Wealth, Portfolios, and Unemployment Duration*

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Abstract

We use administrative data on individual balance sheets in Denmark to document how an individual's financial position affects job search behavior. We look at the effect of wealth at the entry into unemployment on the exit rate from unemployment, as well as the effect on the subsequent job stability. We show that if the distinction between liquid and illiquid net wealth is important, the decomposition of wealth between asset and liabilities is key to measure the effect of liquidity on job search behaviors. We show that liquid assets reduce the probability of becoming re-employed, but we do not see an effect of liquid liabilities or the illiquid wealth components, while interest payments speed up re-employment. We show that these stylized facts can be rationalized by a job search model where individuals can simultaneously save and borrow and where we make the distinction between the stock of liabilities and the stock of assets. In this model, greater indebtedness, by lowering net wealth, damages the ability to borrow in employment and thus lowers the consumption level during the first periods of re-employment. This lowers the return of job search and thus the search intensity.

JEL Classification numbers: J6, J64, J65
Keywords: Non-Employment Duration, Wealth Composition, Job Search Behavior

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1 Introduction

In designing government programs such as unemployment insurance the classical trade-off is between efficiency and insurance. Thus, the design requires detailed knowledge about how the program distorts choices. In the case of unemployment insurance, the primary choice affected is job search behavior. How this is affected critically depends on the degree to which workers are able to smooth consumption. However, there is very little empirical evidence on how job search behavior changes when workers have different types and degrees of wealth.

In this paper, we decompose net wealth into the degree of liquidity (liquid/illiquid) and type of wealth (assets/liabilities). We use detailed Danish population-wide data on worker's portfolios and show that such detailed data are essential for the analysis. Using worker fixed effects to control for individual level permanent differences, we show that it is not only important to account for different degrees of liquidity, but also to separate assets and liabilities. When looking at total net wealth, we do not see any effect on the re-employment probability. But this result hides important aspects of how the different wealth components affect the re-employment probability. Decomposing net wealth, we find a significant effect of liquid assets on the probability of becoming re-employed after 12 months. However, we find no significant effects of liquid liabilities or illiquid assets or liabilities. Furthermore, we analyze whether there are non-linearities in the effects of the wealth components and find that, in accordance with standard economic theory, the effect for liquid assets is more pronounced for those with low levels of liquid assets. Individuals who are closer to their borrowing constraint have a higher effect of a marginal increase in liquidity as this increases their possibilities to smooth consumption. Including interest payments in order of controlling for the heterogeneity in the individual interest rates on debt, we find that higher interest payments on liquid liabilities speed up the exit to employment. We also investigate the effects of wealth on the subsequent job match quality in the form of durations of the first job and employment spell and on re-employment wages. We find mixed results.

In order of illustrating how the result that liquid assets matter for the probability of being re-employed, but liquid liabilities do not, we propose a job search model with both assets and debt (liquid liabilities), where workers when employed accumulate debt for precautionary reasons in order of smoothing consumption if they lose their job. We show that the job finding probability is monotonically decreasing in assets, but that it is not monotonically increasing in debt.

Net wealth, that is assets minus liabilities, is the key variable in models that link saving decisions and job search activities (e.g. Lentz and Tranas (2005), Lentz (2009) and Lise (2013)). Usually, these models abstract from the fact that household portfolios differ in terms of liquidity. In their empirical exercises, they pool all assets and liabilities

together (as in Rendon (2006), Lise (2013) or Lentz (2009)[1] for example) or focus on liquid wealth as in Algan, Cheron, Hairault, and Langot (2003). Most of the theoretical papers use net wealth instead of separating assets and liabilities because in a canonical model of precautionary savings it is not optimal to borrow and keep low return liquidity at the same time. At odds with this prediction, Telyukova (2013) states that a little more than a quarter of US households has both credit card debt and liquidity at the same time. In the same way, we find in our data that 71% of the workers hold both liquid assets and liquid debt.[2] Such behavior is only plausible if individuals face income shocks where they cannot borrow and where liquidity is needed to smooth consumption (Telyukova (2013)). We relate our empirical findings to some of this literature by proposing a simple partial equilibrium model of job search, where workers cannot costlessly pay back debt. We use the model to illustrate how some of our empirical findings could arise.

Decomposing net wealth by liquidity is not a new idea in general. The degree of liquidity of the workers' portfolios has indeed been shown to be important for a number of things like the sensitivity of consumption to income shocks or the response to fiscal stimulus (Kaplan, Violante, and Weidner (2014)). Likewise, Gross and Souleles (2002) show that distinguishing the components of individual financial wealth is important to understand consumption behaviors. Our paper contributes to the literature on how wealth affects job search behavior by showing empirically that the portfolio choices are also important for labor market behavior.

Liquid assets are of particular interest. In an environment with credit constraints, precautionary savings are important to smooth consumption in case of unemployment shocks and thus we would expect these to affect the intensity of search effort and potentially the reservation job quality. Hence, a large share of the effect of unemployment insurance generosity could come from its effect on easing the liquidity constraint faced by the unemployed, see Chetty (2008). In this paper Chetty defines sub-groups of job seekers based on liquid wealth net of unsecured debt at the time of job loss. In our paper, we show that such a definition is not without consequences. In particular, liquid assets and liabilities have very different effects on the unemployment duration, which is not captured by the setup in Chetty (2008).

A closely related study is that of Card, Chetty, and Weber (2007). They use a quasi-experiment based on a discontinuity in the eligibility to severance payments in Austria that creates liquidity shocks at the entry into unemployment and measures the effect of liquidity on the exit rate from unemployment. A transfer equivalent to two months of wages at the entry into unemployment is shown to reduce the exit rate by 10% around the discontinuity. Basten, Fagereng, and Telle (2014) use a similar setup by exploiting

[1] Lentz (2009) includes a dummy for real estate holdings, but does not account for the value of this illiquid asset or for the mortgage loans if any.

[2] 80% of workers have both assets and debt at the same time and almost the entire sample (99.6%) has either assets or debt. 71% hold both liquid assets and liquid debt, while 40% have illiquid assets as well as illiquid debt (46% have either illiquid assets or debt).

the same type of discontinuity in severance payments in Norway. They find that the severance payments increase average non-employment durations and lower the fraction re-employed after one year. The advantage of the approach used in the two papers, with respect to previous works, is that it solves the problem of the endogeneity of the wealth variables by using a regression-discontinuity (RD) design. In our paper we cannot exploit such a discontinuity but, since we follow the same individuals over time we rely on a fixed-effect approach combined with a very rich set of control variables. To the best of our knowledge, we are the first to consider how the different components of net wealth affect job search behavior whereas Card, Chetty, and Weber (2007) and Basten, Fagereng, and Telle (2014) only look at liquid assets.

Finally, illiquid assets (housing) and mortgage loans may also have a particular role to play on the labor market. In most countries one cannot easily borrow against real estate holdings, which reduces its value in terms of insurance. In that case, being a home owner could actually reduce mobility on the labor market by increasing the adjustment costs implied by a job change (e.g. Munch, Rosholm, and Svarer (2008), Coulson and Fisher (2009), Winkler (2011), Head and Lloyd-Ellis (2012), Caliendo, Gielen, and Mahlstedt (2015)). On the contrary, mortgage value or at least the interest payments on mortgage loans may speed up the exit from unemployment by constraining consumption smoothing. Again, separating all these different components is likely to matter.

The paper proceeds as follows. Section 2 presents the data used for the estimations and Section 3 outlines the empirical strategy. Section 4 analyzes the results and Section 5 sets up and solves a model of job search and worker portfolio. Section 6 concludes.

2 Data

We use administrative register data from Denmark for the period 1997 to 2011 containing socio-demographic, labor market, and financial information. Our point of departure is the DREAM data set, which records the primary public transfer to all individuals in Denmark each week. From this register we sample all individuals recorded as unemployed at least once. We use a narrow definition of unemployment and only sample those who where not on other public benefits before the beginning of the current unemployment spell, who are on unemployment benefit or social insurance and ready for the labor market.[3] We use this data set to later extract unemployment spells. We merge these data with daily job spell information from a matched employer-employee data set. Finally, these two data sources are combined with yearly socio-demographic information such as detailed information on wealth holdings, interest payments, hourly wages, background characteristics as well as household information. We merge background information in-

[3]Our definition of unemployment includes workers on unemployment benefit and social insurance if they are deemed ready for the labor market. It consists of the following: people on unemployment benefits ('Dagpenge, ledighed'), social assistance and ready to take a job ('Arbejdsmarkedsparate kontanthjælpsbrugere'), transitional benefits ('Overgangsydelse') or special unemployment benefits ('Ledighedsydelse').

cluding financial information onto the unemployment spells using the information at the end of the year prior to the start of the unemployment spell. The financial information is collected by the tax authorities and there is very limited self-reporting. Most of the information is automatically reported by the banks, mortage institutions etc. Thus, the data is considered to be of very high quality.

One of the main advantages of the data is the very detailed information on wealth. We know the portfolio composition of individual wealth and are able to split wealth into assets and liabilities for cash holdings, stocks and bond holdings as well as the cash value of properties owned by the individuals and the amount owed to credit institutions. We use this information to decompose assets and liabilities according to liquidity. The first measure is liquid assets, which consists of bank deposits and stock and bond holdings. Second, we measure liquid liabilities as the amounts owed to credit institutions such as bank or credit card companies. The third measure we use is illiquid assets measuring the value of properties owned by the individuals.[4] Finally, illiquid liabilities measure bond debts capturing primarily mortgage dept. We measure all these variables at the individual annual level.

We only keep the unemployment spells where we also observe wealth data and information on spouses, loosing 1.2% of the spells.[5] This gives us a sample of 2,030,105 unemployment spells experienced by 1,138,898 individuals. Notice that 45.54% of individuals experience more than one unemployment spell while 88.76% of the individuals experience at most three unemployment spells during our sample period. Table 1, 2 and 3 show background information, labor market and financial information and information about the outcomes for the sample used in the main analysis which consists of 1,419,244 observations.[6]

In Table 1 it can be seen that almost 40% of our sample are female and 60% are married or cohabitating with a partner and 40% are singles. We have a bit higher percentage of individuals being single compared to all individuals in Denmark for the same time period, where 35% are single and 65% are married or cohabitating. Almost half of our sample has a high school or vocational education as their highest attained education and 16% have completed college or higher.

Table 2 provides information about the labor market attachment and financial outcomes for the individuals. The mean duration of unemployment is 18 weeks. Workers on average have almost 13 years of experience and 77% are members of an unemployment fund. Average total income the year before the beginning of the unemployment spell is 228,000 DKK (35,000 USD) with 190,000 DKK (29,000 USD) coming from wage income

[4]The value of properties is based on public valuations, which form the basis for property taxation. House and apartment values are updated every second year and individuals can complain if they do not think that the valuation is fair. In general, the tax valuations are thought to be of good quality.

[5]Wealth data is missing for 35,251 observations, i.e. reducing the sample by 0.4 percentage points. Information on spouses is missing for 63,706 observations reducing the sample by 0.8 percentage points

[6]The main sample used is those experiencing multiple spells and whose unemployment spell begins at least 12 months before the end of the sampling period.

Table 1: Descriptive statistics, background information

	Mean	SD
Personal characteristics		
Age	38.36	11.42
Female (%)	39.53	48.89
Single (%)	40.31	49.05
Married/cohabitating (%)	59.69	49.05
Education (%)		
Less than high school	35.95	47.99
High school/vocational education	48.07	49.96
College or more	15.98	36.64
Occupation (%)		
Unknown	25.23	43.43
Military	0.61	7.78
Management at highest level	1.06	10.26
Job requiring knowledge at the highest level	5.97	23.70
Job req. knowledge at the medium level	7.91	26.99
Office jobs	6.88	25.31
Sales/Service/Care	8.90	28.47
Job in agriculture, forrestry, fishing req. basic level knowledge	1.26	11.17
Craftsmanlike jobs	16.97	37.53
Process tech., maschine techm., transportation, construction	11.23	31.58
Other	13.97	34.67
Number of observations	1,419,244	

Note: All variables are measured the year before the beginning of the unemployment spell.

on average.

Our main outcome variable is the probability of being re-employed within the first 12 months after the unemployment spell begins. As can be seen in Table 3, this is the case for 83% of our sample. Furthermore, we investigate the match quality of the job following an unemployment spell by looking at the probability that the first job after re-employment lasts at least one year, that the total employment spell after re-employment lasts at least two years as well as the re-employment wage.[7] The probability that the first job after re-employment lasts at least one year is 32% while the probability of the total employment spell lasting at least two years is almost 30%.[8] Mean re-employment wages are equal to 43,000 DKK (6500 USD) monthly.

[7]Job spell length refers to the length of the first job held after unemployment, while employment spell length refers to the length of the entire spell without breaks in employment. The employment spell can thus consist of several jobs.

[8]On average, the first job lasts a bit more than a year (59 weeks) while the total employment spell lasts almost two years (95 weeks).

Table 2: Descriptive statistics, labor market and financial information

	Mean	SD
Labor market attachment		
Duration of unemployment (weeks)	17.97	21.74
Member of an unemployment fond (A-kasse) (%)	77.23	41.94
Tenure in previous job (weeks)	49.44	69.86
Total experience	12.69	9.12
Experience gained, 1 year before U	0.73	0.32
Experience gained, 2 years before U	0.70	0.35
Experience gained, 3 years before U	0.67	0.37
Degree of unemployment, 1 year before U (%)	12.22	18.83
Degree of unemployment, 2 years before U (%)	12.53	20.76
Degree of unemployment, 3 years before U (%)	13.15	22.07
Other financial variables (in year 2000 DKK)		
Total income	227,662	116,121
Wage income, 1 year before U	189,516	106,318
Wage income, 2 years before U	179,372	112,155
Wage income, 3 years before U	169,228	115,067
Hourly wage, 1 year before U	157	103
Hourly wage, 2 years before U	152	96
Hourly wage, 3 years before U	148	88
Number of observations	1,419,244	

Note: All variables are measured the year before the beginning of the unemployment spell (except the duration of unemployment). All financial values are measured in 2000 DKK prices.

The mean amounts of liquid assets and liabilities are 59,000 DKK (9000 USD) and 90,000 DKK (14,000 USD) respectively. A lot of the individuals have low liquid net wealth which lowers the mean. For the illiquid wealth components, the mean amounts of illiquid assets and liabilities are 316,000 DKK (48,000 USD) and 186,000 DKK (28,500 USD), respectively. A lot of individuals do not have any illiquid net wealth, but those who do tend to hold large amounts. Recall, that this primarily reflects homeownership. On average, individuals receive 1000 DKK (153 USD) in interest payments from banks but pay 6000 DKK (900 USD) to banks and more than 10.000 DKK (1500 USD) to credit institutions.

Figure 1 gives more details about the distribution of the wealth variables. The first graph shows the 10 deciles of the liquid assets and liquid liabilities and the second graph shows the same for the illiquid assets and liabilities. As can be seen from the figure, the distributions of the wealth variables are very different, as expected. Even the individuals in the first decile of the liquid asset distribution hold a positive amount (only 6.7% hold zero liquid assets), but the holdings of liquid assets are in general not large. A larger fraction has no liquid liabilities (22.7% have zero liquid liabilities), but the top 10% owe

Table 3: Descriptive statistics, wealth and outcomes

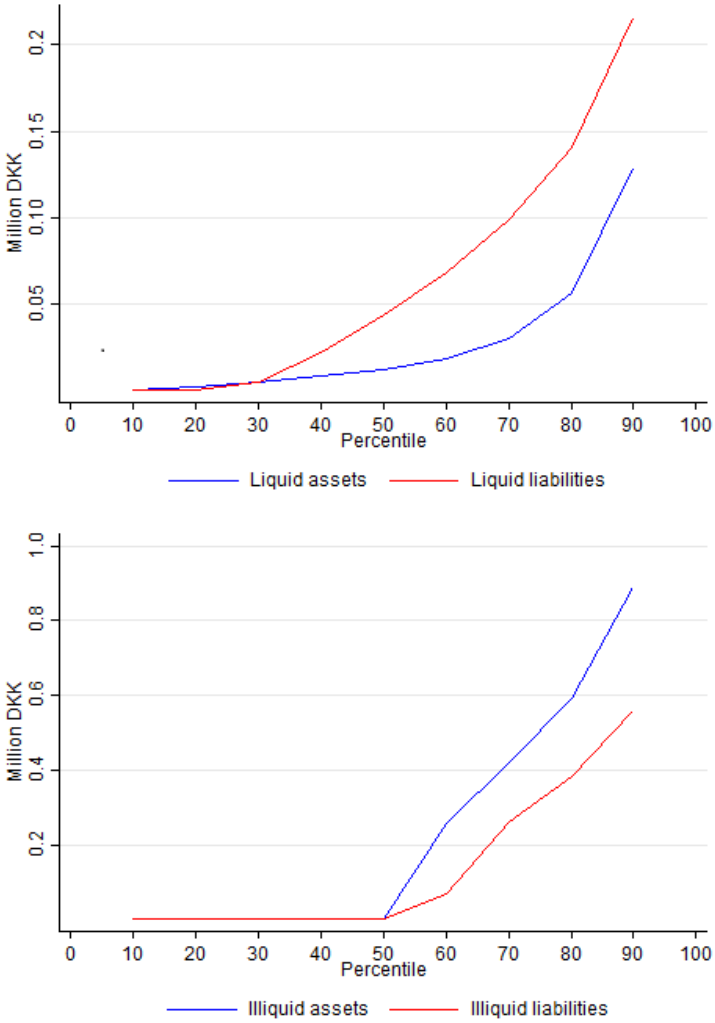
	Mean	SD
Fraction re-employed after (%)		
6 months	70.06	45.80
9 months	78.31	41.21
12 months	82.62	37.90
24 months	90.16	29.78
36 months	92.48	26.37
Match quality of job following unemployment		
First job lasts at least 1 year	32.09	46.68
Total employment spell lasts at least 2 years	29.61	45.65
Re-employment labor income (monthly, year 2000 DKK)	43,105	53,275
Wealth variables (in year 2000 DKK)		
Total net wealth	99,308	500,906
Liquid net wealth	-30,511	286,914
Illiquid net wealth	129,819	390,162
Liquid assets	59,140	226,590
Liquid liabilities	89,651	203,026
Illiquid assets	316,112	581,354
Illiquid liabilities	186,293	336,229
Positive interest payments, banks	1,122	6,329
Negative interest payments, banks	6,363	9,961
Negative interest payments, mortgage institutions	10,603	16,690
Number of observations	1,419,244	

Note: Wealth variables are measured the year before the beginning of the unemployment spell. All financial values are measured in 2000 DKK prices.

almost twice as much as the top 10% of individuals hold in liquid assets. For the illiquid components, a lot of individuals do not hold any positive or negative amounts, i.e. a lot of individuals are not home owners. 55.7% hold zero illiquid assets while 58.8% have no mortgage debt. All wealth variables show considerable dispersion.

The paper by Kaplan, Violante, and Weidner (2014) divides the hand-to-mouth (HTM) households into wealthy HTM and poor HTM. Both groups do not have any net liquid wealth (liquid assets minus liquid liabilities), but only the wealthy HTM households hold positive amounts of illiquid net wealth. Empirically, it is not straightforward to measure the HTM-status of the individuals. One problem is the timing of the measurement of assets and liabilities (for a thorough discussion, see Kaplan, Violante, and Weidner (2014)). Our wealth variables are measured at the end of the year, i.e. the 31th of December. Another problem is that we do not have any information on cash holdings. This will lead us to overestimate the proportion of HTM individuals, as a positive

FIGURE 1: DECILES OF WEALTH VARIABLES



Note: The figure shows the 10 deciles of the four wealth components separately. The top graph shows the deciles for liquid assets and liabilities while the bottom graph shows the deciles for illiquid assets and liabilities.

cash holding could change their HTM-status. This is not likely to be a big problem in Denmark though. Keeping these shortcomings in mind, if we use the definitions from Kaplan, Violante, and Weidner (2014), 62% of the individuals in our sample are HTM. Of these, 63% are poor HTM (no liquid or illiquid net wealth), while 37% are wealthy HTM.[9] So more than half of our sample is measured as being HTM, but this higher share of HTM individuals compared to the results in Kaplan, Violante, and Weidner (2014) might be explained by the fact that we look at a sample of individuals who are becoming unemployed and thus this might not be representative of the entire population. Another reason for this difference could be that it is easier to obtain overdraft facilities in Denmark

[9]This is in contrast to Kaplan, Violante, and Weidner (2014) finding that between 25 and 40% of US households are HTM with one-third being poor HTM and two-thirds being wealthy HTM. For Australia, France, Italy, and Spain the number of HTM are below 20% and still the share of wealthy HTM is larger than poor HTM.

than in the US or other countries.

3 Empirical strategy

Several previous studies have investigated the question of how individual wealth affects job search behavior using proportional hazard models or other models assuming that all unobserved heterogeneity is uncorrelated with observable characteristics. If this is not the case, the estimates will not be consistent. If for example individuals differ in their risk aversion, this is likely to be correlated with their wealth holdings. In this case, the hazard model would not be able to control for such differences, since it only controls for unobserved heterogeneity that is uncorrelated with the independent variables.

We prefer to control for constant unobserved individual heterogeneity that is potentially correlated with the independent variables. To do this, we perform an individual fixed effects estimation. We consider the following equation:

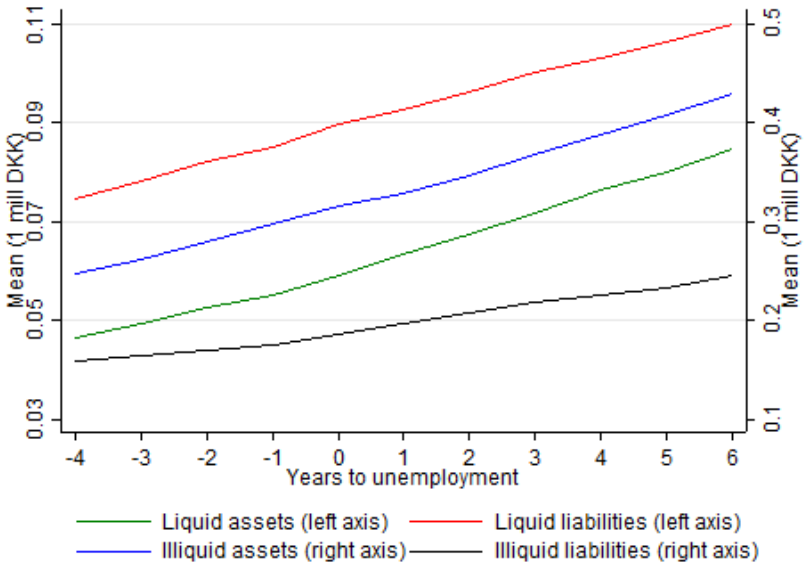
$$Y_{it} = \alpha_i + \gamma_t + f(z_{it}) + \delta x_{it} + \epsilon_{it} \tag{1}$$

where Y_{it} denotes different outcome variables, e.g. the probability of being employed 12 months after initiating the unemployment spell, α_i is an individual fixed effect, γ_t is year dummies, z_{it} is the wealth holdings of the individual, x_{it} contains the control variables and ϵ_{it} is the error term.

Our main coefficients of interest are the effects of the portfolio composition, z_{it}, on job search behavior. Theory would suggest that individuals with higher wealth levels search less hard for a job as they can use some of their savings to smooth consumption. This gives them more time to search for the best job, so besides affecting the unemployment duration directly, it could result in a better job match after unemployment. A main threat to causal identification of the effects of the portfolio choices is selection; both into job search behaviors and wealth accumulation. As argued above, our estimation strategy eliminates any constant unobserved differences between individuals, but there could be other possible threats to the identification strategy. For example, if the individuals anticipate a long unemployment spell, they might borrow liquid assets in advance. This would result in a spurious negative correlation between wealth and the duration of the unemployment spell. We are not able to directly control for this, but looking at the wealth accumulation prior to unemployment, this does not seem to be a huge problem as can be seen in Figure 2.

In general, we would expect that selection would work in the opposite direction of economic theory. While economic theory would suggest that those with high levels of wealth would find a job slower, it is probably the case that these individuals have better unobserved labor market characteristics than those with low levels of wealth. Again, using a fixed effects approach takes care of part of this problem by comparing the same

Figure 2: Wealth accumulation 5 years before and after the beginning of unemployment



Note: Year 0 corresponds to the end of the year before the beginning of the unemployed spell (the year the control variables are measured). Year 1 is the year of the unemployment spell. Year -4 is five years before the year the unemployment spell begins and year 6 is five years after the unemployment spell begins.

individual across different unemployment spells. However, it is still important to have very detailed controls for labor market quality of a given worker.

Our main outcome is the probability of being re-employed 12 months after the beginning of the unemployment spell, but we will also look at 6, 9, 24 and 36 months to check that the choice of 12 months does not drive the results. Appendix A investigates the effects of wealth on the probability of exiting unemployment instead of the probability of becoming re-employed. The results are quantitatively similar to those found using re-employment, but the effects are smaller.

Finally, differences in job search behavior might affect the quality of the resulting job match. To examine this, we proxy the quality of the job following an unemployment spell by looking at the probability that the job or employment spell lasts more than two years. We also look at the re-employment wage in the first job after unemployment.

4 Results

In the following, we estimate the effect of individual wealth on the job finding probability step by step. First, we distinguish between liquid net wealth (bank deposits and stock and bond holdings minus debt to credit institutions) and illiquid net wealth (value of properties minus mortgage debt). We proceed by splitting each type of wealth into assets and liabilities. We look at both linear and non-linear effects of each of the components

and include interest payments for each group. We look at the effect of wealth on the probability to become re-employed and on the match quality in terms of wages, job and employment durations conditional on re-employment.

4.1 Decomposing Wealth

We begin by considering the effect of total net wealth. The first column in Table 4 shows that there is no significant effect of total net wealth on the probability of re-employment. This is a robust finding. We find no effects even if we re-estimate the model for different groups (by gender or marital status for example) or if we look at the probability to find a job after two or three years. Notice, that this is a very precisely estimated zero effect. A one standard deviation increase in total net wealth decreases the probability of finding a job by only 0.05 percent and we reject effects higher than 0.015 percent at a 95 percent level. At first sight this result is surprising, since it contradicts standard economic theory. However, there are several possible explanations. First, it might be that even our multitude of control variables and using individual fixed effects are not enough to control for difference between individuals with different values of net wealth. In this case, we would expect that individuals with a high level of net wealth also have better unobserved labor market characteristics, which would bias the estimate in a positive direction. However, given our set of control variables, we think that this is only a small part of the explanation. Second, economic theory suggests that workers who are better able to smooth consumption find a job at a slower rate since they put less effort into finding a job and because they accept less of the jobs they find. However, total net wealth might not be a good measure of the ability to smooth consumption. For example, if much of the wealth is illiquid then accessing it will be costly. Thus, the effect of wealth on the probability of finding a job probably varies depending on the type of portfolio composition in terms of liquidity that the individual has access to.[10] As such total net wealth is a poor measure for the ability to smooth consumption. Pooling liquid and illiquid net wealth thus renders the identification of any wealth effect very fragile.

In the second column in Table 4 we decompose total net wealth into liquid and illiquid net wealth. Interestingly, we find no effect of illiquid net wealth, but we do find a significant negative effect of liquid net wealth on the probability of being re-employed one year after the entry into unemployment. Notice however, that the estimated effect is still quite small with a one standard deviation increase in liquid net wealth decreasing the probability of re-employment by only 0.2 percent. This result is consistent with standard job search models, where the cost of unemployment is higher for workers with less savings, since they cannot maintain consumption to the same degree as workers who can use their savings as a buffer. This is the case in Lentz (2009), who finds a positive

[10]For example, one strand of the literature has developed around the heterogeneity in the response to fiscal stimulus, see Kaplan, Violante, and Weidner (2014), Kaplan and Violante (2014) or Misra and Surico (2014)

Table 4: The effect of wealth on the probability to find a job within 12 months.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total net wealth	-0.001							
	(0.002)							
Liquid net wealth		-0.006***						
		(0.002)						
Illiquid net wealth		0.002						
		(0.002)						
Liquid assets			-0.022***	-0.034***	-0.021***	-0.018***	-0.020***	-0.022***
			(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Illiquid assets			0.001	-0.020***	-0.007***	-0.002*	-0.002**	0.001
			(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Liquid liabilities			-0.003	-0.004*	-0.004*	0.003*	0.002	-0.003
			(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Illiquid liabilities			-0.003	-0.013***	-0.026***	-0.022***	-0.022***	-0.003
			(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Observations	1,419,244	1,419,244	1,419,244	1,419,244	1,419,244	1,419,244	1,419,244	1,419,244
Personal controls	x	x	x		x	x	x	x
Labor market controls	x	x	x			x	x	x
Financial controls	x	x	x				x	x
Individual FE	x	x	x					x

Note: ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. Results from estimations of Equation 1 using re-employment within the first twelve months as the outcome variable. Wealth variables are expressed in million DKK. Squared terms and zero dummies for the wealth variables as well as month and year dummies are added to all regressions. Personal controls: Age, age^2, female, single vs. married/cohabitating and educational level. Labor market controls: Experience, tenure in previous job, occupation, member of unemployment insurance fund, experience gained each year for the last three years, degree of unemployment each year for the last three years. Financial controls: Total income, wage income each year for the last three years, hourly wage each year for the last three years.

relationship between liquid net wealth and unemployment durations. In his model, this is a result of the search behavior of the workers as he finds that wealthier workers search less. Consistent with the results presented here, Lentz (2009) finds no significant effects of being a home-owner.

Liquid and illiquid net wealth pool assets and liabilities in each category. Economically, the two can have very different effects. For example, two individuals with a total net wealth of 10,000 DKK, where one has liquid assets worth 10,000 DKK and the other has 200,000 DKK in liquid assets and 190,000 DKK in liquid liabilities (debt to e.g. banks) are likely to have different access to credit. In that case, their ability to smooth consumption differs and liquid net wealth can be misleading. Moreover, the distinction between assets and liabilities is necessary if the interest rates on liquid liabilities and on cash holdings or other liquid assets are different. Usually the interest rate on bank deposits is lower than the interest rate paid to credit institutions or on bank loans.

The third column in Table 4 provides results when assets and liabilities are separated for both the liquid and illiquid categories. As in column (1) and (2), we use our full set of controls. Again, in line with the job search theory, liquid assets have a significant and negative effect on the probability of becoming re-employed one year after the beginning of an unemployment spell. Job seekers with more liquid assets at the entry into unemployment have a lower probability of becoming re-employed and the effect is almost five times what we found when using liquid net wealth. Because liquid net wealth pools liquid liabilities and liquid assets, an increase in liquid net wealth can come from a change in both sides of worker's financial position, either an increase in the asset holdings or a decrease in liabilities. On the contrary, separating the two allows us to isolate the effect of an increase in liquid assets. Here, an increase in the amount of liquid assets by 1 million DKK, 150.000 USD, (one standard deviation) decreases the probability of becoming re-employed within the first year by 2.2 (0.5) percentage points. The result that higher liquid assets increase the time spent in unemployment is also found in the papers by Card, Chetty, and Weber (2007) and Basten, Fagereng, and Telle (2014). Both papers exploit a discontinuity in the eligibility to severance payments in Austria and Norway, respectively to create liquidity shocks at the entry into unemployment. In both papers, the increase in liquid assets increases the duration of non-employment. Table 4 shows that there are no significant effects of debt to banks and credit institutions (liquid liabilities), the value of properties (illiquid asset) or of mortgage debt (illiquid liabilities).

Columns (4) to (8) show the estimated coefficients, where different sets of control variables as well as the individual fixed effect are added. Column (8) is the same as column (3). We show this to highlight the importance of using the fixed effect approach even after controlling for a vast set of observable differences. Looking at the effect of liquid assets, we see that once we control for personal characteristics, the effect is rather stable across specifications. For illiquid assets and illiquid liabilities, we see that the effect of higher property value and higher mortgage debt both decrease when adding

more control variables and vanish once the fixed effect is included in the regression. Not taking the unobserved, time-invariant individual heterogeneity into account would lead to different conclusions about the effects of these two variables. The effect of liquid liabilities disappears once all control variables are included. These results show that the inclusion of a vast set of control variables is important and furthermore, it is important to account for unobserved individual heterogeneity.

4.2 Non-linear Effects Of Wealth

In the previous section, we investigated the linear effects of the different components of wealth on the probability to find a job. However, economic theory would suggest non-linear effects to be important as well as for example poor individuals would respond more than wealthy individuals to changes in the wealth components. To include this in the estimation model, we specify a linear spline for each of the wealth components. The knots are chosen in the following way. For each wealth component we create a knot at the 99th percentile, where the percentiles are taken over the non-zero values of that component. We then create intervals $(0, \overline{x}_{99}/5], (\overline{x}_{99}/5, 2\overline{x}_{99}/5], ..., (4\overline{x}_{99}/5, \overline{x}_{99}])$, where $\overline{x}_{99}$ is the value of the 99th percentile. Thus, we have 7 groups: One with zero, five in each of the intervals, and one group with values higher than the 99th percentile. We then create a spline with knots between the intervals and at the 99th percentile and add a dummy for zero. I.e. for liquid assets, la_{it}, we let

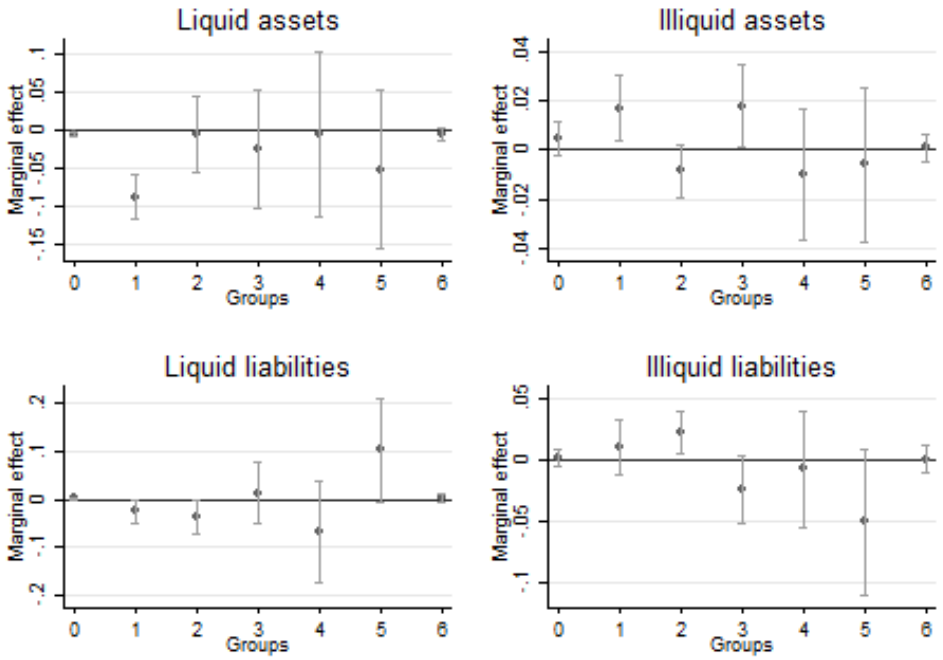
$$f(la_{it}) = \beta_0 \mathbb{1}[la_{it} = 0] + \beta_1 la_{it} + \beta_2 (la_{it} - \overline{la}_{99}/5)\mathbb{1}[la_{it} > \overline{la}_{99}/5] + ... + \beta_6 (la_{it} - \overline{la}_{99})\mathbb{1}[la_{it} > \overline{la}_{99}] \tag{2}$$

where $\overline{la}_{99}$ is the value of the 99th percentile of liquid assets. Thus, the function is continuous except at the value zero. We do the same for all four wealth components and estimate the same model as table 4, column (8) but with the non-linear specification for the wealth components. Figure 3 plots the marginal effects for each group and 95 percent confidence bands. The marginal effect is the effect of having one additional unit (DKK 1 million or USD 150.000) of the wealth component. Notice, that for group 0 it is the effect of having zero of that particular wealth component.[11]

The first graph shows the results for liquid assets. If we focus on group 1-6 which is where we can calculate the marginal effects, we see that the effect of having more liquid assets is lowest at low levels. I.e. for individuals with low levels of liquid assets the effect of having additional liquid assets is higher in the sense that they tend to find a job with a lower probability. This is in accordance with standard economic theory, where a small amount of liquid assets for people who are close to their borrowing constraint, decreases the effort to get out of unemployment and also decreases the acceptance probability as

[11] Figure 6 in the Appendix shows the results when using dummy groups instead of the spline. The results show a similar pattern.

FIGURE 3: MARGINAL EFFECTS OF ASSETS AND LIABILITIES ON THE PROBABILITY TO BE RE-EMPLOYED BEFORE 12 MONTHS.



Note: This figure displays the estimated marginal effects and 95 percent confidence bands, where the four wealth groups are split into groups. The outcome variable is finding a job in the first twelve months after the beginning of unemployment. Month and year dummies as well as individual fixed effects are added. All controls are added (age, age^2, female, single vs. married/cohabitating, educational level, experience, tenure in previous job, occupation, member of unemployment insurance fund, experience gained each year for the last three years, degree of unemployment each year for the last three years, total income, wage income each year for the last three years and hourly wage each year for the last three years).

the additional assets increase the possibility for consumption smoothing.

For the other three groups we find mixed evidence. There is a tendency that at low levels of liquid liabilities there is a marginally significant negative effect on the re-employment probability, but the effect is qualitatively small. One reason why we do not find that liquid liabilities matter for the re-employment probability could be that workers with better access to credit in general are granted bigger loans. Thus, the variable picks up two competing forces. First, the fact that the individual has a big loan in the bank means that the individual is more credit constrained and therefore should search more for a job. Second, since the individual was in the first place able to borrow in the bank, the individual might have better access to credit again because of unobserved heterogeneity. For both illiquid liabilities and illiquid assets we find no clear marginal effects.

4.3 Interest Payments

Besides the wealth components themselves, the possible interest rates earned or paid could also play a part. The size of a loan in itself might not be a good indicator of

the constraints on consumption. What really matters is the financial conditions of the loan, that is its duration and the required monthly payments, not the value of debt in itself. Following that idea, we introduce in our estimations three new variables; the interest payments on mortgage, the interest payments to financial institutions (that is on liquid liabilities) and the interest payments the worker receives from her liquid assets. As usual, the variables are defined the year before unemployment. Table 5 displays the results, where wealth enters linearly and interest payments are included in column (1)-(3) and the results where wealth enters non-linearly and interest payments are included in column (4)-(6).[12] The first column of each specification shows the results without control variables, the second column adds control variables and the third column further adds the individual fixed effect to see how that affects the results.

Table 5: The effects of interest payments on the probability to become re-employed within the first 12 months after unemployment begins.

	(1)	(2)	(3)	(4)	(5)	(6)
	Linear wealth			Non-linear wealth		
Positive interest payments,	-0.058	0.067	0.064	-0.015	0.090	0.097
banks	(0.068)	(0.067)	(0.097)	(0.069)	(0.067)	(0.097)
Negative interest payments,	0.504***	-0.051	0.067	0.440***	-0.102**	0.193***
banks	(0.041)	(0.040)	(0.063)	(0.044)	(0.043)	(0.066)
Negative interest payments,	-0.213***	-0.328***	-0.048	-0.183***	-0.292***	-0.130**
mortgage institutions	(0.035)	(0.034)	(0.051)	(0.037)	(0.036)	(0.053)
Liquid assets	-0.032***	-0.024***	-0.022***			
	(0.002)	(0.002)	(0.004)			
Illiquid assets	-0.019***	-0.005***	0.001			
	(0.001)	(0.001)	(0.002)			
Liquid liabilities	-0.018***	0.004	-0.005			
	(0.002)	(0.002)	(0.004)			
Illiquid liabilities	-0.006***	-0.010***	-0.002			
	(0.002)	(0.002)	(0.004)			
Observations	1,419,244	1,419,244	1,419,244	1,419,244	1,419,244	1,419,244
All controls		x	x		x	x
Individual FE			x			x

Note: ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. This table displays the results from estimations of Equation 1 using the probability of becoming re-employed in the first twelve months after the unemployment spell begins as the outcome variable. Wealth variables are as specified in equation (2). Interest payments are expressed in millions of Danish Kroner. Month and year dummies are added to all regressions. Personal controls: Age, age^2, female, single vs. married/cohabitating and educational level. Labor market controls: Experience, tenure in previous job, occupation, member of unemployment insurance fund, experience gained each year for the last three years, degree of unemployment each year for the last three years. Financial controls: Total income, wage income each year for the last three years, hourly wage each year for the last three years.

When the wealth components enter linearly, (1) shows that higher negative interest

[12]For the non-linear specification, only the effects of interest payments are shown in the table. The non-linear effects of the four wealth components when interest payments are included can be seen in Figure 7 and 8 in the Appendix. The results do not change much compared to Figure 3 above and Figure 6 in the Appendix.

payments to banks increase the probability of re-employment whereas mortgage interest payments decrease the probability. But as can be seen in column (2), adding our controls removes the effect of mortgage payments and the individual fixed effect removes the effect of interest payments to banks in (3). So in the linear specification we do not see an effect of interest payments on the probability to be re-employed. Comparing the effects of the wealth components here to those found in Table 4 (columns (4), (7) and (8)) shows that adding the interest payments does not affect the estimated coefficients of the wealth components much.

Turning to the non-linear specification in Equation 2, we see that the positive interest payments received by the individual do not seem to matter for the probability to find a job no matter what we add as control variables. Interest payments on liquid debt which reduces the resources available for consumption are rather sensitive to the inclusion of control variables. Without any controls, the effect of higher payments on liquid debt increases the job finding probability, but adding all control variables makes the effect negative. However, when we control for constant unobserved individual heterogeneity the effect again becomes positive. Our preferred specification in column (6) thus reveals that higher interest payments on liquid debt do speed up the probability of becoming re-employed. This is in accordance with economic theory. However, the effect is limited. An increase of yearly interest payments by 1 million DKK (150.000 USD) would increase the probability of finding a job in the first year by 19 percentage points. The interest payments on mortgage debt on the other hand are not very sensitive to the inclusion of control variables. The effect is significantly negative and even though the individual fixed effect reduces the estimate, it is still significantly negative.

4.4 Wealth Effects on Match Quality

We now turn to look at what happens after re-employment. The worker's financial wealth at the entry into unemployment, can impact the next employment spell because it impacts the type of job a worker is willing to accept.[13] Empirically, the evidence is scarce. Using a quasi-experiment and Austrian data, Card, Chetty, and Weber (2007) find no evidence of match quality gains for workers who receive a positive liquidity shock at the entry into unemployment. The same is the case in Basten, Fagereng, and Telle (2016), using a lump-sum severance payment in Norway and finding no effects on the length of the new job or the re-employment wage. Confirming the elusive nature of the link between unemployment value and reservation wage/utility, the results on the effect of unemployment insurance generosity on reservation wages and job stability are also mixed (see references in Tatsiramos (2014)).

Table 6 presents the results for three measures of a job's match quality. The prob-

[13]Notice that, even in theory, this is not always true, if the marginal job arrival rates are the same in unemployment and employment, then the reservation wage simply equals the unemployment benefits (Lise (2013)).

Table 6: The effects of assets and liabilities on the match quality of the job following unemployment.

	(1) First job above 1 year	(2) Re-employment spell above 2 years	(3) Re-employment wage
Liquid assets	-0.004	-0.006	-0.002**
	(0.007)	(0.007)	(0.001)
Illiquid assets	0.002	0.010**	-0.001***
	(0.004)	(0.005)	(0.000)
Liquid liabilities	-0.001	-0.018**	0.000
	(0.008)	(0.008)	(0.001)
Illiquid liabilities	0.020***	0.002	0.002**
	(0.007)	(0.007)	(0.001)
Positive interest payments, banks	0.172	0.023	-0.006
	(0.203)	(0.197)	(0.023)
Negative interest payments, banks	0.042	-0.141	0.039***
	(0.129)	(0.130)	(0.014)
Negative interest payments, mortgage institutions	-0.001	-0.179*	0.004
	(0.097)	(0.097)	(0.011)
Observations	865,355	821,352	897,188
All controls	x	x	x

Note: ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. Results from estimations of Equation 1 using the probability of the first job accepted lasting 12 months ore more, the probability of the re-employment spell lasting 24 months or more and the re-employment labor income as the outcome variables and controlling for individual fixed effects. Wealth variables and interest payments are expressed in million DKK. Squared terms and zero dummies for the wealth variables, individual fixed effects as well as month and year dummies are added to all regressions. All controls are added (age, age^2, female, single vs. married/cohabitating, educational level, experience, tenure in previous job, occupation, member of unemployment insurance fund, experience gained each year for the last three years, degree of unemployment each year for the last three years, total income, wage income each year for the last three years and hourly wage each year for the last three years).

ability that the first job accepted lasts more than one year, the probability that the re-employment spell (thus including job-to-job mobility) lasts more than two years, and finally the re-employment wage.

Effects on the duration of the first job and on the duration of the entire re-employment spell are conceptually different. Indeed, if job-to-job mobility is risky, more liquid individuals might be more willing to change jobs and thus could have shorter durations in the first job after unemployment, but longer employment duration on average because they reallocate.

We find very mixed results. Only mortgage debt has an effect on the probability that the first job lasts at least one year. There is no effect of liquid assets on the probability of the first job lasting at least one year or the employment spell at least lasting two years. This lines up with the results found in Card, Chetty, and Weber (2007) and Basten, Fagereng, and Telle (2014) described above. The effect of the value of illiquid assets (properties) is positive for the probability of the re-employment spell being above 2 years

and higher mortgage debt increases the probability that the first job lasts more than one year. Both of these results are in accordance with the idea that being a home owner could actually reduce mobility on the labor market by increasing the adjustment costs implied by a job change (see e.g. Munch, Rosholm, and Svarer (2008), Coulson and Fisher (2009), Winkler (2011), Head and Lloyd-Ellis (2012), Caliendo, Gielen, and Mahlstedt (2015)).

Higher housing value reduces the re-employment wage slightly whereas higher mortgage debt increases the wage. This could be due to the mobility effect described above. Munch, Rosholm, and Svarer (2008) show that being a home-owner has a positive impact on wages but we do not see a clear direction of the effect of being a home-owner in this study. Furthermore, higher liquid assets reduce the re-employment wage but again, the effect is small and only significant at a 5% significance level. We do not find much evidence of an effect of interest payments on the match quality of the following job.

4.5 Robustness

We now return to look at the linear effects of the wealth components on the probability of becoming re-employed and how the results are affected when looking at different groups and using different outcomes. We restrict the model to linear effects to keep the amount of information manageable. We start by showing how the results vary across marital status, education and pre-unemployment wages and afterward, we check how the results are affected when looking at the probability of becoming re-employed within the first 6, 9, 24 or 36 months instead of the first 12 months as is used in the main part of the paper.

The results in Section 4.1 do not control for the fact that individuals can pool risks within households. In practice, risk sharing within households is very common and it is expected to have important consequences for consumption, income and labor supply or the impact of social security (e.g. Ortigueira and Siassi (2013), Blundell, Graber, and Mogstad (2015) or Yum (2018) for recent references). However, there are few direct measures of how labor supply decisions are affected by spouse's wealth. Most of the papers generally pool wealth at the household level while, in principle, sharing is never perfect and can be subject to intra-household bargaining. In Table 7, we re-do the estimations where the four wealth components enter linearly. (1) depicts the results from Table 4 (3), (2) shows the results separately for singles while (3) shows the results for married or cohabiting couples.

There is almost no difference between being single or married/cohabiting for the effect of liquid assets. For both groups the effect is almost the same as for the entire sample. The same is seen for the other wealth components where we do not see any significant differences. Turning to spouses' wealth, we find that if the spouse has a lot of liquid assets then this decreases the probability of finding a job for the individual. A 1 million DKK (150.000 USD) increase in spouse's liquid assets decreases the probability of re-employment for the worker by 0.6 percentage points and a similar increase in the

Table 7: The effects of assets and liabilities on the probability to be re-employed before 12 months for singles and couples.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All	Marital status		Education			Wage	
		Single	Married/cohab.	Low	Medium	High	Low	High
Liquid assets	-0.022***	-0.024***	-0.023***	-0.034***	-0.018***	-0.030***	-0.023**	-0.013***
	(0.003)	(0.007)	(0.005)	(0.009)	(0.005)	(0.007)	(0.010)	(0.004)
Illiquid assets	0.001	0.009*	-0.001	-0.001	0.010***	-0.005	0.006	-0.003
	(0.002)	(0.005)	(0.003)	(0.006)	(0.003)	(0.005)	(0.005)	(0.003)
Liquid liabilities	-0.003	-0.014*	-0.002	-0.002	-0.006	-0.002	0.003	-0.003
	(0.003)	(0.007)	(0.004)	(0.008)	(0.005)	(0.009)	(0.009)	(0.004)
Illiquid liabilities	-0.003	0.000	-0.007	0.011	-0.015***	0.010	0.027***	-0.005
	(0.003)	(0.008)	(0.004)	(0.008)	(0.005)	(0.008)	(0.010)	(0.004)
Spouse, liquid assets			-0.006**					
			(0.003)					
Spouse, illiquid assets			-0.005***					
			(0.002)					
Spouse, liquid liabilities			-0.000					
			(0.003)					
Spouse, illiquid liabilities			-0.004					
			(0.003)					
Observations	1,419,244	572,121	847,123	510,200	682,231	226,813	575,398	843,846
Control variables	x	x	x	x	x	x	x	x

Note: ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. Results from estimations of Equation 1 using re-employment in the first twelve months as the outcome variable. Wealth variables and interest payments are expressed in million DKK. Squared terms and zero dummies for the wealth variables, individual fixed effects as well as month and year dummies are added to all regressions. All controls are added (age, age^2, female, single vs. married/cohabitating, educational level, experience, tenure in previous job, occupation, member of unemployment insurance fund, experience gained each year for the last three years, degree of unemployment each year for the last three years, total income, wage income each year for the last three years and hourly wage each year for the last three years).

spouse's illiquid assets decreases the probability by 0.5 percentage points. Thus, the effects are lower than the direct effect of the worker's own liquid assets indicating that wealth sharing across spouses is not perfect.

For the three educational groups, the table shows that no matter the degree of education, liquid assets have a negative effect on the probability of becoming re-employed within the first year after the unemployment spell begins. Interestingly, the effect is highest for the low and highly educated groups. For either of these groups, a 1 million DKK (150.000 USD) increase in liquid assets decreases the probability of re-employment by more than 3 percentage points. On the other hand, for those with high school or a vocational education both illiquid assets and illiquid liabilities now affect the probability significantly. An increase in the property value increases the re-employment probability whereas an increase in mortgage debt decreases the probability.

Table 8: The effects of assets and liabilities on the probability to have found re-employment after 6, 9, 12, 24 or 36 months.

	(1)	(2)	(3)	(4)	(5)
	Re-employed within (months)				
	6	9	12	24	36
Liquid assets	-0.028***	-0.027***	-0.022***	-0.012***	-0.010***
	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)
Illiquid assets	-0.003	-0.002	0.001	0.002	-0.004**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Liquid liabilities	-0.004	-0.004	-0.003	0.005*	0.005*
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Illiquid liabilities	-0.002	0.001	-0.003	-0.008***	-0.002
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Observations	1,457,592	1,444,850	1,419,244	1,323,383	1,202,278
All controls	x	x	x	x	x

Note: ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. Results from estimations of Equation 1 using re-employment in the first 6, 9, 12, 24 or 36 months as the outcome variable. Wealth variables and interest payments are expressed in million DKK. Squared terms and zero dummies for the wealth variables, individual fixed effects as well as month and year dummies are added to all regressions. All controls are added (age, age^2, female, single vs. married/cohabitating, educational level, experience, tenure in previous job, occupation, member of unemployment insurance fund, experience gained each year for the last three years, degree of unemployment each year for the last three years, total income, wage income each year for the last three years and hourly wage each year for the last three years).

Differences in pre-unemployment wages also affect the results. Those with hourly wages below the median before unemployment have a higher decrease in the re-employment probability compared to the rest. Furthermore, for the individuals with low wage we see a positive effect of mortgage debt.

Next, we investigate how important the choice of the outcome variable regarding the number of months before becoming re-employed is. Table 8 shows the effect of the four

wealth components on the probability of becoming re-employed after 6, 9, 12, 24 and 36 months.

As Table 3 showed, 70% of the sample are re-employed after 6 months, 78% after 9 months, while 83%, 90% and 92% are re-employed after one, two and three years. The negative effect of higher liquid assets is strongest for the probability of being re-employed after 6 months and then slowly drops from 2.8 percentage points to 1 percentage point after three years. As expected, these results indicate that the effect of initial wealth is decreasing as the duration of unemployment increases. When a worker has been unemployed for a longer period of time, the effect of wealth at the beginning of the unemployment spell diminishes. Higher illiquid assets decrease the re-employment probability after three years and higher illiquid liabilities decrease the probability of being re-employed after two years. But the effects are small and there does not seem to be a consistent pattern.

Generally, the choice of how many months after the beginning of the unemployment spell we check whether the individual has found a job does not affect the results much. As most of the sample are re-employed when we look at a time horizon of two years or more, it could be expected that the effects of wealth are not as pronounced as for the other outcomes.

5 Model

In this section, we provide a model of job search and worker portfolio, focusing on the liquid part of the worker's portfolio, excluding real estate and mortgage loans. We do this to illustrate one channel that can explain the result that liquid assets seem to matter for the re-employment probability while liquid liabilities do not. For that purpose, we extent Druedahl and Jørgensen (2018) by adding job-search. To our knowledge this is the first job search model where workers save and borrow simultaneously. The model is meant as an illustration of how the empirical results for the liquid components of wealth found in the previous sections could arise. It also shows that modeling the dynamics of worker's indebtedness can be of interest for studying search behaviors.

5.1 Labor Market

Time is discrete and workers discount the future with the discount factor β. Employed workers always earn an individual specific wage, w_i. Since this does not vary for a given individual there is no on-the-job search. However, unemployed workers can exert an effort e_{it} at a utility cost $c(e_{it})$ to find a job with probability λe_{it}. Notice that λe_{it} is individual specific. In a similar way, an employee looses her job at the end of each period with a probability δ. When unemployed, the worker's income is μw_i, with $\mu \in [0, 1[$.

5.2 Credit Market

A worker saves at interest rate r_a and borrows at interest rate $r_d > r_a$. The state variables at the start of each period are the labor market state, s_{it} (unemployed or employed), the gross stock of assets $a_{it} \geq 0$ and the gross stock of debt $d_{it} \leq 0$. Each period, the worker has to pay interest rates on her debt $r_d d_{it}$ and to reimburse the debt installment γd_{it}. On top of that the worker can adjust its debt level.

When unemployed, an individual can choose to reimburse more than the installment and the next period debt is thus comprised between zero and $(1-\gamma)d_{it}$. Notice however that she can't accumulate additional debt. In employment, the credit constraint is less stringent. Since asset-rich individuals and workers with high incomes are likely to be less constrained on the credit market, we assume that she can borrow up to a limit which is a function of her net wealth $a_{it} - d_{it}$ and her labor income w_i. Formally, next period debt is comprised between zero and $\max\{(1-\gamma)d_{it}, x_1(a_{it} - d_{it}) + x_2 w_i\}$ with $x_1 > 0$ and $x_2 > 0$.

5.3 Value Functions

The value function of an employed worker satisfies

$$W(a_{it}, d_{it}) = \max_{a_{i,t+1}, d_{i,t+1}} u(c^e_{it}) + \beta\delta \left(U\left(a_{i,t+1}, d_{i,t+1}\right) - W\left(a_{i,t+1}, d_{i,t+1}\right)\right) + \beta W(a_{i,t+1}, d_{i,t+1}) \tag{3}$$

with

$$c^e_{it} = w_i + (1+r_a)a_{it} - a_{i,t+1} - r_d d_{it} - \gamma d_{it} + \underbrace{(d_{i,t+1} - (1-\gamma)d_{it})}_{\text{new debt}} \tag{4}$$

$$d_{i,t+1} \leq \max\{(1-\gamma)d_{it}, x_1(a_{it} - d_{it}) + x_2 w_i\} \tag{5}$$

In employment, the worker has access to credit. Each period, she can decide to increase her debt up to a maximum which is a function of her earnings in employment but also her net assets. In this model, borrowing is a way to speed up the accumulation of liquid assets to be used in case of unemployment. The value function of an unemployed worker is given by

$$\begin{aligned} U(a_{it}, d_{it}) = \max_{a_{i,t+1}, d_{i,t+1}, e_{it}} & u(c^u_{it}) - c(e_{it}) + \beta\lambda e_{it} \left(W\left(a_{i,t+1}, d_{i,t+1}\right) - U\left(a_{i,t+1}, d_{i,t+1}\right)\right) \\ & + \beta U\left(a_{i,t+1}, d_{i,t+1}\right) \end{aligned} \tag{6}$$

with

$$c_{it}^{u} = \mu w_i + (1 + r_a)a_{it} - a_{i,t+1} - r_d d_{it} - \gamma d_{it} + \underbrace{(d_{i,t+1} - (1-\gamma)d_{it})}_{\text{new debt}} \tag{7}$$

$$d_{i,t+1} \leq (1-\gamma)d_{it} \tag{8}$$

When unemployed, the individual can only rely on the stock of assets accumulated in the past, possibly through borrowing, to smooth consumption. Since she can decide to only pay the installment, past borrowing relaxes today's constraints on consumption.

5.4 Saving, Borrowing and Searching for a Job

To understand the role of borrowing in the model, remember that in unemployment, a worker is assumed to be unable to borrow more than her current debt minus the installment. To put it differently she has to stay with her current installment loan contract or repay in advance part of her debt. Hence, to smooth consumption, only savings can be used. Formally, borrowing has some value in employment if it relaxes the debt constraints in unemployment (that is the debt limit $(1-\gamma)d$) and speed up the accumulation of precautionary saving. To see that consider the optimal choices in period t, considering first asset choices and then borrowing, and assume that the borrowing constraints are not *currently* binding:

$$\beta^{-1}u'(c_{it}^{e}) = \delta\frac{\partial U\left(a_{i,t+1}, d_{i,t+1}\right)}{\partial a_{i,t+1}} + (1-\delta)\frac{\partial W\left(a_{i,t+1}, d_{i,t+1}\right)}{\partial a_{i,t+1}}$$

$$\beta^{-1}u'(c_{it}^{e}) = -\delta\frac{\partial U\left(a_{i,t+1}, d_{i,t+1}\right)}{\partial d_{i,t+1}} - (1-\delta)\frac{\partial W\left(a_{i,t+1}, d_{i,t+1}\right)}{\partial d_{i,t+1}}$$

In the current period, borrowing or saving are two symmetric choices. Borrowing possibly increases consumption while saving reduces current consumption. Consider then the effects in the next period of today's choices using the envelope conditions and accounting for the possibility that next period, in unemployment, the borrowing constraint can be binding. For the sake of simplicity we assume that no other constraint is binding. First, consider how the choice of $d_{i,t+1}$ affects the intertemporal utilities of tomorrow, where η_{t+1} is the Lagrange multiplier associated with the constraint $d_{i,t+1} \leq (1-\gamma)d_{it}$ in unemployment,

$$\frac{\partial W\left(a_{i,t+1}, d_{i,t+1}\right)}{\partial d_{i,t+1}} = -(1+r_d)u'(c^e_{i,t+1})$$

$$\frac{\partial U\left(a_{i,t+1}, d_{i,t+1}\right)}{\partial d_{i,t+1}} = -(1+r_d)u'(c^u_{i,t+1}) + \eta_{t+1}(1-\gamma)$$

Interestingly, if $\eta_{t+1} > 0$ the value of having more debt today, that is $d_{i,t+1} - (1-\gamma)d_{it} > 0$, can increase the value of unemployment tomorrow. Using the envelope conditions for $a_{i,t+1}$, one finally gets

$$(r_d - r_a)\left(\delta u'(c^u_{i,t+1}) + (1-\delta)u'(c^e_{i,t+1})\right) = \delta\eta_{t+1}(1-\gamma)$$

A high value of the Lagrange multiplier associated with the credit constraint (η_{t+1}) equates to expected low consumption levels in the next period. To sum up, in such an environment, workers borrow today to get extra liquidity and thus relax tomorrow's borrowing constraints. In a way, when borrowing in employment the worker gets an insurance against an unexpected income shock at a cost $r_d - r_a$.

Job search models with savings do not separate savings and debt and only consider net wealth (e.g. Lentz and Tranas (2005) or Lise (2013) among others). In that framework, search intensity decreases with net wealth. Our model delivers a more nuanced message. Obviously, a worker that increases her debt today would benefit from more liquidity tomorrow. However, today's borrowing choices impact tomorrow's credit constraints. For that reason, the usual relationship breaks down. Let's differentiate the optimality condition for search intensity,

$$\frac{de_{it}}{dd_{it}} = \frac{\beta\lambda}{c''(e_{it})}\left(\frac{\partial W\left(a_{i,t+1}, d_{i,t+1}\right)}{\partial d_{i,t+1}}\frac{dd_{i,t+1}}{dd_{it}} + \frac{\partial W\left(a_{i,t+1}, d_{i,t+1}\right)}{\partial a_{i,t+1}}\frac{da_{i,t+1}}{dd_{it}}\right.$$

$$\left. - \frac{\partial U\left(a_{i,t+1}, d_{i,t+1}\right)}{\partial d_{i,t+1}}\frac{dd_{i,t+1}}{dd_{it}} - \frac{\partial U\left(a_{i,t+1}, d_{i,t+1}\right)}{\partial a_{i,t+1}}\frac{da_{i,t+1}}{dd_{it}}\right)$$

Liabilities have two effects, the effect on tomorrow's repayments and the effect on liquidity, and these effects differ according to the labor market state. First, an increase in debt increases the repayments and reduces next period's liquidity which is more costly in unemployment than in employment. This goes towards the expected effect of pushing the individual to increase her search intensity. The ambiguity in the total effect comes from a second element, namely the fact that today's liabilities change the ability to borrow tomorrow. Notice that, if she finds a job then next period borrowing will have to be lower

than $\max\{(1-\gamma)d_{i,t+1}, x_1(a_{i,t+1}-d_{i,t+1})+x_2 w_i\}$. An increase in debt today decreases tomorrow's net wealth $(a_{i,t+1}-d_{i,t+1})$ which is used as collateral when borrowing. By lowering the ability to borrow in employment, and thus lowering future wealth accumulation, it decreases the marginal value of employment. This decrease can offset the decrease in the value of unemployment, inducing a lower search intensity. To put it simply, a greater indebtedness, by lowering net wealth, damages the ability to borrow in employment and thus lowers the consumption level during the first periods of re-employment. This lowers the return of job search. At this stage, it remains to be seen how likely this effect is and we thus propose a numerical exercise in the next subsection showing that this can arise for plausible parameter values.

Finally, notice that, contrary to the stock of debt, an increase in the interest paiments coming from a rise in the interest rate, r_d, unambiguously increase the exit rate from unemployment. Because of the concavity in the utility function, the decrease in consumption it induces is more costly in unemployment.

5.5 Numerical Exercise

We now illustrate the above using numerical simulations. We solve the model by value function iteration. We first discretize the asset state space and debt state space by constructing a grid vector of one hundred points for each of the state variables.[14] Remember that we assume no default which implies that some borrowing choices could not be sustainable if they induce the worker to be insolvent at some point in the future. To determine the feasible choice set, following a similar idea by Druedahl and Jørgensen (2018), we first consider a finite horizon version of the model. In the last period, the individual repays her remaining debt and consumes her remaining savings/income. This determines a first set of asset/debt couples. Then we iterate recursively on the optimal choices for 1000 periods such that at the end, for each point of the choice set there is an optimal saving-borrowing path where the worker is never insolvent, even in the worst case scenario.[15] Given the feasible choice set, we finally solve our model by iterating on the value functions.

Table 9: Parameter values

	w	μ	σ	λ	δ	β	r_a	r_d	x_1	x_2
Values	1	0.5	4.62	0.6	0.05	0.9957	0.0016	0.0048	0.5	0.5

Note: The table shows the parameter values used in the numerical simulations.

The utility function is assumed to be CRRA, $u(c) = \frac{c^{1-\sigma}}{1-\sigma}$, the cost function is quadratic

[14] We create the grid vectors by putting more points around 0 and by checking that a change in the state space doesn't change the policy functions and quantitative predictions.

[15] The number of periods used for the recursion has to be large enough such that the choice set obtained recursively does not change when the number of periods increases.

($c(e) = 0.5e^2$) following the results of Christensen, Lentz, Mortensen, Neumann, and Werwatz (2005), and the parameters are calibrated at the values displayed in Table 9. The model is solved/simulated at a monthly frequency. The discount rate corresponds to five percent annually. The wage is normalized to one, the interest rate on asset corresponds to 1.92% annually while the interest rate on debt is 5.9%: the interest rate spread is thus relatively limited. The minimum repayment share γ is 1% per month, the collateral limit x_1 equals 50% and the part of the credit limit related to income, x_2, is 50% of the monthly wage. The individual faces a destruction rate of 5%, a marginal search efficiency parameter $\lambda = 0.6$ and a replacement rate of 50%.

Put together, this implies at the steady state an unemployment rate of 6.8% and a proportion of borrowers-savers ($a > 0$ and $d > 0$) of 95.7%.[16] Notice, that if one would have considered a destruction rate of 2% with the same search efficiency the unemployment rate would have been 2.1% and the share of savers-borrowers would have dropped to 70.1%. This proportion is a direct function of labor market risks. Remember that in more canonical frameworks, keeping low interest assets and holding high interest debt at the same time violates the no-arbitrage condition. Here, the risk of unemployment and the fact that the credit constraint becomes tighter in unemployment give a rational for this apparent puzzle. In the steady state, and for our chosen calibration, assets and debt are positively correlated. This is not always the case. This can easily be explained by the fact that if having liquidity reduces the need to borrow, borrowing is also used to increase the stock of liquidity. These are two sides of the same coin and, in equilibrium, which of the two dominates for the overall population depends on the labor market risks, interest rates and worker preferences.

To give a better sense of the saving/borrowing choices, we simulate an individual starting in employment with zero assets and no debt. She saves and borrows according to the optimal choice functions and we assume that she stays employed for four years after which she looses her job and becomes unemployed for one year (which is very unlikely given her calibration but this allows us to observe a complete path of dis-accumulation). After that, she becomes re-employed. The assets, debt and net wealth trajectories are displayed in Figure 4.

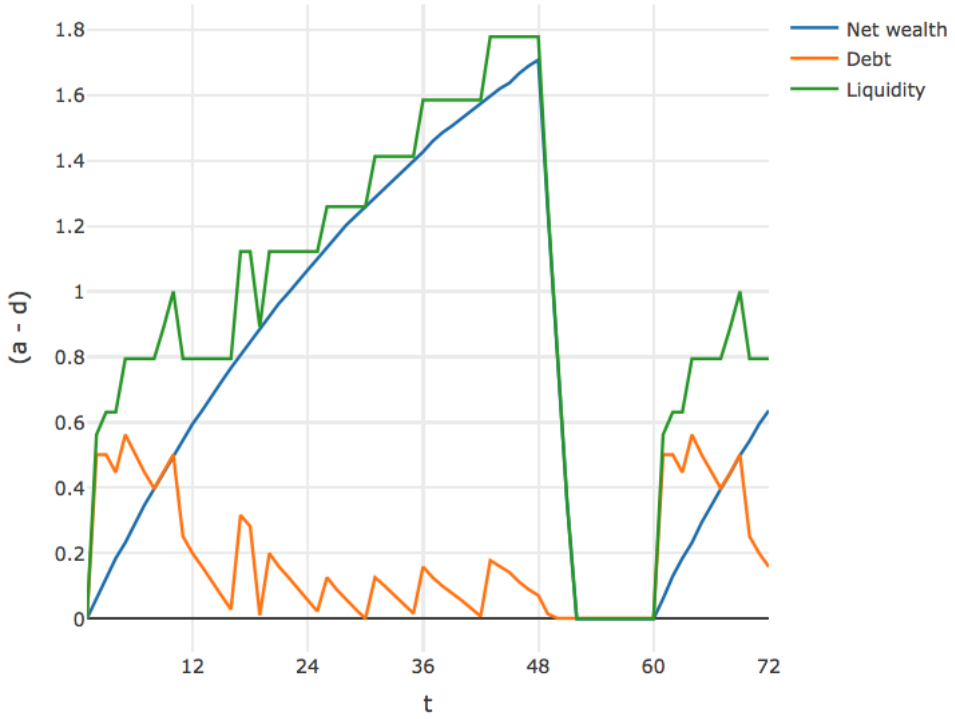
Interestingly, net wealth evolves smoothly with time and in the expected way: It increases in employment[17] and then decreases in unemployment.If we now separate liquid assets and debt, we see that debt is used to speed up accumulation in case of unemployment. Liquidity follows a step function where the worker borrows to reach the next step and then repays over a few months. The borrowing is more pronounced at lower assets level where unemployment would be very costly.

Looking at job search when unemployed, the probability of finding a job in period t,

[16] We simulate 1000 workers for 1000 periods. They all start in unemployment with no assets and no debt. The last period is used to compute the aggregate moments. We check that the numbers do not change when we increase the number of periods ensuring we reached a steady state.

[17] It would have reached a maximum after a while if the worker had stayed long enough in employment.

FIGURE 4: SAVING AND BORROWING



Note: The figure shows simulated trajectories of assets, debt and net wealth for a worker being employed for the first 48 months, then being unemployed for 12 months and finally becoming re-employed again.

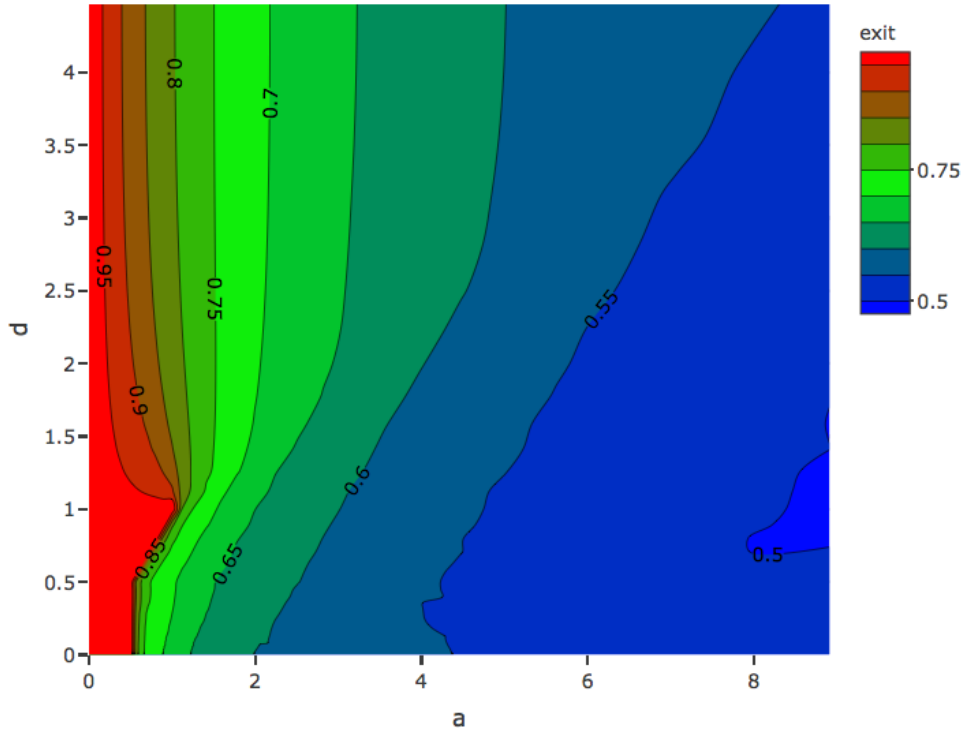
$\lambda e(a_t, d_t)$, is a function of assets and debt. Figure 5 displays the function contour plots. It makes apparent that if the exit rate seems to be a decreasing function of the asset level, it is *not* monotonic with respect to the individual degree of indebtedness. There are many (a, d) regions where an increase in d, hence a decrease in net wealth, would *decrease* the worker's search intensity and exit rate. This is consistent with our empirical findings. In our model this comes from the fact that an increase in d increases the credit constraint in the next period and thus decreases the ability for the worker to regain a high consumption level in employment, limiting the returns to job search.

This section has shown that it is possible to create a model allowing for workers to save and borrow simultaneously as is seen in the data but omitted from standard job search models. In our calibrated model, we have shown that the job finding rate is a monotonically decreasing function of assets. However, it is not a monotonically increasing function of debt. This is consistent with our empirical analysis, where we find that liquid assets matter, but that liquid liabilities do not.

6 Conclusion

This is one of the first papers to have shown that the portfolio composition of the unemployed workers affects their job search behavior. The decomposition of wealth into liquid

Figure 5: Worker's Wealth and the Exit Rate from Unemployment



Note: The figure shows how the probability of finding a job in period t is a function of the asset and debt levels.

and illiquid assets and liabilities is important to understand how wealth affects the exit rate from unemployment. In particular, we have shown that higher liquid assets decrease the probability of becoming re-employed within the first year after the beginning of the employment spell whereas higher interest payments on bank loans speed up the exit to employment when we allow for non-linear effects of the four wealth components.

The result that higher liquid assets decrease the probability of re-employment was stable across educational levels, the pre-unemployment wage level as well as the marital status of the individual. Furthermore, the effect was not driven by the choice of looking at the re-employment probability after one year but was present for being re-employed from 6 months to 3 years after the beginning of the unemployment spell. On the contrary, the value of owning a house and the mortgage debt did not have significant effects on the probability of exiting unemployment. As liquid assets prolonged the time spent in unemployment, we investigated whether this had any effect on the subsequent job match quality. This could be expected as individuals with higher liquid assets could spend more time searching for the best job match while still maintaining a high consumption level. Similar to previous research on the subsequent job quality (see e.g. Card, Chetty, and Weber (2007) or Basten, Fagereng, and Telle (2014)), we did not find any clear pattern of wealth on the match quality of the job after re-employment.

The main finding is that the re-employment probabilities depend negatively on liquid

assets, but not on liquid liabilities or illiquid wealth. To illustrate how this result could arise, we presented a theoretical model, where workers chose to save and borrow at the same time. To our knowledge, we are the first to develop such a model. In this framework, greater indebtedness, by lowering net wealth, damages the ability to borrow in employment and thus lowers the consumption level during the first periods of re-employment. This can lower the return of job search and thus the search intensity. Using a calibrated version of the model, we showed that the search effort is generally a monotonically decreasing function of assets. However, as predicted, it is not a monotonically increasing function of debt. This was consistent with our empirical analysis, where we found that liquid assets mattered, but that liquid liabilities did not.

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Appendices

A Probability of Exiting Unemployment

In this appendix we will show how the results change when we use the exit from unemployment as the outcome variable instead of the re-employment probability. When looking at exiting unemployment individuals can exit to the following states; Employment, Education, Retirement, Other public benefits, or Non-participation. The frequencies for each of the exit states can be seen in Table 10. The table shows that 62% exit to employment

Table 10: Exit states

	Frequency	Percent
Employment	876,010	61.72%
Education	15,419	1.09%
Retirement	13,177	0.93%
Other public benefits	398,960	28.11%
Non-participation	115,678	8.15%

Note: The table shows the possible exit states after the unemployment spell ends.

whereas 28% exit to other public benefits. Notice, that even if the individual exits to other public benefits the individual could easily find a job later. In Table 11 we show the probabilities of exiting from unemployment within 6, 9, 12, 24 and 36 months as well as the probabilities for becoming re-employed (i.e. exiting to employment) from Table 3.

Table 11: Probability of exiting from unemployment within 6, 9, 12, 24 and 36 months.

	Mean	SD
Fraction exiting unemployment after (%)		
6 months	77.87	41.51
9 months	87.99	32.51
12 months	92.81	25.83
24 months	99.04	9.76
36 months	99.80	4.49
Fraction re-employed after (%)		
6 months	70.06	45.80
9 months	78.31	41.21
12 months	82.62	37.90
24 months	90.16	29.78
36 months	92.48	26.37

Note: The table shows the probability of exiting from unemployment within 6, 9, 12, 24 and 36 months after the beginning of the unemployment spell.

As can be seen from the table, the fraction exiting unemployment before a given month is of course larger than the fraction exiting to employment. To have a comparable fraction of observations where an exit is observed, Table 12 shows the effect of wealth on the probability of exiting unemployment within 9 months after the unemployment spell begins. The fraction exiting to unemployment after 9 months is 88% whereas the fraction exiting to employment after 12 months which is the main outcome in Section 4 is 83%.

In Table 12 we replicate Table 4, but using exiting unemployment as the outcome instead of finding a job.

Table 12: The effect of wealth on the probability of exiting unemployment within 9 months.

	(1)	(2)	(3)
Total net wealth	-0.002		
	(0.001)		
Liquid net wealth		-0.001	
		(0.002)	
Illiquid net wealth		-0.002	
		(0.002)	
Liquid assets			-0.009***
			(0.003)
Illiquid assets			-0.001
			(0.002)
Liquid liabilities			-0.007**
			(0.003)
Illiquid liabilities			0.003
			(0.003)
Observations	1,444,850	1,444,850	1,444,850
Personal controls	x	x	x
Labor market controls	x	x	x
Financial controls	x	x	x
Individual FE	x	x	x

Note: ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. Results from estimations of Equation 1 using exit within the first nine months as the outcome variable. Wealth variables are expressed in million DKK. Squared terms and zero dummies for the wealth variables as well as month and year dummies are added to all regressions. Personal controls: Age, age^2, female, single vs. married/cohabitating and educational level. Labor market controls: Experience, tenure in previous job, occupation, member of unemployment insurance fund, experience gained each year for the last three years, degree of unemployment each year for the last three years. Financial controls: Total income, wage income each year for the last three years, hourly wage each year for the last three years.

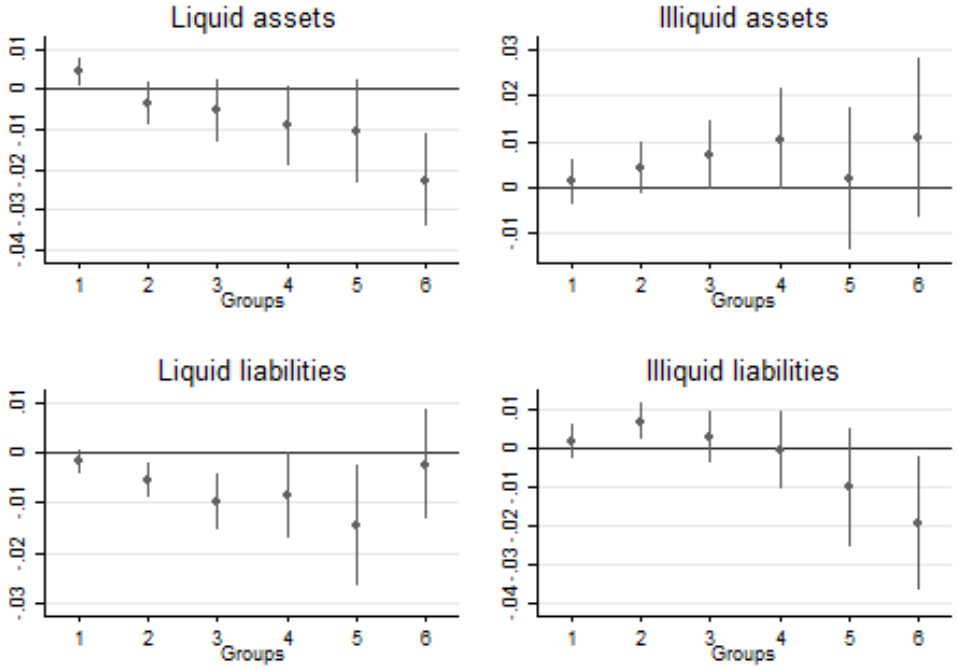
Table 12 shows no effect of total net wealth. This is similar to the results from Table 4. When splitting total net wealth into liquid and illiquid net wealth, no effect on the probability of exiting unemployment is found for either of these variables. In Table 4 we saw that there was a small but significantly negative effect of liquid net wealth on the probability of becoming re-employed. If we look at the effect of the four wealth

components on the probability of exiting unemployment within the first 9 months, we see that there is a negative effect of liquid assets. This effect is smaller than the effect of liquid assets on the probability of re-employment within 12 months, which was found to be 2.2 percentage points. Furthermore, Table 12 shows a negative effect of liquid liabilities on the probability of exiting unemployment. This is only significant at a 5% significance level though. In general, the effects of the wealth components on the probability of exiting unemployment are smaller than the similar effects of the wealth components on the probability of becoming re-employed, but qualitatively the results are similar.

B Non-linear Effects using Dummy Groups

This appendix shows the non-linear effects estimating the same regression as for Figure 3, but using dummy groups instead of the spline. We show the results from this specification in Figure 6. Notice, that group 0, which is the reference group, and group 6 is special. Group 0 has zero of the wealth component, while the individuals in group 6 are those with an extreme amount, i.e. higher than the 99th percentile.

FIGURE 6: NONLINEAR EFFECTS OF ASSETS AND LIABILITIES ON THE PROBABILITY TO BE RE-EMPLOYED BEFORE 12 MONTHS USING DUMMIES.



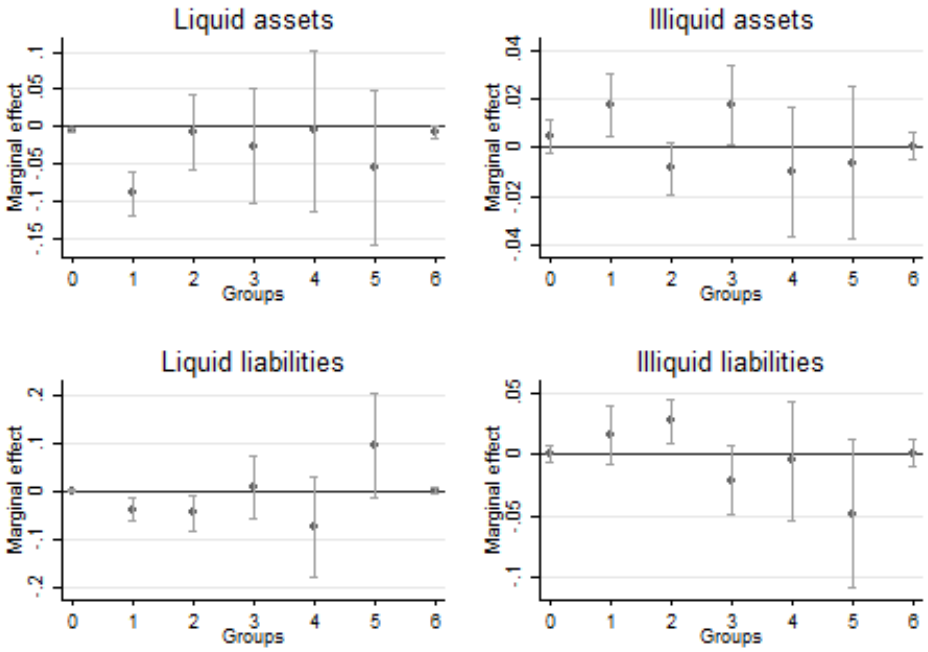
Note: This figure displays the estimated coefficients and 95 percent confidence bands, where the four wealth groups are split into groups and dummies for each group are used. The outcome variable is the probability of becoming re-employed in the first twelve months after the unemployment spell begins. Month and year dummies as well as individual fixed effects are added. All controls are added (age, age^2, female, single vs. married/cohabitating, educational level, experience, tenure in previous job, occupation, member of unemployment insurance fund, experience gained each year for the last three years, degree of unemployment each year for the last three years, total income, wage income each year for the last three years and hourly wage each year for the last three years).

Looking first at liquid assets, we again find a clear effect. The more liquid assets the lower is the re-employment probability and the effect is clearly decreasing in the groups. For liquid liabilities we find a significant cumulative effect, i.e. having liquid liabilities in group 5 significantly decreases the re-employment probability compared to being in group 0. But the pattern is less clear than for liquid assets.

Again, for the illiquid variables we find no clear pattern.

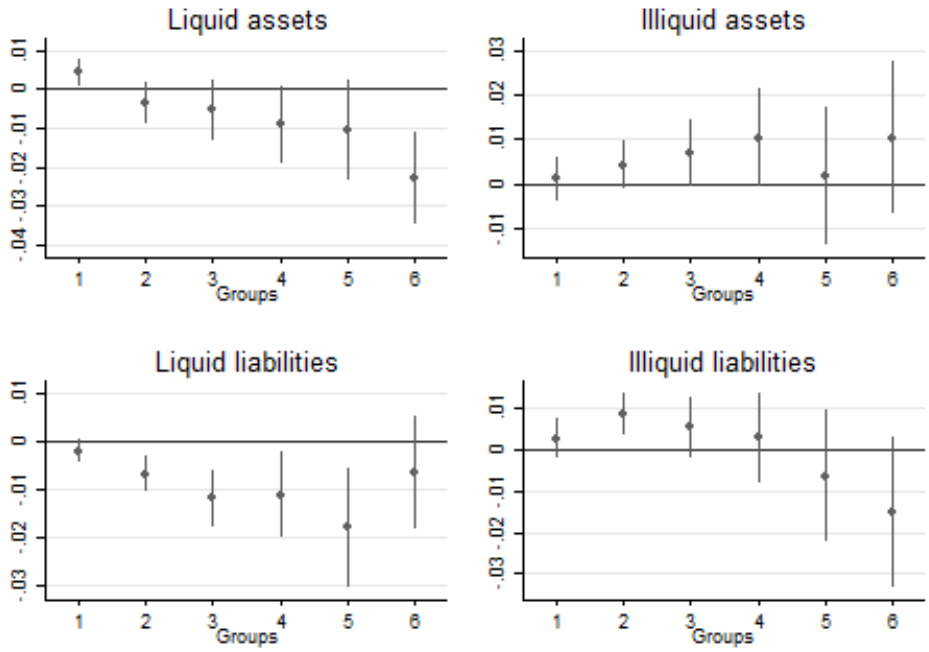
C Non-linear Effects Including Interest Payments

Figure 7: Marginal effects of assets and liabilities on the probability to exit unemployment before 12 months including interest payments.



Note: This figure displays the estimated marginal effects and 95 percent confidence bands, where the four wealth groups are split into groups. The outcome variable is finding a job in the first twelve months after the beginning of unemployment. Interest payments, month and year dummies as well as individual fixed effects are added. All controls are added (age^2, female, single vs. married/cohabitating, educational level, experience, tenure in previous job, occupation, member of unemployment insurance fund, experience gained each year for the last three years, degree of unemployment each year for the last three years, total income, wage income each year for the last three years and hourly wage each year for the last three years).

Figure 8: Nonlinear effects of assets and liabilities on the probability to become re-employed within the first 12 months after unemployment begins using dummies and including interest payments.



Note: This figure displays the estimated coefficients and 95 percent confidence bands, where the four wealth groups are split into groups and dummies for each group are used. The outcome variable is the probability of becoming re-employed in the first twelve months after the unemployment spell begins. Interest payments, month and year dummies as well as individual fixed effects are added. All controls are added (age^2, female, single vs. married/cohabitating, educational level, experience, tenure in previous job, occupation, member of unemployment insurance fund, experience gained each year for the last three years, degree of unemployment each year for the last three years, total income, wage income each year for the last three years and hourly wage each year for the last three years).