distribution in this sample.

2.6 Conclusions

Availability of a buffer stock as self-insurance against future income risk may be regarded as an important saving motive. But what seems to be clear from the theory of precautionary saving appears to be difficult to prove empirically. Although estimates of the extent of precautionary saving differ between studies, most authors agree that it plays a role in intertemporal decision making. Numerous cross-section studies use data on subjective expectations regarding the income variance one year ahead as a proxy for income uncertainty. Using such proxies observed only at one point in time may give rise to biased estimates for precautionary wealth if expectations are

not stable over time or change faster than the buffer stock can be adjusted to those updated beliefs. Survey data from the Dutch DNB Household Survey indeed suggest that subjective future income distributions are not stable over the mid-term. Moreover, I contrasted estimates of precautionary wealth using the variation coefficient observed at one point in time with those using a simple mid-term average of that measure. In the preferred regressions, estimates of precautionary wealth based on the average are about 40% higher with regard to net financial assets (80% to 112% for total net wealth) than the estimates using the variation coefficient observed only once. This difference in the estimates demonstrates that one has to be careful when using subjective income expectations over the next twelve months as a measure for income uncertainty if the expectations are not stable over time.

The instability of subjective expectations may be due to changes at the workplace, the general economic situation or the socio-demographic environment of the household. To analyze the reasons for changes in expectations of future income variance (besides pure noise) seems to be an interesting topic for future research.[20]

Overall, the estimates of the share of wealth held by households for precautionary reasons account for up to 15.39% of net financial assets and 24.25% with regard to total net wealth and are somewhat higher than those in the literature that use subjective expectations as well.

As a second contribution to the literature, I re-estimated the model separately for the bottom, middle and upper third of the income distribution. The findings suggest that the fraction of precautionary wealth follows a hump-shaped pattern over the income distribution. Although the mean income uncertainty is similar across all income groups, the share of precautionary wealth is highest in the middle income group. For that group, estimates of precautionary wealth amount up to 27.08% with regard to net financial assets and up to 47.42% with regard to total net wealth which is above average. One possible explanation for that finding at the bottom of the

[20]Obviously, some (unexplained) variation in such a quantitative measure of income risk as presented in this chapter may be induced by forcing the respondents to 'translate' their uncertainties into quantifiable risks.

income distribution is that those households simply do not have the financial means to build up a substantial buffer stock. Theoretical models of precautionary saving as well as future empirical work may take this additional constraint into account. The smaller estimate of precautionary wealth at the top may be explained by decreasing prudence.

A Appendix

Table 2.8: Summary statistics

Variable	2009	2008	2007	2006	2005	2004	Sample[a]
Age							
under 25	0.17	0.34	0.53	0.68	1.42	0.68	0.19
25-39	29.62	34.51	37.91	40.43	41.53	35.64	32.77
40-55	45.54	43.69	43.24	43.61	42.76	48.17	44.19
56-65	24.67	21.46	18.32	15.28	14.29	15.51	22.84
Education[b]							
Primary/Special	1.82	2.27	2.63	2.64	2.98	3.39	2.84
VMBO	20.96	22.05	20.72	21.38	22.07	21.37	21.11
HAVO/VWO	9.32	9.85	9.68	9.88	10.16	10.45	9.36
Vocational Training	22.11	22.14	24.02	23.34	23.04	20.83	22.27
University degree	44.80	42.76	41.89	41.75	40.84	43.01	43.51
other	0.99	0.93	1.05	1.01	0.91	0.95	0.90
Employment status							
employed (contract)	81.35	83.08	83.33	81.81	81.37	81.17	81.16
works in own business	1.07	0.59	0.68	0.61	0.84	1.02	0.77
self-employed, freelance	7.18	6.23	6.23	5.88	5.63	5.35	6.32
unemployed	1.73	1.35	1.65	2.17	2.39	2.31	2.06
student	0.17	0.08	0.38	1.08	1.68	1.15	0.26
works in own household	1.40	1.52	1.65	1.96	1.68	1.83	2.00
unpaid work, keeping benefit payments	0.25	0.34	0.08	0.20	0.13	0.14	0.06
partly disabled	5.61	5.64	5.18	5.00	5.30	6.03	6.19
works as a volunteer	0.74	0.76	0.60	0.74	0.39	0.54	0.58
other	0.50	0.42	0.23	0.54	0.58	0.47	0.58

Continues on next page

Table 2.8: ...continued

Variable	2009	2008	2007	2006	2005	2004	Sample[a]
No. of HH-members							
1 person	22.11	22.81	23.80	26.03	25.74	25.81	24.52
2 people	29.62	29.63	28.98	27.92	28.59	29.40	28.77
3 people	14.27	14.23	13.51	14.00	13.91	13.21	12.97
4 people	22.77	22.31	22.67	22.04	21.60	21.54	22.77
5 people	9.59	8.84	8.71	7.71	7.70	7.99	8.45
more	1.73	2.18	2.33	2.30	2.44	2.03	2.51
No. of children							
none	50.08	51.09	51.73	51.93	52.59	54.27	51.61
1 child	14.52	13.80	12.99	15.01	14.55	13.21	13.16
2 children	24.26	24.07	24.55	22.85	22.64	22.22	23.81
3 children	9.32	8.92	8.48	7.91	7.83	8.33	8.90
more	1.81	2.10	2.26	2.30	2.38	1.97	2.51
Sex							
male	74.01	75.17	73.57	73.02	74.51	76.36	73.42
female	25.99	24.83	26.43	26.98	25.49	23.64	26.58
Family status							
married	60.51	60.07	59.19	57.17	57.23	59.26	59.32
divorced	8.10	8.20	7.67	8.04	7.54	7.96	9.01
living with partner	12.28	11.85	12.14	12.10	12.66	11.76	11.27
widowed	1.42	1.43	1.36	0.94	0.76	1.08	1.26
never married	17.79	18.45	19.65	21.74	21.80	19.94	19.15
N	1212	1188	1332	1479	1546	1476	1550

Source: DNB Household Survey; waves 2004-2009. Household demographic statistics refer to the main income earner. Retired (incl. early retirement) main income earners as well as persons under age 18 and over age 65 are excluded.

[a] The general sample contains all non-retired main income earners of age 18-65 who participated in the DNB survey at least in four waves within a five-year period.

[b] VMBO (*voorbereidend middelbaar beroepsonderwijs*) and HAVO/VWO (*hoger algemeen voortgezet onderwijs/voorbereidend wetenschappelijk onderwijs*) are forms of secondary education in the Netherlands. HAVO or VWO diploma is needed for an access to higher education for example at a university.

Table 2.9: Summary statistics (Basic Sample)

Variable	(in % of sample)
Age	
under 25	0.00
25-39	22.24
40-55	48.29
56-65	29.47
Education[a]	
primary/Special	1.52
VMBO	20.00
HAVO/VWO	10.67
vocational Training	20.95
university degree	45.71
other	1.14
Employment Status	
employed (contract)	86.12
works in own business	0.76
self-employed, freelance	3.61
unemployed	1.52
student	0.00
works in own household	0.57
unpaid work	0.00
partly disabled	6.65
works as a volunteer	0.57
other	0.19
No. of HH-members	
1 person	32.51
2 people	29.47
3 people	9.13
4 people	17.30
5 people	8.75
more	2.85
No. of children	
none	61.03
1 child	9.13
2 children	18.06
3 children	8.94
more	2.85
Sex	
male	76.62
female	23.38
Family Status	
married	58.55
divorced	9.32
living with partner	6.46
widowed	0.76
never married	24.90

Table 2.9: Summary statistics (Basic Sample) (continued)

Variable	
Permanent income (in 2005 euros)	
mean	33231.97
std. dev.	16973.93
median	30454.77
Net financial assets (in 2005 euros)	
mean	39881.39
std. dev.	58318.19
median	19616.13
Total net wealth (in 2005 euros)	
mean	162480.08
std. dev.	185407.10
median	124393.69
Other controls	
Risk attitude	
mean	2.39
std. dev.	1.68
Share of home owners (in % of sample)	77.00
Share of smokers (in % of sample)	25.86
Share of people with tendency to save (vs. spending)(in % of sample)	73.38
Time horizon for financial planning (in % of sample)	
Next couple of month	28.14
Next year	24.33
Next couple of years	30.99
Next 5 to 10 years	13.69
>10 years	2.85
N	526

Source: DNB Household Survey; waves 2004-2009. Household demographic statistics refer to the main income earner. Retired (incl. early retirement) main income earners as well as persons under age 18 and over age 65 are excluded.
[a] VMBO (*voorbereidend middelbaar beroepsonderwijs*) and HAVO/VWO (*hoger algemeen voortgezet onderwijs/voorbereidend wetenschappelijk onderwijs*) are forms of secondary education in the Netherlands. HAVO or VWO diploma is needed for an access to higher education for example at a university.

Table 2.10: Descriptive statistics for the answers to the quantitative questions for the sample

	Highest income	**Lowest income**	**pro1**	**pro2**	**pro3**	**pro4**
Min	1075	0	0	0	0	0
p25	5000	3200	5	10	25	50
p50	26350	22000	10	30	50	70
p75	40000	32000	30	50	70	85
Max	200000	100000	100	100	100	100
Mean	27403.50	22110.38	20.93	32.77	47.45	62.29
Sd	21326.10	16931.78	23.31	25.64	27.64	29.41

Remarks: 526 observations; 36 respondents gave the same answer for the lowest and highest possible income. For these observations the values for pro1 to pro4 are not determined, subjective income uncertainty is assumed to be zero.

Table 2.11: Precautionary accumulation: Net financial assets (Median)

Variables	(1)		(2)		(3)		(4)	
Constant	-7.572***	(2.279)	-7.300***	(2.461)	-6.286***	(1.910)	-5.057**	(2.110)
Age	0.073	(0.082)	0.051	(0.084)	0.065	(0.062)	0.053	(0.069)
Age^2	-0.001	(0.001)	-0.0003	(0.001)	-0.0005	(0.001)	-0.0004	(0.001)
Sex (1=male)	-0.237	(0.187)	-0.108	(0.198)	-0.003	(0.146)	0.016	(0.162)
Married	-0.008	(0.262)	0.018	(0.275)	-0.123	(0.205)	-0.105	(0.226)
Divorced	-0.072	(0.276)	-0.108	(0.295)	-0.235	(0.221)	-0.334	(0.245)
No. of adults	0.238	(0.258)	0.098	(0.272)	0.185	(0.204)	0.104	(0.224)
No. of children	-0.151**	(0.074)	-0.143*	(0.079)	-0.063	(0.058)	-0.046*	(0.065)
Permanent income	1.415***	(0.178)	1.438***	(0.189)	1.207***	(0.157)	1.125***	(0.172)
Risk aversion	0.046	(0.041)	0.045	(0.044)	0.053*	(0.032)	0.067*	(0.036)
Home owner					-0.049	(0.144)	-0.014	(0.160)
Spending vs. saving					0.840***	(0.124)	0.843***	(0.137)
Smoker					-0.201	(0.123)	-0.201	(0.136)
Time horizon for financial planning								
Next year					0.554***	(0.150)	0.514***	(0.166)
Next couple of years					0.610***	(0.143)	0.592***	(0.160)
Next 5 to 10 years					0.643***	(0.180)	0.672***	(0.200)
>10 years					1.214***	(0.333)	1.162***	(0.369)
Income uncertainty (σ/μ)	2.273**	(1.024)			1.597*	(0.882)		
Av. income uncertainty (σ/μ)			3.237**	(1.606)			1.846**	(1.306)
$PseudoR^2$	0.137		0.136		0.207		0.204	
No. of observations	526		526		526		526	

Remarks: *,**,*** indicate significance at 10, 5 and 1 per cent respectively. Standard errors are in parentheses.
Dummies for the waves 2004-2009 are included.

Table 2.12: Precautionary accumulation: Total net wealth (Median)

Variables	(1)		(2)		(3)		(4)	
Constant	-4.744**	(2.108)	-5.842***	(1.770)	-3.837**	(1.507)	-3.811***	(1.227)
Age	0.118*	(0.072)	0.172***	(0.060)	0.161***	(0.049)	0.170***	(0.040)
Age^2	-0.001	(0.001)	-0.001**	(0.001)	-0.001**	(0.001)	-0.001***	(0.0004)
Sex (1=male)	0.189	(0.173)	0.169	(0.141)	0.115	(0.116)	0.146	(0.096)
Married	0.305	(0.243)	0.225	(0.202)	-0.036	(0.166)	-0.027	(0.136)
Divorced	0.037	(0.256)	-0.046	(0.210)	-0.223	(0.176)	-0.167	(0.145)
No. of adults	0.207	(0.237)	0.256	(0.198)	0.138	(0.161)	0.104	(0.134)
No. of children	0.024	(0.068)	0.019	(0.056)	0.023	(0.046)	0.009	(0.039)
Permanent income	1.102***	(0.170)	1.077***	(0.138)	0.772***	(0.125)	0.757***	(0.101)
Risk aversion	0.031	(0.038)	0.047	(0.031)	-0.002	(0.026)	-0.006	(0.021)
Home owner					1.973***	(0.114)	1.867***	(0.094)
Spending vs. saving					0.428***	(0.100)	0.320***	(0.082)
Smoker					-0.043	(0.098)	-0.035	(0.081)
Time horizon for financial planning								
Next year					0.140	(0.120)	0.168*	(0.099)
Next couple of years					0.166	(0.115)	0.174*	(0.094)
Next 5 to 10 years					0.203	(0.144)	0.209*	(0.117)
>10 years					0.507*	(0.263)	0.619***	(0.217)
Income uncertainty (σ/μ)	2.676**	(1.042)			1.545**	(0.692)		
Av. income uncertainty (σ/μ)			3.938***	(1.179)			2.911***	(0.809)
$PseudoR^2$	0.202		0.204		0.355		0.358	
No. of observations	515		515		515		515	

Remarks: *,**,*** indicate significance at 10, 5 and 1 per cent respectively. Standard errors are in parentheses.
Dummies for the waves 2004-2009 are included.

Table 2.13: Precautionary accumulation: IV-Estimations

	Net financial assets				Total net wealth			
Variables	(3)		(4)		(3)		(4)	
Constant	-7.368	(4.801)	-7.652	(4.802)	-3.255*	(4.542)	-4.019	(4.504)
Age	-0.016	(0.078)	-0.0118	(0.078)	0.034	(0.077)	0.045	(0.076)
Age^2	0.0003	(0.001)	0.0002	(0.001)	0.00002	(0.001)	-0.0001	(0.001)
Sex (1=male)	-0.096	(0.171)	-0.115	(0.172)	0.062	(0.165)	0.014	(0.164)
Married	-0.088	(0.237)	-0.094	(0.236)	0.130	(0.231)	0.125	(0.228)
Divorced	-0.556**	(0.260)	-0.547**	(0.261)	-0.364	(0.250)	-0.333	(0.248)
No. of adults	0.068	(0.258)	0.075	(0.257)	0.057	(0.246)	0.065	(0.243)
No. of children	-0.110*	(0.064)	-0.115*	(0.064)	-0.059	(0.063)	-0.068*	(0.062)
Permanent income	1.573***	(0.546)	1.591***	(0.546)	1.019*	(0.521)	1.059**	(0.516)
Risk aversion	0.024*	(0.036)	0.026	(0.036)	0.020	(0.035)	0.025	(0.034)
Home owner	-0.062	(0.213)	-0.070	(0.214)	1.730***	(0.203)	1.721***	(0.201)
Spending vs. saving	0.861***	(0.138)	0.854***	(0.139)	0.645***	(0.134)	0.620***	(0.133)
Smoker	-0.336**	(0.141)	-0.330**	(0.141)	0.004	(0.137)	0.032	(0.136)
Time horizon for financial planning								
Next year	0.319*	(0.169)	0.310*	(0.170)	0.234	(0.166)	0.217	(0.164)
Next couple of years	0.412**	(0.177)	0.400**	(0.177)	0.181	(0.171)	0.164	(0.170)
Next 5 to 10 years	0.611***	(0.211)	0.609***	(0.211)	0.174	(0.202)	0.186	(0.201)
>10 years	0.785**	(0.359)	0.778**	(0.359)	0.419	(0.344)	0.388	(0.341)
Income uncertainty (σ/μ)	1.918**	(0.973)			1.945**	(0.966)		
Av. income uncertainty (σ/μ)			2.545**	(1.299)			4.649***	(1.299)
R^2	0.290		0.288		0.504		0.513	
No. of observations	454		454		444		444	
Overid. test (p-value)	0.452		0.422		0.323		0.305	
First-stage partial R^2	0.097		0.097		0.100		0.099	
First-stage F-value	6.54		6.50		6.60		6.54	

Remarks: *,**,*** indicate significance at 10, 5 and 1 per cent respectively. Two-step GMM estimation. Heteroscedasticity robust standard errors are in parentheses.
Instruments used: Unemployment experience, Education, Experience (yrs.) in current job
Dummies for the waves 2004-2009 are included.

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Chapter 3

Reform of unemployment insurance, income uncertainty, and precautionary saving

Abstract

Social insurance, especially unemployment insurance, provides agents with income insurance against not marketable income risks. Since the early 1990s, reform measures like more activating policies as suggested by the OECD Jobs Study in 1994 (OECD [1994]) have been observed in Europe. In this chapter, it is argued that such changes in unemployment insurance reduce public insurance and increase income uncertainty. Moreover, I discuss a simple three period model which shows a link between a welfare state reform and agents' saving decisions as one possible reaction of agents to self-insure against income risk. Two sources of uncertainty seem to be important in this context: (1) uncertain results of the reform process concerning the replacement rate, and (2) uncertainty regarding the timing of information about the content of the reform. It can be shown that the precautionary motive for saving explains an increased accumulation of capital in times of reform activities. In addition to that, early information about the expected replacement rate increases agents' utility and reduces under and oversaving.

JEL codes: J65, D81, D91

Keywords: Unemployment insurance, Precautionary saving, Reform

3.1 Introduction

In the 1980s and the first half of the 1990s, numerous European countries have started to implement 'activating' components within their labour market policies and social insurance systems (Eichhorst and Konle-Seidl [2005]). At least since the publication of the influential 1994 OECD Jobs Study (OECD [1994]), the deregulation of labour markets with the aim of more flexibility has attracted the attention of both policy makers and economists as a strategy to lower unemployment and to enhance the overall economic performance. The reforms of institutions can be regarded as a reaction to the high unemployment rates in the 1980s and the beginning of the 1990s. The main focus of the measures taken in such reform processes was and still is to influence the behaviour of the unemployed and to generate a more "desirable" behaviour (Dingeldey [2005, 22f]). Activation policies have therefore been designed to fight moral hazard and to avoid a lock-in effect of unemployment in order to reduce long-term unemployment because of its detrimental effects on human capital and individual well-being (Winkelmann and Winkelmann [1998]). Among others, such policies include the extension of active labour market policies but also stricter entitlement rules and sanctions or even cut-backs of social benefits like a reduction of income replacement in case of unemployment. Because the main objectives of the institutional changes concern unemployment and the behaviour of the unemployed, almost all studies evaluating such reform processes concentrate on how the persons concerned react to changed incentive structures, to the development of the unemployment rate or to other closely related issues like the compression of the income distribution (for Germany, see e.g. Hagen and Steiner [2000], Steiner [2004], Arntz et al. [2007] or Pannenberg [2007]). However, modifiying the unemployment insurance schemes is not only supposed to affect the unemployed but also the employed.

This is because some of the reform measures such as reducing the replacement rate may be considered as (partial) privatisation of social risks for which there exists no alternative insurance at the market.[1] Recent survey data indeed suggest that unemployment benefits have a positive impact on perceived income certainty of employees (Lollivier and Rioux [2006] and Clark and Postel-Vinay [2009]). From an economic perspective, the crucial issue is now, in which way and to what extent the reform addressees react to changes of benefits and increased income uncertainty. The precautionary savings literature suggests increased saving as one possible reaction of individuals to an increased income uncertainty. This means that individuals may substitute public insurance to a certain degree by accumulating a buffer stock to insure themselves against income losses due to unemployment (Engen and Gruber [2001]). Moreover, individuals may be unsettled by another source of uncertainty during reform processes. From the perspective of the individual, it may not be clear from the outset what the final outcome of the reform will be. It is possible that there are different scenarios that are on the political agenda and either of them may finally be implemented. As a consequence, the addressees of the reform may not be able to optimally adapt their buffer stock to the new institutional context before one of the reform scenarios comes into effect. The timing of the resolution of this kind of uncertainty and its effect on consumption and utility is addressed in Eeckhoudt et al. [2005]. In this chapter, I adapt their model to a reform of the unemployment benefits showing the combined effect of different sources of uncertainty on saving. Furthermore, it will be shown that the timing of the resolution of uncertainty matters for consumption and utility of a representative addressee of such a reform process. Early information about the expected replacement rate increases the agent's utility and reduces under and oversaving. Before setting out the model in section 3.3, I will briefly discuss the meaning of labour market institutions and the social welfare system as an insurance mechanism using

[1] Stricter entitlement rules may also contibute to a higher income uncertainty as they force an unemployed person to accept a job at a lower wage than before the reform.

Germany as an example. Furthermore, section 3.2 provides some anecdotal evidence of uncertainty during reform processes by looking at the case of the German Hartz reform.

3.2 Unemployment benefits as social insurance - the case of Germany

Providing insurance based on the principle of solidarity is one of the basic characteristics of social insurance systems (Lampert and Althammer [2004]).[2] The meaning of the insurance function of institutions in modern welfare states is also accentuated by Siebert [1987]. He stresses that one economically important effect of the labour laws and social legislation is to reduce the variance of expected income and therefore the income risk of employees. This statement is largely consistent with the jurisprudential view that "labour law is a reaction to social shortcomings of a free market economy" (Junker [2006, 6]). Furthermore, in Germany the establishment of social insurance is regarded as an important task of policy makers that derives from the principle of the welfare state enshrined in articles 20(I) and 28(I) of the German Constitution (Junker [2006, 8]). Concerning unemployment insurance, the most important function of cash benefits is to "avoid existential uncertainty by smoothing the income flow and by covering unexpected expenses based on intertemporal and interpersonal redistribution of income" (Lampert and Althammer [2004, 306]).[3] Since January 2005, there are two 'categories' of unemployment

[2]The essential differences to private insurance mechanisms are the following: Firstly, the insurance premium is not calculated according to the individual risk. Moreover, social insurance is often organized as compulsory insurance. That means, individuals with characteristics which make them high risks from the perspective of an insurer cannot be excluded. Finally, benefits are standardized concerning type and level and individuals possess a legal claim to the benefits (see Lampert and Althammer [2004, 237]).

[3]Gruber [1997] evaluates the consumption smoothing benefits of unemployment insurance in the United States. He finds that the income drop after loosing the job decreases with the replacement rate and therefore unemployment benefits help to smooth consumption. Furthermore, this finding rejects the existence of complete markets for income insurance in case of unemployment.

benefits in Germany which differ in their purpose and the level of insurance. The unemployment benefits ('Arbeitslosengeld I') are meant to relatively insure the previous income level, whereas the social insurance benefits ('Arbeitslosengeld II') are provided to secure a minimum living wage. The latter is mainly paid out to the long-term unemployed or those who are otherwise not entitled to unemployment benefits.[4] One of the gains of an income position secured in such a way is that it "increases the personal freedom which allows individuals to achieve their individually set objectives at their own opinion" (Lampert and Althammer [2004, 306]). Unemployment insurance also enables and encourages the person insured to take risks that may finally generate new income and increase welfare (Sinn [1996]). Another aspect of unemployment benefits that may positively affect individual and overall welfare is pointed out by Acemoglu and Shimer [2000]. Although higher benefits reduce the search effort of the unemployed in their model, income insurance increases the incentive for the unemployed to search for jobs with higher productivity, but which are more difficult to obtain. This in turn finally results in more productive job matches that may outweigh the negative effects of increased moral hazard. So, when considering a reduction of insurance, for example to increase the incentive to search for a job and to combat moral hazard (see e.g. Cahuc and Zylberberg [2004, 122ff] and Hopenhayn and Nicolini [1997]), one has to contrast those benefits of reduced moral hazard with the potential loss of the positive aspects of insurance mentioned above.[5]

[4]For further and more detailed information on the German unemployment insurance system see e.g. Breyer and Buchholz [2007, 257ff].

[5]There are generally two additional channels through which unemployment benefits may affect unemployment besides the reduction of moral hazard. Firstly, reducing benefit generosity lowers the fallback option of employees in (collective) wage negotiations and may decrease efficiency wages to prevent employees from shirking. Secondly, labour supply may also be affected. On the one hand, reduced benefits potentially require lower contributions to unemployment insurance making work more attractive by a higher net labour income. On the other hand, the value of inactivity might be increased relativly to the value of participation on the labour market (see Boeri and van Ours [2008, ch. 11]). But even if the reduction of benefit generosity is used as instrument to fight unemployment as such (and not only to reduce moral hazard), one still has to take into account the potential loss of desirable aspects of insurance with regard to individual and collective welfare.

As the example of the reform of the unemployment insurance system in Germany shows, a change in the status quo of the social insurance system which consists of benefit cuts and the extension of activation policies is perceived as a reduction of the insurance and a reallocation of social risks. In this context, surveys reveal basic attitudes towards the social welfare state as well as uncertainties during reforms. According to the results of the research project 'attitudes towards the welfare state' (EZS) conducted in 2006 by the Centre for Survey Research and Methodology (ZUMA), activation policies that involve increased individual responsibility and a tendency towards an individualization of risks seem not to be broadly accepted by the respondents.[6] The consent to egalitarian perceptions of distributional justice is larger than the consent to individualistic views. About 80% of respondents think that social justice has decreased, that income gaps are too large and conflicts exist between poor and wealthy groups of the population (ZUMA [2006, 2]). Concerning the relevance of the public institutions, a majority of the respondents still ascribes an important role to them for the provision of social insurance. Again, around 80% agree with the principle of the welfare state that 'people get what they need for living', even if this is only achievable by redistribution (ZUMA [2006, 2f]). Increased individual responsibility seems to be accepted primarily in the realm of old-age provisions, whereas the request for more individual responsibility (including financing) is smallest in the context of securing the standard of living in case of unemployment. Overall, most of the interviewees seem to perceive the state as an actor that enables a life secured by institutions of the social insurance system. Interestingly, the confidence in those institutions is not very strong. The authors of the study point out that respondents are sceptical whether the state has the ability to react sufficiently to social risks against the background of 'serious' social changes. Moreover, they think that this scepticism is attended by a reduction of the

[6]The EZS study consists of four waves, covering the years 2005 to 2008. Each wave is organised as a representative CATI-survey based on at least 5000 interviewees. The population comprises of all residents in Germany aged 18 or older.

individual feeling of security and that 'liberal reform measures' have not increased the confidence in institutions (ZUMA [2006, 4]). So, although reforms do not inevitably lead to more uncertainty as it seems to be the case with regard to old-age provisions, the recent changes in the unemployment insurance system seem to stand in contrast to the general perceptions and attitudes of those concerned and are therefore likely to evoke uncertainty.

A recent survey of the Friedrich-Ebert Foundation hints at uncertainty in the general public with regard to general economic trends like globalisation as well as concerning institutional changes (Müller-Hilmer [2006]). Accordingly, 63% of the population in 2006 indicated that they are scared of the ongoing societal changes. 44% feel to be 'left alone' by the state and another 49% of respondents fear not be able to hold their current standard of living in the future. Findings by Mansel et al. [2006] support this concern of a loss of social status. The share of those who fear that their own economic situation deteriorates in the next years has been risen from 23.8% in 2002 to 40.2% in 2004 and 37.5% in 2005. The authors emphasize that this observation not only applies to the lowest social class but also to the middle class. Furthermore, uncertainty is expressed with regard to current and future income maintenance at old age and in case of unemployment. In general, there are "feelings of disorientation [...] of which goals are to be persued and how they can be achieved under uncertain circumstances and constraints" (Mansel et al. [2006, 43f]). Among other reasons, the rising uncertainty is seen as a result of of the increased individualisation in the working environment which includes the reforms of the unemployment insurance system. This sociological view interestingly corresponds with that of legal commentators with regard to the changes in the German Social Security Code (cf. Wissing et al. [2004]).

In sum, survey evidence supports the hypothesis that citizens became accustomed to the state as the 'guardian of welfare'. Thus the approval of the status quo is high and opposition to reforms strengthens (cf. Heiniger et al. [2004]). But if a reform of unemployment insurance nevertheless takes place and involves a (partly)

retreat of the state from social insurance (be it in form of financial cut-backs or stricter entitlements and sanctions), the perceived income uncertainty of those concerned may increase. There are essentially two potential sources of uncertainty that are associated with such a reform process. Firstly, there is uncertainty during the reform process with regard to the future design of insurance (Heiniger et al. [2004, 39]). Secondly, the expected variance of income may rise because the reduced financial support by the state in case of unemployment and the increased strictness of eligibility rules that may force an unemployed to accept low-paid jobs after a certain period of unemployment. Sociological research that originated the studies cited above mainly seems to be interested in the consequences of an increased demand for flexibility and higher individual uncertainty for social interactions and social cohesion. From an economic point of view, the crucial issue is now in which way and to what extent the reform addressees react to reforms of the unemployment insurance system and increased uncertainty. The literature on precautionary savings dating back to Leland [1968], Sandmo [1970] and Kimball [1990] suggests that actual saving behaviour of individuals does not only depend on the expected level of income, but also on future income uncertainty. Therefore, it is likely that people tend to withhold consumption or actively increase saving during reform periods as an immediate reaction to increased uncertainty, and that they adjust their financial buffer stock as a way to self-insure against a higher expected income uncertainty in the future.

With regard to Germany, there is some anecdotal evidence that such a reaction took place during the reform of the unemployment insurance between February 2002 and January 2005, the so-called Hartz reform (a more detailed description of the reform can be found in appendix B.2). Consumer confidence may serve as a first rough indicator of increased uncertainty during this period (cf. Heinemann et al. [2008] for a similar approach in case of Denmark, Finland, Sweden and UK). The consumer confidence index as it is reported by the European Commission is depicted

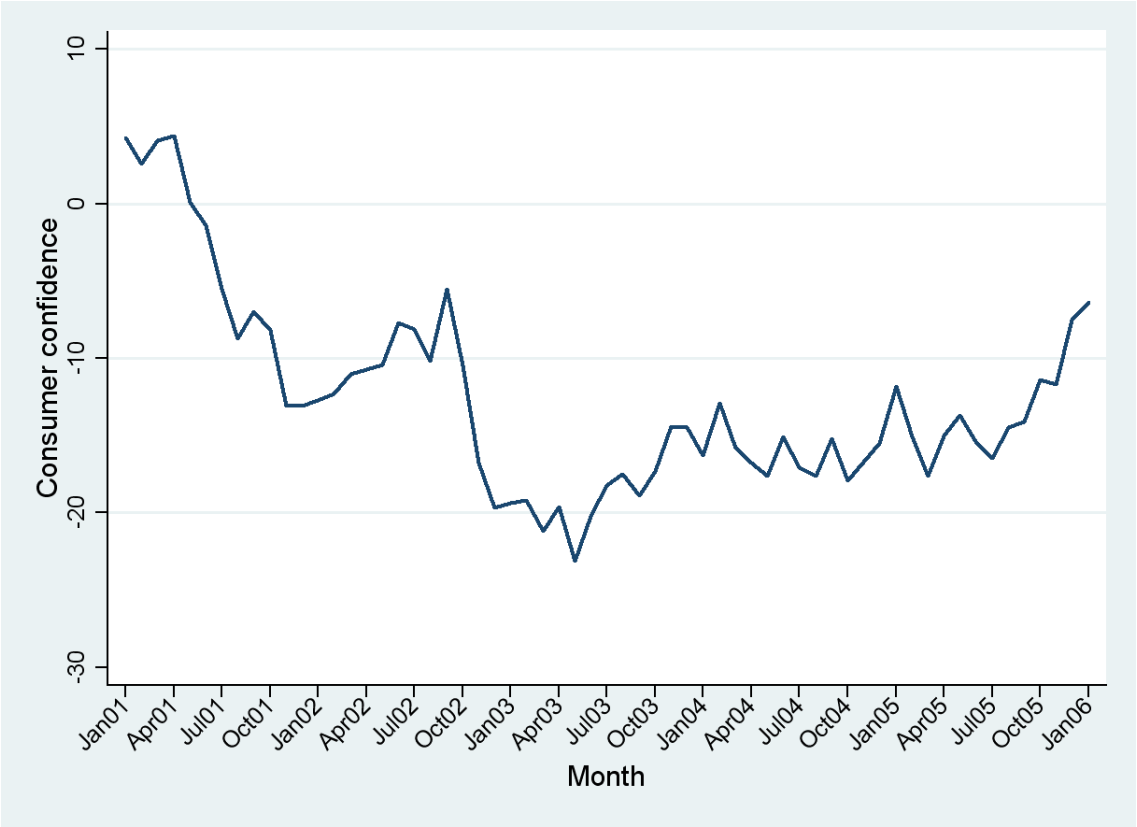


Figure 3.1: Consumer confidence in Germany
Source: European Commission (DG Ecofin); seasonally adjusted values.

in figure 3.1. Consumer confidence shows high negative values during the reform period. It sharply decreased until spring 2003 and afterwards fluctuated around a level of -16 until the third quarter in the year 2005. The low consumer confidence in combination with some fluctuations may indicate uncertainty and unconfident expectations. At least it seems to be the case that labour market reforms did not release a positive pulse concerning consumer confidence and there was no anticipation of any potential positive effects of the reform, for example on the overall economic performance. Comments on the savings rate of private housholds in Germany point into the same direction. The savings rate in Germany increased during the reform period, although income growth was rather weak (see figure 3.2 and table 3.1).

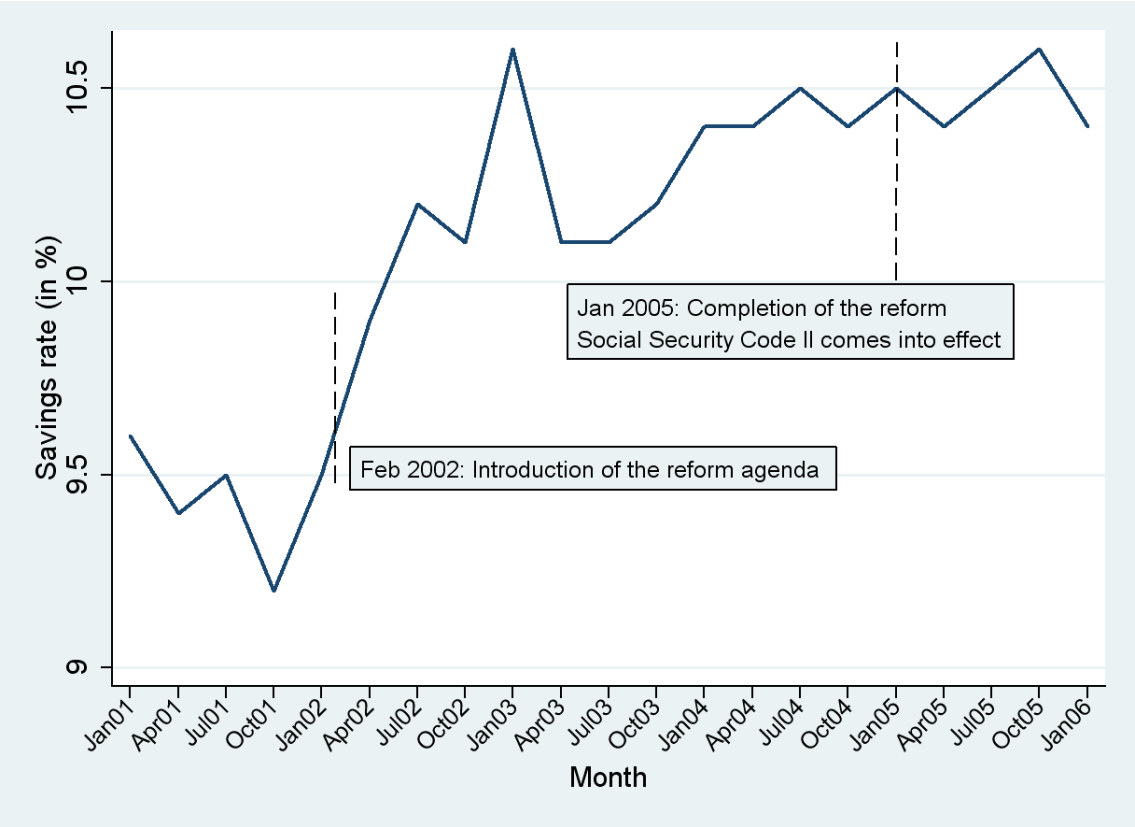


Figure 3.2: Savings rate of private households in Germany
Source: Deutsche Bundesbank (based on national accounts data); seasonally adjusted values.

Table 3.1: Macroeconomic variables for Germany 2001-2006

Variable (in %)	2001	2002	2003	2004	2005	2006
Real GDP per capita (growth rate)	1.2	0.0	-0.2	1.1	0.8	2.9
Unemployment rate	7.4	8.2	9.0	9.5	9.4	8.4
Inflation rate (HVPI)	1.9	1.4	1.0	1.8	1.9	1.8

Sources: Statistisches Bundesamt Deutschland, Eurostat;
Unemployment rate: Harmonised unemployment rate (Eurostat)

The former president of the Deutsche Bundesbank, Axel Weber, commented in 2004 on this trend that "the pronounced uncertainty about the specific details of the social and labour market reforms, however, has made it considerably more difficult to assess the future outlook for households' incomes and has led to additional restraint in spending. The sooner and more convincingly the relevant policy measures are put in place for greater planning certainty and reliability in terms of the underlying

conditions, the sooner the present caution can be overcome" (BUNDESBANK [2004, 14]). Besides the precautionary motive of increased saving, the higher savings rate may also be due to the accumulation of capital for private old-age provision since the reform of the pension insurance in 2001. The German Council of Economic Experts (SVR) interprets the development in the same direction. The council presumes an increased willingness to save for old-age pensions and a risen importance of the precautionary motive for saving. Generally, in similar stages of the business cycle private households rather tend to decrease saving (SVR [2005, Ziff. 125]). Although the relative importance of both saving motives cannot be disentangled at a first glance in this special case (i.e. saving for old-age pensions and precautionary saving because of increased income uncertainty), it can still be maintained that the uncertainty induced by the labour market reform is one of the reasons for increased saving in the period described. Moreover, the structure of the private households' deposits by contract period (figure 3.3) also supports the precautionary saving hypothesis. During the reform period there was a slight trend towards short-term liquid deposits. This again may be an indicator for increased uncertainty since precautionary motives may not only affect the level of savings but also increase the demand for liquidity (KIMBALL [1992]).

To summarise, the example of Germany suggests that a reform of the unemployment insurance system may induce uncertainty and may prompt individuals to increase saving as a kind of self-insurance. The simple model outlined in the next section illustrates this relationship and explicitly takes into account the different sources of uncertainty that may arise in a reform period.[7]

[7]Instead of pursuing the difficult task of attempting to model realistically the saving behaviour during a reform process by including all the various saving motives, the following section concentrates on a more heuristic discussion of how changes in unemployment insurance affect an individual's savings for precautionary reasons in the short term. Therefore the model is labelled 'illustrative'. Some possible extensions and alternatives to this approach are discussed in section 3.3.3.

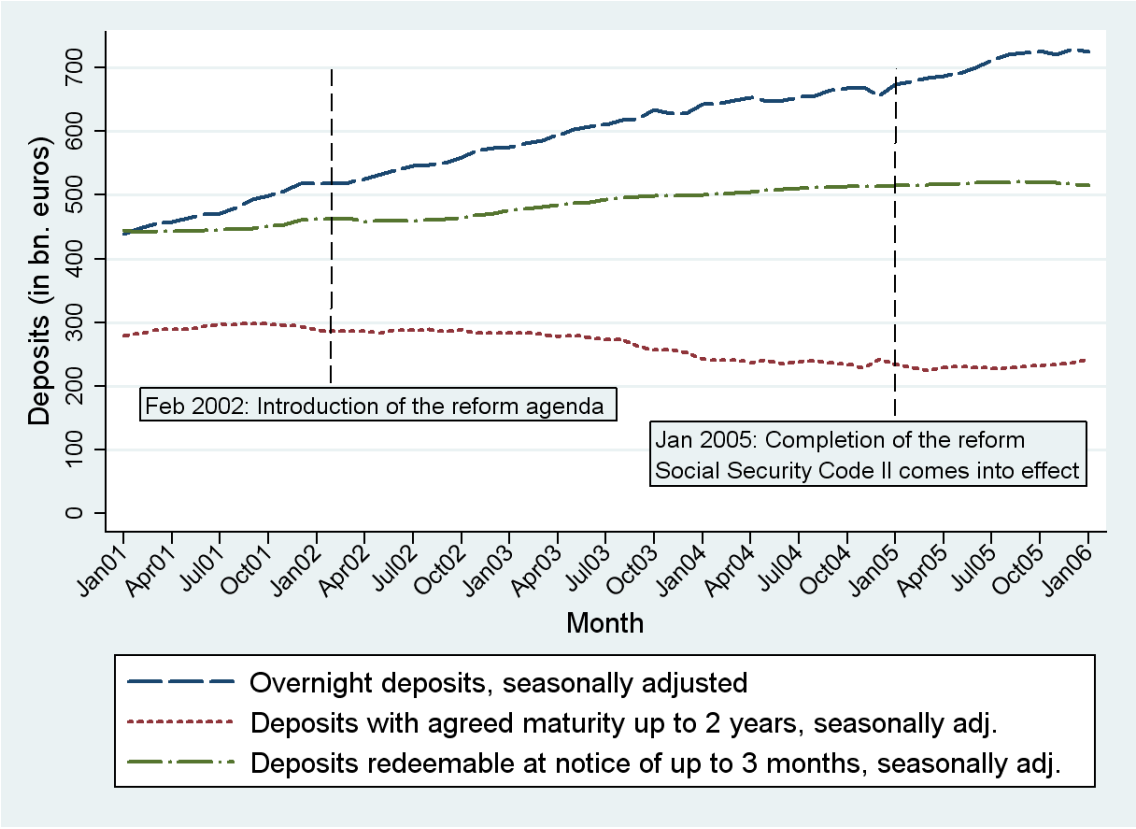


Figure 3.3: Deposits of private housholds in Germany
Source: Deutsche Bundesbank; seasonally adjusted values.

3.3 Modelling the saving response to an institutional reform

As denoted in section 3.2, the idea that increased income variance influences the saving behaviour goes back to Leland [1968] and Sandmo [1970]. They basically show in a two-period model that an agent responds to increased uncertainty in the second-period income by accumulating more assets in the first period. In contrast to the assumption of 'certainty equivalence' in previous models of intertemporal decision making, this reaction holds true even in case of a mean-preserving spread of second-period income, i.e. even if the expected income in the second period remains the same. A crucial assumption for this property of an agent's preferences is that the period utility function has convex marginal utility ($u''' > 0$). The basic intuition behind the precautionary motive for saving is that the agent builds up a buffer stock and thereby tries to reduce the expected cost of the uncertainty by balancing the marginal utilities in both periods (Kimball [1992]).[8] The works just mentioned are built on two-period models in which there is an uncertain income in the second period in any case. Furthermore, the income distribution is given and known to the agent. So when he decides about consumption (or saving, respectively) in the first period, it is assumed that he knows the future distribution of income. In the context of a reform, this means that the agent knows from the beginning of the reform process what his income will be both in case of employment and unemployment in the last period. Primary concerns of these models have been to analyse optimal present savings in face of future income risk and to explain the time series properties of consumption growth by buffer-stock behaviour of consumers

[8] In what follows, I use the terms 'uncertainty' and 'risk' synonymously. Strictly speaking, the 'uncertainties' in the model are 'risks' because I assume that the agent knows the exact probability distribution of events. Uncertainties, on the other hand, may be characterized by unknown subjective or objective probabilities. Because the model generally illustrates a decision under uncertainty of an individual in a reform period, this differentiation of terms is not that relevant. Additional information to the differentiation of both concepts can be found e.g. in Farny [2006, 26ff] or Knight [1971].

(Carroll [1997]). Moreover, those models have been used as starting points for empirical analyses of the importance of precautionary saving because of income uncertainty.[9] In this chapter, the focus is on the saving behaviour of an agent who faces income uncertainty due to an expected change of the benefit generosity.[10] The agent is supposed to adapt his saving inasmuch as the reform changes the level of insurance in case of unemployment and therefore the future income uncertainty. There may be yet another source of uncertainty in the context of a reform. At the starting point of the reform period, the ultimately resulting extent of insurance may not be clear from the perspective of the representative addressee of the reform. That means that the future income distribution is not exactly known at the start of the reform process, and the individual does not exactly know the point in time at which he will learn about the final design of the unemployment insurance. The resolution of the latter source of uncertainty may further influence saving behaviour and welfare of the individual. The way in which the timing of the resolution of uncertainty affects optimal saving is analysed by Blundell and Stoker [1999] and Eeckhoudt et al. [2005]. Both studies consider a three-period model to address this issue. The latter shows that an early resolution of uncertainty has a positive effect on consumption in the first period given the agent is prudent and the utility function belongs to the class of HARA utility functions (hyperbolic absolute risk aversion). The intuition for this result is that an early resolution of uncertainty allows to diversify risk over time. In other words, the expected costs of the risk in

[9] As outlined in chapter 2, the empirical results concerning the relative importance of the buffer stock with regard to the total wealth of a household differ in the literature. Estimates cover the range from about 50% of a household's assets (Carroll and Samwick [1998]) to more modest levels between 2% (Guiso et al. [1992]) and about 20% (Lusardi [1997]). According to own estimations in chapter 2 based on a Dutch household panel, the buffer stock amounts up to 15.39% of the total financial assets of a household.

[10] Unemployment insurance systems in the real world obviously comprise combinations of different issues such as benefit generosity, the time profile of benefits and sanctions for non-compliance with the obligations of the unemployed. For the sake of simplicity, in what follows all reform measures that involve a reduction of the generosity of insurance and that may increase income uncertainty are subsumed under the level of the benefits. Although this simplification therefore cannot capture all details, it is nevertheless sufficient enough to illustrate the basic effects of reforms on uncertainty and saving behaviour.

the last period and the adjustment of the buffer stock to a known state of the world in this last period can be disseminated over more periods (Eeckhoudt et al. [2005, 762]). I adopt this idea and adjust the model in a simplified version to the reform of the generosity of unemployment insurance and the different kinds of uncertainty involved. As argued in section 3.2, there are three sources of uncertainty that may be relevant for the saving behaviour of an agent who is confronted with such a reform process. Firstly, the future state benefits are uncertain and so is the level of income insurance in case of a job loss. Secondly, there is the risk to be negatively affected by the reform if the agent becomes unemployed under the reformed institutional set-up. The final source of uncertainty is the unknown point in time, at which the uncertainty about the generosity of state insurance that applies in the end will be resolved. These various sources of uncertainty are combined in the following three-period model.

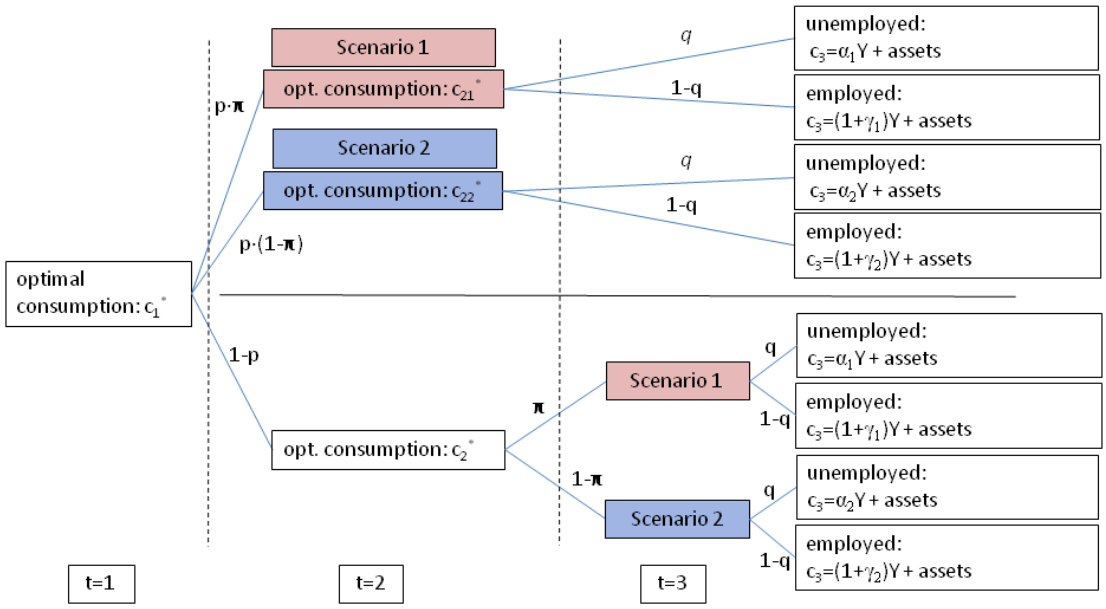
3.3.1 A three-period model

The structure of the model is given in figure 3.4 and will be described in detail below.[11] In the first period, the agent receives the message that in the last period there will be a change in the unemployment insurance system which replaces the current level of income support in case of a job loss. From the perspective of the agent at time t=1, it is assumed that two reform scenarios $i = 1, 2$ are imaginable. This may be due to two publicly discussed reform proposals.[12] Because the focus here is on the reaction of an agent to uncertainty in a reform process both scenarios are modelled as 'mean-preserving spreads' (MPS) according to Rothschild and

[11] It is more convenient to frame the model in terms of a consumption decision rather than a decision to save. Obviously, this does not change the results. Savings of the agent are obtained by subtracting consumption from income.

[12] Alternatively, this assumption can be motivated by a simple voting-model. Each individual possesses a preferred replacement rate that maximises his expected utility depending on his socio-economic characteristics like income and education. Given the assumptions of majority-voting, the agent with median characteristics will be the Condorcet-winner whose preferred benefit level will be realized. But if the median voter is not known a priori, there is uncertainty about the benefit generosity that may be implemented at t=3.

Figure 3.4: Structure of the model



Stiglitz [1970]. By holding constant the expected income, I concentrate on the effects of increased uncertainty during a reform process on consumption disregarding any expected income effects. Furthermore, it is assumed that the agent receives a sure income Y in t=1,2 , i.e. he is fully insured against income risks due to unemployment before the reform takes place.[13] Now, both reform scenarios differ in the replacement rate $0 < \alpha_i < 1$ if the agent becomes unemployed. The probability of becoming unemployed is denoted by q. So if the agent becomes unemployed, he gets an income of $\alpha_i Y$. Because the reform scenarios are characterised as MPS, the agent receives an income $(1 + \gamma_i)Y$ if employed with $\gamma_i = \frac{q \cdot (\alpha - 1)}{q - 1}$. This may be regarded as an implicit redistribution of saved expenses on the unemployed by

[13]Comparing a stochastic income before the reform with an increase in variance because of the reform measures does not change the results qualitatively.

a reduction of the contributions of the employed to the unemployment insurance, resulting in a higher net income.[14] Assuming that the risk of becoming unemployed remains constant during the reform period considered here, the variance of the future income distribution at time t=3 is determined by α_i.

$$Var(\widetilde{Y_{3i}}) = q \cdot (\alpha_i \cdot Y - Y)^2 + (1-q) \cdot [(1+\gamma_i) \cdot Y - Y]^2 = \frac{q \cdot Y^2 \cdot (\alpha_i - 1)^2}{1-q} \quad (3.1)$$

It can easily be shown that $\frac{\partial Var(\widetilde{Y_{3i}})}{\partial \alpha_i} < 0$ for all $0 < q < 1 \wedge 0 < \alpha < 1$. The income lottery at t=3 generated by the reform can alternatively be expressed by

$$\widetilde{Y_{3i}} = Y + \widetilde{\epsilon_i} \quad \text{with} \quad \widetilde{\epsilon_i} \sim (0, \sigma^2_{\epsilon_i}) \quad (3.2)$$

where ϵ can take the values $\alpha_i Y - Y$ if the agent is unemployed or $\gamma_i Y$ if he is employed in the last period. The variance $\sigma^2_{\epsilon_i}$ is given in equation (3.1).
At time t=2 the agent gets another message M with probability $prob(M) = p$. This message reveals the scenario that will finally be implemented in t=3. In other words, one source of uncertainty will be eliminated at time t=2 with probability p, because if he gets the additional message, he knows the future income distribution in t=3 for sure. This situation is depicted in the upper part of figure 3.4. Let π denote the probability that the first reform scenario is the one that will be relevant in the future. Then from the perspective of the agent in t=1 the probability of an early information that the first scenario will be implemented in t=3 is $p \cdot \pi$ (and $p \cdot (1-\pi)$ for the second scenario respectively). The lower part of figure 3.4 describes what happens otherwise. With probability $(1-p)$ the agent does not receive any additional information about the reform in t=2. In this case, there is no early resolution of

[14] Again, the labour market reform in Germany may serve as an example for such a kind of redistribution. Contributions to unemployment insurance had been held constant at 6.4% of gross income between 1995 and 2006. In 2007 these have been reduced to 4.2% and further to 3.3% in January 2008. The reduction of contributions was possible due to surpluses of the national employment agency ('Bundesagentur für Arbeit') which in turn are partly the result of a favourable development of unemployment as well as the saved expenses on unemployed induced by the Hartz reforms.

uncertainty concerning the future benefit generosity and he will not learn about the final scenario until t=3. Therefore, he cannot condition his consumption decision in t=2 on one of the two scenarios.

Finally, in t=3 the income of the agent is realized subject to his labour market status and the ratified reform scenario. He consumes the current income $\widetilde{Y_{3i}}$ plus the assets accumulated so far. The model can now be solved by backward induction. To keep things simple, in what follows I assume that the agent possesses no initial wealth, the time preference rate equals the interest rate and the latter are both zero. Furthermore, because consumption in the last period is the result both of the decisions taken by the agent at earlier stages of the model and the income lottery, consumption in t=3 is not explicitly depicted.

Consumption decision in t=2

At time t=2 the agent's optimisation problem depends on his available information with regard to the reform. Either he already knows about the institutional design in t=3 because he has received the additional information M, or he is still uninformed and therefore cannot condition his decision on one of the reform scenarios. The former case is examined first.

Consumption decision with information

Because the agent has already been informed about the content of the reform, the remaining uncertainty consists of the risk to become unemployed in t=3. He chooses optimal consumption c_{2i}^* to maximize his expected utility.

$$\max_{c_{2i}} \quad u(c_2) + Eu(c_3) \tag{3.3}$$

with regard to the following constraints

$$c_{2i} = A_2 + Y - A_3$$

and

$$\widetilde{c_{3i}} = A_3 + Y + \widetilde{\epsilon_i}$$

where A_2, A_3 denote the assets that are transferred from t=1 to t=2 ($A_2 = Y - c_1$) and from t=2 to t=3 respectively. Given the differentiability of the period utility function $u(.)$, the first order condition for optimal consumption is

$$u'(c^*_{2i}) = Eu'(A_2 + 2 \cdot Y - c^*_{2i} + \widetilde{\epsilon_i}) = Eu'(V_2 + Y - c^*_{2i} + \widetilde{\epsilon_i}) \tag{3.4}$$

The term $V_2 = A_2 + Y$ stands for the available assets of the agent at time t=2 which consists of the means carried over from t=1 to t=2 plus the deterministic income Y. The simplest period utility function of the HARA-class for which $u''' > 0$ holds and which has the advantage to enable an analytical solution is the following CARA-utility function (constant absolute risk aversion) (cf. Caballero [1990] and Leimer and Richardson [1992]).

$$u(c_t) = -\frac{1}{a} \cdot e^{(-a \cdot c_t)}$$

with the coefficient of absolute risk aversion a. By using CARA preferences the effect of wealth on the level of precautionary saving cannot be modelled explicitly. For the time being, this specification of preferences is sufficient because the purpose of this section is to illustrate the effect of uncertainty during a reform process on consumption and the impact of early information. Given such preferences the first order condition in equation (3.4) can be rewritten as

$$e^{(-a \cdot c^*_{2i})} = E_\epsilon[e^{(-a \cdot (V_2 - c^*_{2i} + Y - \widetilde{\epsilon_i}))}] \tag{3.5}$$

The Euler equation (3.4) can now be solved for optimal consumption in t=2 given scenario i[15]

$$c_{2i}^{*} = \frac{V_2 + Y}{2} - \frac{1}{2a} \cdot ln[E(e^{(-a \cdot \widetilde{\epsilon_i})})] \tag{3.6}$$

Accounting for the assumed characteristic of the reform scenario according to which the income depends on the labour market status, equation (3.6) becomes

$$c_{2i}^{*} = \frac{V_2 + Y}{2} - \frac{1}{2a} \cdot ln[q \cdot e^{(-a \cdot (\alpha_i Y - Y))} + (1 - q) \cdot e^{(-a \cdot (\gamma_i Y))}] \tag{3.7}$$

To obtain an interpretable solution in terms of uncertainty, a second order Taylor-approximation of the expectation term around the full insurance level $\epsilon = 0$ in equation (3.6) is considered.[16]

$$c_{2i}^{*} \approx \frac{V_2 + Y}{2} - \frac{1}{4} \cdot a \cdot (\sigma_{\epsilon_i})^2 \tag{3.8}$$

Since the variance $\sigma_{\epsilon_i}^2$ is given by equation (3.1) and $\frac{\partial Var(\widetilde{Y_{3i}})}{\partial \alpha_i} < 0$, it is obvious that optimal consumption in t=2 positively depends on the income replacement rate α_i in case of unemployment. The higher the generosity of the unemployment insurance, the lower is the income uncertainty from the agent's perspective. With $\alpha_1 > \alpha_2$ and the MPS assumption it follows that $Var(\widetilde{\epsilon_1}) < Var(\widetilde{\epsilon_2})$. A less uncertain future income induces the agent to withhold a smaller share of assets to self-insure. Therefore $c_{21}^{*} > c_{22}^{*}$, i.e. consumption in t=2 is supposed to be higher under the first reform scenario.

[15] It can be shown that the second order condition (S.O.C.) is < 0; therefore c_{2i}^{*} represents a maximum.

[16] $ln[Ee^{(-a \cdot \widetilde{\epsilon_i})}] \approx ln[E[e^{(-a \cdot 0)} + (-a) \cdot e^{(-a \cdot 0)} \cdot \epsilon_i + \frac{1}{2}a^2 \cdot e^{(-a \cdot 0)} \cdot \epsilon_i^2]] = ln[e^0 + \frac{1}{2}a^2 \cdot e^0 \cdot \sigma^2] = ln[1 + \frac{1}{2}a^2 \cdot \sigma_i^2] \approx \frac{1}{2}a^2 \cdot \sigma_i^2$

Consumption decision without information

With probability p the agent does not possess any information in t=2 about the benefit generosity he can rely on in the end. Therefore the agent's uncertainty results from two sources. Firstly, there is the risk to become unemployed (just as in the case considered above). Secondly, there is additional uncertainty concerning which one of the potential scenarios will finally be implemented in t=3. Denoting the (subjective) probability for the occurrence of the first scenario by π, the optimisation problem takes a similar form as in equation (3.3), but the agent faces a somewhat different income lottery due to the missing information. This lottery can be depicted as follows.

$$\widetilde{Y_{33}} = Y + \widetilde{\epsilon_3} \quad \text{with}$$
$$\widetilde{\epsilon_3} = [\alpha_1 Y - Y, \pi q; \gamma_1 Y, \pi(1-q); \alpha_2 Y - Y, (1-\pi)q; \gamma_2 Y, (1-\pi)(1-q)]$$

The expected value $E[\widetilde{\epsilon_3}]$ is zero and the variance of this composite lottery is $Var(\widetilde{\epsilon_3}) = \pi \cdot Var(\widetilde{\epsilon_1}) + (1-\pi) \cdot Var(\widetilde{\epsilon_2})$. Because $Var(\widetilde{\epsilon_1}) < Var(\widetilde{\epsilon_2})$ and $0 < \pi < 1$ the following relation holds for optimal consumption levels in t=2

$$c_{21}^* > c_2^* > c_{22}^* \tag{3.9}$$

with c_2^* given by

$$c_2^* = \frac{V_2 + Y}{2} - \frac{1}{2a} \cdot ln[E(e^{(-a \cdot \widetilde{\epsilon_3})})] \approx \frac{V_2 + Y}{2} - \frac{1}{4} \cdot a \cdot (\sigma_{\epsilon_3})^2 \tag{3.10}$$

From the perspective of t=3, the missing information about the reform scenario results in a suboptimal consumption decision compared to the case with information.

At time t=2, he cannot optimally condition his buffer stock on a certain future income distribution. Put differently, if the first scenario is finally realized in t=3, his consumption in t=2 is lower and his buffer stock is higher than in the optimal situation under early information dissemination. On the other hand, the buffer stock is smaller than optimal in case of the second scenario that is characterised by a higher income risk.

Consumption decision in t=1

At t=1, the agent neither has information about the reform scenario that will ultimately be implemented nor can he decide on the assumption that he will get this information in t=2. Therefore the agent maximises

$$\underset{c_1,c_2,c_3}{max} \quad u(c_1) + E[u(c_2)] + E[u(c_3)] \tag{3.11}$$

with regard to the following constraints

$$c_1 = Y - A_2 \rightarrow A_2 = Y - c_1 \tag{3.12}$$

$$c_2 = \begin{cases} c_{21}^* & \text{with prob(.)}= p \cdot \pi \\ c_{22}^* & \text{with prob(.)}= p \cdot (1-\pi) \\ c_2^* & \text{with prob(.)}= (1-p) \end{cases} \tag{3.13}$$

$$c_3 = \begin{cases} \widetilde{\theta_1} = V_2 - c_{21}^* + Y + \widetilde{\epsilon_1} & \text{with prob(.)}= p \cdot \pi \\ \widetilde{\theta_2} = V_2 - c_{22}^* + Y + \widetilde{\epsilon_2} & \text{with prob(.)}= p \cdot (1-\pi) \\ \widetilde{\theta_3} = V_2 - c_2^* + Y + \widetilde{\epsilon_1} & \text{with prob(.)}= (1-p) \cdot \pi \\ \widetilde{\theta_4} = V_2 - c_2^* + Y + \widetilde{\epsilon_2} & \text{with prob(.)}= (1-p) \cdot (1-\pi) \end{cases} \tag{3.14}$$

with $V_2 = 2Y - c_1$.

Since all terms in (3.11) implicitly depend on c_1, the first order condition for optimal consumption c_1^* is given by

$$\begin{aligned} u'(c_1) \quad - \quad & \frac{1}{2} \cdot [p\pi \cdot u'(c_{21}^*) + p(1-\pi) \cdot u'(c_{22}^*) + (1-p) \cdot u'(c_2^*)] - \\ & \frac{1}{2} \cdot [p\pi \cdot E_{\epsilon_1} u'(\widetilde{\theta_1}) + p(1-\pi) \cdot E_{\epsilon_2} u'(\widetilde{\theta_2}) + (1-p)\pi \cdot E_{\epsilon_1} u'(\widetilde{\theta_3}) \\ & + (1-p)(1-\pi) \cdot E_{\epsilon_2} u'(\widetilde{\theta_4})] = 0 \end{aligned} \tag{3.15}$$

Again, applying CARA preferences as outlined above, the first order condition (3.15) can be solved for the optimal consumption in the first period c_1^*.

$$c_1^* = \frac{1}{3} \cdot (3Y) - \frac{2}{3} a \cdot ln[\psi] \tag{3.16}$$

with ψ given by

$$\begin{aligned} \psi \quad = \quad & 2 \cdot p\pi \cdot [E_{\epsilon_1}(e^{-a \cdot \widetilde{\epsilon_1}})]^{\frac{1}{2}} + 2 \cdot p(1-\pi) \cdot [E_{\epsilon_2}(e^{-a \cdot \widetilde{\epsilon_2}})]^{\frac{1}{2}} + \\ & (1-p) \cdot [E_{\epsilon_3}(e^{-a \cdot \widetilde{\epsilon_3}})]^{\frac{1}{2}} + (1-p)\pi \cdot [E_{\epsilon_3}(e^{-a \cdot \widetilde{\epsilon_3}})]^{-\frac{1}{2}} \cdot E_{\epsilon_1}(e^{-a \cdot \widetilde{\epsilon_1}}) + \\ & (1-p)(1-\pi) \cdot [E_{\epsilon_3}(e^{-a \cdot \widetilde{\epsilon_3}})]^{-\frac{1}{2}} \cdot E_{\epsilon_2}(e^{-a \cdot \widetilde{\epsilon_2}}) \end{aligned}$$

The expression ψ in equation (3.16) includes the terms representing income uncertainty. In case of an unchanged future income distribution, i.e. there is no reform, it can easily be shown that $\psi = 1$, $c_1^* = Y$ and $A_2 = 0$. Next, I will consider a numerical example to show the movement of the agent's assets and savings rate over time as well as to illustrate the effects of uncertainty on an agent's welfare.

3.3.2 A numerical example

The values chosen for the parameters of the model are given in table 3.2. The income Y corresponds to the mean net income of a German household in the year 2005 (IW [2007]). The value assumed for the coefficient of absolute risk aversion a is within the range of an interval which is considered in the literature to be plausible based

Table 3.2: Numerical example: parameter values

Variable	
Y (income)	2164 EUR
α_1 (replacement rate, scenario 1)	0.51
α_2 (replacement rate, scenario 2)	0.35
γ_1 (income supplement, scenario 1)	0.037
γ_2 (income supplement, scenario 2)	0.049
a (coeff. of absolute risk aversion)	0.003
p (probability of early information)	0.5
π (probability for scenario 1)	0.5
q (unemployment rate)	0.07

on estimations (Babcock et al. [1993]). The probability of an early resolution of uncertainty p is 0.5, just as the probability of the occurrence of both possible reform scenarios. Finally, the parameters that characterise the reform scenarios, i.e. the replacement rate α_i and the 'income supplement' in case of employment γ_i, are simply chosen to guarantee an MPS at an assumed risk of unemployment of 7%. The following figures show the development of an agent's wealth and his savings rate given the chosen values.

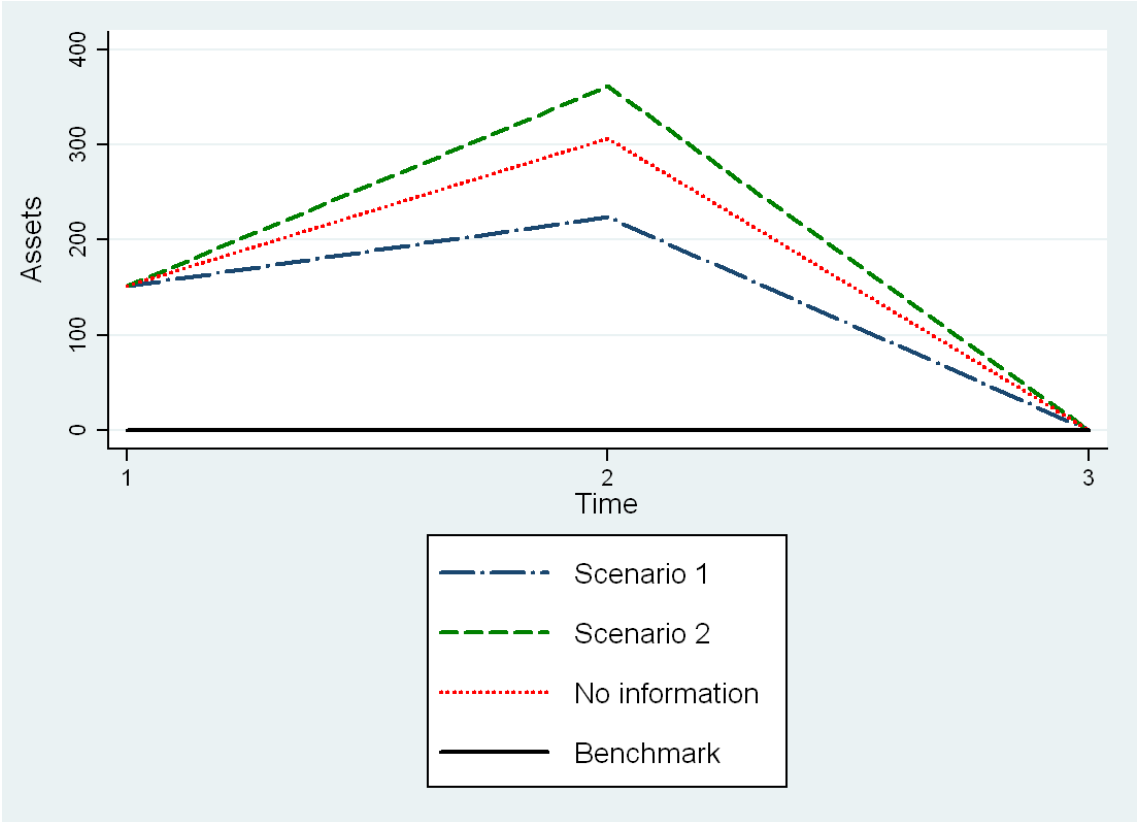
To begin with, figure 3.5 illustrates the development of wealth over time. Since it is assumed that the agent does not possess any initial wealth, the level of assets at time t=1 represents the money saved to build up a buffer stock. In contrast to the certainty benchmark without a reform, it is obvious that the agent has positive savings due to his precautionary motive to self-insure against expected income risks.[17] At time t=2 the agent's buffer stock depends on his information status. If he has already been informed about the contents of the reform coming into effect in t=3, he optimally adjusts his assets to the new conditions. A prudent individual accumulates more assets if he is confronted with the second scenario that implies a

[17]In the benchmark case no reform takes place. In this case, income uncertainty does not change from the perspective of the individual. Given the assumption of full insurance against the income consequences of unemployment before the reform, there is no income uncertainty at all. Therefore the individual has no incentive to save for precautionary reasons. He consumes his income in each period and does not accumulate any assets.

larger spread of income in t=3. On the other hand, if the agent in t=2 has yet not received a signal, he cannot condition his buffer stock on one of the reform scenarios. In this case, it is optimal to hold assets amounting to a level between those of the informed status. He somewhat mixes between the wealth levels depending on the probability of the occurence of the two reform scenarios. The zero wealth in t=3 is due to the constraint that the agent consumes all his assets in t=3.

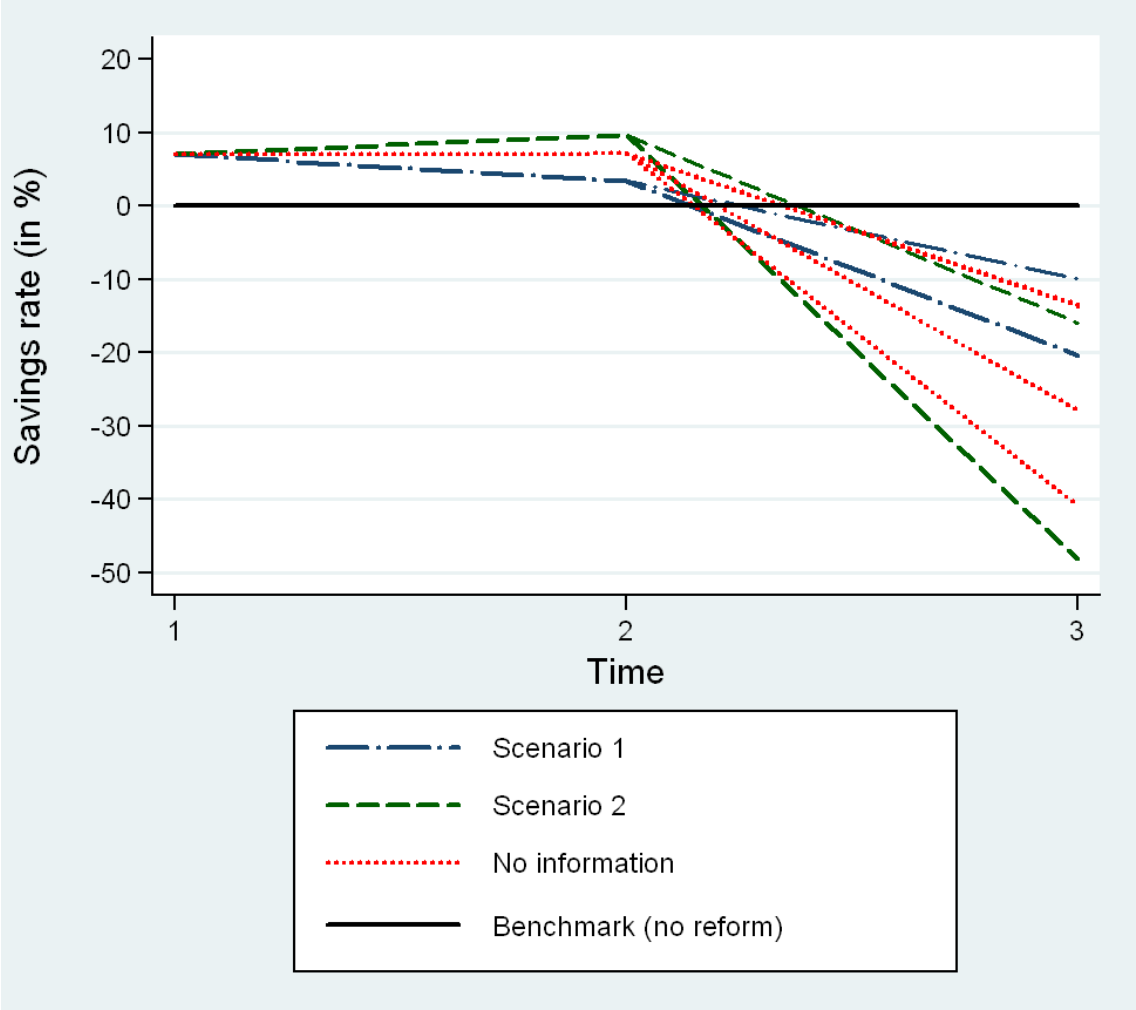
In sum, the precautionary motive for saving is a possible explanation for the (increased) accumulation of assets during a reform of the unemployment insurance that is accompanied by increased future income uncertainty due to a cut of benefit generosity.

Figure 3.5: Numerical example: wealth



An additional aspect of the model can be learned from figure 3.6 that depicts the simulated savings rate of the agent. The savings rate is here defined as the ratio of saving to the available income of the agent at each point in time.

Figure 3.6: Numerical example: savings rate



The savings rate in the context of a reform is positive at t=1 compared to the zero savings rate in the benchmark case, again indicating a precautionary motive for saving. Furthermore, the savings rate decreases between time t=1 and t=2 if the agent is informed in t=2 that the first reform scenario will finally be implemented. This case is represented by the line 'Scenario 1'. At time t=1 the agent takes into account

the possible realisation of the second scenario and choses to save accordingly. Once he gets the message that the 'unfavourable' event from the agent's perspective is dropped from the political agenda, he adjusts his savings rate in t=2. The savings rate is still positive but smaller than at t=1.

Leaving the framework of the model for a moment, such a development of the savings rate may occur in situations where there is a more 'unfavourable' reform scenario than the one that will finally be implemented and the agents ascribe a positive probability to its appearance. Following this thought, this pattern of the savings rate during a reform process may be observed if the reform addressees are overly 'pessimistic' with regard to their future income uncertainty. Such an 'overshooting' of expectations and saving may be explained by misperceptions of objective probabilities or other aspects known in behavioural economics like framing. These kinds of phenomena might also result in a high savings rate at the beginning of the reform process which decreases over time as more and precise information about the contents of the reform becomes available. However, by assumption psychological aspects do not play a role in the model.

As described above with regard to the agent's wealth, one can observe how the agent adapts his saving behaviour to the circumstances. If the agent receives no message in t=2, he still has to take into account both scenarios ('No information'). This results in an intermediate savings rate between the two cases in which he already knows the risk in the end. The negative values of the different paths of the savings rate in t=3 again originate from the assumption that the agent consumes all his assets in the final period. He dissaves in t=3.[18]

From an ex-post point of view, the early resolution of uncertainty would have enabled the agent to optimally adjust his assets to the changed income distribution in t=3. This leads to the second insight from the model: the expected utility of the

[18]In each scenario, dissaving (measured by the savings rate) is highest, when the agent becomes unemployed in the last period. This is because dissaving the same stock of assets at a lower income level results in a lower savings rate.

agent in t=1 is highest when the early resolution of risks definitely takes place in t=2, i.e. $p = 1$. Holding constant the values of the other paramters of the model, it can be shown that $EU_{t=1,p=1} > EU_{t=1,0<p<1} > EU_{t=1,p=0}$.

The change in the agent's utility induced by the reform that consists only of an increased income uncertainty without a change of the expected income (MPS), can also be clarified by considering the risk premium as a measure of the 'willingness-to-pay' or alternatively the equivalent variation to capture the 'willingness-to-accept' the reform. The latter is the amount of money one would have to give to an agent to induce him to accept the reform or to waive the additional information.

Firstly, the value of the early information for the agent is considered. The risk premium τ here is understood as the agent's maximum willingness to pay for an early resolution of uncertainty with $p = 1$ from an ex-ante point of view (i.e. immediately after the announcement of the reform in t=1). The case of an uncertain dissemination of information in t=2 with $p = 0.5$ as given in table 3.2 serves as the benchmark. For τ being the maximum willingness-to-pay the following equation must be satisfied.

$$EU_{t=1}(p = 1, -\tau) = EU_{t=1}(p = 0.5) \tag{3.17}$$

Given the assumptions in table 3.2 above, the willingness to pay for an early resolution of uncertainty is about 6.75 euros. This amount equals a share in the total income in the first period of 0.3%. Although this number seems not to be large, it clearly shows that an early resolution of uncertainty would leave the agent better off. Besides the issue of the timing of information during the reform process, the change in the replacement rate has an effect on the utility of the agent as such, because the individual has a preference for insurance. Compared to the benchmark case of the numerical example above, the certainty equivalent is an income of about 2012.49 euros. In other words, a certain income of 2012.49 euros in each period makes the agent indifferent between this non-stochastic income and the reform lottery. Again,

this is only the effect of the uncertainty induced by a reform process keeping the expected income at the previous level. So when thinking about a reform of the benefit generosity, the loss in the utility of the reform addressees has to be contrasted with the potential gains of reduced moral hazard and the behaviour of the unemployed. Finally, one has to keep in mind that the optimal saving in t=1 and the reduction in consumption induced by a reform depends on the parameters of the model. Varying single parameters and holding constant the other parameters gives plausible results. The higher ceteris paribus (c.p.) the coefficient of absolute risk aversion a is (i.e. the more risk averse the agent is), the lower is the level of optimal consumption c_1^* (or the higher the savings, respectively). The higher the probability for the first reform scenario π is, the higher (lower) is c.p. consumption (saving) in t=1. In accordance with Eeckhoudt et al. [2005], saving in t=1 c.p. decreases with the probability of an early resolution of uncertainty during the reform process.[19]

3.3.3 Discussion

The simple model in this section illustrates the effect of different sources of uncertainty that may emerge during a reform of the unemployment insurance system on the saving behaviour and on the welfare of a representative agent. Basically, the announcement of changes in the generosity of the unemployment benefits lets a prudent agent reduce his consumption to build up a buffer stock. This is the result of an increased motive for self-insurance when the state insurance is cut down to a lower level. Given that the agent is risk averse and has a preference for insurance, the reform also affects his individual welfare. So when policy makers consider such a type of reform to fight moral hazard, they should take the effects of reduced consumption and lower individual welfare into account. Reduced consumption may in turn have an impact on unemployment in the medium term and therefore even aggravates the future income uncertainty from the perspective of the reform addressees.

[19]Some sensitivity checks concerning the impact of a change in those parameters on saving in t=1, the risk premium τ and the certainty equivalent are given in appendix B.1.

The model of an individual intertemporal consumption decision as outlined above, however, can capture neither the aggregate effects of a reform on total consumption nor the incentives for the reform addressees to reduce moral hazard, for example in form of a higher effort to search for a new job if the agent becomes unemployed. To combine these different impacts of a reform on aggregate demand and unemployment in a more comprehensive (general equilibrium-type) model represents an interesting topic for further research. Furthermore, the model demonstrates that saving is affected not only by the dimension of the reform concerning the unemployment benefits affects saving, but also by the timing of information during the reform process if the resulting benefit level is unknown from an ex-ante point of view of the agent. An early resolution of uncertainty with regard to the reform scenario that will be relevant in the end, increases the agent's welfare. This is because he is able to time-diversify the future income risk. In other words, early information allows the agent to optimally adjust his buffer stock to the new circumstances and therefore to reduce suboptimal over or undersaving from an ex-post perspective.

However, there are some important issues which the reader should bear in mind. Firstly, by modelling the reform as a mean-preserving spread only the effect of uncertainty on saving is regarded in the model. A change in the unemployment insurance system may influence not only the future income uncertainty of an agent but also the expected level of income. For example, this might be the case in the short run if the benefits are reduced without adjustment of the contributions of the insurance premiums. Moreover, due to time-lags of the reaction of the unemployment rate on the reform measures, the unemployment rate may remain constant during the reform period. This would result in an expected reduction of the income level. A negative expected effect on income is supposed to further reduce consumption at the beginning of the reform period. On the other hand, in the long run the reform measures may become effective in reducing unemployment and therefore increase the expected level of income. So, if the reform addressees anticipate any positive

effects on expected income in the long run, the negative effect of uncertainty on consumption may be overcompensated by an increased expected income in the future. The model here illustrates only potential short-term uncertainty effects in reform periods when the agent does not anticipate possible positive impacts of the reform on unemployment or any change of expected income. Behind this condition is the implicit assumption that the agent does not have perfect foresight with regard to long-term effects of the reform. To include such effects into the analysis, a more comprehensive model would be needed which goes beyond the scope of this chapter. On the other hand, the model outlined above possibly draws a more realistic picture of how an agent reacts during such a reform process just because of this assumption of limited foresight.

Secondly, the model assumes that the agent has a precise conception of probabilities in mind about the occurrence of unemployment, early information and the realisation of one of the discussed reform scenarios. He is also supposed to exactly know the consequences of each kind of risk for his income distribution. In general, the way in which individuals make decisions depend on motivations and needs in a specific situation. One might argue that a down-to-earth calculation of risks and the weighting of alternatives to maximise expected utility is not likely to be applied in most every day decisions. However, assuming such rational ways of decision making may be the more adaquate, the higher the possible losses (or gains) are and the more uncommon that specific decision is from the perspective of the individual (Engel and Weber [2007]). The change of the unemployment insurance system and the related consequences for the income distribution of the individual may be regarded as such an non-ordinary kind of decision that brings about more rational ways of decision making. For all that, it is possible that addressees of such reforms misperceive the 'objective' risks. For example, in case of an overestimation of the risk of loosing the job or when the agent is overly pessimistic concerning the impact of the reform with regard to his individual well-beeing, this may induce him

to withhold consumption even stronger than outlined in the model.[20] Strong pessimism or concerns of the agent with regard to their future income uncertainty may also affect the optimal timing of information during a reform process. Deterring the announcement of the planned reform may be beneficial for the agent's utility from an ex-post point of view if the expected negative effect from suboptimal saving on the agent's utility exceeds the potential positive effect of time-diversifying the future risk. Yet there has been some work on the role of emotions in economic decision making (see e.g. Loewenstein [2000], Elster [1998] or Brocas and Carrillo [2007] for an overview). There are two approaches that may be of interest when dealing with real 'Knightian uncertainty' and biases in the perception of probabilities of events as alternatives to the 'expected-utility' theory. The first one is the 'rank-dependent utility' theory that integrates weights to capture optimism and pessism (cf. Quiggin [1982], Gonzales and Wu [1999] and Starmer [2000]). Secondly, 'multiple-prior' models can be applied to model the ambiguity and the consequences of ambiguity aversion on consumption behaviour (cf. Gilboa and Schmeidler [1989] or Backus et al. [2004] for an introduction). Considering such kind of preferences in the context of a labour market reform goes beyond the scope of this chapter, but represents another interesting direction for future research.

3.4 Conclusions

The unemployment insurance system as an important pillar of labour market institutions in modern welfare states has primarily been designed to insure labour market participants against the adverse consequences of a job loss with regard to their income. By providing benefits as income maintenance in case of unemployment, the social insurance system reduces the future income uncertainty of employees. Using the example of Germany, it becomes apparent that the citizens in fact consider the

[20] Some evidence for the overestimation of the job loss risk of employees is given in table 2.7 in chapter 2. The means of the subjective probabilities of unemployment are far above the official unemployment rate.

insurance function as a primary objective of the welfare state. Additionally, there is some evidence that over time individuals get used to the role of the state as an insurer and a 'guardian of welfare'. On the other hand, generous unemployment insurance and other labour market institutions have been criticized in the past to have detrimental effects on unemployment and the flexibility of the labour market by increasing moral hazard. At least since the publication of the influential OECD Jobs Study in 1994, the deregulation of labour markets and the limitation of the welfare state generosity attracted notice of both policy makers and economists. A number of countries has already conducted reforms in line with measures suggested by the Jobs Study to combat moral hazard. It is argued in this chapter that given the employees' reliance on state insurance, such reforms of the unemployment insurance system generate uncertainty. From the perspective of the addressees of a reform, there are two important sources of uncertainty that may appear during a reform process. Firstly, at the beginning of the process the level of state insurance on which the individuals can finally count on may be unclear. This in turn may increase future income uncertainty. Secondly, the specific date within this period at which the reform addressee will receive precise information about the measures that will become effective in the end may be uncertain as well. Moreover, there is the risk to be adversely affected by the reform measures immediately after their implementation because of unemployment. As a result, individuals may withhold consumption and increase saving for precautionary reasons in the face of an expected reduction of state insurance and increased expected future income uncertainty. The development of consumer sentiment and the savings ratio in Germany during the reform of the unemployment insurance system ('Hartz reform') seem to provide some anecdotal evidence that supports this kind of reaction during reform processes.

A simple three-period model is outlined to illustrate the link between the different forms of uncertainty and saving behaviour during a reform process from a theoretical point of view. To this end, I adapt the three-period model of Eeckhoudt et al. [2005] which explicitly takes into account the timing of the resolution of

uncertainty to the context of a reform that cuts back the generosity of benefits. In sum, changes in the generosity of the unemployment benefits let a prudent agent reduce his consumption to build up a buffer stock. This is the result of an increased motive for self-insurance when the state insurance is cut down to a lower level. The model also demonstrates that not only the dimension of the reform concerning the unemployment benefits affects saving, but also the timing of information during the reform process. An early resolution of uncertainty with regard to measures that will become effective in the end, increases the agent's welfare. This is because he is able to time-diversify the future income risk. In other words, early information allows the agent to optimally adjust his buffer stock to the new circumstances and therefore to reduce suboptimal over or undersaving from an ex-post perspective. An implication of the model is that policy makers should take the effects of reduced consumption and lower individual welfare into account when they consider reducing the generosity of insurance to fight moral hazard. Because of its adverse effects on consumption and demand in the short run, pessimism concerning the overall objective of a reduction in unemployment may result in a J-curve type adjustment path towards a new equilibrium.[21] The model of an individual intertemporal consumption decision as outlined in this chapter, however, cannot capture both the aggregate (dynamic) effects of a reform on total consumption and the incentives for the reform addressees to reduce moral hazard. To combine these different impacts of a reform on aggregate demand and unemployment in a more comprehensive (general equilibrium-type) model represents an interesting topic for further research. Besides saving for precautionary reasons, there are obviously other plausible reactions of individuals to changes in the generosity of the unemployment insurance. Whereas a buffer stock serves as a direct substitute of the state insurance to alleviate the adverse monetary consequences of unemployment, the individual may increase his effort to reduce the

[21] Blanchard [1993] considers 'animal spirits' that result in a sharp drop in consumption as one plausible explanation for the recession in the years 1990-1991. Based on a simple VAR model he shows that such a sudden shock in consumption may have a long-lasting humped-shaped effect on output and consumption (Blanchard [1993, 273]).

probability of unemployment as such. In this context, employees can increase their private investment in advanced training. Moreover, an employee may increase his current working time as a reaction to increased expected uncertainty in the future.[22] Alternatively, increasing the working time of other members of the household may not only raise the household's income, but also diversifies the income risk. Those reactions just mentioned, however, can be regarded as rather long-term strategies in the light of increased expected uncertainty if for example working hours cannot arbitrarily be expanded by the individual employee in the short term. An examination of such rather long-term behavioural changes of participants on more flexible and deregulated labour markets from a theoretical and empirical point of view is another interesting issue for future reasearch that can help to complete the knowledge about the consequences of increased income uncertainty as well as the recent trend to flexibility and deregulation of labour markets. In sum, by looking at the influence of labour market reforms on (perceived) income uncertainty and potential changes in the consumption behaviour, this chapter addresses an issue that has largely been neglected so far but that has potentially interesting implications for the design and realisation of reforms.

[22] Pijoan-Mas [2005] und Low [2005] think about working time as an instrument to self-insure against future income shocks in the context of a life-cycle model. Based on data from the Panel Survey of Income Dynamics (PSID) in the United States, they argue that both higher savings and increased working time early in life may serve as a buffer stock for shocks in the future.

B Appendix

B.1 Sensitivity analysis

The following table gives an indication of how the basic results from section 3.3.2 change if the values of single parameters are varied, holding constant the other ones in the numerical example. Basically, the changes in savings in t=1, in the willingness to pay for early information and in the certainty equivalent are considered that occur due to changes in risk aversion a and the probability distribution of both the early information and the first reform scenario.

Table 3.3: Sensitivity analysis

	Saving in t=1	Willingness-to-pay τ	Certainty equivalent
Example from section 3.3.2	151.512	6.754	2012.488
Parameters changed			
$a = 0.001$	29.494	0.103	2134.506
$a = 0.005$	254.377	15.409	1909.623
$a = 0.01$	354.208	21.132	1809.792
$\pi = 0.3$	168.222	4.875	1995.778
$\pi = 0.7$	132.697	6.720	2031.303
$p = 0.3$	152.407	9.437	2011.593
$p = 0.7$	150.615	4.061	2013.385

All values in euros.

In sum, the modifications in the parameters result in expected changes in the outcomes. Firstly, if the agent is less risk averse than assumed in the numerical example above, he saves considerably less and is not willing to pay much for an early resolution of uncertainty. The certainty equivalent in this case is higher, indicating that the reduction in utility is lower because of the income lottery induced by the reform.

The opposite holds if the agent shows a higher degree of risk aversion. A similar pattern can be observed with regard to the probability π of the final implementation of the first reform scenario that is more favourable from the agent's perspective concerning his (future) income uncertainty. Saving in t=1 is lower at a higher likelihood of the first scenario. The change in the willingness-to-pay seems somewhat puzzling at a first glance. In both cases, namely a higher and lower probability π, the risk premium τ is smaller compared to the example in section 3.3.2. This indicates that the value of the early information for the agent is lower in those cases. In other words, the value of an early information with probability $p = 1$ is highest, when there is maximum ambiguity concerning the design of the unemployment insurance in the end ($\pi = 0.5$ in the numerical example above). Moreover, among the cases depicted in table 3.3 the willingness to pay for a certain resolution of uncertainty in t=2 is lower at a lower level of π. Because the willingness to pay for an early resolution of uncertainty in the model depends on the expected additional utility from an optimal adjustment of the agent's buffer stock to the final income uncertainty, the loss in utility due to an only suboptimal adjustment seems to be lower if the first scenario is less likely than the other way round. Finally, it is obvious that the willingness to pay for information about the reform scenario decreases with the probability of early resolution. Furthermore, a higher certainty equivalent confirms that the expected utility of the agent rises with p.

B.2 The German Hartz reform

One objective of the Hartz reform in Germany aimed at the reorganisation of the German labour administration from the former 'Bundesanstalt für Arbeit' into the more service-based 'Bundesagentur für Arbeit'. Besides this mainly organisational target, the reform's primary objective was to change the labour market policy by introducing more 'activating' elements into the unemployment insurance system. Just as in other European countries, the pronounced goals of the German labour market reform have been to fight unemployment, to enhance the flexibility of the labour market in a globalised economy and to cheapen labour by reducing the contributions to social insurance. This latter objective should be enabled by reduced unemployment and an increased labour force potential.

The reform process was announced by the German Federal Government in February 2002. At this point in time the government introduced a reform agenda and mandated an expert commission under the direction of Peter Hartz, the personnel director of the Volkswagen AG at that time, to elaborate and suggest realisable reform measures. The suggestions of the so-called 'Hartz-commission' contained guidelines for an 'activating labour market policy'. This term basically means that an unemployed person should take a more active role and more responsibility for his reintegration back into employment than it was the case under the policy at that time. In August 2002 the commission presented its final report. The suggested measures were then gradually brought in the legislative process and implemented in law. The coming into effect of the second Social Security Code (SGB II) on January 1st 2005 finalised the reform period. Within this reform period, a number of measures have been implemented that can be regarded as a reduction of the generosity of unemployment insurance. Firstly, there are parts of the reform that directly affect the generosity of unemployment benefits. The SGB II involved the consolidation of the former long-term unemployment benefits ('Arbeitslosenhilfe') and social insurance ('Sozialhilfe') into a new means-tested long-term unemployment insurance

('Arbeitslosengeld II') affecting mainly the benefit generosity of the long-term unemployed. Under the old regulation ('Arbeitslosenhilfe'), a long-term unemployed person received up to 57% of his former net income as benefits. Now there are fixed monetary benefits, for example 364 euros/month for a solitary person plus appropriate means for housing and energy. This reform implies in part a considerable cut of benefits for those who have been entitled to Arbeitslosenhilfe under the old regulation. Moreover, a long-term unemployed person now has to accept any kind of legal work independent from its wage level (Lampert and Althammer [2004, 331]).

In the course of the Hartz reforms, the maximum period of time for the reception of unemployment benefits ('Arbeitslosengeld') has been reduced considerably also for older workers. Before the year 2004, the benefit duration for workers older than 42 years was between 18 months (for workers aged 42 to 44) and 32 months (workers aged 54 and more). Currently, persons aged between 50 and 55 receive unemployment benefits for a period of 15 months, given all other requirements for an entitlement are satisfied. The maximum duration of benefit is 24 months for those aged 58 or more. For all other persons the maximum benefit duration is 12 months. After this period, long-term unemployed persons only receive the fixed-monetary benefits under the regulation of the long-term unemployment insurance ('Arbeitslosengeld II').

Secondly, although not directly affecting the income replacement in the form of benefits, the tightening of conditions under which an unemployed has to accept a job offer as well as possible sanctions in case of non-compliance in the form of cuts in monetary benefits also represent a reduction of unemployment insurance. Additional terms and conditions were added under which a job has to be accepted by an unemployed person. With these measures the legislator updated the regulations of the act to reform employment promotion ('Arbeitsförderungsreformgesetz') dating back to March 1997. The paragraph 121 of the third Social Security Code (SGB III) now contains clear-cut conditions under which a job offer has to be accepted by the

unemployed. In general, during the first three months of unemployment a job that offers a wage up to 20% under the last wage has to be accepted. If unemployed for more than seven months, each job which offers a net income above the unemployment benefits has to be accepted. If a reasonable job offer is denied, benefit payments can be blocked for a period up to twelve weeks (§ 144 SGB III). With these rules, the prescription to weight the interests of the unemployed against those of society encoded in the employment promotion act (§ 103 Abs. 1 Arbeitsförderungsgesetz) has been shifted in favour of the latter (Wissing et al. [2004]). A person that receives long-term unemployment benefits ('Arbeitslosengeld II') and who is capable of work has to accept any job offer (§ 10 SGB II).[23]

[23]Exceptions from that rule are given in § 10 (1) SGB II. For example, the education of children or the care of family members must not be at risk.

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Chapter 4

Do labour market institutions influence consumers' saving intentions? Aggregate evidence from Europe.

Abstract

Intertemporal decision making of a private household depends on its expected income distribution. Since an important feature of labour market institutions in modern welfare states is to provide cash transfers as income replacement in case of unemployment, it is hypothesised that unemployment benefits reduce the motive to save for precautionary reasons. Based on consumer sentiment data from the European Commission's Consumer Survey, this chapter provides evidence that aggregate saving intentions are significantly influenced by unemployment benefits. It can be shown that higher benefits lower the intention to save.

JEL codes: J65, E21, D12, D84

Keywords: Labour market institutions, Unemployment benefits, Precautionary saving, Consumer confidence

4.1 Introduction

Labour market institutions and their influence on economic behaviour have become major issues in economic policy over the past two decades (Freeman [1998]). The focus in the literature has primarily been on the link between institutions and labour market performance, especially unemployment (see e.g. the contributions of Nickell and Layard [1999], Blanchard and Wolfers [2000] and Nickell et al. [2005]). By looking at consumers' saving intentions, this chapter expands this focus and adds to our understanding of how labour market institutions affect consumers' expectations and intertemporal decision making.

One important feature of labour market institutions in modern welfare states is to provide cash transfers as income replacement in case of unemployment. In this respect, unemployment benefits represent a (partial) insurance of households against a potential loss of labour income and therefore might reduce expected income uncertainty. Recent work based on survey data indeed suggests that benefits have a positive impact on perceived job satisfaction and perceived income certainty of employees (Lollivier and Rioux [2006] and Clark and Postel-Vinay [2009]). Income uncertainty in turn determines the magnitude of capital accumulation for precautionary reasons. According to the precautionary savings' literature, an increase in uncertainty concerning labour income is expected to influence intertemporal decision making and increase saving (and decrease consumption, respectively). A necessary condition to save for precautionary reasons is a positive third derivative ($u''' > 0$) of the household's period utility function (see Leland [1968], Sandmo [1970], Kimball [1990]). Under this condition, a higher expected variance of future income leads a prudent household to accumulate a 'buffer stock' with intent to insure against income risk and to smooth consumption (Carroll [1997]). Empirical analyses generally support the existence of a precautionary saving motive. The estimates of the extent of a household's buffer stock (i.e. the share of assets which

have been accumulated for precautionary reasons) range from about 50% (Carroll and Samwick [1998]) to more modest levels between 2% (Guiso et al. [1992]) and 20% (Lusardi [1997]). To the best of my knowledge, the only study which examines the impact of unemployment insurance on wealth accumulation is that of Engen and Gruber [2001]. The authors use household panel data from the Survey of Income and Program Participation and show that a 50% reduction of the replacement rate results in 14% higher asset holdings. Their results may be read as evidence that social insurance is a (at least imperfect) substitute for private insurance in the form of a buffer stock. In sum, theoretical considerations and existing empirical analyses suggest that unemployment benefits reduce income uncertainty and therefore lower the incentive to save for precautionary reasons. Therefore, the first hypothesis to be tested is that the income replacement rate has a negative impact on households' saving intentions.

There may be a second, more indirect effect of unemployment insurance on the incentive to accumulate buffer-stock wealth: unemployment benefits may mitigate the responsiveness of saving to increased probability of job loss. For example, let us assume that the probability of job loss rises. As argued above, the extent of unemployment benefits determines the possible income loss if the job loss actually occurs. Therefore, a household's reaction concerning its precautionary saving is ceteris paribus supposed to be the smaller, the higher the income replacement rate in case of unemployment is. In this chapter, I follow Malley and Moutos [1996] who use the aggregate unemployment rate as a proxy for the probability of job loss.[1] So, I further hypothesise that the income replacement rate reduces the reaction in saving intentions to a given change in unemployment. In this sense, unemployment insurance may contribute to smooth saving behaviour and stabilise expectations with respect to macroeconomic shocks like a rise in the unemployment rate (see e.g.

[1] Malley and Moutos [1996] analyse the impact of aggregate income uncertainty on US quarterly car sales. They find that the consumption of motor vehicles significantly decreases with the unemployment rate.

Ochel [2005] or Dolls et al. [2009] for a simulation study)[2].

The study is based on subjective measures of saving intentions to capture the genuine response of the households' saving behaviour to changes in unemployment insurance as well as to the interaction of benefits and the unemployment rate. Using saving intentions seems to be a well suited alternative to the use of aggregate saving rates from the national accounts system. The latter is defined as a 'residual', calculated as the difference of disposable income and aggregate consumption. This variable therefore maps both intended saving and unintended saving, which simply consists of funds not spent at the end of the year. Following Katona's concept of the 'willingness to buy', which "depends primarily on attitudes and expectations about personal finances and the economy as a whole" (Katona [1960, 22]), this chapter focuses on the 'willingness to save' and the way it is influenced by unemployment insurance. Although intended saving and actual aggregate saving are not totally congruent, there is evidence in the literature that subjective expectations and intentions are highly relevant to actual behaviour. Consumer sentiment, for example, is not only found to be highly correlated with aggregate consumption growth but also to be able to explain it beyond other economic indicators like disposable income, indicating that it may contain additional information (Ludvigson [2004], Carroll [1997], Acemoglu and Scott [1994] and Souleless [2004] using microdata).

Instead of using the overall index of consumer sentiment, which is composed of the balance of answers to five questions concerning both the current economic conditions and future prospects, Kwan and Kotsomitis [2004] only use those questions expressing consumers' expectations. Their results suggest that private households' subjective assessments of their future income situation do matter for consumption growth in the US. Furthermore, they find that expectations are incrementally more informative about household spending than the overall index. Roos [2008] also

[2]This is especially the case if the households act under liquidity constraints.

uses only two questions out of the consumer confidence data of the European Commission related to the consumption expectations over the next 12 months instead of the summary index of consumer confidence.[3] He finds that aggregate information on households' consumption expenditure has predictive power for the actual change in consumption. For my study on saving behaviour, the composite consumer confidence index of the European Commission is not an adequate measure as well. Besides saving intentions, it includes additional items on expected economy-wide unemployment and on expectations on the economic situation both of the individual household as well as the economy as a whole. These items are not of central interest here and may rather overlay the effects on saving behaviour.

The predictive power of saving intentions for actual saving crucially depends on the successful implementation of intentions via "careful planning and efforts of self-control" (Rabinovich and Webley [2007, 444]). Using the Dutch DNB Household Survey and additional survey data from Belarus, Rabinovich and Webley [2007] show that about 94% (68%) of the respondents in the Netherlands (Belarus) who planned to save actually implemented their plans. So the 'willingness to save' materialised in the majority of the cases.

Reactions of households' saving intentions on reforms of unemployment insurance may additionally indicate whether the intended effects on labour market performance are anticipated by consumers. Consumer pessimism during reforms may influence the adjustment path to a new equilibrium and cause J-curve effects. In that case, addressees of labour market deregulation do not anticipate any positive long-run effects to income and unemployment, but are sceptical about the results of the reform. Additionally, temporary burdens may induce pessimism and resistance to the reform. Optimism on the other hand may support the aim of the reform (Bertola et al. [1995, 381ff] and Heinemann et al. [2008, 131f]).

[3] He uses questions 8 and 9 on the attitude to major purchases at the present and expected purchases in the next 12 months respectively. Both questions are part of the European Commission's survey, but are not included in the summary consumer confidence indicator (Roos [2008, 393f]).

The work of Heinemann et al. [2008] represents the study most closely related to the analysis in this chapter. Among other things, the authors are interested in estimating the impact of labour market deregulation on consumer confidence. They use a composite consumer confidence index as dependent variable, and a single dummy variable indicator as a proxy for labour market reforms which is not specified in detail. Including 20 OECD countries in their panel, they find no significant effect of labour market deregulation on consumer confidence.[4] This chapter differs from Heinemann et al. [2008] in two aspects. As argued above, I will use saving intentions as the dependent variable to capture the households' saving behaviour instead of using a composite indicator for consumer confidence. Moreover, instead of using a single indicator variable for labour market deregulation, I concentrate on unemployment benefits. This approach allows clearer theoretical predictions and interpretation of results in contrast to summary indicators. In such an analysis, various effects may interfere with each other which in addition have not yet been identified from a theoretical point of view. Secondly, they estimate a simple fixed-effect instrumental variable model without including any interaction effects. I will present a more thorough analysis by applying a variety of econometric methods and robustness checks. Additionally, to test the indirect effect of unemployment benefits on incentives to save, the interaction effect of the unemployment rate and benefits will be included in some specifications.

The remainder of this chapter is organised as follows. The next section describes the dataset and covers methodological issues. Results are presented in section 4.3, followed by some robustness checks. Section 4.5 concludes with a summary of the findings and suggestions for future research.

[4] In some specifications the authors use the saving rate as dependent variable. Here they do find a significantly positive effect of labour market deregulation on the saving rate.

4.2 Data and methodology

To study the two main hypotheses of this chapter – namely unemployment benefits (1) have a direct negative effect on saving intentions and (2) reduce the reaction in saving intentions to a given change in unemployment – I use panel data of 11 European countries, covering the years 1985-2005.[5] Combining observations for several countries in a panel framework not only introduces more variation since especially unemployment benefits show little variation over time in some countries, but may also give more accurate estimators (see e.g. Verbeek [2004, 343]).

Detailed data on consumer confidence is provided by the EU Commission's consumer survey program. Besides the composite index on consumer confidence itself, the dataset provides information on all single questions from which the summary index is calculated.[6] The monthly surveys are conducted by national agencies, either commercial or official ones, starting in January 1985 for the early EU member states. For this study, I aggregated the seasonally adjusted monthly series to a yearly average to obtain the same time span as for the benefit data. Comparability among the member states is ensured by harmonised methods of data collection, especially concerning the design of the questionnaire, sampling methods and the number of respondents (see appendix C.1 for additional information). Survey responses on attitudes and expectations are provided as aggregate balances of positive and negative answers, so that they range between +100 and -100. Because this study focuses on saving behaviour, I use the information on saving intentions. The question in the survey reads as follows:

Over the next 12 months, how likely is it that you save any money?

[5]The countries included are: Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, United Kindom; other countries are not included due to data deficiencies.

[6]Furthermore, it allows a differentiated analysis by socio-economic groups, e.g. by income groups. This feature will be used in section 4 by re-estimating the basic specifications for different income quartiles.

Answers are given on a four point scale ('very likely' / 'not likely at all').[7] The reader should bear in mind that this question differs from the one used in Rabinovich and Webley [2007] and might cover both the willingness and the expected ability to save. For example, one could imagine that a household really *wants* to save but expects not to have the means to do so and hence responds a small likelihood to save. This question therefore is assumed to catch the expected saving behaviour of the household even better than just asking whether the household plans to save. Descriptive statistics of the saving intentions are given in the appendix.

Information on unemployment insurance is provided by the CEP-OECD dataset [Nickell, 2006]. The OECD reports replacement rate aggregates, which represent the average gross replacement rate over two income levels and three family situations.[8] Following Nickell et al. [2005], I use the aggregate replacement rate during the first year of unemployment instead of the OECD summary measure representing the average replacement rate during five years after the job loss. The generosity of the unemployment insurance in the first year of unemployment is supposed to be more relevant to the households' saving behaviour than the summary measure, because it (1) covers income replacement in the period immediately following a potential job loss and (2) the median unemployment duration in the sample over the years 1992-2005 amounts to 10.12 months[9]. In section 4.4, I will test the sensitivity of the results by using the average replacement rate over three unemployment durations. An aspect of unemployment insurance, which is not explicitly included in the OECD indicator, is eligibility. This term refers to the norms that determine the access to the benefits, especially the minimum contribution period

[7]Interpersonal comparability of this question therefore is limited because different respondents may understand the question itself as well as the categories differently (see e.g. Dominitz and Manski [2004]). However, by using aggregate data and avoiding direct interpersonal comparisons, this aspect of the questioning is not seen as a major problem in this study.

[8]Data on replacement rates are available only for odd years. Data for even years were linearly interpolated following Di Tella and MacCulloch [2004] and Nickell et al. [2005].

[9]The (exact) median was calculated based on grouped data from the OECD annual Labour Force Survey (age 15-64). Unfortunately, data on unemployment duration before 1992 are not available.

to qualify for benefits in case of unemployment. By considering only the level of benefits, the extent of income insurance in case of unemployment may therefore be overestimated. However, neglecting eligibility does not severely bias estimates, if only the countries differ in their eligibility criteria without pronounced variation over time. In this case, unobserved heterogeneity is captured by fixed country effects in the panel estimation. According to some data available in the MISSOC database of the European Commission, the range of qualifying periods differs between six (e.g. France) and twelve months (e.g. Germany and Italy) of employment within a period of one to three years before unemployment.[10] Over the period 2004 to 2008 covered by the MISSOC database there are no major changes. Another source of information on institutional changes is offered by the 'Social Reforms Database' from the Fondazione Rodolfo DeBenedetti.[11] Between 1986 and 2005 there are only marginal changes in the qualifying period in Portugal (1988) and Spain (1995). Although the OECD index displays mainly the monetary generosity of benefits, disregarding eligibility criteria is therefore not considered a serious problem in the context of this study.

Despite these drawbacks of the indicator on unemployment benefits and the ongoing debate over the usefulness and precision of the OECD indicators in general (see e.g. Eichhorst et al. [2008]), these indicators are widely used in the literature and are the best available indicators at the moment for the purpose of doing international comparative research (Allard [2005] and Ochel [2006]). Data on other variables are taken from SourceOECD databases. Sources and descriptive statistics are given in the appendix.

[10]The Mutual Information System on Social Protection (MISSOC) of the European Union provides basic information about most of the social protection areas in each country, as well as about the financing of social protection, with highly structured and comparative information in over 300 information categories, grouped in 12 tables. The database is available online: http://ec.europa.eu/employment_social/spsi/missoc_en.htm.

[11]Further information about the 'Social Reforms Database' under http://www.frdb.org/. Only recently, the foundation set up a (preliminary) update of the database jointly with the IZA, covering the years 1980 onwards.

Methodology

In order to identify common patterns in the relationship between saving intentions and unemployment insurance across all countries in the sample, I will resort to panel estimation techniques. Basically, the following reduced form models are estimated:

$$\begin{aligned} SI_{i,t} &= \alpha + \beta_1 UB_{i,t} + \beta_2 UR_{i,t} + \beta_3 (UB * UR)_{i,t} + \\ &\quad + \gamma_1 INT_{i,t} + \gamma_2 WGDP_{i,t} + u_i + \lambda_t + \epsilon_{i,t} \end{aligned} \tag{4.1}$$

and

$$\begin{aligned} SI_{i,t} &= \alpha + \delta SI_{i,t-1} + \beta_1 UB_{i,t} + \beta_2 UR_{i,t} + \beta_3 (UB * UR)_{i,t} + \\ &\quad + \gamma_1 INT_{i,t} + \gamma_2 WGDP_{i,t} + u_i + \lambda_t + \epsilon_{i,t} \end{aligned} \tag{4.2}$$

where SI is the survey indicator for saving intentions, UB represents the unemployment benefits measured by the OECD replacement rate and UR the unemployment rate as a proxy for the threat of a job loss. Additionally, short term real interest rates (INT) and the growth rate of real GDP per capita (WGDP) enter the equation as controls. The estimation is therefore based on a core set of explanatory variables that are suggested by theory to have an influence on saving intentions. According to standard models, current saving may be influenced not only by current income but also by the one expected in the future. The future expected income is mainly determined by (1) the probability of job loss, (2) the replacement rate concerning labour income and (3) interest rates concerning the income from assets.[12] Fixed country effects which are generally allowed to be correlated with the regressors are included to account for unobserved time invariant heterogeneity. Common time effects capture shocks to saving intentions which affect all countries in the sample in

[12]In general there are two possibilities to include those variables in equations (4.1) and (4.2). A rational expectation's view would suggest using a one (or more) period lead of those controls. A more conservative approach is followed in this study by using the current value of the controls. This approach assumes that the respondents extrapolate the numbers at the date of the interview into the near future.

a certain year. Moreover, there are a couple of other econometric issues that need to be handled by the estimation approach.

Firstly, the idiosyncratic error term has to be tested for the standard assumptions of no serial correlation and groupwise homoscedasticity. Although the fixed year effects included in the equations may already capture a large part of possible cross-sectional or spatial correlation of the disturbances, I additionally apply the formal Breusch-Pagan test for cross-sectional independence suggested by Greene [2000, 601]. If cross-sectional dependence is detected, one has to apply robust estimation techniques in order to obtain consistent estimates of the standard errors of the estimated parameters. The test statistics in table 4.8 in the appendix suggest that the basic specifications suffer from all three problems. In the basic fixed effects OLS estimations, I therefore apply the nonparametric covariance matrix estimator proposed by Driscoll and Kraay [1998] which produces standard errors that are robust to violations of the standard assumptions of homoscedasticity, spatial independence and no serial correlation of the disturbances.

Secondly, since the current growth rate of real GDP per capita may be endogenous with regard to saving intentions, it is instrumented in some specifications by the level and growth rate of unit labour cost, an election dummy, the fertility rate and the participation rate. Those instruments are mainly used in pursuance of Heinemann et al. [2008, 123ff].

Finally, to account for potential inertia in saving intentions due to lagged effects from the regressors on expected saving or simply habit persistence, I additionally estimate a dynamic panel data model (equation (4.2)). Following Loayza et al. [2000, 169], such a dynamic specification allows me both to distinguish between short and long run effects and to maintain the annual information of the data without having to utilise three- or five-year (moving) averages. However, one crucial issue arising in estimating dynamic panel data models with small N – a common feature of macro panels – is that the estimated coefficients are biased because the lagged dependent variable is correlated with the error term u_i (Nickell [1981]). Nickell

[1981] and KIVIET [1995] derive an expression for this bias and Kiviet develops a bias-corrected Least Square Dummy Variable estimator (LSDVC). Although the bias declines with the time dimension T of the panel and the fixed effects estimators of the coefficients in equation (4.2) are consistent if T tends to infinity (see e.g. BALTAGI [2005, 135]), the LSDVC estimator is applied to the sample and may be regarded as a robustness check. The basic idea of this estimator is to correct the standard Least Square Dummy Variable estimator by an approximation of the bias. Bias approximations are initialised by three possible consistent estimators (Anderson-Hsiao, Arellano-Bond and Blundell-Bond estimators). JUDSON AND OWEN [1999] and KIVIET [1995] show that this estimator often outperforms GMM estimators like Arellano/Bond or Blundell/Bond when N is small or only moderately large. Here I use the LSDVC estimation technique developed by BRUNO [2004].[13] The issue of potential unit roots in the panel and alternative estimation approaches are discussed in section 4.4.

4.3 Results

Results for the static model according to equation (4.1) are given in table 4.1. The first three specifications refer to standard two-way error component models including both fixed country and fixed year effects. Joint significance test statistics show that the year effects do have significant explanatory power and are therefore better included in the estimations. The results are obtained by ordinary least squares estimation with Driscoll-Kraay standard errors. The last specification gives the results for an instrumental variable (IV) estimation using the instruments suggested by HEINEMANN ET AL. [2008] and with standard errors robust to autocorrelation and heteroscedasticity in the disturbances. However, the coefficients do not change

[13] A direct application of the GMM estimator does not fit well to the panel dimensions of the sample. The estimator is best applied to the 'small T, large N' case, because the number of instruments sharply increase with T. As a result, the estimated coefficients converge to those obtained by fixed-effects OLS and cluster-robust standard errors as well as specification tests may be not reliable (see ROODMAN [2008, 14] and BALTAGI [2005, 153]).

substantially between the IV-estimation and the fixed-effects model with the full set of control variables (specification (3)). The Hansen J-statistic does not allow me to reject the null of exogeneity of the instruments, but the underidentification-test (Kleibergen-Paap LM statistic) indicates a weak instruments problem. The results of the IV-specification are therefore to be treated with caution.

Table 4.1: Panel estimation for saving intentions: static model

		FE-OLS		IV-OLS[a]
Variable	(1)	(2)	(3)	(4)
Unemployment benefits (UB)	-0.586***	-0.413***	-0.851***	-0.851***
	(0.082)	(0.083)	(0.225)	(0.245)
Unemployment rate (UR)		-1.879***	-3.988***	-3.987***
		(0.393)	(1.248)	(1.131)
UB*UR			0.047*	0.046**
			(0.021)	(0.023)
Real GDP per capita		120.379**	124.176**	118.151
(growth rate)		(42.506)	(41.354)	(112.002)
Short term real interest rate		-0.018	-0.133	-0.130
		(0.327)	(0.233)	(0.311)
Constant	6.262	13.523**	33.728**	
	(3.863)	(4.980)	(12.144)	
No. of observations	229	229	229	229
No. of countries	11	11	11	11
R^2 [b]	0.496	0.624	0.649	0.649
F-test fixed year effects	537.38	1693.93	782.22	141.71
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)

Remarks:
*,**,*** indicate significance at 10, 5 and 1 per cent respectively. All fixed-effects OLS estimations with Driscoll/Kraay std.errors robust to heteroscedasticity, autocorrelation and cross-sectional correlation. FE-IV estimation with heteroscedasticity and autocorrelation consistent standard errors. Robust std. errors in parentheses.
[a] Kleibergen-Paap test statistic (underid. test) is 5.585 (p-value: 0.232). Hansen J-statistic (overid. test) is 4.060 (p-value: 0.255). Instruments used: unit labour cost (level/growth rate), election dummy, participation rate.
[b] R^2 in fixed-effects OLS estimations refers to R^2 (within) while R^2 in FE-IV estimation refers to centered R^2.

According to the results in the first column in table 4.1, the unemployment benefits significantly influence the households' saving intentions. Raising the replacement rate by ten percentage points ceteris paribus results in a 5.86 points drop in saving intentions. When additional explanatory variables are added (column 2), this effect is still highly significant but somewhat smaller. The coefficients on GDP growth and the real interest rate are generally in line with findings in the literature on the determinants of saving rates (see e.g. Callen and Thimann [1997], Loayza et al. [2000] or Schrooten and Stephan [2004]). The growth rate of the real GDP per capita has a positive sign: the higher the income growth, the higher the saving. The short term real interest rate, however, does not significantly affect expected saving. The estimated coefficient of the unemployment rate deserves some more explanation. Following the precautionary savings argument, a positive sign would has been expected, since a higher risk of unemployment and therefore labour income in the future is supposed to increase current saving. I find, however, a significantly negative effect of the unemployment rate on saving intentions. An explanation for this result may be found in the wording of the question in the consumer survey on saving intentions. The respondents are asked to indicate the likelihood of saving in the next 12 months following the date of the survey. As mentioned above, the question therefore may capture both the willingness and the expected ability to save. The expected ability to save, in turn, is likely to crucially depend on the expected employment status during the period in question. So, although a household that faces a high risk of unemployment may be willing to save for precautionary reasons, it may nevertheless indicate a small likelihood of actually being able to save, because in the case of unemployment it expects not to have enough money left after having paid for basic necessities. This effect may be labelled as an 'expected income effect' due to the risk of unemployment. In a simple two-period model given in appendix C.3, it is indeed possible to show that under certain assumptions concerning the expectation formation of the respondent the current unemployment rate at the time of the survey negatively influences expected saving. The negative sign here

may therefore indicate that the negative 'expected income effect' due to a higher unemployment rate overcompensates the precautionary effect of a higher risk of unemployment. Following this line of argument, the positive sign of the interaction term in column (3) suggests an expectation smoothing effect of the unemployment benefits. The higher the benefits at a given unemployment rate, the less threatening is the negative expected income effect due to unemployment and the smaller is the reduction in the propensity to save. For a hypothesised country with the average unemployment rate of the sample, an increase of the first-year benefits by 10% significantly reduces saving intentions by 4.48 points.

By comparison of the different estimates in table 4.1, it becomes clear that there is a direct negative effect of unemployment benefits on saving intentions as well as a more indirect channel that affects saving intentions through the moderation of the expected income effect. Whereas the estimates in specifications (1) and (2) comprise both effects, the estimated coefficients of the unemployment benefits in columns (3) and (4) only refer to the direct effect. According to the latter, an increase of the replacement rate leads the households to indicate smaller intended saving for precautionary reasons (-0.851 points for each percentage point of income replacement). On the other hand, the expected drop of income in case of unemployment becomes smaller, making the households more confident that they may be able to accumulate any assets at a given current rate of unemployment. With regard to an average standard deviation of the saving intentions within countries of 10.73 points, the impact of the replacement rate on saving intentions does not seem to be substantial. This result, however, is not surprising, given the existing evidence in the literature. Saving for precautionary reasons is one out of many motives for saving and, as mentioned in the introduction, some authors give not much importance to precautionary savings in relation to the total assets of a household. But the negative impact of unemployment benefits on saving intentions in this sample of European countries supports the result of Engen and Gruber [2001], who also find an imperfect substitution effect of unemployment insurance and private savings

in the US. Moreover, this finding is consistent with more recent contributions indicating that unemployment insurance positively affects the perceived income security (Lollivier and Rioux [2006] and Clark and Postel-Vinay [2009]). The higher the replacement rate, the lower is the income uncertainty and the smaller is therefore the motive for building up a buffer stock for precautionary reasons.

The specifications based on the dynamic panel model outlined in equation (4.2) basically support the findings of the static model. Table 4.2 reports the results for the dynamic model. Besides the fixed-effects OLS (spec. (1)-(3)) and the IV estimates (spec. (4)), coefficients estimated by LSDVC are given in column (5). According to the diagnostic statistics of the IV model, there are no problems concerning the relevance and exogeneity of the instruments.[14]

Taking a closer look at the estimated coefficients, the saving intentions show a high degree of persistence, i.e. saving intentions in the past have a significant and positive impact on the current saving intentions. Estimates of the coefficients on the lagged saving intentions range between 0.752 and 0.830. This finding is basically in line with the results of e.g. Loayza et al. [2000, 176] who also find a high degree of persistence (0.674) of the private saving rates in the OECD countries. With regard to EU 15 countries, Schrooten and Stephan [2004, 16] report coefficients between 0.55 and 0.62. In contrast to the static estimations in table 4.1, the short term real interest rate has a (weakly) significant and positive influence on the saving intentions. Additionally, the dynamic model allows me to distinguish between short-run and long-run effects of the regressors. Evaluated at a constant average unemployment rate, the full specifications (3)-(5) suggest a short-run effect of the first-year unemployment benefits on saving intentions between -0.137 (spec. (3)) and -0.082 (spec. (5)). Due to the persistence in the saving intentions, the long-run effects are higher in absolute terms and range between -0.522 (spec. (3)) and -0.463 (spec. (5)).

[14]However, based on the endogeneity test, I cannot reject the null hypothesis that the real growth rate of GDP per capita may actually be treated as exogenous.

Table 4.2: Panel estimation for saving intentions: dynamic model

		FE-OLS		FE-IV[a]	LSDVC[b]
Variables	(1)	(2)	(3)	(4)	(5)
Saving intention (lagged)	0.830***	0.782***	0.752***	0.752***	0.824***
	(0.040)	(0.034)	(0.033)	(0.048)	(0.056)
Unemployment benefits (UB)	-0.118**	-0.098*	-0.324***	-0.325***	-0.277**
	(0.043)	(0.044)	(0.095)	(0.097)	(0.110)
Unemployment rate (UR)		-0.468*	-1.533**	-1.536***	-1.332***
		(0.220)	(0.515)	(0.426)	(0.506)
UB*UR			0.022**	0.023***	0.023***
			(0.008)	(0.008)	(0.008)
Real GDP per capita		91.942***	95.101***	96.993**	94.655***
(growth rate)		(15.323)	(55.408)	(40.739)	(20.754)
Short term real interest rate		0.482**	0.385**	0.384*	0.426*
		(0.163)	(0.161)	(0.228)	(0.254)
Constant	6.047**	1.839	13.100**		
	(2.225)	(2.208)	(5.263)		
No. of observations	218	218	218	218	218
No. of countries	11	11	11	11	11
R^2 [c]	0.822	0.846	0.852	0.852	-
F-test fixed year effects	218.47	649.65	1213.54	46.89	23.68 (χ^2)
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.209)

Remarks:
*,**,*** indicate significance at 10, 5 and 1 per cent respectively. Fixed year effects included. All fixed-effects OLS estimations with Driscoll/Kraay std.errors robust to heteroscedasticity, autocorrelation and cross-sectional correlation. FE-IV estimation with heteroscedasticity and autocorrelation consistent standard errors. Robust std. errors in parentheses.

[a] Kleibergen-Paap test statistic (underid. test) is 10.207 (p-value: 0.069). Hansen J-statistic (overid. test)is 7.716 (p-value: 0.103). Endogeneity test (p-value): 0.052 (0.8201). Instruments used: unit labour cost (level/growth rate), election dummy, fertility rate, participation rate.

[b] LSDVC-Estimator; Arellano-Bond used as consistent estimator to initialise bias correction; bootstrapped std. errors.

[c] R^2 in fixed-effects OLS estimations refers to R^2 (within) while R^2 in FE-IV estimation refers to centered R^2.

In sum, the results suggest that unemployment benefits have two countervailing effects on the saving behaviour of households. As hypothesised above, an increase of the replacement rate on the one hand alleviates the income consequences of a potential job loss and lowers the future income uncertainty and hence the precautionary motive for saving. On the other hand, there is a positive expectation smoothing effect making households more confident to be able to realise their saving plans at a given unemployment rate. The joint effect is found to be negative, indicating that unemployment benefits reduce saving intentions. The following section provides some sensitivity checks of the findings.

4.4 Robustness checks

I conduct four kinds of sensitivity checks to assess the robustness of the basic results. Firstly, first-year benefits have been used in the previous section as a measure for benefit generosity, arguing that the benefits in the first twelve months of unemployment are possibly more important to the households' saving behaviour than the average benefit generosity during the five years following a potential job loss. I re-estimate the models using the average gross replacement over three periods of unemployment including the benefits during the second/third and the fourth/fifth year of unemployment. Secondly, there are plausible reasons to suspect differing reactions of saving behaviour to changes in benefits in different income groups. The dataset of the European Commission allows me to check this possibility by estimating models for each income quartile. Thirdly, the cross-sectional stability of the results is assessed to see if the results critically depend on the inclusion of certain countries. Finally, I check the stability of the long-run relationship by estimating an error-correction model based on equation (4.2) using the 'pooled mean group estimator' developed by Pesaran et al. [1999]. This estimator explicitly allows the use of nonstationary I(1) regressors and imposes less strict assumptions concerning

the homogeneity of coefficients across countries.[15]

Average benefits

As a first sensitivity check, I use the OECD average gross replacement rate over three periods of unemployment as an alternative measure for benefit generosity, covering the first twelve months, the second/third year as well as the fourth/fifth year of unemployment. In section 4.2 it has been argued that the benefit generosity during the first year of unemployment is likely to have a larger influence on the households' saving behaviour than the summary measure of benefits, because (1) it represents the income replacement immediately after a potential job loss and (2) the expected duration of unemployment may not exceed one year because the median of unemployment duration in a large part of the sample amounts to 10.12 months. To check this, I re-estimate the basic specifications using the summary measure as a proxy for unemployment generosity. Table 4.3 reports the coefficients of the unemployment benefits as well as the interaction term for the full specifications including all controls from tables 4.1 and 4.2.

Although still significant in some specifications, the estimated coefficients suggest a smaller reaction of saving intentions to changes of the average replacement rate both concerning the direct effect and the joint direct and indirect effect. According to the dynamic specification in column (3), an increase of the average benefits by ten percentage points reduces the saving intentions by 0.59 points in the short run and about 3.93 in the long run. Compared to the estimates using the first-year benefits only, the results here indicate that the average benefit generosity has a smaller and in some specifications even insignificant impact on the saving intentions

[15] Additionally, tables 4.9 and 4.10 in the appendix show that the results are robust to the inclusion of employment protection legislation (EPL) and expenditures on active labour market policies (ALMP) as two other important labour market institutions. However, the channels through which those (and perhaps other) labour market institutions affect the saving behaviour are not clear from a theoretical point of view. Before seriously going about empirical analyses on the influence of those institutions and possible interactions between them, more theoretical work needs to be done to clarify the relevant effects and to set up hypotheses substantiated by theory.

Table 4.3: Robustness checks: average unemployment benefits

	Static model		Dynamic model		
	FE-OLS	IV-OLS[a]	FE-OLS	IV-OLS[b]	LSDVC[c]
UB	-0.409*	-0.464	-0.210**	-0.203*	-0.171
	(0.219)	(0.381)	(0.091)	(0.104)	(0.107)
UB*UR	-0.011	-0.015	0.018**	0.018*	0.017
	(0.027)	(0.032)	(0.007)	(0.009)	(0.014)
No. of observations	251	251	240	240	240
No. of countries	11	11	11	11	11

Remarks:
*,**,*** indicate significance at 10, 5 and 1 per cent respectively. Fixed country effects and common year effects included. Controls (not reported in the table): Growth rate of real GDP per capita, short term real interest rate, unemployment rate. All fixed-effects OLS estimations with Driscoll/Kraay std.errors robust to heteroscedasticity, autocorrelation and cross-sectional correlation. FE-IV estimation with heteroscedasticity and autocorrelation consistent standard errors. Robust std. errors in parentheses.
[a]Instruments used: unit labour costs (level/growth rate), election dummy, participation rate; Kleibergen-Paap statistic (underid. test): 8.515 (p-value: 0.0744), Hansen J-statistic (overid. test): 5.134 (p-value: 0.1622), Endogeneity test: χ^2: 0.014 (p-value: 0.907).
[b]Instruments used: unit labour costs (level/growth rate), election dummy, fertility rate, participation rate; Kleibergen-Paap statistic (underid. test): 7.851 (p-value: 0.165), Hansen J-statistic (overid. test): 3.871 (p-value: 0.4237), Endogeneity test: χ^2: 0.407 (p-value: 0.523).
[c] LSDVC-Estimator; Arellano-Bond used as consistent estimator to initialise bias correction; bootstrapped std. errors.

of households. This may be interpreted as evidence that the benefit generosity in the initial period of unemployment alone indeed has a larger influence on the saving behaviour of the households than the average replacement rate. Further disentangling the various effects of changes in the benefit profile on (aggregate) saving behaviour of the households is beyond the scope of this chapter and may be an interesting topic for further research.

Estimation by income quartiles

The analysis of the impact of unemployment insurance on aggregate saving intentions above implicitly assumes that reactions on saving behaviour are similar for different parts of the income distribution as well as other socio-economic variables. Although it is not possible to control these factors directly due to the lack of individual data, the EU Consumer Survey provides aggregate responses by income quartiles. It is hypothesised that the reaction of the saving behaviour to a given change in benefit generosity in the first income quartile is insignificant for two reasons. Firstly, households with low income may simply not have the financial scope to increase saving in case of a reduction of unemployment insurance and therefore to (partly) substitute public insurance by a private buffer stock. This may especially be the case for those who are already unemployed. Secondly, income is supposed to be closely related to wealth. Hubbard et al. [1995] suggest that households at the bottom of the wealth distribution may not have an incentive to save because they are most likely to depend on means-tested social insurance. Table 4.4 reports the estimates by income groups. The households in the first income quartile indeed show a smaller response of the saving intentions on unemployment benefits than those in the other parts of the income distribution. Moreover, the coefficients are not significantly different from zero. With regard to the dynamic specifications, the highest short-run direct impact of unemployment insurance on the saving behaviour can be observed in the second and third quartile. Using the LSDVC estimator,

Table 4.4: Estimation by income quartiles

Income quartile		Static model FE-OLS	Static model IV-OLS	Dynamic model FE-OLS	Dynamic model IV-OLS	Dynamic model LSDVC[a]
1^{st}	UB	-0.225	-0.235	-0.247	-0.244	-0.226
		(0.372)	(0.429)	(0.226)	(0.156)	(0.191)
	UB*UR	0.016	0.018	0.029	0.029**	0.028
		(0.034)	(0.034)	(0.017)	(0.013)	(0.018)
2^{nd}	UB	-0.744**	-0.753**	-0.420*	-0.433***	-0.363*
		(0.319)	(0.295)	(0.225)	(0.136)	(0.201)
	UB*UR	0.043	0.045*	0.027	0.028***	0.023
		(0.026)	(0.024)	(0.015)	(0.010)	(0.018)
3^{rd}	UB	-1.365***	-1.370***	-0.398**	-0.401**	-0.299
		(0.285)	(0.355)	(0.174)	(0.169)	(0.221)
	UB*UR	0.077***	0.078***	0.020*	0.020	0.014
		(0.015)	(0.026)	(0.010)	(0.013)	(0.020)
4^{th}	UB	-1.567***	-1.574***	-0.380***	-0.379**	-0.273
		(0.279)	(0.511)	(0.112)	(0.168)	(0.200)
	UB*UR	0.073***	0.075**	0.019	0.019	0.014
		(0.015)	(0.038)	(0.011)	(0.014)	(0.018)

Remarks:
*,**,*** indicate significance at 10, 5 and 1 per cent respectively. Fixed country effects and common year effects included. Controls (not reported in the table): Growth rate of real GDP per capita, short term real interest rate, unemployment rate. All fixed-effects OLS estimations with Driscoll/Kraay std.errors robust to heteroscedasticity, autocorrelation and cross-sectional correlation. FE-IV estimation with heteroscedasticity and autocorrelation consistent standard errors. Robust std. errors in parentheses. Full results are given in tables 4.11 and 4.12 in the appendix.
[a] LSDVC-Estimator; Arellano-Bond used as consistent estimator to initialise bias correction; bootstrapped std. errors.

only households in the second income quartile show a significant relationship to the benefits. The interaction effects have the expected sign, but are not significantly different from zero in some specifications.[16]

Cross-sectional stability

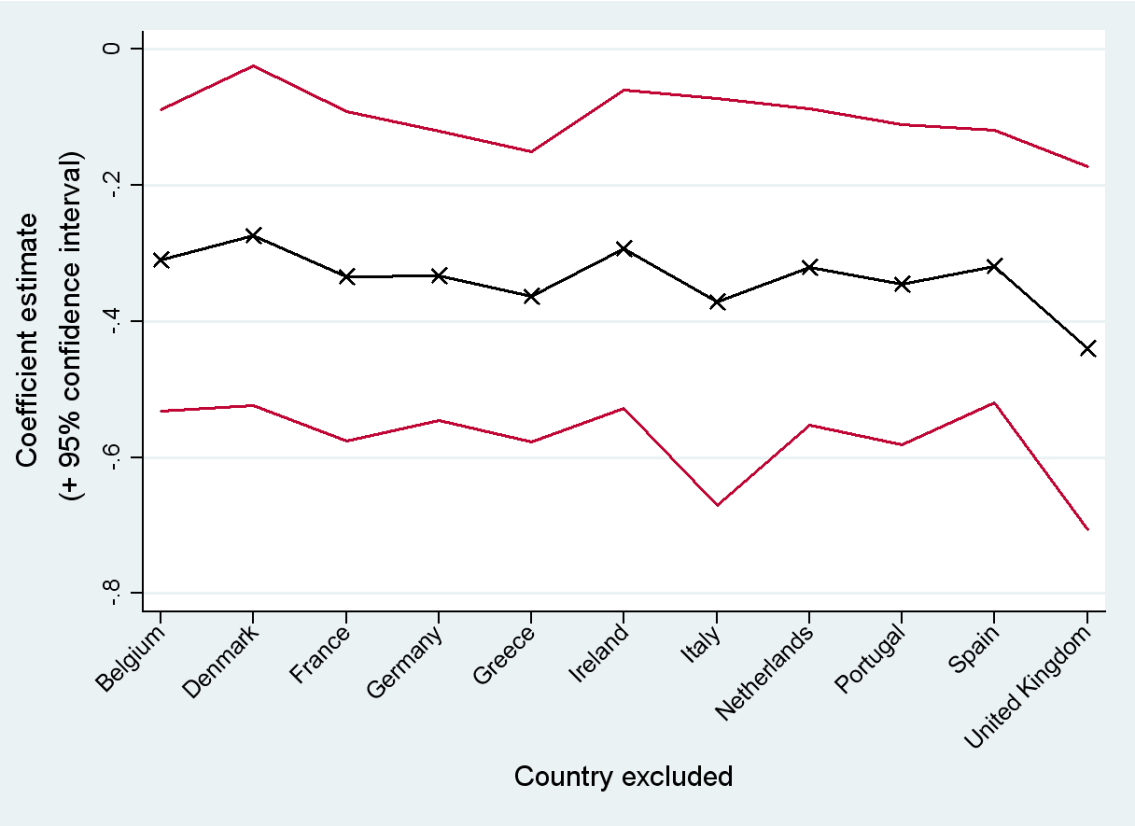
To test whether the basic results are stable to the exclusion of single countries from the sample, estimations based on subsamples are conducted by dropping one country at a time. The estimates for both the static and dynamic models are presented in table 4.13 in the appendix. To illustrate the basic results, the estimates of the dynamic FE-OLS specification may serve as an example. Figures 4.1 and 4.2 show the point estimators as well as the 95%-confidence intervals for the unemployment benefits and the interaction term, respectively.

The level of the first-year benefits are found to significantly decrease saving intentions, irrespective of the country excluded from the panel. The point estimates basically fluctuate around the corresponding values of table 4.2 (third column) including all countries. A similar pattern can be observed for the interaction effect.

The coefficient estimates are significantly positive on a 5%-level, except when Denmark is excluded (still significant on a 10%-level). Again, coefficients do not deviate severely from the regression including the full sample of countries. Holding the unemployment rate constant at an average level, the net effect of an increase of the replacement rate by 10% on saving intentions is between -2.12 and -1.12 in the short-run and between -8.99 and -4.04 in the long-run. The patterns shown in the

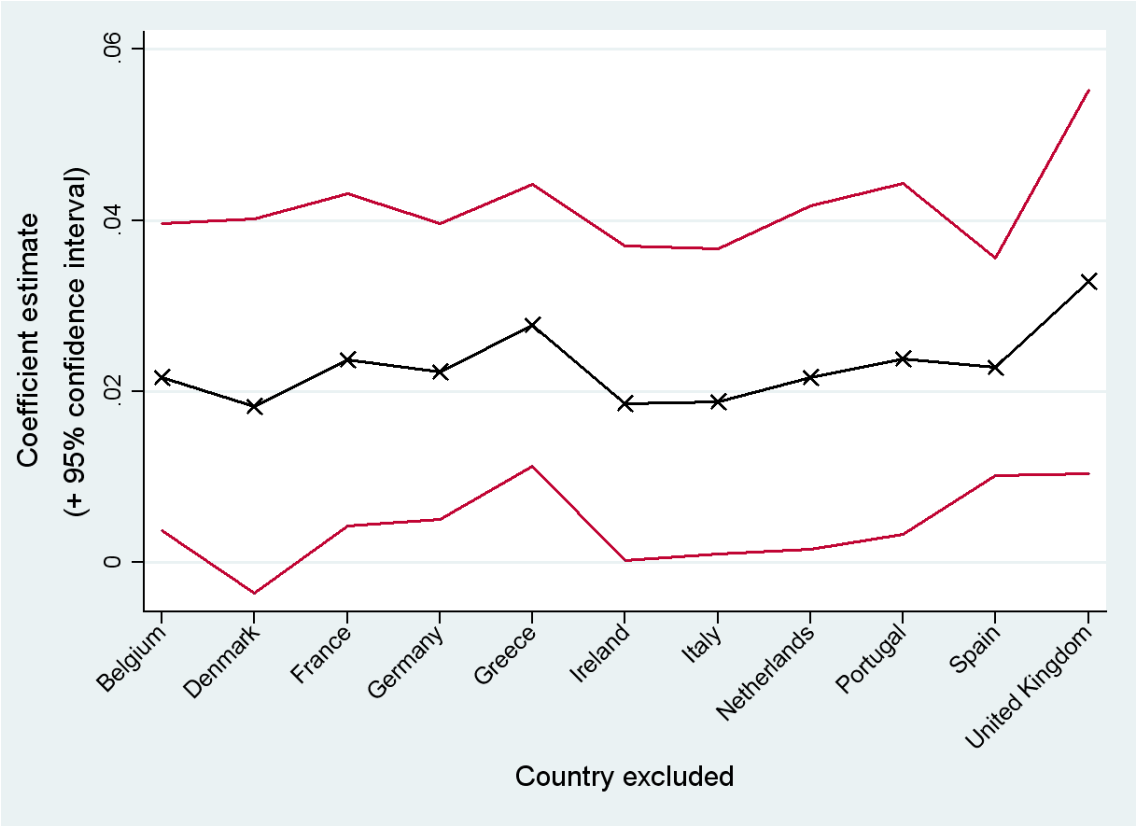
[16] Based on the results in chapter 2, one might have expected a smaller and possibly insignificant impact of benefits on saving behaviour for those at the top of the income distribution. But because of the differences in the empirical design, the results in table 4.4 and those of chapter 2 are comparable only to a limited extent. Whereas chapter 2 is based on microdata and focuses on the income uncertainty as a determinant of a household's asset holdings and the extent of the buffer stock as a share of total assets, this chapter asks for the impact of unemployment insurance on saving intentions based on macrodata. The finding that unemployment insurance affects the saving intentions of respondents in the fourth income quartile does not generally contradict the statement in chapter 2 that the share of assets held for precautionary reasons is lower at the top than at the middle of the income distribution and that income uncertainty does not represent a significant determinant of wealth for the top income group.

Figure 4.1: Cross-sectional stability: unemployment benefits



figures generally hold true for the other static and dynamic specifications. Unemployment benefits are always found to significantly decrease saving intentions, the interaction term is significant at least on a 10%-level in 7 to 11 out of all 11 regressions. Although the main result is therefore qualitatively stable to the dropping of individual countries from the sample, the point estimates exhibit some variation. This indicates that the reaction of saving behaviour to changes in unemployment insurance as well as in the other variables included in the regressions may differ across countries. To fully capture the heterogeneity of the countries, separate estimates for each country would be needed. Unfortunately, the time dimension of the panel is to short to obtain reliable estimates. As soon as there are sufficient data, identifying the full heterogeneity between the countries will surely be an important issue for future research.

Figure 4.2: Cross-sectional stability: interaction term



Pooled mean group estimation

As an intermediate alternative between a separate estimation for each country and a pooled estimation that assumes homogeneity of the short-run as well as of long-run coefficients, Pesaran et al. [1999] suggest the 'pooled mean group (PMG) estimator' for the estimation of the long-run relationships in heterogeneous panels. This technique is based on the error-correction form of dynamic panel data models and relies on less restrictive assumptions concerning the homogeneity of parameters. It includes heterogeneous intercepts, short-run coefficients and speeds of adjustment to the long-run equilibrium and assumes only homogeneity of the long-run coefficients. In addition to that, the PMG estimator explicitly allows for nonstationarity in the data as long as a long-run relationship between the dependent variable and

the regressors exists.[17] To set out the model underlying the PMG estimator more clearly, I start with the unrestricted version of the autoregressive distributed lag model (ARDL) presented in section 4.2 without fixed year effects (see e.g. Pesaran et al. [1999] or Asteriou [2009] for this proceeding).

$$\begin{aligned} SI_{i,t} &= \delta_i SI_{i,t-1} + \beta_{1i} UB_{i,t} + \beta_{2i} UR_{i,t} + \beta_{3i}(UB * UR)_{i,t} + \\ &\quad + \gamma_{1i} INT_{i,t} + \gamma_{2i} WGDP_{i,t} + \mu_i + \epsilon_{i,t} \end{aligned} \tag{4.3}$$

This can be reparameterised into the following error-correction form:

$$\begin{aligned} \Delta SI_{i,t} &= \phi_i(SI_{i,t-1} - \theta_{1i} UB_{i,t} - \theta_{2i} UR_{i,t} - \theta_{3i}(UB * UR)_{i,t} - \\ &\quad - \theta_{4i} INT_{i,t} - \theta_{5i} WGDP_{i,t}) + \mu_i + \epsilon_{i,t} \end{aligned} \tag{4.4}$$

where $\phi_i = -(1 - \delta_i)$, $\theta_{ji} = \frac{\beta_{ji}}{1-\delta_i}$ for $j = 1, 2, 3$, and $\theta_{k+3,i} = \frac{\gamma_{ki}}{1-\delta_i}$ for $k = 1, 2$. ϕ_i is the error-correction term and represents the speed of adjustment to the long-run equilibrium. Assuming that a long-run relationship between the variables exists, the parameter is expected to be significantly negative. If ϕ_i equals zero, then the existence of a long-run relationship is not supported by the data. The PMG estimator now restricts the long-run coefficients to be the same for each country, so equation 4.4 becomes

$$\begin{aligned} \Delta SI_{i,t} &= \phi_i(SI_{i,t-1} - \theta_1 UB_{i,t} - \theta_2 UR_{i,t} - \theta_3(UB * UR)_{i,t} - \\ &\quad - \theta_4 INT_{i,t} - \theta_5 WGDP_{i,t}) + \mu_i + \epsilon_{i,t} \end{aligned} \tag{4.5}$$

[17] In the appendix (tables 4.14 and 4.15), I report some panel unit root tests and Pedroni's cointegration test which are often applied in recent research (see e.g. Lee [2006] for a dataset with similar panel dimensions (N=16, T=20)). Details of the tests are outlined e.g. in Baltagi [2005, 239ff], and I take into account possible cross-sectional correlation of the data. The test statistics indicate that the variables may be treated as integrated of order one (I(1)) and that a cointegration relationship exists.

Pesaran et al. [1999] propose a maximum likelihood approach for the estimation of parameters.[18] Following Loayza and Ranciere [2005, 11], cross-country common factors are eliminated by substracting the cross-sectional means for each period from the data (demeaning) which is equivalent to the inclusion of time-specific intercepts.[19] In addition to the ARDL(1,0,0,0,0,0) without additional lags of the exogenous regressors, the following ARDL(1,1,1,1,1,1) including one lag of each regressor is estimated as a further sensitivity check.

$$\begin{aligned}\Delta SI_{i,t} = \phi_i(SI_{i,t-1} - \theta_1 UB_{i,t} - \theta_2 UR_{i,t} - \theta_3(UB*UR)_{i,t} - \\ - \theta_4 INT_{i,t} - \theta_5 WGDP_{i,t}) + \zeta_{1i}\Delta UB_{i,t} + \zeta_{2i}\Delta UR_{i,t} + \\ + \zeta_{3i}\Delta(UB*UR)_{i,t} + \zeta_{4i}\Delta INT_{i,t} + \zeta_{5i}\Delta WGDP_{i,t} + \mu_i + \epsilon_{i,t}\end{aligned} \tag{4.6}$$

Table 4.5 gives PMG estimates of the long-run coefficients for both models. As would have been expected for cointegrated I(1) variables, the error-correction term is estimated to be significantly negative. Again, the unemployment benefits are found to significantly decrease saving intentions. The direct effect of a change in unemployment benefits by ten percentage points on saving intentions is -17.16 points (-13.48 in specification (2)). Taking into account the interaction term, the net effect of such a change holding constant the unemployment rate at an average level is estimated to be -6.03 points (-3.96 in specification (2)). Thus, the basic results still hold for less strict homogeneity assumptions.[20]

[18] The PMG estimator is implemented in STATA's 'xtpmg' command, developed by Blackburn and Frank [2007].

[19] This approach is adopted since the PMG estimator does not converge when including year dummies.

[20] Table 4.16 in the appendix gives the full results of the PMG estimators with and without controlling common year effects.

Table 4.5: Pooled mean group estimation

Variable	(1)	(2)
Unemployment benefits (UB)	-1.716***	-1.348***
	(0.451)	(0.331)
Unemployment rate (UR)	-7.881***	-6.791***
	(2.278)	(1.767)
UB*UR	0.131***	0.112***
	(0.045)	(0.037)
Real GDP per capita (growth rate)	370.196***	221.369***
	(86.216)	(60.829)
Short term real interest rate	1.331	0.172
	(0.835)	(0.530)
(Average) Speed of adjustment ϕ	-0.261***	-0.363***
	(0.041)	(0.087)
No. of observations	218	218
No. of countries	11	11

Remarks:
*,**,*** indicate significance at 10, 5 and 1 per cent respectively. Std.errors in parentheses. The table gives the common long-run relationships between saving intention and the included variables. Specification (1) refers to an ARDL(1,0,0,0,0,0) model, specification (2) refers to an ARDL(1,1,1,1,1,1) model including one lag of each right-hand side variable. Common year effects and fixed country effects included.

4.5 Conclusions

The empirical evidence presented in this chapter strongly suggests that the generosity of unemployment insurance affects the households' saving behaviour. Based on survey data on saving intentions in 11 European countries, the income replacement rate in case of unemployment is found to significantly reduce the propensity to save. This finding is basically in line with the theoretical prediction from the precautionary savings literature and some related empirical evidence (Engen and Gruber [2001], Lollivier and Rioux [2006] and Clark and Postel-Vinay [2009]). Unemployment insurance is supposed to cushion an income drop in case of a job loss, and hence reduces income uncertainty and the need to save for precautionary reasons. Furthermore, unemployment benefits are likely to counterbalance a negative expected income effect from high unemployment rates, and therefore contribute to a stabilisation of expectations and in the end perhaps aggregate consumption. Although significant, the overall effect of a change in unemployment benefits by ten percentage points amounts to about one half of the average standard deviation in saving intentions. Again, this result is consistent with the literature which attaches only small to medium importance to precautionary savings as a determinant of overall savings of a household. The estimates in this study are based on aggregate panel data. The evidence presented here might therefore be regarded as suggestive evidence for the influence of unemployment insurance on saving behaviour of the individual household. The robustness checks may provide some indications for a refinement of the results and may point out directions for future research. Firstly, saving behaviour of households at the bottom of the income distribution is not significantly influenced by the replacement rate. This may be due to the lack of financial scope to save after having paid for basic necesseties or little overall incentives to accumulate assets because of means-tested social insurance. In any case, future theoretical as well as empirical work should take such constraints at lower incomes into account. Secondly, although the basic result is robust to the exclusion of individual

countries, and the long-run effect of the benefits on saving intentions can still be maintained under less strict homogeneity assumptions, the time dimension of the panel is insufficient to detect differing reactions in the countries. With adequate oberservations over time, the question of heterogeneity may be tackled in the next years. Furthermore, other labour market institutions as well as interactions between them may possibly affect a household's income uncertainty and saving behaviour. Before seriously going about empirical analyses on those topics, more theoretical work needs to be done to clarify the relevant effects and to set up hypotheses substantiated by theory.

C Appendix

C.1 Data

Table 4.6 gives the sources of the variables used in this study. Additionally, detailed definitions are reported for those variables that are not directly taken from the cited sources. Descriptive statistics can be found in table 4.7. The means of saving intentions across countries itself suggest the inclusion of fixed country effects to take into account potential unobserved heterogeneity.

Data on consumer confidence are taken from the EU Commission's Consumer Survey. Methods of collecting data are similar across the countries under consideration to ensure comparability. With the exception of Germany and Portugal where the interviews are conducted as computer assisted face-to-face interviews, the data are collected by telephone interviews. Representative samples are drawn each month, including between 1400 (IRL) and 3300 (FR) subjects. The minimum age of interviewees is between 14 and 18, and except for Denmark (74) there is no maximum age. The questionnaires are harmonised, although the national survey organisations are allowed to integrate the consumer confidence survey into a more comprehensive survey. In all countries the data are collected in the first half of each month.
Additional and more detailed information is available via the Commission's website:
http://ec.europa.eu/economy_finance/db_indicators/surveys/documents/metadata/cons_metadata_all.pdf.

Table 4.6: Sources and definitions

Series	**Data and Definitions**
Election dummy	National elections; Source: www.parties-and-elections.de (last update: Januar 2011)
Fertility rate	OECD Health Statistics/Gender, Institutions and Development Database
Growth rate of real GDP per capita	OECD Economic Outlook Database (No. 85)
Short term real interest rate	OECD Economic Outlook Database (No. 85) r $= \left(\frac{\frac{1+i}{100}}{\frac{1+\pi}{100}} - 1 \right) * 100$ with π as the CPI inflation rate; i is the 90 days nominal interest rate
Participation rate	Total labour force in % of population; Source: OECD Annual labour force statistics
Saving intention (SI)	European Commision, DG Ecofin, Consumer Survey, Question 11, Saving over next 12 month
Unemployment benefits	Gross replacement rate; OECD, Tax benefit models Data available for uneven years; data for even years are obtained by linear interpolation (see e.g. Di Tella and MacCulloch [2004]).
Unemployment rate	OECD Economic Outlook Database (No. 85)
Unit labour costs	level and annual growth rate; OECD Database: Unit labour costs - annual indicators

C.2 Tables

Table 4.7: Descriptive statistics

Variable		Mean	Std.dev.	Min	Max	Obs.
Total Sample						
Saving intention	overall	-7.660	24.366	-55.983	49	229
	between		23.886			
	within		10.725			
Saving intention	overall	-37.086	22.479	-83.408	17.617	212
(1^{st} income quartile)	between		18.932			
	within		13.097			
Saving intention	overall	-14.645	27.876	-70.467	49.442	212
(2^{nd} income quartile)	between		26.370			
	within		11.220			
Saving intention	overall	3.942	31.278	-75.033	69.650	212
(3^{rd} income quartile)	between		29.670			
	within		12.408			
Saving intention	overall	14.939	30.377	-45	77.483	212
(4^{th} income quartile)	between		25.426			
	within		17.618			
Unemployment rate	overall	8.582	3.234	2.533	19.108	229
	between		2.460			
	within		2.245			
Real short term interest rate	overall	3.460	2.633	-3.671	10.925	229
	between		0.611			
	within		2.567			
Av. unemployment benefits	overall	32.784	14.120	0.347	64.944	229
	between		13.743			
	within		5.052			
First-year benefits	overall	48.681	19.301	1.042	77	229
	between		18.196			
	within		7.873			
Real GDP per capita	overall	0.023	0.022	-0.983	0.103	229
(growth rate)	between		0.011			

Continues on next page

Table 4.7: ...continued

Variable	Mean	Std.dev.	Min	Max	Obs.
within		0.019			
By country					
Belgium					
Saving intention	8.242	11.374	-28.217	23.992	21
1^{st} quartile	-25.610	10.659	-43.117	0.517	20
2^{nd} quartile	1.398	10.471	-26.967	14.925	20
3^{rd} quartile	27.093	17.284	-14.583	50.408	20
4^{th} quartile	36.266	25.847	-11.157	68.558	20
Unemployment rate	8.428	1.241	6.442	10.117	21
Real short term interest rate	3.372	2.315	-0.597	6.778	21
Av. unemployment benefits	40.721	1.503	38.488	43.111	21
First-year benefits	47.112	1.842	44.410	50.167	21
Real GDP per capita (growth rate)	0.019	0.013	-0.013	0.044	21
Denmark					
Saving intention	15.940	15.091	-6.858	36.85	21
1^{st} quartile	-2.544	20.912	-43.883	17.617	20
2^{nd} quartile	9.412	14.968	-16.458	27.842	20
3^{rd} quartile	30.406	11.596	9.3	49.625	20
4^{th} quartile	35.912	22.374	-6.683	60.492	20
Unemployment rate	6.021	1.480	4.258	9.540	21
Real short term interest rate	3.749	2.809	0.282	9.049	21
Av. unemployment benefits	54.349	5.284	49.4	64.944	21
First-year benefits	69.900	5.095	63.057	77	21
Real GDP per capita (growth rate)	0.018	0.016	-0.004	0.052	21
France					
Saving intention	-24.408	6.439	-36.025	-11.658	21
1^{st} quartile	-52.355	7.652	-63.229	-34.842	20
2^{nd} quartile	-29.327	6.840	-43.608	-17.233	20
3^{rd} quartile	-11.585	7.173	-20.883	3.242	20
4^{th} quartile	-3.673	19.753	-42.971	19.608	20
Unemployment rate	9.138	0.969	7.773	10.755	21

Continues on next page

Table 4.7: ...continued

Variable	Mean	Std.dev.	Min	Max	Obs.
Real short term interest rate	3.679	2.259	-0.028	7.751	21
Av. unemployment benefits	37.974	1.977	34.389	43.528	21
First-year benefits	59.453	1.252	57.875	61.5	21
Real GDP per capita (growth rate)	0.017	0.013	-0.013	0.039	21
Germany					
Saving intention	7.989	5.841	-1.608	19.992	21
1^{st} quartile	-17.851	8.055	-35.817	-8.9	20
2^{nd} quartile	5.088	8.212	-13.742	15.358	20
3^{rd} quartile	17.979	9.700	2.342	31.492	20
4^{th} quartile	28.978	8.536	18.643	43.425	20
Unemployment rate	7.433	1.684	4.470	10.530	21
Real short term interest rate	2.450	1.397	0.448	5.659	21
Av. unemployment benefits	27.450	1.303	24.171	29.407	21
First-year benefits	37.819	1.354	35.392	39.997	21
Real GDP per capita (growth rate)	0.010	0.028	-0.098	0.035	21
Greece					
Saving intention	-44.455	7.079	-55.983	-31.842	21
1^{st} quartile	-63.274	15.587	-83.408	-32.392	20
2^{nd} quartile	-54.181	10.181	-70.467	-35.492	20
3^{rd} quartile	-44.093	16.820	-75.033	-11.475	20
4^{th} quartile	-18.491	12.786	-45.0	0.0	20
Unemployment rate	9.610	1.402	7.426	12.096	21
Real short term interest rate	2.738	3.197	-3.671	7.621	21
Av. unemployment benefits	12.301	3.151	7.139	17.111	21
First-year benefits	32.887	7.135	21.417	43.917	21
Real GDP per capita (growth rate)	0.20	0.022	-0.025	0.052	21
Ireland					
Saving intention	-6.725	19.096	-30.15	21.983	21
1^{st} quartile	-45.619	15.886	-64.575	-21.542	20
2^{nd} quartile	-23.394	16.299	-45.792	5.483	20
3^{rd} quartile	8.332	16.822	-20.983	34.033	20

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Table 4.7: ...continued

Variable	Mean	Std.dev.	Min	Max	Obs.
4^{th} quartile	22.567	24.960	-26.442	51.492	20
Unemployment rate	10.945	5.137	3.865	17.150	21
Real short term interest rate	3.903	3.677	-1.262	10.925	21
Av. unemployment benefits	29.426	1.747	26.264	33.684	21
First-year benefits	39.994	5.238	31.625	50.292	21
Real GDP per capita (growth rate)	0.052	0.029	-0.005	0.103	21
Italy					
Saving intention	-14.007	9.028	-36.25	-0.608	21
1^{st} quartile	-49.830	4.192	-59.642	-43.883	12
2^{nd} quartile	-29.388	7.718	-49.458	-19.217	12
3^{rd} quartile	-2.657	10.694	-39.0	1.525	12
4^{th} quartile	11.622	9.596	-10.358	22.95	12
Unemployment rate	9.813	1.193	7.778	11.502	21
Real short term interest rate	3.896	2.551	-0.330	8.305	21
Av. unemployment benefits	17.764	13.775	0.347	34.458	21
First-year benefits	26.878	24.102	1.042	59.5	21
Real GDP per capita (growth rate)	0.017	0.013	-0.002	0.041	21
Netherlands					
Saving intention	-32.816	11.595	5.95	49.0	21
1^{st} quartile	-16.558	16.750	-43.067	13.333	20
2^{nd} quartile	37.803	8.183	17.971	49.442	20
3^{rd} quartile	59.191	5.723	45.508	69.65	20
4^{th} quartile	58.320	23.112	8.9	77.483	20
Unemployment rate	5.763	1.926	2.533	8.439	21
Real short term interest rate	2.899	2.340	0.031	6.239	21
Av. unemployment benefits	52.149	4.596	35.235	56.706	21
First-year benefits	70.704	0.889	70.0	72.5	21
Real GDP per capita (growth rate)	0.021	0.013	-0.006	0.040	21
Portugal					
Saving intention	-33.413	7.967	-51.792	-22.108	20
1^{st} quartile	-50.362	9.527	-68.883	-29.792	20

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Table 4.7: ...continued

Variable	Mean	Std.dev.	Min	Max	Obs.
2^{nd} quartile	-39.949	12.405	-62.483	-22.667	20
3^{rd} quartile	-27.948	15.720	-54.875	-0.708	20
4^{th} quartile	-22.912	11.693	-40.667	-1.05	20
Unemployment rate	5.848	1.401	3.957	8.736	20
Real short term interest rate	2.702	2.379	-0.903	6.562	20
Av. unemployment benefits	36.309	4.628	26.194	44.5	20
First-year benefits	65.335	2.604	60	69.999	20
Real GDP per capita (growth rate)	0.028	0.027	-0.022	0.076	20
Spain					
Saving intention	-21.949	8.998	-34.357	-4.583	20
1^{st} quartile	-48.351	9.602	-63.058	-23.925	20
2^{nd} quartile	-30.971	11.765	-43.258	-4.767	20
3^{rd} quartile	-17.272	9.818	-30.908	1.733	20
4^{th} quartile	-7.042	13.714	-30.171	14.533	20
Unemployment rate	13.863	3.114	9.157	19.108	20
Real short term interest rate	3.616	3.392	-1.146	10.047	20
Av. unemployment benefits	35.631	2.193	31.667	39.038	20
First-year benefits	66.178	3.331	62.887	72.125	20
Real GDP per capita (growth rate)	0.027	0.016	-0.013	0.053	20
United Kingdom					
Saving intention	-6.199	10.516	-20.508	15.117	21
1^{st} quartile	-40.689	16.177	-60.433	-7.957	20
2^{nd} quartile	-13.488	13.681	-37.283	-16.383	20
3^{rd} quartile	7.272	11.077	-13.25	25.367	20
4^{th} quartile	21.451	10.796	-9.757	37.358	20
Unemployment rate	7.664	2.242	4.763	11.358	21
Real short term interest rate	4.640	1.662	2.272	8.216	21
Av. unemployment benefits	16.758	2.531	12.349	20.736	21
First-year benefits	20.226	3.722	14.249	25.542	21
Real GDP per capita (growth rate)	0.025	0.015	-0.017	0.048	21

Remarks: Descriptive statistics refer to the static specification in table 4.1.

Table 4.8: Diagnostic statistics

	Table 1			Table 2		
Specification	(1)	(2)	(3)	(1)	(2)	(3)
Breusch-Pagan χ^2-test	174.505	169.071	175.633	70.570	69.627	65.787
(cross-sectional corr.)	(0.0000)	(0.0000)	(0.0000)	(0.0769)	(0.0886)	(0.1514)
Wooldrigde F-test	31.974	280.294	476.610	11.366	11.944	11.892
(autocorrelation)	(0.0002)	(0.0000)	(0.0000)	(0.0071)	(0.0062)	(0.0062)
Wald χ^2-test	68.67	22.56	22.56	43.41	32.03	27.81
(heteroscedasticity)	(0.0000)	(0.0204)	(0.0204)	(0.0000)	(0.0000)	(0.0035)

Remarks:
p-values in parentheses. Breusch-Pagan test for cross-sectional correlation in fixed effects models is implemented in STATA ('xttest2' command). The Wooldridge test for serial correlation in the idiosyncratic errors is implemented in STATA's 'xtserial' command (see Drukker [2003]).

Table 4.9: Additional controls: employment protection legislation (EPL)

	Static model		Dynamic model			
Variables	(1)	(2)	(3)	(4)[a]	(5)	(6)[a]
Saving intention (lagged)			0.754***	0.822***	0.754***	0.822***
			(0.033)	(0.056)	(0.033)	(0.056)
Unemployment benefits (UB)	-0.863***	-0.909***	-0.303**	-0.261**	-0.298**	-0.259**
	(0.209)	(0.217)	(0.100)	(0.115)	(0.129)	(0.131)
Unemployment rate (UR)	-4.039***	-4.023***	-1.444**	-1.259**	-1.447**	-1.245**
	(1.181)	(1.175)	(0.554)	(0.518)	(0.554)	(0.523)
UB*UR	0.047**	0.052**	0.022**	0.019**	0.021*	0.019*
	(0.021)	(0.021)	(0.008)	(0.009)	(0.010)	(0.011)
Real GDP per capita	124.664**	126.009**	94.463***	93.315***	94.355***	93.707***
(growth rate)	(41.221)	(41.175)	(16.418)	(21.140)	(16.663)	(21.290)
Short term real interest rate	-0.113	-0.086	0.350*	0.399	0.346*	0.397
	(0.221)	(0.234)	(0.170)	(0.251)	(0.174)	(0.245)
EPL	-0.544	0.763	0.927	0.779	0.794	0.768
	(2.242)	(2.381)	(1.171)	(1.209)	(1.939)	(2.251)
EPL*UR		-0.127			0.013	-0.001
		(0.205)			(0.163)	(0.196)
Constant	35.921***	35.196**	9.394		9.468	
	(11.427)	(11.242)	(7.381)		(7.277)	
No. of observations	229	229	218	218	218	218
No. of countries	11	11	11	11	11	11
within R^2	0.649	0.650	0.852		0.852	

Remarks:
*,**,*** indicate significance at 10, 5 and 1 per cent respectively. Fixed year effects and common year effects included. All fixed-effects OLS estimations with Driscoll/Kraay std.errors robust to heteroscedasticity, autocorrelation and cross-sectional correlation (spec. (1),(2),(3),(5)). FE-IV estimation results are not qualitatively different and are not reported here. Robust std. errors in parentheses.
[a] LSDVC-Estimator; Arellano-Bond used as consistent estimator to initialise bias correction; bootstrapped std. errors.
Data source: EPL; OECD index for Employment Protection Legislation (Version 1: 1985-2008 comparable series).

Table 4.10: Additional controls: active labour market policies (ALMP)

	Static model			Dynamic model		
Variables	(1)	(2)	(3)	(4)[a]	(5)	(6)[a]
Saving intention (lagged)			0.734***	0.808***	0.723***	0.797***
			(0.039)	(0.066)	(0.047)	(0.067)
Unemployment benefits (UB)	-0.920***	-0.924***	-0.342**	-0.286**	-0.353**	-0.296**
	(0.217)	(0.228)	(0.117)	(0.125)	(0.123)	(0.126)
Unemployment rate (UR)	-4.388***	-4.149***	-1.698**	-1.481***	-1.685**	-1.465***
	(1.140)	(1.137)	(0.577)	(0.508)	(0.580)	(0.503)
UB*UR	0.062***	0.061**	0.027**	0.024**	0.028**	0.024**
	(0.019)	(0.020)	(0.010)	(0.010)	(0.010)	(0.010)
Real GDP per capita	148.447***	150.961***	100.381***	99.313***	101.725***	100.670***
(growth rate)	(33.803)	(28.263)	(16.274)	(21.627)	(16.149)	(21.649)
Short term real interest rate	-0.115	0.048	0.396**	0.443*	0.422**	0.466*
	(0.253)	(0.260)	(0.144)	(0.265)	(0.145)	(0.268)
ALMP	0.024**	-0.014	0.006	0.005	-0.002	-0.003
	(0.009)	(0.012)	(0.004)	(0.005)	(0.007)	(0.010)
ALMP*UR		0.015***			0.003	0.003
		(0.005)			(0.003)	(0.003)
Constant	34.188***	28.908**	12.910*		11.854*	
	(11.622)	(12.185)	(5.933)		(6.076)	
No. of observations	222	222	213	213	213	213
No. of countries	11	11	11	11	11	11
within R^2	0.673	0.688	0.853		0.854	

Remarks:
*,**,*** indicate significance at 10, 5 and 1 per cent respectively. Fixed year effects and common year effects included. All fixed-effects OLS estimations with Driscoll/Kraay std.errors robust to heteroscedasticity, autocorrelation and cross-sectional correlation (spec. (1),(2),(3),(5)). FE-IV estimation results are not qualitatively different and are not reported here. Robust std. errors in parentheses.
[a] LSDVC-Estimator; Arellano-Bond used as consistent estimator to initialise bias correction; bootstrapped std. errors.
Data source: ALMP; CEP-OECD Dataset (see Nickell [2006]): Expenditures on active labour market policies (without wages of state employees) per unemployed individual normalised on GDP per member of the labour force.

Table 4.11: Estimation by income quartiles (static model)

	FE-OLS				IV-OLS			
Variables	1^{st}	2^{nd}	3^{rd}	4^{th}	1^{st}	2^{nd}	3^{rd}	4^{th}
Unemployment benefits (UB)	-0.225	-0.744*	-1.365***	-1.567***	-0.235	-0.753**	-1.370***	-1.547***
	(0.372)	(0.319)	(0.285)	(0.279)	(0.429)	(0.295)	(0.355)	(0.511)
Unemployment rate (UR)	-2.280	-3.659*	-4.926***	-4.681***	-2.363	-3.735***	-4.970***	-4.741**
	(2.043)	(1.671)	(1.095)	(0.944)	(1.499)	(1.234)	(1.378)	(1.906)
UB*UR	0.016	0.043	0.077***	0.073***	0.018	0.045*	0.078***	0.075**
	(0.034)	(0.026)	(0.015)	(0.015)	(0.034)	(0.024)	(0.026)	(0.038)
Real GDP per capita	148.025**	96.499*	29.462	97.459	342.895	276.346	132.851	239.439
(growth rate)	(61.481)	(45.412)	(46.211)	(60.436)	(221.330)	(196.082)	(176.125)	(154.781)
Interest rate (real)	0.730	0.768	0.080	-1.490*	0.676	0.718	0.051	-1.529**
	(0.498)	(0.512)	(0.463)	(0.671)	(0.446)	(0.555)	(0.679)	(0.738)
Constant	-16.124	33.801*	80.843***	106.510***				
	(20.408)	(17.876)	(14.524)	(14.676)				
No. of observations	212	212	212	212	212	212	212	212
No. of countries	11	11	11	11	11	11	11	11
R^2	0.408	0.370	0.360	0.628	0.358	0.313	0.345	0.614
Kleibergen-Paap (p-value)					0.115	0.115	0.115	0.115
Hansen J-statistic					0.835	0.094	0.111	0.032

Remarks:
*,**,*** indicate significance at 10, 5 and 1 per cent respectively. All OLS estimations with Driscoll/Kraay std. errors robust to heteroscedasticity, cross-sectional correlation and autocorrelation. IV estimations with heteroscedasticity consistent standard errors. Fixed country effects and common year effects included. Robust std. errors in parentheses.

Table 4.12: Estimation by income quartiles (dynamic model)

	FE-OLS				IV-OLS			
Variables	1^{st}	2^{nd}	3^{rd}	4^{th}	1^{st}	2^{nd}	3^{rd}	4^{th}
Saving intention (lagged)	0.683***	0.685***	0.767***	0.785***	0.658***	0.648***	0.760***	0.777***
	(0.055)	(0.082)	(0.117)	(0.089)	(0.059)	(0.064)	(0.053)	(0.053)
Unemployment benefits (UB)	-0.247	-0.420*	-0.398**	-0.380***	-0.244	-0.433***	-0.401**	-0.379**
	(0.226)	(0.225)	(0.174)	(0.112)	(0.156)	(0.134)	(0.169)	(0.168)
Unemployment rate (UR)	-2.169*	-1.965*	-1.409	-0.990	-2.246***	-2.142***	-1.478**	-1.080
	(0.977)	(0.888)	(0.880)	(0.642)	(0.662)	(0.520)	(0.635)	(0.683)
UB*UR	0.029	0.027	0.020*	0.019	0.029**	0.028***	0.020	0.019
	(0.017)	(0.015)	(0.010)	(0.011)	(0.013)	(0.010)	(0.013)	(0.014)
Real GDP per capita	80.858**	52.590	33.048	87.010*	155.588**	179.633*	114.748	219.995**
(growth rate)	(27.802)	(31.451)	(31.955)	(41.227)	(77.017)	(94.685)	(82.816)	(98.281)
Interest rate (real)	0.542	0.527	0.148	0.157	0.534	0.522	0.138	0.132
	(0.314)	(0.375)	(0.369)	(0.376)	(0.358)	(0.391)	(0.423)	(0.433)
Constant	1.134	16.352	22.652**	17.367**				
	(11.993)	(11.993)	(9.621)	(5.809)				
No. of observations	201	201	201	201	201	201	201	201
No. of countries	11	11	11	11	11	11	11	11
R^2	0.740	0.669	0.712	0.858	0.733	0.643	0.703	0.844
Kleibergen-Paap (p-value)					0.0685	0.184	0.125	0.090
Hansen J-statistic					0.329	0.237	0.294	0.488

Remarks:
*,**,*** indicate significance at 10, 5 and 1 per cent respectively. All OLS estimations with Driscoll/Kraay std. errors robust to heteroscedasticity, cross-sectional correlation and autocorrelation. IV estimations with heteroscedasticity consistent standard errors. Fixed country effects and common year effects included. Robust std. errors in parentheses.

Table 4.12: Estimation by income quartiles (dynamic model)[continued]

	LSDVC			
Variables	1^{st}	2^{nd}	3^{rd}	4^{th}
Saving intention (lagged)	0.751***	0.768***	0.860***	0.856***
	(0.056)	(0.063)	(0.065)	(0.050)
Unemployment benefits (UB)	-0.226	-0.363*	-0.299	-0.273
	(0.191)	(0.201)	(0.221)	(0.200)
Unemployment rate (UR)	-2.051**	-1.687*	-1.070	-0.664
	(0.858)	(0.903)	(0.999)	(0.854)
UB*UR	0.028	0.023	0.014	0.014
	(0.018)	(0.018)	(0.020)	(0.018)
Real GDP per capita	78.666**	52.496	33.402	85.191***
(growth rate)	(108.890)	(35.348)	(36.944)	(32.758)
Interest rate (real)	0.538	0.521	0.156	0.239
	(0.398)	(0.400)	(0.412)	(0.380)
Constant				
No. of observations	201	201	201	201
No. of countries	11	11	11	11

Remarks:
*,**,*** indicate significance at 10, 5 and 1 per cent respectively. LSDVC-Estimator; Arellano-Bond used as consistent estimator to initialise bias correction; bootstrapped std. errors. in parentheses.

Table 4.13: Cross-sectional stability

Country excluded		Static model FE-OLS		Static model IV-OLS		Dynamic model FE-OLS		Dynamic model IV-OLS		Dynamic model LSDVC[a]	
Belgium	UB	-0.834***	(0.229)	-0.834***	(0.253)	-0.310**	(0.098)	-0.308***	(0.071)	-0.258***	(0.098)
	UB*UR	0.046*	(0.021)	0.046**	(0.023)	0.022**	(0.008)	0.021***	(0.007)	0.019**	(0.009)
Denmark	UB	-0.660**	(0.258)	-0.661***	(0.233)	-0.274**	(0.110)	-0.279***	(0.057)	-0.232**	(0.097)
	UB*UR	0.034	(0.025)	0.031	(0.023)	0.018*	(0.010)	0.019***	(0.006)	0.016*	(0.009)
France	UB	-0.876***	(0.224)	-0.876***	(0.245)	-0.334**	(0.107)	-0.335***	(0.071)	-0.285***	(0.109)
	UB*UR	0.049**	(0.022)	0.049**	(0.023)	0.024**	(0.009)	0.024***	(0.007)	0.021**	(0.010)
Germany	UB	-0.848***	(0.216)	-0.851***	(0.234)	-0.333***	(0.094)	-0.333***	(0.098)	-0.277***	(0.098)
	UB*UR	0.044*	(0.022)	0.043**	(0.022)	0.022**	(0.008)	0.022***	(0.008)	0.019**	(0.009)
Greece	UB	-0.917***	(0.249)	-0.875***	(0.233)	-0.363***	(0.094)	-0.361***	(0.065)	-0.312***	(0.094)
	UB*UR	0.051*	(0.023)	0.052**	(0.021)	0.028***	(0.007)	0.029***	(0.005)	0.025***	(0.009)
Ireland	UB	-0.810***	(0.216)	-0.812***	(0.245)	-0.294**	(0.103)	-0.289***	(0.062)	-0.255**	(0.099)
	UB*UR	0.040*	(0.020)	0.041*	(0.025)	0.019**	(0.008)	0.018***	(0.006)	0.017*	(0.010)
Italy	UB	-0.866***	(0.197)	-0.865**	(0.353)	-0.372**	(0.132)	-0.372***	(0.103)	-0.311**	(0.135)
	UB*UR	0.041	(0.024)	0.041*	(0.025)	0.019**	(0.008)	0.019**	(0.008)	0.016	(0.010)
Netherlands	UB	-0.941***	(0.197)	-0.941***	(0.246)	-0.320**	(0.103)	-0.317***	(0.094)	-0.263**	(0.128)
	UB*UR	0.056**	(0.018)	0.056**	(0.023)	0.022**	(0.009)	0.021**	(0.009)	0.018*	(0.010)
Portugal	UB	-0.857**	(0.267)	-0.856***	(0.261)	-0.346***	(0.104)	-0.346***	(0.078)	-0.295**	(0.126)
	UB*UR	0.046	(0.025)	0.045*	(0.025)	0.024**	(0.009)	0.024***	(0.007)	0.021*	(0.011)
Spain	UB	-0.700***	(0.188)	-0.700**	(0.301)	-0.319***	(0.088)	-0.319***	(0.092)	-0.274**	(0.130)
	UB*UR	0.032	(0.019)	0.034	(0.028)	0.023***	(0.006)	0.023**	(0.009)	0.021*	(0.011)
UK	UB	-1.195***	(0.232)	-1.210***	(0.219)	-0.439***	(0.118)	-0.439***	(0.098)	-0.372**	(0.145)
	UB*UR	0.080***	(0.020)	0.080***	(0.020)	0.033***	(0.010)	0.033***	(0.009)	0.029**	(0.011)

Remarks:
*,**,*** indicate significance at 10, 5 and 1 per cent respectively. Fixed country effects and common year effects included. Controls (not reported in the table): Growth rate of real gdp per capita, short term real interest rate, unemployment rate. All OLS estimations with Driscoll/Kraay std. errors robust to heteroscedasticity, cross-sectional correlation and autocorrelation. IV estimations with heteroscedasticity and autocorrelation consistent std. errors; instruments used: unit labour cost (level/growth rate), election dummy, participation rate, (fertility rate). Robust std. errors in parentheses.
[a] LSDVC-Estimator; Arellano-Bond used as consistent estimator to initialise bias correction; bootstrapped std. errors.

Table 4.14: Panel unit root tests

	Saving intention	**GDP p.c.(growth rate)**	**Unemployment rate (UR)**
Levels			
Levin, Lin, Chu (2002) (LLC)	0.2390 (0.5944)	-6.5542*** (0.0000)	0.1866 (0.5740)
Im, Pesaran, Smith (2003) (IPS)	0.4548 (0.6754)	-5.2565*** (0.0000)	0.3128 (0.6228)
Fisher-type test (combined ADF)	1.0577 (0.1451)	4.3357*** (0.0000)	1.0339 (0.1506)
Hadri (2000)	20.8285*** (0.0000)	3.3664*** (0.0004)	15.9592*** (0.0000)
No. of countries with ind. unit root (p-value >0.10)	9	6	9
First differences			
Levin, Lin, Chu (2002) (LLC)	-9.4108*** (0.0000)	-12.8254*** (0.0000)	-7.5662*** (0.0000)
Im, Pesaran, Smith (2003) (IPS)	-8.1810*** (0.0000)	-11.3316*** (0.0000)	-5.3273*** (0.0000)
Fisher-type test (combined ADF)	9.5908*** (0.0000)	20.7258*** (0.0000)	7.2025*** (0.0000)
Hadri (2000)	0.8891 (0.1870)	-2.4788 (0.9934)	1.1094 (0.1336)
No. of countries with ind. unit root (p-value >0.10)	2	0	2

	Short term interest rate(IRS)	**First-year unemployment benefit(UB)**	**Interaction-effect (UR*UB)**
Levels			
Levin, Lin, Chu (2002) (LLC)	-4.2003*** (0.0000)	-2.8109*** (0.0025)	-1.8710** (0.0307)
Im, Pesaran, Smith (2003) (IPS)	-3.3818*** (0.0004)	-1.1393 (0.1273)	-0.0446 (0.4822)
Fisher-type test (combined ADF)	1.2321 (0.1090)	2.9898*** (0.0014)	0.5856 (0.2791)
Hadri (2000)	26.4438*** (0.0000)	25.2307*** (0.0000)	20.3760*** (0.0000)
No. of countries with ind. unit root (p-value >0.10)	11	10	9
First differences			
Levin, Lin, Chu (2002) (LLC)	-16.4813*** (0.0000)	-7.1092*** (0.0000)	-7.3499*** (0.0000)
Im, Pesaran, Smith (2003) (IPS)	-13.0463*** (0.0000)	-5.9129*** (0.0000)	-5.3331*** (0.0000)
Fisher-type test (combined ADF)	14.1327*** (0.0000)	12.4228*** (0.0000)	7.8523*** (0.0000)
Hadri (2000)	-0.1361 (0.5541)	0.2598 (0.3975)	1.0965 (0.1364)
No. of countries with ind. unit root (p-value >0.10)	0	0	2

Remarks:
The following test statistics are reported in the table:
i) LLC: adjusted t* (H0: Panels contain unit roots; Ha: Panels are stationary)
ii) IPS: W-t-bar (H0: All panels contain unit roots; Ha: some panels are stationary)
iii) Fisher: modified Chi-square (H0: All panels contain unit roots; Ha: At least one panel is stationary)
iv) Hadri: z-statistic (H0: All Panels are stationary; Ha: Some panels contain unit roots).
In the tests for the levels, potential cross-sectional dependence is is taken into account by subtracting cross-sectional means ('demeaning'). p-values are given in parentheses. Schwarz-criterion was applied in LLC and IPS to determine the optimal lag length in the estimation; lag(1) in Hadri and Fisher. Augmented Dickey-Fuller unit root test for individual countries can be obtained from the author upon request.

Table 4.15: Panel cointegration tests (Pedroni 1999, 2004)

Panel t-test statisitc	-2.6649*** (0.0039)
Group t-statistic	-3.53189*** (0.0002)

Remarks:
Following Pedroni [2004] and Lee [2006], Panel t-statistic and Group t-statistic are the most powerful cointegration tests among those suggested by Pedroni [1999], given the sample size of N=11 and T=20.
Both tests are based on averaging ADF test statistics of the cross-sections. The tests were performed by Eviews6.
H0: no cointegration, estimation without assuming deterministic trend, automatic lag length selection by Schwarz-criterion.

Table 4.16: Pooled mean group estimation

Variables	ARDL(1,0,0,0,0,0)		ARDL(1,1,1,1,1,1)	
Long-run coefficients				
Unemployment benefits (UB)	-1.157**	-1.716***	-0.881**	-1.348***
	(0.506)	(0.451)	(0.368)	(0.331)
Unemployment rate (UR)	-4.828**	-7.881***	-3.296**	-6.791***
	(2.381)	(2.278)	(1.607)	(1.767)
UB*UR	0.113**	0.131***	0.0753*	0.112***
	(0.053)	(0.045)	(0.039)	(0.037)
Real GDP per capita	424.807***	370.196***	84.764**	221.369***
(growth rate)	(82.859)	(86.216)	(36.859)	(60.829)
Short term real interest rate	1.383**	1.331	2.322***	0.172
	(0.574)	(0.835)	(0.521)	(0.530)
(Average) Speed of adjustment ϕ	-0.224***	-0.261***	-0.259**	-0.363***
	(0.055)	(0.041)	(0.103)	(0.087)
Av. short-run coefficients				
ΔGDP growth			40.051**	-11.978
			(16.035)	(22.234)
ΔUR			-2.123	-2.472
			(7.612)	(2.552)
ΔInterest rate			-0.087	0.019
			(0.327)	(0.271)
ΔUB			-0.063	-0.868**
			(1.390)	(0.358)
ΔUB*UR			-0.025	0.027
			(0.127)	(0.041)
No. of observations	218	218	218	218
No. of countries	11	11	11	11
Fixed year effects	-	Yes	-	Yes
BIC	1239.372	1219.592	1149.718	1154.589

Remarks:
*,**,*** indicate significance at 10, 5 and 1 per cent respectively. The table gives the common long-run relationships and average short-run effects for the included variables. Specification (1) and (2) refer to an ARDL(1,0,0,0,0,0) model, specification (3) and (4) refer to an ARDL(1,1,1,1,1,1) model including one lag of each right-hand side variable. Variables in specifications (2) and (4) are demeaned, i.e. given as differences from their cross-sectional means to account for common time effects. Fixed country effects included.

C.3 A simple illustrative model

The simple two-period model in this section is meant to illustrate the basic idea that survey respondents may indicate lower expected saving when the current unemployment rate rises. As argued above, this may be due to an 'expected income effect', i.e. expected saving decreases because the probability of unemployment rises and therefore the respondent might fear not to have enough financial means left to save after having paid for basic necessities. A crucial assumption for this result is that the individual has certain expectations concerning the future unemployment rate. The expectation formation process can be stated as follows: the further in the future is the expected value of the unemployment rate, the smaller is the influence of current realisations of the unemployment rate on that value. In other words, the individual may adopt the current unemployment rate as the expected probability of unemployment in the near future. From the perspective of the individual, the unemployment rate in the remote future may not be as easily assessable. He may instead rely more on prior beliefs concerning the unemployment rate. Just to give an example, this prior belief may be represented by the long-term average unemployment rate. The following simple two-period model may illustrate this idea.

The set-up of the model is as follows. There is a representative individual who lives for two periods, has no assets at the start and (in expectation) is not allowed to leave any bequests (i.e. all assets have to be consumed in the last period). Moreover, it is assumed that the rate of time preference equals the interest rate and both are zero. Income is uncertain in both periods due to the possibility of unemployment. When employed, he receives a labour income y, in case of unemployment he gets a known fraction αy as income replacement (with $0 < \alpha < 1$). To capture the effect of prior beliefs and the formation of expectations about the unemployment rate on expected saving, it is simply assumed that the individual possesses some belief q_0 from the outset. Before the first period begins, he is asked to indicate his expected savings in the first period. The expected savings in the first period crucially depend

on (1) the employment status in the first period and (2) the probability of job loss (and therefore the income) in the second period. However, at the time of the survey the individual only has information about the current unemployment rate p_t, the labour income and the replacement rate. When asked about his expected savings, he therefore has to build expecations about the probability of unemployment in the first and the second period. To incorporate the idea that more remote expectations are influenced less by current realisations, I presume that the expectation formation at time $t = 0$ concerning the future unemployment rate can be represented by $E_t(p_{t+i}) = q_0 + \rho^{i-1}(p_t - q_0)$. For $i = 1$ (first period) and $i = 2$ (second period), the expected probability of unemployment given the prior beliefs and the current unemployment rate amounts to $E_0(p_1) = p_0$ and $E_0(p_2) = \rho \cdot p_0 + (1 - \rho) \cdot q_0$ with $0 < \rho \leq 1$. Applying a standard CARA period utility function, the expected savings of the individual in the first period based on the information set at the time of the survey are determined in the following two steps. Firstly, the expected optimal savings in the first period given a certain employment status (employed, unemployed) and the information at the time of the survey are calculated. Secondly, the overall expected savings of the respondent are calculated as the sum of those numbers, weighted by the expected probability of both possible states of employment in the first period. At the time of the survey ($t = 0$), the expected savings s_1 in the first period given the individual becomes unemployed in that period solve the following maximisation problem:

$$\begin{aligned} \max_{s_1} \quad & u_1 + E(u_2) = -1/a \cdot exp^{-a(\alpha y - s_1)} + \\ & + E_0(p_2) \cdot (-1/a \cdot exp^{-a(s_1 + \alpha y)}) + (1 - E_0(p_2)) \cdot (-1/a * exp^{-a(s_1 + y)}) \end{aligned} \tag{4.7}$$

In the case of employment in the first period the maximisation problem is:

$$\begin{aligned} \max_{s_2} \quad & u_1 + E(u_2) = -1/a \cdot exp^{-a(y - s_2)} + \\ & + E_0(p_2) \cdot (-1/a \cdot exp^{-a(s_2 + \alpha y)}) + (1 - E_0(p_2)) * (-1/a \cdot exp^{-a(s_2 + y)}) \end{aligned} \tag{4.8}$$

Finally, the expected savings of the respondent are calculated as

$$E(s) = E_0(p_1) \cdot s_1 + (1 - E_0(p_1)) \cdot s_2 \tag{4.9}$$

Intuitively, there are generally two channels by which the current unemployment rate impacts expected savings at the time of the survey. Firstly, a higher unemployment is reflected in a higher expected unemployment rate in the second period. Concerning the first period, this leads to lower dissaving in the case of unemployment and higher savings if the individual is employed. Secondly, the current unemployment rate directly impacts the expected probability of unemployment in the first period and therefore the weighting of savings and dissavings in the expression for the expected savings (this effect may be labelled as the 'expected income effect'). Now, it can be shown that there are parameter values for those the first derivative $(\partial E(s)/\partial p_0)$ becomes negative, i.e. expected savings decrease with the unemployment rate. Because the purpose of this illustrative example is just to show that saving intentions may be negatively related with the current unemployment rate under certain circumstances, the following table 4.17 gives some exemplary parameter values and the sign of $\partial E(s)/\partial p_0$.

For a wide range of parameter combinations, a higher current unemployment rate is associated with lower expected savings. This holds true especially if the impact of the unemployment rate at the time of the survey only has a small impact on the expectations of unemployment in the remote future ('small' ρ). If ρ rises, $\partial E(s)/\partial p_0$ is negative only in the cases of a high current rate of unemployment. That is because if ρ is high, the current unemployment rate is more strongly incorporated in the expected unemployment rate in the second period, leading generally to a stronger increase in savings (and a decrease of dissaving, respectively) in the first period. Only if the expected probability of job loss in the first period is on a relatively high level, the expected saving at the time of the survey decreases with the current unemployment rate in this case.

Table 4.17: Simulations

Parameter values			
ρ	α	q_0	$\partial E(s)/\partial p_0$
0.2	0.5	0.05	< 0
0.2	0.7	0.05	< 0
0.2	0.9	0.05	< 0
0.2	0.5	0.15	< 0
0.2	0.7	0.15	< 0
0.2	0.9	0.15	< 0
0.1	0.5	0.05	< 0
0.2	0.5	0.05	< 0
0.3	0.5	0.05	< 0 (if $p_0 > 0.068$)
0.5	0.5	0.05	< 0 (if $p_0 > 0.149$)

Remarks:
In all simulations, a labour income of $y = 3000$ and rate of risk aversion $a = 0.003$ is assumed. If not stated otherwise, the sign for $\partial E(s)/\partial p_0$ holds for all values of p_0.

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