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*Precaution and Risk Aversion:
Decomposing the Effect of
Unemployment Benefits on Saving*

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PRECAUTION AND RISK AVERSION: DECOMPOSING THE EFFECT OF
UNEMPLOYMENT BENEFITS ON SAVING

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Precaution and Risk Aversion: Decomposing the Effect of Unemployment Benefits on Saving^{*}

Jonas Kolsrud[†]

August 13, 2013

Abstract

Reduced form estimations of precautionary saving with respect to labor market risk have hitherto failed to consider that a decrease of say unemployment probability or an increase in unemployment insurance (UI) generosity affects saving not only by reducing the expected variance in earnings but also by raising expected earnings. This paper studies the possibility of decomposing the treatment effect of UI on asset accumulation into two parts; one part where more generous UI leads to raised expected earnings and a second part where a more generous UI reduces the expected variation in earnings. The decomposition is applied to rich Swedish register data on both financial assets and debt. UI's effect on assets is identified with a kinked policy rule in the UI scheme. First, increased UI generosity has a significant effect, both economically and statistically, on asset holdings; a one percentage point increase in UI benefits decrease net financial asset holdings by 1 percentage point. Second, decomposing the total effect UI has on asset accumulation shows that raised expected earnings increase savings while a decreased variation in earnings decrease saving. Not accounting for the effect on expected earnings on saving underestimates the impact UI has on precautionary saving by 70 percent.

JEL codes: D91, J64, J65

Keywords: Saving; wealth; unemployment benefit; unemployment; consumption smoothing

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1 Introduction

A long standing question in economics concerns people's reasons for saving. While the well known life-cycle motive has by far gained the most attention, the role and importance of the precautionary saving motive have constituted a focal point in the consumption-savings literature since the early 1990s.¹ The insight from this literature is that income uncertainty, interpreted as the variance of earnings, has a positive effect on the amount of wealth an individual chooses to hold. This sets the precautionary motive aside from the life-cycle motive where a life's expected income evolution is what matters to asset accumulation; the precautionary saving motive thus shifts the attention from the first- to the second-order moment of the income distribution. With this in mind, the perfect experiment used to assess the significance of the precautionary savings motive would be an intervention that works as a mean preserving spread or a mean preserving contraction of the income distribution.

Such experiments seem hard to come by, however. Instead, empirical researchers have had to settle with reforms that change both the first- and the second-order moments of the distribution of income; affecting both life-cycle and precautionary grounds for saving. Examples are Engen and Gruber (2001) who study the effect of unemployment insurance (UI) on asset accumulation, Carroll et al. (2003) who estimate what effect differences in unemployment probability has on saving and Fuchs-Schündeln and Schündeln (2005) who explore the implications of job security for saving.

Nevertheless, the literature has previously not addressed the fact that factors which affect both expected income and its variability, such as a higher risk of becoming unemployed or cuts in UI benefits, do double duty with respect to savings; first by an income effect that decreases expected income, and second, by a variance effect that increases the difference in expected marginal utility of consumption between being employed and unemployed. Both effects add to the need for saving as consumption and its growth rate need to be smoothed over good and bad states. Since unemployment is not something that hit everyone sometime but rather something that hits some people repeatedly, income effects can be of great importance (OECD, 2002).

In this paper, I use Swedish register data to present evidence on how precautionary saving is linked to UI benefit generosity. This is done controlling for the increase in expected income due to higher unemployment benefits, thus achieving an effect on assets

¹For the record: J. Maynard Keynes wrote about precautionary saving in 1936 and several other scholars have also pondered the topic during the intervening 55 years. However, the surge in the precautionary savings literature has taken place during the last 20 years. Carroll (1992) is a key reference and one of the first papers that "puts everything together" into one theory.

that is only due to a mean preserving contraction of the income distribution. Then the residual effect of UI on assets can be attributed to precautionary savings behavior. UI's effect on assets is identified by a kinked policy rule in the formula that assigns benefits as a fraction of pre-job-loss earnings. Since the income uncertainty posed by a supposed job loss is reduced with the generosity in UI benefits, UI should have a great bearing on the share of assets workers hold against unforeseen events. In addition, UI benefit levels are exogenous to risk preference; no matter how risky an occupation, all eligible workers are entitled to UI benefits if they become unemployed.

My estimations show that a one percentage point increase in UI benefits generosity decrease the average worker's net financial assets by 1 percentage point. When controlling for the rise in expected income brought on by UI benefits, the precautionary effect of UI is increased by a factor 3.5. Thus, not controlling for the rise in income expectations, understates the effect UI has on precautionary saving by 70 percent. In addition, as the precautionary response is larger in magnitude than the total response that is estimated without controlling for the income effect. Higher UI seem to increase income expectations and thereby increase savings in accord with the results of Dynan et al. (2004).

Further, UI affect debt rather than traditional savings. I find that workers increase their debt-to-income ratio substantially when UI generosity is higher. The decrease in income variance caused by a 10 percent increase in UI results in a 36 percent increase in the debt-to-income ratio. Thus, the greatest concern when workers are cautious seem to be financial exposure; workers are not willing to take on large debts if they at the same time face a high income variation and thus an uncertain income development in the foreseeable future. Indeed, debt puts restrictions on the income a worker requires to fulfil the obligations to his creditors. In that perspective, it is intuitive that saving is affected less by income uncertainty as compared to debt.

I start by reviewing and analyzing previous empirical work on precautionary saving. I then develop a theoretical model where the effect of UI on assets is decomposed into a part that affects the variance of income and therefore precautionary saving and one part that affects savings through expected income. Next section analyze data and overview the Swedish UI scheme as well as the estimation strategy. The last three sections cover the empirical results, their robustness and concludes.

2 Empirical Literature on Precautionary Saving

Below I review and analyze previous empirical literature on precautionary saving, focusing on the research strand dealing with reduced form measurements of the relation between uncertainty and financial wealth. However, the theoretical foundation of the empirical precautionary saving literature is the notion that uncertainty affects consumption through the curvature of the marginal utility function (Leland, 1968; Sandmo, 1970; Drèze and Modigliani, 1972; and Kimball, 1990). Unlike permanent income models where marginal utility is linear and individuals display certainty equivalence behavior, precautionary saving arises when marginal utility is convex.

In the standard model of consumption, for instance used by Carroll (1992) and (1997) and Zeldes (1989), a consumer solves

$$\max_C u(C_t) + E_t \left[\sum_{\tau=t+1}^T \beta^{\tau-t} u(C_\tau) \right] \quad (1)$$

subject to $A_{\tau+1} = RA_\tau + Y_\tau - C_\tau$ with $u(C_\tau) = C_\tau^{1-\theta}/(1-\theta)$ and θ as the parameter of relative risk aversion. Here $\beta = (1 + \rho)$ and $R = (1 + r)$, where parameters ρ and r denote the rate of time preference and the interest rate while assets, income and consumption are denoted as A , Y and C , respectively. Optimal consumption is best described by the Euler equation

$$R\beta E_t \left[(C_{t+1}/C_t)^{-\theta} \right] = 1 \quad (2)$$

Now, follow Carroll (2001) and rewrite $C_{t+1}/C_t = 1 + \eta_{t+1}$ with η as the growth rate of consumption. A second-order Maclaurin approximation gives:

$$(1 + \eta_{t+1})^{-\theta} \simeq 1 - \theta\eta_{t+1} + (1 + 1/\theta)\eta_{t+1}^2.$$

Insert the approximation into the expectations operator in (Euler Equation) and take logs on both sides:

$$(r - \theta) + \ln E_t \left[1 - \theta\eta_{t+1} + (1 + 1/\theta)\eta_{t+1}^2 \right] \simeq 0. \quad (3)$$

Use the approximations $\ln(1 + g) \simeq g$ for a small number g and $\eta_{t+1} \simeq \Delta \ln C_{t+1}$ and collect terms. The precautionary savings behavior is then readily highlighted in the following equation:

$$\Delta \ln C_{t+1} \simeq \theta^{-1} (r - \rho) + \frac{\theta + 1}{2} V_t [\Delta \ln C_{t+1}] + \varepsilon_{t+1} \quad (4)$$

Consumption growth thus depends positively on the variance of consumption. Increased income variability makes consumption grow over time, which is equivalent to increased saving and thus decreased consumption in period t . By introducing a positive third derivative in the utility function, the marginal utility of consumption will differ between good and bad states. This makes the variance of consumption a relevant factor for consumption decisions. Note, however, that this approach assumes that liquidity markets works perfectly and that expected income can always be smoothed.

2.1 Brief Review of Empirical Research²

The empirical implication of (4) is that individuals with a larger income variability should hold more assets to use as a buffer against consumption shortfalls. Some papers, like Dynan (1993), have tried to directly estimate (4) to recover the structural parameters ρ and θ . However, such estimations have not been very successful; probably since higher-order terms of the Taylor expansion from the big O are found in the error, a point made forcefully by Carroll (2001). Structural ambitions aside, one can still directly measure the effect of uncertainty on asset accumulation with a model such as:

$$g(A/Y^P) = f(X, \sigma) + \varepsilon \quad (5)$$

where σ is some measure of income uncertainty, X is the control set, ε the error term and A/Y^P the assets-to-permanent income ratio.

Early empirical studies such as Skinner (1988), Guiso et al. (1992) and Kazarosian (1997) try to relate risk, either from being employed in a sector with a high turnover or by having a large income variance, to wealth accumulation or consumption. The results in these papers suggest that precautionary saving accounts for about half of all assets holdings (Kazarosian, 1997) down to a few percent (Guiso et al. 1992). However, as pointed out by Carroll and Samwick (1997) and Lusardi (1997 and 1998), these results suffer from selection on unobservables as none of them uses instruments that are correlated with the risk measure but uncorrelated to unobserved preferences towards risk. For instance, working in a sector with a high probability of being laid off is not negative per se for individuals who do not mind a varying income. These groups will not necessarily hold more wealth, which is exactly what was found by Skinner (1988);

²This subsection is based on the review by Carroll and Kimball (2007).

farmers and self-employed, the two occupational groups with the most varying income, were also the two groups that saved the least.

Uncertainty is instrumented by Carroll and Samwick (1997) who test whether increases in permanent and transitory income variability affects individual wealth holdings. Fundamentally, however, their approach is not very different from that of Skinner (1988) as they instrument earnings variance with choice variables such as the worker's type of occupation, education level and the industry which the worker is employed in. More recent studies have used measures such as residential area and regional unemployment rates and their variances to instrument for unemployment risk and income variability (Carroll et al., 2003; Lusardi, 1997; and Hurst et al., 2010). The importance of precautionary saving when uncertainty has been instrumented ranges between 20-50 percent of all wealth in Carroll and Samwick (1997), below 10 percent in Hurst et al. (2010) and amounts to a few percent in Lusardi (1997 and 1998).

The other strand in the empirical precautionary savings literature has a more direct way of pursuing the task. By using some exogenous measure of income uncertainty one can test whether it affects individuals' wealth levels. Engen and Gruber (2001) utilize differences in UI generosity between U.S. federal states to achieve an exogenous variation in income uncertainty between workers. The intuition is that individuals residing in states with low UI generosity should hold more assets compared to workers living in states where the generosity is higher, all else being equal. Engen and Gruber find that halving the UI system's generosity would raise average asset holdings by a mere 0.8 percent.

Fuchs-Schündeln and Schündeln (2005) exploit the sudden German reunification to test for differences in asset accumulation between East and West German civil servants. As civil servant is considered to be a more secure occupation with respect to layoff risks and salary cuts as compared to private sector work, risk averse individuals can be assumed to choose work in the public rather than the private sector. In the German Democratic Republic, however, every citizen had the right to full time labor and thus there were no differences in layoff risks between public servants and other workers and arguably no selection among East Germans into the two sectors.

Fuchs-Schündeln and Schündeln then compare savings rates between Western public servants and the Eastern public servants who continued to work in the reunified German administration. As the Eastern public servants did not have to save for the risk of becoming unemployed, savings should be lower in this group as compared both to Western public servants and Germans in general. This is also what they find. However, their result is entirely driven by a subsample of former Eastern public servants who hold no

wealth while there are no significant differences in positive assets holdings between East and West German public servants.

Finally, Carroll et al. (2003) mix the direct approach by Engen and Gruber and Fuchs-Schündeln and Schündeln with the IV-approach covered above. They estimate what impact unemployment risk has on asset holdings using region of residence as an instrument for becoming unemployed. A one percentage point increase in unemployment risk raise the net worth-to-earnings ratio by 0.29 percent. Their findings show that home equity plays an important role for household behavior when facing risk but they find no robust indication that liquid financial resources such as money in checking accounts respond to unemployment risk. In addition, precautionary savings behavior is found among middle and high income households whereas low income households do not seem to hold wealth for precautionary purposes.

2.2 Shortcomings of the Previous Empirical Literature

To conclude the above review; the importance of the precautionary savings motive is hard to determine as the estimates differ so widely between studies. According to Carroll and Kimball (2007), this type of "large variation in empirical estimates is not plausibly attributable to actual behavioral differences across the various sample populations", a variation that Hurst et al (2010) argue is due to samples mixing business owners with regular employees. When the econometrician assumes that all individuals are engaged in substantial precautionary saving, the results are, in fact, almost solely driven by the large wealth holdings of the self-employed. This line of argument, however, contradicts Skinner's (1988) finding that self-employed save less than others.

One explanation for the mixed evidence assigned to the precautionary savings motive is the difficulty in finding an exogenous variation in risk across individuals and households, as pointed out by Engen and Gruber (2001). The difficulty in using choice variables as both uncertainty measures and instruments for uncertainty has already been raised by the literature. However, more recent ways of instrumenting uncertainty, such as the use of regional unemployment rates and place of residence, aimed at capturing differences in labor market conditions, can be doubted on several grounds as well.

First, regional unemployment should affect individuals' schooling decisions. In regions where work is hard to come by, and has been so for a number of years, the alternative cost of education is reduced as the risk of missing income opportunities while going to school is much lower when unemployment is high. Fredriksson (1997) finds that the demand for higher education in Sweden depends positively on the unemploy-

ment rate. Given this evidence, the instrument region violates the exclusion restriction as education should be included in the structural model. In addition, individuals who have experienced unemployment are likely to move to regions where work is easier to get which could lead to selection on regional unemployment rates. Needless to say, labor force migration is more likely to occur from places where unemployment levels are high.

Second, the potential causes for the differing results in this literature can also be explained by separate views on how to interpret the expected variance term in equation (2). Carroll and Samwick (1997) and Hurst et al. (2010) assume that expected income variance can be replaced by previous income variance. However, this means that an individual's income variability is only affected by income drops caused by unemployment if such have previously occurred. If the income variance is instrumented by, for instance UI, there will only be an effect among those who have actually experienced an unemployment spell and have taken up UI benefits. The other way is to use surveys, like Guiso et al. (1992) and Lusardi (1997), where people are asked about whether they think their income will vary or not during the year to come. In this case, UI generosity lowers the expected income variance for everyone which makes it a more appropriate instrument for the income variance.

A third explanation why reduced form studies puts such different weight to the precautionary savings motive is that local effects are drastically extrapolated in almost all reduced form studies. Typically, reduced form estimates show that decreased uncertainty reduces wealth holdings. However, the estimated effects are valid only for small changes in uncertainty in the environment in which estimates are made. This as uncertainty depends on economic policy which makes elasticities on saving with respect to uncertainty endogenous to the prevailing economical-political environment. Consequently, extrapolating the estimated impact of uncertainty on savings to alternative scenarios with complete income insurance, no uncertainty or worlds where UI is "shut off" or where there is no uncertainty about layoff are not meaningful. For such endeavours, a structural approach must be taken.

However, the literature that relates the income uncertainty of unemployment directly to wealth holdings, here represented by Engen and Gruber (2001), Carroll et al. (2003) and Fuchs-Schündeln and Schündeln (2005), suffers from a possibly more severe problem: It does not exclusively consider the effect of a mean preserving spread of the income distribution on savings since reductions in UI generosity or an increased unemployment probability raises the expected income variability and affects the expected income. Instead, the entire treatment effect of reduced income uncertainty on asset holdings estimated in these papers is attributed to a reduction of the income variance.

Ultimately, the size of the income effect is an empirical matter but if it is of any economic significance, it will cause biased estimates of the treatment effect of reductions in UI generosity or increased unemployment probability on savings. The change in expected income must therefore be held constant, while only the variance effect is allowed to vary; thus creating a mean preserving spread of the income distribution instead of shifting the spread distribution which is otherwise being done.

3 Theoretical Framework

To study how UI affects an individual's intertemporal asset allocation, assume a two-period version of (1) where the individual is initially employed but faces the probability α of becoming unemployed in the second period. Consumption in the states employed, E , and unemployed, U , is given by $C_{1E} = W - A$, $C_{2E} = RA + W$ and $C_{2U} = RA + B$, where A denotes savings, W is the wage, B the unemployment benefit and $R = 1 + r$ is the gross rate of return on assets. For the sake of simplicity, assume the wage to be constant between periods and that $B < W$.³ Thus, the only uncertainty comes from whether the individual will remain employed in period 2 as well. The value function is given by:

$$V(A) = u(C_{1E}) + \beta [(1 - \alpha) u(C_{2E}) + \alpha u(C_{2U})] \quad (6)$$

where $u'(C) > 0$, $u''(C) < 0$ and $u'''(C) > 0$. $\beta = 1/(1 + \rho)$ is the discount factor and ρ is the rate of time preference. Maximization of (6) with respect to A and implicit differentiation of $V'(A)$ with respect to UI and assets gives an expression for the effect of UI benefits on assets:

$$\frac{dA}{dB} = -\frac{\alpha u''(C_{2U})}{u''(C_{1E}) + R[(1 - \alpha) u''(C_{2E}) + \alpha u''(C_{2U})]} < 0 \quad (7)$$

where I assume $r = \rho$. As expected, (7) is negative suggesting that increased UI generosity decrease saving. Call this measure the total effect of UI on assets.

The aim of UI is to reduce fluctuations in individuals' income between employment and unemployment. Consequently, an increased UI generosity in the above context affects both the mean and the variance of the income distribution as a higher UI both shifts the distribution to the right and contracts it around the new mean. To break up

³Implicitly, I assume that $W = \widetilde{W} - T$ where T is the tax levied to pay for the UI benefits. Including T will not change any of the calculations since the worker takes it as given and there is no government that endogenously optimize UI benefits.

the total effect of UI and derive the impact on assets stemming exclusively from the reduced income variance, I start by determining what is the effect of UI on saving when u'' is constant. This income effect on saving is then written as:

$$\mu = -\frac{\alpha}{1+R}. \quad (8)$$

The income effect thus shows how much less an individual will save due to raised UI when only expected consumption is of importance to marginal utility. Thus, μ represents the effect on savings from a rightward shift of the income distribution. A linear decomposition of UI's effect on assets can then be written as:

$$\frac{dA}{dB} = \mu + \sigma < 0 \quad (9)$$

If (9) is reshuffled, it can be shown that the effect of UI on assets is greater when individuals display a precautionary savings behavior as compared to the quadratic case, since unemployment with a more generous UI results in a smaller rise in marginal utility and therefore a lower valuation of future consumption. The larger effect of UI on assets among cautious individuals is seen as the inequality $\sigma = dA/dB - \mu < 0$ always holds since $Ru''_{2U} - u''_{1E} < (1 - \alpha)R(u''_{2E} - u''_{2U})$ when $u''' > 0$. The difference in response between cautious behavior and certainty equivalent behavior arises as $-u'''/u'' > -u''/u'$ given that $u''' > 0$ (Kimball, 1990). Thus, the effect on asset accumulation and consumption from increased UI generosity is greater when not only income expectations but also the variance of income matter to individuals.

4 Empirical Strategy

The section begins by describing the Swedish UI scheme and the Swedish register data I use to evaluate UI's impact on asset holdings. To analyze the data, I set up an empirical model that captures both the income effect and the variance effect of UI on asset accumulation which allows me study what effect a mean preserving spread or contraction would have on wealth. The section ends with a discussion of the main identifying assumptions of the empirical model.

4.1 Institutions and Data

Institutional features. UI in Sweden is voluntary and administered by the labor unions through some 30 UI-funds; a set-up referred to as the Gent system. The funds are subject

to detailed regulation and large subsidies by the Swedish government. The UI scheme requires workers to meet two eligibility criteria in order to receive UI benefits if they are laid off. First, the worker must pay UI-fund fees. Second, time spent employed before layoff must be at least equivalent of six months full time employment during the course of the past year. During the period considered, year 2001-2002, workers who fulfilled these requirements received a statutory replacement rate of 80 percent of the previous wage in case of a job separation. However, workers who earned more than $k = 850$ SEK a day only received 80 percent of k if they were laid off where 1 SEK is about 1/7 U.S dollar and 1/9 Euro. k thus works as a cap on UI payments. In addition, UI is subject to a minimum level as well.

The relation between UI and previous earnings can be described according to:

$$b = b_{\min}1[\omega W \leq b_{\min}] + \omega W 1[b_{\min} < \omega W < b_{\max}] + b_{\max}1[\omega W \geq b_{\max}] \quad (10)$$

where ω is the replacement rate while b_{\min} and b_{\max} denotes the minimum and maximum benefit respectively. The kink is given by $k = b_{\max}/\omega$

Data description. To evaluate UI's impact on asset accumulation, I use register data from the longitudinal data set LINDA combined with wealth data from Statistics Sweden. LINDA is an annually updated panel that covers about 300,000 Swedes and mainly contains information on income and transfer payments, household composition and individual characteristics such as education, place of residence, and national origin (Edin and Fredriksson, 2000). Since LINDA largely lacks information on wealth, it is coupled with detailed data on financial assets, taxable real estate, and liabilities. Financial assets constitute money in checking accounts, bonds, stocks, funds and other financial instruments. To be registered, assets in checking accounts must amount to 10,000 SEK or have a minimum return of 100 SEK on an annual basis; no such restriction is put on other types of financial assets. Housing wealth consists of all taxable real estate; apartments, houses, holdings, second homes, and commercial realty. Real as well as financial assets are reported in their market value by December 31 each year.

I will primarily use data on net financial assets (NFA) and gross financial assets (GFA). Net financial assets consist of the sum of all gross financial assets; money in checking accounts, bonds, stocks, funds and other financial instruments, minus debt. UI can be assumed to affect both the propensity to borrow and the propensity to save. A shortcoming of net financial assets, pointed out by Engen and Gruber (2001), is that debt is not only a proxy for financial constraints but also for access to debt markets; large debt does not rule out a large stock of precautionary wealth. Therefore, I also

study the two asset measures that make up net financial assets; gross financial assets and debt, separately. While it is easy to imagine that UI affect liquid assets held in bank accounts et cetera, UI should also affect on debt, especially in light of the research on consumption commitments (Chetty and Szeidl, 2007). As a worker’s debt level sets a restriction on how low his earnings are allowed to fall to still fulfill the obligations toward his creditors that might involve substantial transaction costs to adjust, the amount of debt workers feel comfortable with should thus be affected by UI generosity.

Variable	Mean	Median
Male	0.568	
Age	44.69 (10.29)	45
Married or cohabitant w/children	0.633	
Household size	2.565 (1.376)	2
Born in Sweden	0.904	
High school	0.474	
College less than 2 years	0.061	
College 2 years or more	0.306	
Daily wage	1106.7 (819.1)	964.9
Earns above the cap	0.675	
No. obs.	82,033	

Table 1: Mean and median values for covariates. All variables but age, household size and daily wage are dummies. The dummy "Married or cohabitant with children" does not detect unmarried cohabitants without children. Standard deviations in parenthesis.

Sample selection. Sample members should be workers who are employed throughout 2001 and eligible to receive UI benefits in 2002. To receive UI benefits in case of a layoff, the applicant is required to have worked at least 840 hours during the last 12 months, or 45 hours a month during 6 consecutive months, prior to the job separation. However, LINDA has no information on hours of work, part time work or the like. Therefore, I select individuals on basis of their 2001 labor income where workers who earn at least 150,000 SEK are assumed to be employed in 2001. This number approximates the lowest possible yearly wage as a full-time employee. In addition, I restrict the sample to individuals who have not experienced an unemployment spell during 2001. Note that I do not use the panel dimension of data since it oversamples low risk individuals. As many workers never experience layoffs they would enter the sample year after year thus

creating selection on layoff risk. This would a priori bias the impact UI has on asset accumulation downwards.

I consider individuals aged 25-64 to target those who fulfill the work requirement. Without the age criterion, I run the risk of including young workers who have not yet worked enough to qualify for UI. In addition, the age restriction reduces the effects on wealth from schooling and retirement. The resulting sample contains 82,033 individuals. Information on UI-fund membership is not included in LINDA. However, based on figures by Kjellberg (2006 and 2011), 96 percent of all employed workers paid UI-fund fees in the early 2000s.⁴

Table 1 shows means and medians of the background characteristics of the sample. The male workforce participation is slightly higher than the female workforce participation. Age seems evenly distributed around the mean age of 45 and most are married with children. A vast majority of the sample has at least a high school education; 84 percent. The average daily wage of 1107 SEK is some 15 percent higher than the median wage, suggesting that the familiar stretched right tail is present in the wage distribution. The median wage also implies that most workers earn a wage above the cap which means that they would receive a replacement rate below 80 percent if they were to become unemployed.

Table 2 shows the distributions of net and gross financial assets and debt both in levels and divided by the workers' average yearly labor income between 1995 and 2001. Most individuals hold more debt than gross financial assets as net financial assets turn positive between the 50th and 75th percentile. For gross financial assets, table 2 shows that median savings correspond to 14 percent of a year's labor income, which implies that the median individual can sustain an unaltered level of income for about seven weeks without UI benefits by drawing from these assets. With UI benefits, this period is prolonged to about 6 months as the wealth holdings only need to compensate for a smaller fraction of the lost income. UI benefits thus play an important role when individuals lose their work.

4.2 Econometric Specification

UI's effect on assets. I identify UI's effect on asset accumulation by exploiting the quasi-experiment of differences in UI benefit generosity created by the kink in the earnings-benefit relation. Assume now that asset accumulation depends on UI benefits which are mechanically determined by previous earnings according to (10). Under a few empirically

⁴Calculations leading up to this figure is included in the appendix.

Percentile	NFA	GFA	Debt
10th	-533,907	0	0
25th	-319,116	1066	39,151
50th	-114,221	31516	172,198
75th	13,381	129,871	352,000
90th	227,617	366,112	568,573

Percentile	NFA/Income	GFA/Income	Debt/Income
10th	-2.48	0.00	0
25th	-1.48	0.01	0.18
50th	-0.52	0.14	0.75
75th	0.06	0.54	1.53
90th	0.95	1.46	2.50

Table 2: Assets and liabilities. The table presents year 2001 SEK wealth holdings. The first section shows net financial assets (NFA), gross financial assets (GFA) and debt in levels while the second table displays the same numbers divided by average yearly income 1995-2001.

testable assumptions, the benefit cap k then randomly assigns UI generosity as well as in any natural experiment (Card et al., 2009). To show how the kink in the earnings-benefit relation can be used to identify UI's effect on assets, consider a linear model where UI generosity affects asset accumulation:

$$g(A/W^P) = \lambda_0 + \tau_{TE}B(W) + \varepsilon. \quad (11)$$

The function $g(\cdot)$ of the assets-to-permanent income ratio A/W^P is assumed to respond negative to UI: $\tau_{TE} < 0$ with the index TE denoting "Total Effect". The coefficient τ_{TE} corresponds to dA/dB from the theoretical section and denotes the total effect of UI on assets.

The identifying assumption is that if UI benefits have an effect on workers' asset accumulation, the policy-induced upper kink k in the earnings-benefit relation should also induce a kink in the earnings-assets relation at k . If that is the case, then all that is required for identification of the treatment effect of UI on assets is that the density of wages is smooth around k . As a consequence, the marginal effect of earnings on asset accumulation will differ depending on which side of k a worker is positioned. The treatment of the treated effect (TT) of UI on asset accumulation is obtained from:

$$\tau_{TE} = \frac{\lim_{\Delta \rightarrow 0^+} E[g'(A/W^P) | k + \Delta] - \lim_{\Delta \rightarrow 0^-} E[g'(A/W^P) | k - \Delta]}{\lim_{\Delta \rightarrow 0^+} B'(k + \Delta) - \lim_{\Delta \rightarrow 0^-} B'(k - \Delta)} < 0. \quad (12)$$

The treatment effect must only stem from the discontinuity in saving induced by k and not by kink in ε or the earnings distribution at k . Such kinks suggest that workers sort themselves around k depending on the unobservable preferences on labor supply and consumption. If covariates are added, their densities must also be smooth across k . Otherwise, workers sort themselves around the kink depending on the observable characteristics, so models with and without covariates should render treatment effects that do not differ significantly from each other.

Since a reform took place during the period considered, a difference-in-difference (D-i-D) approach could have been used as well. However, the RKD has several advantages compared to D-i-D. First, RKD estimates an elasticity of UI on asset whereas D-i-D estimates the impact of a specific reform on assets. As UI reforms, this one included, often consider not only changes to benefit generosity but also potential benefit duration and different sanctions, it is hard to isolate the effect of the change in benefit generosity from the other changes which also have an impact on asset accumulation. Second, the type of random assignment of UI benefits that RKD exploits cannot be mimicked by D-i-D.

In practice, I follow Card et al. (2009) and estimate polynomial models according to:

$$g(A/W^P) = \lambda_0 + \sum_{m=1}^M (\beta_m (W - k)^m + \gamma_m (W - k)^m \times D) + Z\lambda + \varepsilon \quad (13)$$

when estimating the total treatment effect τ_{TE} . I use $M = 3$ as the largest polynomial order and $D = 1 [W > k]$ shows whether the individual earns a wage above or below k . The Akaike Information Criterion is used to select the best polynomial specification. Equation (13) corresponds to the numerator in (12) while the denominator is the difference between the gradient in the UI benefit schedule on both sides of k . Since it is zero to the right and 0.8 to the left of k , the TT -effect is then:

$$\tau_{TE} = -\gamma_1/0.8.$$

Decomposition. Now, assume that UI's impact on assets in (11) can be decomposed into an income effect and a variance effect:

$$g(A/W^P) = \lambda_0 + \tau_{VE}\sigma(B(W)) + \tau_{IE}\mu(B(W)) + \varepsilon. \quad (14)$$

The assets-to-permanent income ratio A/W^P depends both on an income effect $\mu(B(W))$ and a variance effect $\sigma(B(W))$ of UI benefits. The indexes VE and IE stand for vari-

ance and income effect respectively. According to theory, the income effect of UI on asset accumulation is proportional to the probability of becoming unemployed.

The empirical counterpart of the theoretical expected income effect μ is obtained by interacting UI with the probability of becoming unemployed. Each worker's unemployment probability is assumed to depend on the change in the unemployment rate $\Delta unemp_j$ between 2000 and 2001 in each worker's local labor market j with $j = [1, 100]$.⁵ Unlike the unemployment rate, which is possible to move away from, the *change* in the local unemployment rate should be exogenous to unobserved attitudes towards risk. I also condition on industry, county of residence and county-industry interactions.

The RKD specification of (14) is given by

$$g(A/W^P) = \lambda_0 + \sum_{m=1}^M (\beta_m (W-k)^m + \gamma_m (W-k)^m \times D) + \theta_0 \times \hat{\alpha} + \theta_1 (W-k) \times \hat{\alpha} + \phi (W-k) \times \hat{\alpha} \times D + Z\lambda + \varepsilon \quad (15)$$

with the decomposed effect of UI on assets is written as:

$$\tau_{VE} + \tau_{IE} = -\frac{\gamma_1 + \phi \hat{\alpha}}{0.8}.$$

The empirical importance of the decomposition is determined by comparing the size of the variance effect τ_{VE} relative to the total effect τ_{TE} according to τ_{VE}/τ_{TE} . Any bias from not decomposing depends on how different τ_{VE}/τ_{TE} is from 1.

The key identifying assumption for model (15), apart from the ones made for model (13), is that layoff risk is orthogonal to UI benefits. If there is a kink in the layoff risk at k the decomposed treatment effect is written as:

$$\lim_{W \rightarrow k} \tau_{VE} + \tau_{IE} \rightarrow -(\gamma_1 + (\theta_0 + \theta_1) \times d\hat{\alpha}/dW + \phi \times \hat{\alpha})/0.8.$$

Unless $\theta_0 = -\theta_1$ the decomposed effect will be biased. It is possible to see a link between layoff risk and UI benefits where workers shirk and are asked to quit or that older workers agrees to be laid off by their employer only to receive UI until they can start picking up retirement benefits instead. According to Karni (1999) there is no general empirical evidence pointing towards UI affecting layoffs. However, among older workers empirical evidence of such a link exists, for instance shown by Kyrrä and Ollikainen (2008).

⁵Local labor markets (LLM) are areas constructed by Statistics Sweden (SCB). Each LLM is centered around a hub municipality that attracts labor from adjacent municipalities.

RKD-details. Like Regression Discontinuity Designs, RKD estimates are made for earnings $W \in [k - h, k + h]$. The optimal h is one that produces estimates that are both precise and unbiased. The larger the bandwidth, the more observations it contains which raises the precision. But as the underlying theoretical relation between asset accumulation and UI benefits is assumed to be non-linear, a linear approximation becomes worse as h grows. To determine an optimal bandwidth, I use a "Rule-of-Thumb" test described in Lee and Lemieux (2010). The test suggests an optimal window of $h = 300$ which corresponds to average daily earnings between 576 SEK and 1150 SEK where the lower wage is truncated downwards due to the required minimum yearly income of 150,000 SEK. I will also consider narrower bandwidths to test the robustness of my results.

Regression Kink Designs offer the possibility of testing the robustness of the results to the occurrence of random kinks or discontinuities at other places apart from the kink point k . This is done by dividing the assignment variable normalized daily wage into P number of bins and then attaching a dummy d_p with $p \in [1, P]$ to each bin. These dummies are then included in (15) where the joint null hypothesis $d_1 = d_2 = \dots = d_P = 0$ is tested. If the null is rejected, a significant treatment effect might just as well be due to a bumpy asset distribution as to the UI benefit scheme. In addition, the robustness of the design regarding kinks in the error term and covariates can be tested. To detect any sorting on unobservables, the material is collapsed into bins on which the distribution of the daily wage is plotted. To rule out sorting on unobservables, no visible kink in the wage distribution should be seen at $W = k$. Sorting on observables can be ruled out if estimates of the treatment effect do not differ significantly between specifications where covariates are included and specifications where covariates are omitted.

Asset transformation. As the dependent variable, I use the inverted hyperbole sine (IHS) of the assets-to-average income ratio: $\sinh^{-1}(z) = \ln \left[z + (1 + z^2)^{1/2} \right]$, where average income refers to the mean of labor income between 1995 and 2001.⁶ The IHS, adopted from Carroll et al. (2003), has three useful properties. First, it is defined for both negative and positive integers allowing me to use net financial assets which are often negative. Second, the function is defined for $z = 0$, allowing me to study gross financial assets without excluding observations and thereby reducing the representativeness of the sample as would happen if the log of gross financial assets were used. Finally, the IHS mimics the natural logarithm function for values of $z > 20$ which simplifies the interpretation of the results. The empirical measure of the variance effect of UI on the

⁶The regression results do not differ significantly if labor income in 2001 is used instead. However, if income in 2001 is abnormally high or low, the results can become misleading.

assets-to-permanent income ratio is given by:

$$\frac{d(A/W^P)}{dB} = \tau \left(1 + (A/W^P)^2\right)^{1/2} \simeq \tau (A/W^P) \quad (16)$$

for $A/W^P > 20$ where $\tau \in [\tau_{TE}, \tau_{VE} + \tau_{IE}]$. In practice, a semi-elasticity is estimated since average daily earnings are small compared to assets.

5 Empirical Results

This section deals with both graphic and econometric evidence of a kink in the earnings-asset relation for three different types of assets; net financial assets (NFA), gross financial assets (GFA) and debt. I also do different types of robustness tests which confirms both an economically and a statistically significant effect of UI benefit generosity on both saving and lending behavior.

5.1 Graphical Evidence

To illustrate how the cap on UI benefits affects asset accumulation, figures 1, 2 and 3 plot local averages of net financial assets, gross financial assets and debt against daily wage. The first-order polynomial plotted in the upper panel for net financial assets differs sharply between the two sides of $k = 850$, suggesting that workers who face lower effective replacement rates as unemployed hold more assets compared to workers who receive 80 percent of their previous wage if they were to become unemployed. However, the figure cannot determine whether the relationship is due to risk aversion where workers wish to insure against fluctuations in consumption utility or if it is also due to precaution suggesting that, in addition, workers wish to keep fluctuations in the marginal utility of consumption in check.

The next step is to determine where the chief movement in net financial assets stems from: changes in gross financial assets or differences in the attitude towards credit? As gross financial assets, plotted in figure 2, are easily liquidated in case of unemployment and a subsequent shortfall in income, it is expected that such an asset should be sensitive to UI generosity. On the other hand, one would also expect debt, plotted in figure 3, to also be affected since a more generous UI level makes individuals less financially exposed if they become unemployed.

It is evident in the figure that there is a sharp kink at k in the relation between earnings and gross financial assets. The negative relationship seen for wages below k is due to the fact that wages rise while average assets are more or less the same. For workers

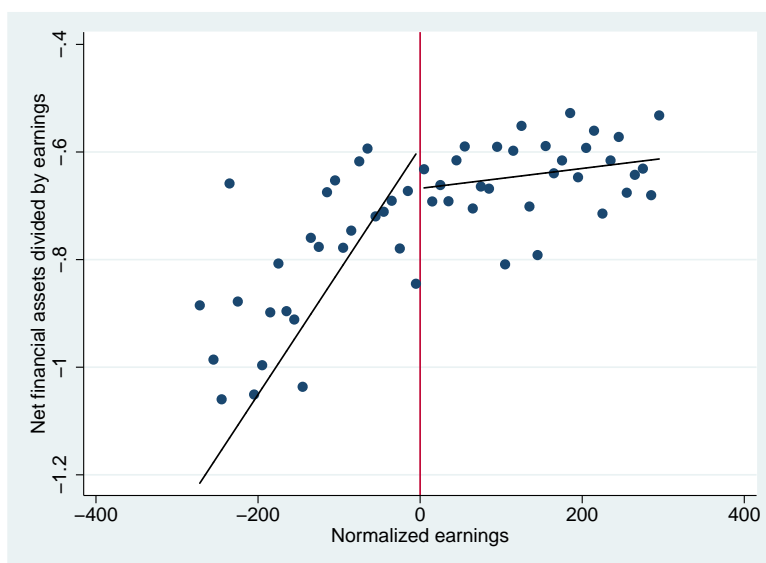


Figure 1: The circles represent the average of assets/income in each bin. A polynomial is added to highlight the relationship between net financial assets and normalized earnings. The line at 0 corresponds to the kink.

earning above k , gross financial assets grow faster than the wage. The figure shows that the kink induces a behavioral response among workers, which therefore suggests that the UI generosity affects liquid asset holdings.

Figure 3 suggests graphical evidence of an effect of UI on the amount of debt that workers take on. When k is reached, the debt-to-average earnings ratio ceases to evolve with the wage which is quite the opposite from what is taking place to the left of k where the debt-to-average earnings ratio falls with earnings. This graphical evidence supports the notion that income insurance, like UI, has effects on how much financial risk individuals are willing to take. The level of UI benefits could therefore have a bearing on, for instance, prices on real estate, vehicles and durables as these types of products often require loans to be purchased

5.2 Econometric Evidence

The total treatment effect. The distinctive graphical evidence above is supported by estimations of (13) which show a strongly significant and negative effect of UI benefit generosity on precautionary saving, displayed in table 3. Results from estimates of the total treatment effect on the net financial assets-to-permanent earnings ratio as well as the gross financial assets-to-permanent earnings ratio and the debt-to-permanent earnings ratio are displayed in table 3. The displayed estimates are for the AIC-preferred

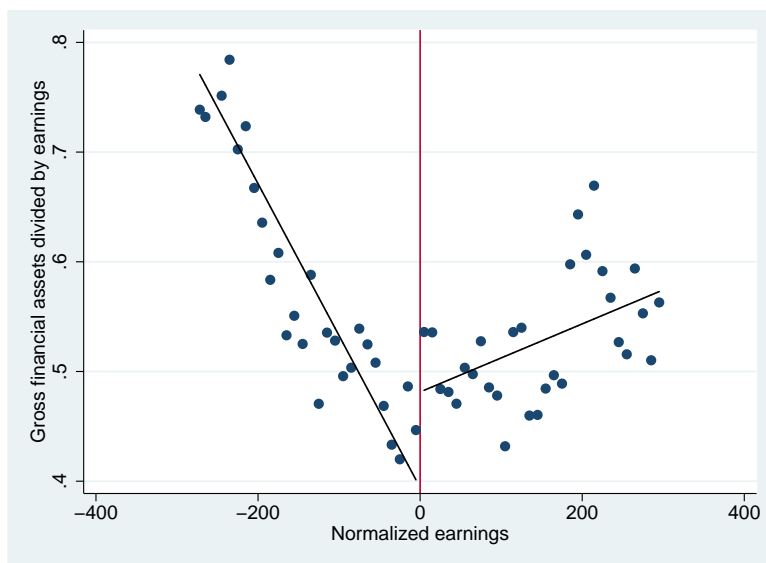


Figure 2: The circles represent the average of assets/income in each bin. A polynomial is added to highlight the relationship between gross financial assets and normalized earnings. The line at 0 corresponds to the kink.

specification for each asset measure. This is done for a baseline specification without covariates and then with covariates included. I estimate first-, second and third-order polynomials where the first-order specification is preferred by the AIC for net financial assets, while data is best described with a third-order polynomial for gross financial assets and debt.

The point estimates from the two models should not differ significantly from each other and should thus be robust between the two specifications. Below the point estimate, the robust standard error is written in parenthesis. Within square brackets, I display the p -value from the goodness-of-fit test described in section 4.2. If the p -value is larger than 0.05, there are no signs of kinks at other random places in the distribution; rather, the kink at k is due to the kink in the earnings-benefit relation. According to the goodness-of-fit tests, there is no evidence of other kinks than the one at k as the p -values are significantly larger than 0.05. Further, none of the point estimates change significantly when covariates are included which suggests that there is no sorting on observables present.

The treatment effect of UI is significant for net financial assets and debt but not for gross financial assets. Thus, the importance of UI to workers' balance sheets is channeled through debt. When UI becomes more generous, workers feel comfortable taking on more debt as the risk of not being able to pay interest after a job loss is lowered the more

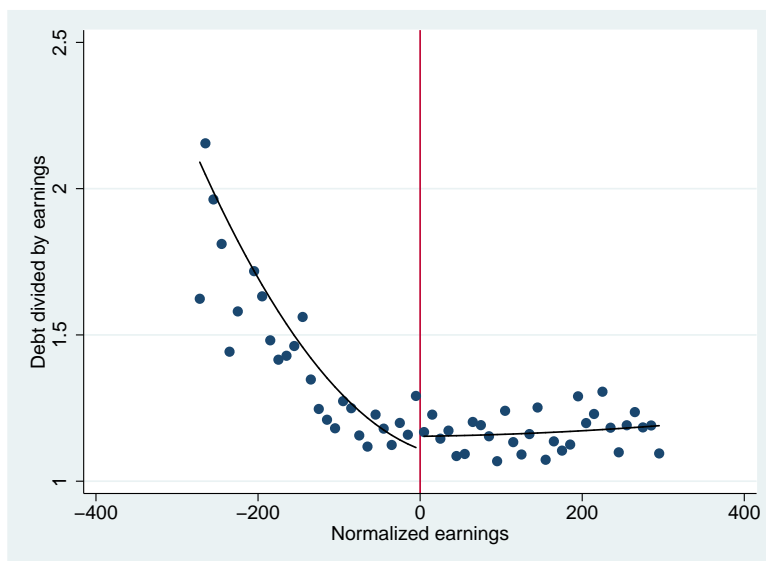


Figure 3: The circles represent the average of debt/income in each bin. A polynomial is added to highlight the relationship between debt and normalized earnings. The line at 0 corresponds to the kink.

generous UI benefits are. The treatment effect show that the net financial assets-to-wage ratio decrease by 0.14 percentage points after a 1 SEK raise in daily UI benefits. This suggests an elasticity of about 1; a one percentage point increase in UI benefits reduce net savings by one percentage point given average daily UI benefits of 680 SEK. Looking at debt, the treatment effect is considerably larger. A 1 SEK raise in daily UI benefits increase the debt-to-earnings ratio by 0.61 percentage points. This corresponds to an elasticity of UI on debt of 4; a one percentage point increase in UI makes debt go up by 4 percentage points.

Decomposition. I now decompose the total treatment effect of UI on assets according to (15). The effects in table 4 from the AIC-preferred specifications are, as above, statistically significant for net financial assets and debt while no impact of UI can be detected on gross financial assets. In addition, the same polynomials are deemed the best by the AIC; the first order specification for net financial assets and the third order polynomial for gross financial assets and debt.

The variance effect of UI on net financial assets is estimated at -0.0049 while the income effect is estimated at $0.0831 \times \hat{\alpha}$. With an average 5 percent risk of being laid off the income effect is 0.0042. The point estimates for debt are given by -0.0081 for the variance effect and 0.0020 for the expected income effect. Further, the estimates from including covariates in the empirical specifications are not significantly different from

Optimal polynomial	NFA	GFA	Debt
RKD Estimate	0.0011* (0.0005)	0.0007 (0.0010)	-0.0049* (0.0024)
Treatment Effect	-0.0014	-0.0009	0.0061
Goodness-of-fit	[0.5279]	[0.4519]	[0.8670]
Optimal polynomial with covariates	NFA	GFA	Debt
RKD Estimate	0.0019*** (0.0005)	0.0002 (0.0003)	-0.0040+ (0.0023)
Treatment Effect	-0.0024	-0.0003	0.0050
Goodness-of-fit	[0.8710]	[0.0846]	[0.9721]
Observations	57,744	57,744	57,744

Table 3: Regression results for assets and liabilities. Estimates of the total treatment effect of UI on assets from the ROT-preferred bandwidth. The number within brackets is the p -value from the goodness-of-fit test. + denotes that the estimate is significant at the 10 percent level, * denotes significance at the 5 percent level, ** denotes significance at the 1 percent level and *** denotes significance at the 0.1 percent level. Robust standard errors in parenthesis.

the those without for net financial assets and debt. This suggests, as above, that no sorting on observables is present in any of the estimations.

What is interesting to note is that both the variance effect and the income effect are statistically and economically significant. Second, given that UI reduces expected income variance, this decrease in income uncertainty has a substantial negative effect on net financial assets and hence a substantial positive effect on debt. However, higher UI seem to increase net financial assets rather than decrease them as expected from the simple two-period model above. The positive effect of expected income on savings is supported by Dynan et al. (2004). Another explanation is Ricardian equivalence. When workers become entitiled to higher UI benefits they might also anticipate a higher future income tax.

The importance of decomposing. How important is it to recognize the two motives that make UI affect saving? How bad a measure of precautionary saving is the total treatment effect? The estimates above allow an assessment of the bias one would get if the two motives that make UI affect saving are not accounted for. First, is the total treatment effect τ_{TE} significantly different from the variance effect τ_{VE} ? The RKD-estimate for τ_{TE} is 0.0012 while the RKD-estimate for the variance effect is $\tau_{VE} = 0.0039$ as shown in table (4). With a standard deviation of 0.0013 for τ_{VE} this gives that

Optimal polynomial	NFA	GFA	Debt
RKD Estimate	0.0049*** (0.0008)	0.0030** (0.0011)	-0.0052* (0.0025)
Treatment Effect	-0.0061	-0.0038	0.0065
Goodness-of-fit	[0.6105]	[0.6444]	[0.9012]
Optimal polynomial with covariates	NFA	GFA	Debt
RKD Estimate	0.0057*** (0.0012)	-0.0009 (0.0010)	-0.0060* (0.0024)
Treatment Effect	-0.0071	0.0011	0.0075
Goodness-of-fit	[0.7678]	[0.5990]	[0.9876]
Observations	57,744	57,744	57,744

Table 4: Regression results for assets and liabilities controlling for UI's influence on income expectations. Estimates of the total treatment effect of UI on assets from the ROT-preferred bandwidth. The number within brackets is the p -value from the goodness-of-fit test. + denotes significance at the 10 percent level, * denotes that the estimate is significant at the 5 percent level, ** denotes significance at the 1 percent level and *** denotes significance at the 0.1 percent level. Robust standard errors in parenthesis.

$\tau_{VE} = 0.0039 \pm 0.0026$ within a 95 percent confidence interval. As $\tau_{VE}^{\min} = 0.0013$ is larger than τ_{TE} , the two estimates are statistically different from each other. Thus, without doing the decomposition the econometrician will underestimate the actual effect that UI has on precautionary saving. Second, comparing the total and decomposed treatment effects for net financial assets, I have that $\tau_{TE}/\tau_{VE} = 0.31$; the total treatment effect only accounts for 31 percent of the effect that UI benefit generosity have on precautionary saving.

This shows that distinguishing between UI's effect on expected earnings and its effect on expected income variance is more important than what previously has been believed. Carroll et al. (2003) acknowledges that unemployment risk, which they consider, affects income expectations also in a certainty equivalence world without precautionary saving. However, they dismiss its impact on savings as "the increase in job-loss probability would have to be maintained for 17 years for our estimates to be in line with this pessimistic scenario from a model without precautionary saving" (p. 598). But this only points towards there being precautionary saving. In addition, in the canonical life cycle model higher expected income lowers saving which is not obvious given the evidence here and in Dynan et al. (2004) referred to above.

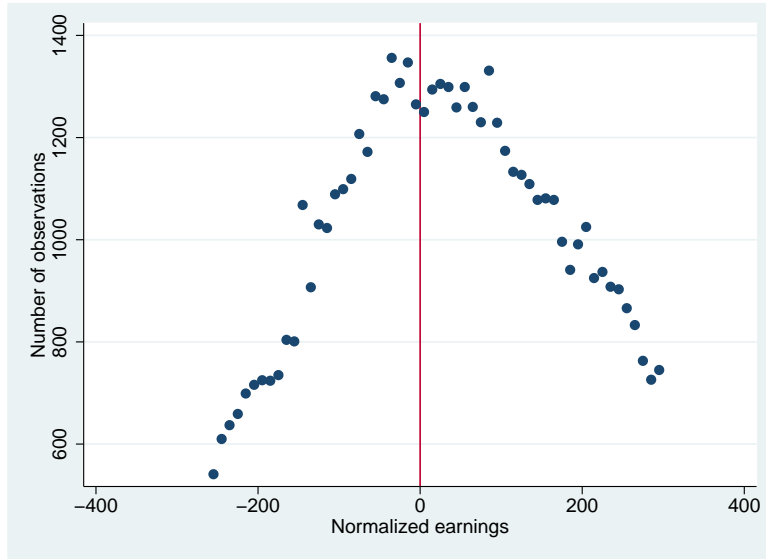


Figure 4: The evolution of the number of observations per bin as a function of normalized earnings for the asset sample. The kink is marked at 0.

5.3 Robustness Tests

To test the robustness of my results, I conduct four robustness tests. I begin with the critical identifying assumption of the RKD; workers cannot manipulate the assignment variable. If so, the distribution of wages should be smooth across the kink in the earnings-benefit relation resulting in randomly assigned UI generosity around the kink k . To investigate whether individuals are randomly assigned around k , I plot the density of the wage distribution after collapsing the sample into wage segments or bins of length 2 SEK. In addition, I fit a fifth-degree polynomial to the plot, computed separately on each side of the kink, which best captures movements in the data.

Figure 4 show no sharp discontinuity around $k = 850$. Rather, the fitted polynomial shows that data behaves the same on both sides of the kink. That $W = k$ coincides with the mode of the distribution does not indicate that individuals sort around k . If so, the incidence of observations should fall rapidly when k is reached. Let N_b be the number of observations per bin. Formally, sorting on unobservables means that $\lim_{W \rightarrow k^+} N_b \neq \lim_{W \rightarrow k^-} N_b$. This can be tested by using a procedure suggested by McCrary (2008) where the number of observations in each bin is regressed on a polynomial of the normalized wage including an interaction term of the normalized wage and the above-the-kink dummy. With no sorting, the estimated coefficient on the interaction term $\hat{\gamma}$ should be statistically insignificant. This is also the case as $t_{\hat{\gamma}} = -0.28$ for the

fifth order polynomial that fits data the best. Combining the evidence from the plot of the wage density and the McCrary test lead to the conclusion that any kink in the relation between wages and assets at k should be attributed to the benefit rule and that UI treatment is as good as randomly assigned around k .

In addition, the risk for sorting around k is reduced due to a reform that took effect on July 1, 2001. Among other changes, the reform raised the benefit cap k by some 17 percent from 725 SEK a day to 850 SEK a day. However, the increase only applied to the first 20 weeks of unemployment which made the system two-tiered in order to maintain job search incentives. By the 21:th week of the unemployment spell, benefits were reduced to the previous maximum amount of 580 SEK a day.

Moving on from sorting on unobservables to sorting on observables, I start by plotting a number of key covariates against earnings to see if there is any changes in the distribution of characteristics around k . The plots are shown in the appendix in figure A3.2. There are slight changes in the distribution of age and the share of married at k . However, any sorting that might be in these covariates is not enough to make treatment effects estimated with and without covariates differ from one another. There is no change in the composition of males around k . For the education variable "share with at most high school education" there seem to be no sorting. For the decomposed model (15) to be identified, $\hat{\alpha} \perp B$ must hold. To test this assumption, I begin by plotting unemployment risk against the normalized wage $W - k$. At $W = k$ there is sign of a kink in unemployment risk. To further investigate whether unemployment risk is affected by UI, I estimate (13) with unemployment risk as the dependent variable. These estimations show sign of a kink when covariates are left out. When covariates are added, all significance disappears. In addition, for none of the models in which the treatment effect of UI is significant, the effect is robust to the goodness of fit test. These results are displayed in table A3.5.

The third robustness test deals with the sensitivity of the results to different bandwidths. In tables shown in the appendix, I re-run the same regression models as above for narrower bandwidths to see in what way the results differ when the distance to the kink becomes shorter. The variance and income effects are alike, both compared to those in table 3 and between specifications with and without covariates. However, the estimates become more imprecise as standard errors rise. The estimates for net financial assets are the most robust across bandwidths as the AIC-preferred specification always shows a negative and statistically significant impact of UI benefits. Debt cannot be seen to react to UI for the narrower bandwidths $h = 200$ and $h = 150$. Gross financial assets are affected by UI when the total treatment effect is estimated. However, the decomposition

is insignificant for all specifications for gross financial assets.

Finally, there might be sample members who are not paying the UI-fund premiums and therefore not eligible to full UI payments in the event of a job loss. As a consequence, the kink k in the earnings-benefit relation does not affect such workers. Assume that a share φ of the sample takes the kink into account as they pay premiums and another share $1 - \varphi$ for which k do not bind. The resulting total treatment effect of UI on assets in models (13) and (15) can then be written as $\varphi\tau_{TE}$ and $\varphi(\tau_{VE} + \tau_{IE})$. With $\varphi < 1$, the estimates are thus understated. However, with $\varphi = 0.96$ in my sample, the small bias that any non-participants cause lays well within the confidence intervals of the estimations.

6 Concluding Remarks

Where the traditional permanent income model with quadratic preferences has failed to explain certain patterns of saving and consumption, models including a precautionary saving motive have gained in relevance (Carroll and Summers, 1991; Carroll, 1997). The presence of precautionary savings behavior in life cycle models has led modern era thought to ask "why do people not save?" and explained it with income risk that is being carried over from the individual on to the public sector via insurance schemes such as UI, health insurance and other welfare programs (Hubbard et al., 1994).

These insights remain highly valid. But, if the effect of the generosity of such programs on precautionary saving should be analyzed, their effect on expected income needs to be taken into account as well. Unless the income effect is considered and removed from the overall effect, the econometrician does not exclusively consider what effect a mean preserving spread or a contraction of the income distribution has on asset accumulation and therefore not exclusively precautionary saving.

This paper sets out to determine the importance of decomposing the effect of UI benefit generosity into an income effect working through individuals' income expectations and a precautionary effect working through the expected income variance. When this decomposition is made, the effect of UI on precautionary net asset accumulation becomes larger compared to a model without decomposition. Not considering that UI raise income expectations leads to an underestimation of the impact of UI on precautionary savings by 70 percent. Consequently, UI affects both expected income and precautionary saving motives and seems to play a large part in determining the amount of assets individuals choose to hold.

Still, reduced form estimations does not allow for any finesse which results in a very

crude assessment of how the expected future stream of UI payments, depending on the likelihood, length and number of future spells, affects saving; a point raised by Engen and Gruber (2001). A further insight into how the state-contingency of UI affects assets could shed some more light on the issue of whether precautionary saving is important to all people all of the time or only to some people some of the time as has been put forward by Browning and Lusardi (1996).

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Appendix

On UI Eligibility

To get an estimate of the eligibility rate, I begin by dividing workers into three groups: those who are UI-fund members through their union membership, those who only participate in the UI-fund and finally those who pay neither of the fees. Call these three groups which constitute the working population (L) Union Members (UM), Fund Members (FM) and Uninsured Workers (UW), respectively, so that $L = UM + FM + UW$.

To estimate the share of employed workers who pay the UI premium, $(UM + FM) / L$, I use figures in Kjellberg (2006 and 2011) which are based on data from Statistics Sweden (SCB) and the Swedish Unemployment Insurance Board (IAF). According to Kjellberg (2006 and 2011), 84 percent of all employed workers between the ages of 25 and 64 were unionized in 2001 and therefore they also paid the UI premium, thus making $UM / L = 0.84$. Numbers on the share of workers who only pay UI premiums FM are only available for 1999 and 2003, not for 2001. In 1999, FM as a share of $UM + FM$ was 11 percent whereas the number had risen to 14 percent in 2003.

Assuming a linear trend in the share of non-unionized UI-fund members during these four years, this makes $UM / (UM + FM) = 0.875$ for 2001. The share $(UM + FM) / L$ is therefore equal to $(UM / L) \times ((UM + FM) / UM) = 0.84 / 0.875$, which is 0.96. These numbers are corroborated by the LINDA-data on unemployed used in Kolsrud (2011) where 7 percent of the Swedish workers aged 25-64 who got laid off in 2001 and 2002 were found to be neither members of a UI-fund nor a labor union, therefore making $(UM + FM) / L = 0.93$.

Figures and Tables

Below I show plots describing the relation between a number of key covariates and normalized earnings as well as all tables on all estimated RK-models.

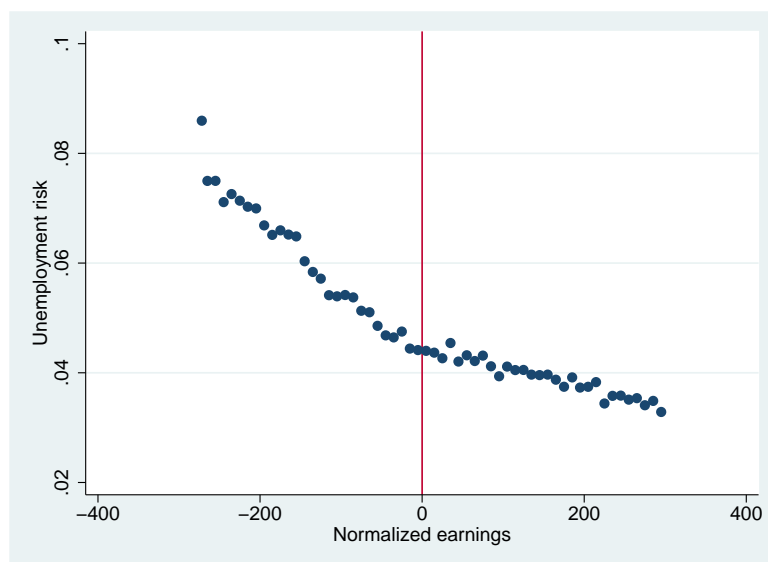


Figure A3.1: The relation between unemployment risk and normalized earnings. The kink is marked at 0.

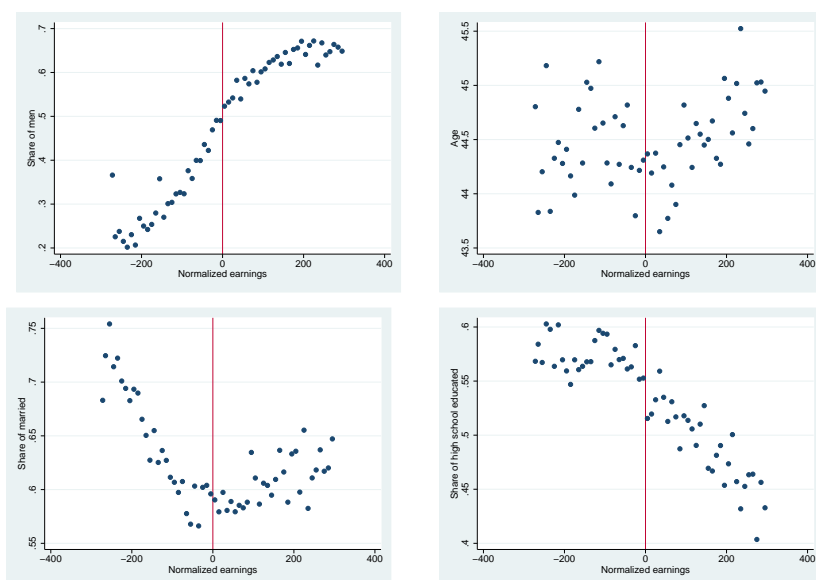


Figure A3.2: Each figure show the evolution of a key covariate across the kink in the earnings-benefit relation. Clockwise from left: share of men, age, share of high school educated and share of married.

Bandwidth	Poly Order	GFA	Debt	NFA	Bandwidth	Poly Order	GFA	Debt	NFA
$h = 300$	1	0.0024 (0.0003)	-0.0010 (0.0003)	0.0011 (0.0005)	$h = 200$	1	0.0015 (0.0004)	-0.0006 (0.0004)	0.0011 (0.0009)
$n = 57,744$		[0.0405]	[0.3369]	[0.5921]	$n = 44,768$		[0.0716]	[0.5495]	[0.4743]
	2	0.0007 (0.0010)	-0.0011 (0.0010)	0.0024 (0.0021)		2	0.0005 (0.0017)	-0.0033 (0.0016)	0.0047 (0.0034)
	3	[0.4519]	[0.6260]	[0.8372]		3	[0.3684]	[0.9614]	[0.5988]
		0.0003 (0.0011)	-0.0049 (0.0024)	0.0040 (0.0051)			0.0039 (0.0041)	-0.0032 (0.0040)	0.0043 (0.0084)
		[0.7295]	[0.8670]	[0.5279]			[0.2870]	[0.8414]	[0.6524]
Optimal Poly		2	3	1	Optimal Poly		1	2	1
$h = 250$	1	0.0024 (0.0003)	-0.0010 (0.0003)	0.0015 (0.0007)	$h = 150$	1	0.0012 (0.0006)	-0.0002 (0.0006)	0.0019 (0.0013)
$n = 52,679$		[0.3183]	[0.8041]	[0.5526]	$n = 35,690$		[0.1183]	[0.7928]	[0.5729]
	2	0.0015 (0.0012)	-0.0019 (0.0012)	0.0014 (0.0025)		2	0.0013 (0.0025)	-0.0037 (0.0024)	0.0058 (0.0051)
	3	[0.5348]	[0.8982]	[0.4519]		3	[0.1221]	[0.5833]	[0.5135]
		0.0019 (0.0030)	-0.0047 (0.0029)	0.0085 (0.0066)			0.0056 (0.0061)	-0.0012 (0.0060)	0.0103 (0.0126)
		[0.6437]	[0.8671]	[0.5041]			[0.0317]	[0.5443]	[0.6209]
Optimal Poly		2	2	1			1	1	1

Table A3.1: Total effect estimates for Financial Assets and Liabilities without Covariates. The first row reports the RKD estimate, the second row the robust standard error and the third row the p -value from the Goodness of Fit test. The optimal polynomial specification recommended by the AIC is also reported.

Bandwidth	Poly Order	GFA	Debt	NFA	Bandwidth	Poly Order	GFA	Debt	NFA
$h = 300$	1	0.0018 (0.0002)	0.0000 (0.0002)	0.0019 (0.0005)	$h = 200$	1	0.0011 (0.0004)	-0.0002 (0.0004)	0.0018 (0.0007)
$n = 57,744$		[0.5418]	[0.0462]	[0.8710]	$n = 44,768$		[0.3197]	[0.9388]	[0.4354]
	2	0.0002 (0.0009)	-0.0006 (0.0007)	0.0020 (0.0017)		2	0.0003 (0.0015)	-0.0022 (0.0014)	0.0038 (0.0027)
	3	[0.0846]	[0.8754]	[0.6082]		3	[0.3339]	[0.9565]	[0.5512]
		0.0010 (0.0022)	-0.0037 (0.0021)	0.0034 (0.0042)			0.0049 (0.0036)	-0.0009 (0.0034)	0.0054 (0.0067)
		[0.6436]	[0.9721]	[0.6660]			[0.3390]	[0.6282]	[0.3858]
Optimal Poly		2	3	1	Optimal Poly		1	2	1
$h = 250$	1	0.0017 (0.0003)	-0.0002 (0.0003)	0.0020 (0.0006)	$h = 150$	1	0.0011 (0.0006)	-0.0007 (0.0005)	0.0026 (0.0011)
$n = 52,679$		[0.0737]	[0.9570]	[0.5580]	$n = 35,690$		[0.0285]	[0.8603]	[0.5494]
	2	0.0005 (0.0011)	-0.0018 (0.0010)	0.0021 (0.0020)		2	0.0017 (0.0022)	-0.0016 (0.0021)	0.0028 (0.0041)
	3	[0.1104]	[0.9545]	[0.5866]		3	[0.0292]	[0.6853]	[0.4909]
		0.0026 (0.0027)	-0.0019 (0.0025)	0.0049 (0.0049)			0.0002 (0.0055)	-0.0001 (0.0052)	0.0058 (0.0102)
		[0.4859]	[0.9832]	[0.6810]			[0.0211]	[0.3689]	[0.3665]
Optimal Poly		2	2	1	Optimal Poly		1	1	1

Table A3.2: Total effect estimates for Financial Assets and Liabilities with Covariates. The first row reports the RKD estimate, the second row the robust standard error and the third row the p -value from the Goodness of Fit test. The optimal polynomial specification recommended by the AIC is also reported.

Bandwidth	Poly Order	GFA	Debt	NFA	Bandwidth	Poly Order	GFA	Debt	NFA
$h = 300$	1	0.0038 (0.0004)	0.0007 (0.0004)	0.0049 (0.0008)	$h = 200$	1	0.0063 (0.0006)	0.0013 (0.0006)	0.0042 (0.0013)
$n = 57,744$		[0.0545]	[0.3987]	[0.6105]	$n = 44,768$		[0.3297]	[0.8238]	[0.5411]
	2	0.0030 (0.0011)	-0.0013 (0.0010)	0.0064 (0.0022)		2	0.0042 (0.0017)	-0.0027 (0.0017)	0.0077 (0.0036)
	3	0.0030 (0.0025)	-0.0052 (0.0025)	0.0077 (0.0052)		3	0.0089 (0.0041)	-0.0027 (0.0041)	0.0080 (0.0085)
		[0.7534]	[0.9012]	[0.5453]			[0.3139]	[0.8736]	[0.6406]
Optimal Poly		2	3	1	Optimal Poly		1	2	1
$h = 250$	1	0.0065 (0.0005)	0.0010 (0.0005)	0.0054 (0.0010)	$h = 150$	1	0.0079 (0.0009)	0.0003 (0.0009)	0.0068 (0.0020)
$n = 52,679$		[0.0932]	[0.6372]	[0.4991]	$n = 35,690$		[0.0921]	[0.7886]	[0.5730]
	2	0.0029 (0.0013)	-0.0019 (0.0012)	0.0055 (0.0026)		2	0.0082 (0.0026)	-0.0031 (0.0026)	0.0109 (0.0053)
	3	0.0057 (0.0030)	-0.0048 (0.0030)	0.0109 (0.0120)		3	0.0021 (0.0036)	-0.0010 (0.0052)	0.0038 (0.0120)
		[0.6511]	[0.9026]	[0.5123]			[0.0214]	[0.5622]	[0.6019]
Optimal Poly		2	2	1			1	1	1

Table A3.3: Variance effect estimates for financial assets and liabilities without covariates. The first row reports the RKD estimate, the second row the robust standard error and the third row the p -value from the Goodness of Fit test. The optimal polynomial specification recommended by the AIC is also reported.

Bandwidth	Poly Order	GFA	Debt	NFA	Bandwidth	Poly Order	GFA	Debt	NFA
$h = 300$	1	0.0012 (0.0005)	-0.0017 (0.0006)	0.0057 (0.0012)	$h = 200$	1	0.0013 (0.0009)	-0.0011 (0.0007)	0.0044 (0.0019)
$n = 57,744$		[0.1089]	[0.9615]	[0.7678]	$n = 44,768$		[0.2788]	[0.9434]	[0.5412]
	2	-0.0009 (0.0010)	-0.0027 (0.0011)	0.0064 (0.0023)		2	0.0006 (0.0018)	-0.0032 (0.0018)	0.0063 (0.0037)
	3	[0.5590]	[0.9685]	[0.7478]		3	[0.3088]	[0.9685]	[0.5684]
		0.0003 (0.0023)	-0.0060 (0.0024)	0.0082 (0.0050)			0.0067 (0.0039)	-0.0038 (0.0039)	0.0097 (0.0081)
		[0.6470]	[0.9876]	[0.6959]			[0.2911]	[0.8241]	[0.5917]
Optimal Poly		2	3	1	Optimal Poly		1	2	1
$h = 250$	1	0.0020 (0.0007)	-0.0014 (0.0007)	0.0058 (0.0014)	$h = 150$	1	0.0012 (0.0014)	-0.0021 (0.0014)	0.0063 (0.0029)
$n = 52,679$		[0.1178]	[0.9832]	[0.6807]	$n = 35,690$		[0.3091]	[0.9611]	[0.5219]
	2	-0.0004 (0.0013)	-0.0035 (0.0013)	0.0059 (0.0027)		2	0.0036 (0.0027)	-0.0048 (0.0027)	0.0116 (0.0056)
	3	[0.4589]	[0.9941]	[0.6949]		3	[0.3106]	[0.8867]	[0.4719]
		0.0032 (0.0029)	-0.0042 (0.0025)	0.0102 (0.0059)			0.0044 (0.0060)	-0.0022 (0.0059)	0.0013 (0.0123)
		[0.5506]	[0.9813]	[0.7008]			[0.1798]	[0.8806]	[0.6461]
Optimal Poly		2	2	1	Optimal Poly		1	1	1

Table A3.4: Variance effect estimates for financial assets and liabilities with covariates. The first row reports the RKD estimate, the second row the robust standard error and the third row the p -value from the Goodness of Fit test. The optimal polynomial specification recommended by the AIC is also reported.

	Poly order	$h = 300$	$h = 250$	$h = 200$	$h = 150$
No covariates	1	-0.0019	-0.0017	-0.0014	-0.0026
		(0.0002)	(0.0003)	(0.0003)	(0.0005)
		[0.0000]	[0.0000]	[0.0004]	[0.0726]
	2	-0.0017	-0.0023	-0.0055	-0.0054
		(0.0005)	(0.0010)	(0.0013)	(0.0020)
		[0.0036]	[0.0086]	[0.0332]	[0.1386]
	3	-0.0078	-0.0104	-0.0069	-0.0035
		(0.0020)	(0.0006)	(0.0032)	(0.0049)
		[0.0290]	[0.0711]	[0.0313]	[0.1234]
With covariates	1	-0.0001	-0.0001	-0.0002	-0.0003
		(0.0001)	(0.0001)	(0.0002)	(0.0002)
		[0.2796]	[0.2087]	[0.3246]	[0.4794]
	2	-0.0000	-0.0002	-0.0002	-0.0009
		(0.0004)	(0.0005)	(0.0006)	(0.0009)
		[0.1768]	[0.1067]	[0.1477]	[0.4493]
	3	-0.0004	-0.0001	-0.0010	-0.0002
		(0.0010)	(0.0012)	(0.0016)	(0.0024)
		[0.1726]	[0.1622]	[0.1515]	[0.2164]
	Optimal poly	3	3	2	1
	No obs	57,864	52,781	44,864	35,765

Table A3.5: Results for placebo test with unemployment risk as dependent variable. The first row reports the RKD estimate, the second row, within parenthesis, the robust standard error and the third row, within square brackets, the p -value from the Goodness of Fit test. The optimal polynomial specification recommended by the AIC is also reported.

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