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The Effects of Savings on Reservation Wages and Search Effort

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The effects of savings on reservation wages and search effort*

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Abstract

This paper discusses the interrelations among wealth, reservation wages and search effort. A theoretical job search model predicts wealth to affect reservation wages positively, and search effort negatively. Moreover, the model shows that reservation wages have a negative effect on search effort, thereby also predicting an *indirect* negative effect of wealth on search intensity. A simultaneous-equation model for wealth, reservation wages and search intensity takes these theoretical results to the data. The data used is a Dutch panel, containing detailed information on individual wealth and income, subjective reservation wages and proxies for search effort. The main empirical results show that wealth has a significantly positive effect on reservation wages, though it has no significant effect on search effort. Since reservation wages do have a significant negative impact on search effort, the wealth-effect on search effort only takes place indirectly, via an increased reservation wage.

Keywords : Search, Reservation Wages, Wealth, Consumption Smoothing.

JEL classification : C30, C36, D01, J64.

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1 Introduction

With the curtailment of social security systems in most countries, individuals have to rely more and more on their individual savings. In particular, the aging of society is a well-known problem that puts pressure on the welfare state. As individuals see governmental generosity decline, it becomes vital to accrue wealth by themselves, for example in order to save up for early retirement, or to overcome a spell of unemployment. It is therefore of increasing importance to allow for effects of savings in theoretical and empirical models of the labour market. Being one of the main strands of literature in studies of the labour market, job search models usually fail to take the savings decision into account. In a standard job search model there is no need for savings since individuals are assumed to maximize *income*, implying workers to be risk neutral. If instead, as is standard in virtually all other fields in macro- and microeconomics, it is assumed that risk-averse individuals try to smooth consumption over their life, savings do become an essential part of the job search model.

Danforth (1979) is the first to consider the effect of a savings decision in a model where a utility-maximizing agent engages in costly search. He shows that in the case of a decreasing absolute risk aversion (DARA) utility function, rich unemployed individuals have higher reservation wages, thereby decreasing the probability that they are employed the next period. Recently, there have been some advances in studies of search that include a savings decision. These models either focus on the effect of assets on reservation wages (Berloffa and Simmons, 2003; Blundell et al., 1997; Rendon, 2006), or they abstract from a reservation wage decision and focus on the choice of search effort only (Lentz and Tranaes, 2005a). In the last case, the negative effect of wealth on the probability to transit to employment is driven by a decreased willingness to search. An exception is Lise (2011), who allows individuals to choose both the reservation wage and search effort. However, since in his model the reservation wage is equal to unemployment benefits and therefore assumed constant, there is no scope for any effect of wealth on reservation wages. Mortensen (1986) shows that reservation wages decline with time spent in unemployment, as a liquidity constraint becomes more binding. Moreover, in a model without a liquidity constraint but with endogenous search, he shows that an increase in the reservation wage decreases search effort.

In this paper, a theoretical model describes the relations among wealth, search, and reservation wages. The model makes it possible to disentangle the various effects of savings on reservation wages and search intensity: wealth affects reservation wages positively. Moreover, reservation wages have a negative impact on search intensity, such that there is also an indirect negative effect of wealth on the willingness to search. However, the direct effect of wealth on search effort is unsigned and depends on the way search costs enter the model and on functional form assumptions of the utility function.

The empirical models in this paper build on these theoretical predictions. The models allow wealth to have a direct effect on reservation wages, and both a direct and an indirect effect on search effort. The estimation uses survey-data from a Dutch panel of households which contains detailed information on the key variables of the empirical model. Subjective information on reservation wages disposes of the need to rely on theoretical restrictions to generate reservation wages. The results can therefore be interpreted generally.

A measure of search intensity is also available: individuals are asked for the number of job applications they made in the two months prior to answering the questionnaire. Moreover, detailed information on wealth and income of individuals is documented in the survey. This data therefore provides the means to study the interrelations among wealth, income, reservation wages and search behaviour empirically.

The empirical analysis starts by estimating two single equations: one for the reservation wage and one for search effort. Subsequently, an IV-method instruments wealth with variables that are exogenous to the reservation wage and search effort. An index for the regional value of the house serves as one of the instruments. Finally, a three-equation simultaneous equation model allows for error correlation between wealth, the reservation wage and search effort. Moreover, this model takes into account that the reservation wage is endogenous to search effort.

Devine and Kiefer (1991) show that the probability to *accept* a job offer plays a much smaller role than the probability to *get* a job offer in explaining transitions into employment. In contrast, our main empirical results show that the effect of wealth on the probability to transit into employment is primarily driven by the positive effect of wealth on reservation wages (which decreases the probability to *accept* a job offer), and not by an effect on search effort (which affects the probability to *get* a job offer). The negative (though insignificant) effect of wealth on search effort found by Alexopoulos and Gladden (2004) may be driven by the fact that they do not account for an indirect effect of wealth on search effort (i.e. via an increased reservation wage). The results from the simultaneous-equation model in this paper, in which search intensity is not directly affected by savings, shows that the effect of wealth on search effort still takes place indirectly, via a positive effect on reservation wages.

The paper is set up as follows. Section 2 develops the theoretical model. Section 3 gives an overview of previous theoretical and empirical literature. The main aim of the summary on theoretical results in this Section is to provide a discussion on the sensitivity of the theoretical model's predictions to the model specification. A data-description can be found in Section 4. Section 5 presents an overview of the main estimation results, and Section 6 concludes.

2 Theoretical Model

This Section presents the theoretical background on which the empirical models in Section 5 are founded. Along the same lines as Lentz and Tranaes (2005a) the model considers a risk averse individual who maximizes lifetime utility, which depends on his choice of consumption c_t and search effort s_t. The utility function $v(c_t, s_t)$ is assumed to be additively separable in its arguments, i.e. $v(c_t, s_t) = u(c_t) - e(s_t)$. In each period, the individual determines his optimal consumption, or equivalently the stock of wealth in the next period A_{t+1}. Savings earn interest at rate r. When unemployed, a worker also chooses optimal search intensity s_t, which influences his probability to get a job offer that period $\lambda_t s_t$.[1] There is no on-the-job search and jobs are destroyed at an exogenous rate η. Irrespective of the state, a worker receives non-labour income μ. Apart from that, an individual receives unemployment benefits b when unemployed. These benefits include the value of household production and the value of leisure. An employed individual works at wage w, drawn from a wage distribution $F(w)$. This implies that, in contrast to Lentz and Tranaes (2005a) who assume a degenerate wage distribution such that a job offer will always be accepted, the models allows the individual to choose a reservation wage every period.

The formal problem facing the individual is:

$$\max_{\{A_{t+1}, s_t\}_{t=0}^{\infty}} E_0 \sum_{t=0}^{\infty} \beta^t \left[u(c_t) - e(s_t)\right] \tag{1}$$

$$\text{subject to } A_{t+1} = A_t(1+r) + I_U b + I_E w + \mu - c_t \tag{2}$$

and subject to the job offer arrival and job destruction processes. The indicator I_U (I_E) takes on the value 1 if the worker is unemployed (employed) at the beginning of the period. Otherwise, it takes on the value 0. The choice of A_{t+1} is restricted by an upper and lower wealth bound, i.e. $A_{t+1} \in [\underline{A}, \overline{A}]$. This assumption is made only in order to ensure that the problem is bounded. Moreover, the upper wealth bound will never be reached as long as it is set high enough and the individual does not choose an infinite value of wealth. The model further assumes a risk averse individual, i.e. $u(.)' > 0$ and $u(.)'' < 0$ and increasing marginal costs of search: $e(.)' > 0, e(.)'' > 0$ and $e(0) = 0$. The Bellman equation for the value of unemployment at time t can be written as a function of wealth at the beginning of the period:

$$V^U(A_t) = \max_{\{A_{t+1}^U \in [\underline{A}, \overline{A}], s_t\}} \left\{ \begin{array}{c} u(A_t(1+r) + b + \mu - A_{t+1}^U) - e(s_t) \\ +\beta\lambda_t s_t \int_0^{\infty} \max[V^E(A_{t+1}^U, w), V^U(A_{t+1}^U)]dF(w) + \beta(1-\lambda_t s_t)V^U(A_{t+1}^U) \end{array} \right\} \tag{3}$$

While the Bellman equation for the value of employment reads:

$$V^E(A_t, w) = \max_{\{A_{t+1}^E \in [\underline{A}, \overline{A}]\}} \left\{ \begin{array}{c} u(A_t(1+r) + w + \mu - A_{t+1}^E) \\ +\beta[(1-\eta)V^E(A_{t+1}^E, w) + \eta V^U(A_{t+1}^E)] \end{array} \right\} \tag{4}$$

[1] As in Mortensen (1986), λ_t can be considered a market-determined search efficiency parameter or 'potential' offer arrival rate. In general, λ_t depends on macro-economic conditions and is therefore non-constant.

Rewriting and taking first order conditions w.r.t. s_t, A_{t+1}^U and A_{t+1}^E:

$$\begin{aligned} e'(s_t) &= \beta\lambda_t \int_{R_t}^{\infty} [V^E(A_{t+1,}^U w) - V^U(A_{t+1}^U)] f(w)dw, \quad \text{if } s_t^*(A_t) > 0 \\ e'(s_t) &\geq \beta\lambda_t \int_{R_t}^{\infty} [V^E(A_{t+1,}^U w) - V^U(A_{t+1}^U)] f(w)dw, \quad \text{if } s_t^*(A_t) = 0 \end{aligned} \tag{5}$$

$$\begin{gathered} u'(c_t^U) = \beta\lambda_t s_t \int_{R_t}^{\infty} \left[V^{E\prime}(A_{t+1}^U) - V^{U\prime}(A_{t+1}^U)\right] f(w)dw + \beta V^{U\prime}(A_{t+1}^U) + \rho_U \\ \rho_U[A_{t+1}^U - \underline{A}] = 0 \end{gathered} \tag{6}$$

$$\begin{gathered} u'(c_t^E) = \beta[(1-\eta)V^{E\prime}(A_{t+1}^E) + \eta V^{U\prime}(A_{t+1}^E)] + \rho_E \\ \rho_E[A_{t+1}^E - \underline{A}] = 0 \end{gathered} \tag{7}$$

where R_t denotes the reservation wage in period t, and ρ_U and ρ_E are the lagrange multipliers on the constraint that wealth cannot be smaller than a lower bound $\underline{A}$.

Existence of a reservation wage is established in the following proposition.

Proposition 1 *For any value of wealth A_t there exists a unique reservation wage $R_t = R(A_t)$ such that $V^E(A_t, R_t) = V^U(A_t)$*

Proof. $V^U(A_t)$ is independent of w and $V_t^E(A_t, w)$ is monotonically increasing in w (for a given A_t), which follows directly from the assumption that $u'(.) > 0$. Hence, there exists a unique value of w for which $V^E(A_t, w) = V^U(A_t)$. ■

Equation (5) shows that the optimal search effort is determined by equating the marginal costs with the marginal benefits of search. The marginal benefit of search is equal to the option value of search, i.e. the discounted difference between the value of employment and unemployment, integrated over all acceptable wage offers. Anything that increases the marginal benefits of search, $V^E(A_t^U) - V^U(A_{t,}^U w)$, will therefore directly increase search effort. At the same time, an increase in $V^E(A_t^U) - V^U(A_{t,}^U w)$ will decrease the reservation wage in period t. This follows directly from the definition of the reservation wage, $V^E(A_t^U, R_t) = V^U(A_t^U)$. *All factors affecting only the difference between the value of employment and unemployment therefore have opposite effects on search and reservation wages.* For example, an increase in the unemployment benefits level b raises the value of unemployment more than the value of employment[2], leading to an increase in reservation wages and a decrease in search effort.

Considering factors shifting up the *cost* of search, the effects are quite different. An increase in search costs causes the function $e(.)$ to shift upward, thereby directly decreasing search effort and V^U (via a decreasing probability to get a job offer and a decrease in consumption c_t). The value of employment (V^E) decreases only indirectly via a decrease in V^U. Because of discounting, a sufficient condition for V^E to decrease less than V^U is $1 - \eta \geq s\lambda_t(1 - F(R_t))$. Intuitevely, employed individuals care less about an increase in search

[2] Because of discounting, a sufficient condition for V^U to decrease more than V^E is $1 - \eta \geq s\lambda_t(1 - F(R_t))$, i.e. employed individuals have a higher probability to be employed, also in the next period.

costs, which they incur only if unemployed. As a result, an increase in the cost of search tends to increase the benefits of search $V^E(A^U_{t,}w) - V^U(A^U_t)$ and therefore the reservation wage decreases. *The conclusion is that factors shifting up the cost of search tend to decrease both search effort and the reservation wage.*

2.1 Theoretical impact of reservation wages on search effort

From the first order condition equation (5) it is predicted that a rise in the individual's reservation wage decreases the option value of search and therefore has a negative effect on current period search effort. What can we say about the shape (i.e. possible nonlinearity) of this 'reservation wage effect'? Consider a high and a low reservation wage, R^H_t and R^L_t, which are both raised by some constant c. In case $f(w)$ is uniform, from equation (5) and the assumption that $\frac{\partial[V^E(A^U_{t+1},w)-V^U(A^U_{t+1})]}{\partial w} > 0$ we can write:

$$e'_{R^H_t} - e'_{R^H_t+c} > e'_{R^L_t} - e'_{R^L_t+c} \tag{8}$$

Since $e(s)$ is assumed to be convex, it follows that the negative reservation wage effect is increasing in R_t. However, in the more realistic case of a right-skewed and well-behaved[3] wage distribution $f(w)$, there is an opposite effect. Since the mass of a right-skewed distribution is higher for low reservation wages, the decrease in $e'(s_t)$ can also be more severe for a *low* reservation wage R^L_t.[4] In conclusion, it is not unlikely that a linear specification may approximate the relationship between reservation wages and search effort well.

2.2 Theoretical impact of wealth on reservation wages and search effort

The theoretical model posits that wealth does not have a direct effect on the (marginal) cost of search. Wealth does influence the difference between the value of employment and the value of unemployment, i.e. it does affect the (marginal) benefits of search. Therefore, as explained in Section 2, wealth has opposite effects on reservation wages and search effort. For instance, suppose that $\frac{\partial V^E_t(A^U_{t+1},w)}{\partial A^U_{t+1}} < \frac{\partial V^U_t(A^U_{t+1})}{\partial A^U_{t+1}}$ $\forall w$ holds. This implies that, in order for the equality $V^E(A^E_{t,}R_t) = V^U(A^U_t)$ to remain valid, R_t must increase upon an increase in wealth.[5] An increasing reservation wage decreases the marginal benefits of search, and thereby a rise in wealth *indirectly* decreases search effort. At the same time, the *direct* effect of wealth on search is also negative under the assumption that if $\frac{\partial V^E_t(A^U_{t+1},w)}{\partial A^U_{t+1}} < \frac{\partial V^U_t(A^U_{t+1})}{\partial A^U_{t+1}}$ $\forall w$.[6] In fact, for the total (direct and indirect) effect of wealth on search intensity to be negative a weaker condition is sufficient: as long as $\frac{\partial}{\partial A}\int_{R_t}^{\infty}[V^E(A^U,w) - V^U(A^U)]f(w)dw < 0$ $\forall A$ the marginal benefits of search are decreasing in A. This can

[3] Well-behaved in this context means smooth, continuous and unimodal. For example, a lognormal distribution.

[4] For very low reservation wages, the two effects point in the same direction even for a right-skewed wage distribution. This implies that for low values of the reservation wage, a rise in the reservation wage has an increasingly negative effect on search effort.

[5] In the calibration of the model in Algan et al. (2003) it can be seen that the value of unemployment is increasing faster in assets than the value of employment. Indeed, they conclude that the reservation wage is increasing in assets.

[6] This can be seen from equation (5) and the fact that the costs of search function $e(s)$ is assumed to be convex. Intuitively, if the difference between the value of employment and the value of unemployment is smaller for a wealthier individual, i.e. the marginal benefits of searching are smaller, the rich individual will search less.

be shown to be true under fairly weak conditions:

Proposition 2 *Under the assumptions that the value functions V^U and V^E are strictly concave in A, and $\lambda_t s_t[1-F(R_t)] \leq [1-\eta]$, it holds that $\frac{\partial}{\partial A}\int_{R_t}^{\infty}[V^E(A,w)-V^U(A)]f(w)dw < 0\ \forall A$. That is: integrated over all acceptable wage offers, the marginal value of wealth is higher in the unemployment state. As a consequence, search effort is decreasing in wealth.*

Proof. The proof is presented in Appendix A. ■

In a similar model but without a reservation wage decision, Lentz and Tranaes (2005a) prove that $\frac{\partial V_t^E(A_t)}{\partial A_t} < \frac{\partial V_t^U(A_t)}{\partial A_t}\ \forall A$ under the assumption that $1-\eta-s_t \geq 0$. In the extended model presented here, search is shown to be decreasing in wealth as long as $1-\eta-\lambda_t s_t(1-F(R_t)) \geq 0$. An intuition for this result is that when $1-\eta \geq \lambda_t s_t(1-F(R_t))$, employed workers have a higher probability of being employed in the next period than unemployed do. Therefore not only current but also future income is lower for the unemployed, letting them put a higher value on an increase in assets (since utility is concave in consumption). In order for this condition to be fulfilled, the time-increments that an individual considers should be short enough, such that an employed individual at time t regards the probability to be employed in period $t+1$ to be higher than an unemployed individual.

For the reservation wage to be increasing in wealth, we need a stronger condition to hold, namely $\frac{\partial V_t^E(A_t,w)}{\partial A_t} < \frac{\partial V_t^U(A_t)}{\partial A_t}\ \forall A, w$. A sufficient assumption for that condition to hold is that $1-\eta >> \lambda_t s_t$. The intuition as to why we need a stronger assumption here is as follows. For low wage workers, a rise in assets is worth more than for high wage workers. After all, low wage workers are more likely to be liquidity constrained, everything else equal. That is, $\frac{\partial^2 V^E}{\partial w \partial A} < 0$, from (strict) concavity of the utility function. For low wage workers, an increase in wealth will therefore cause a large increase in V^E. However, an unemployed worker does face the prospect of getting a high wage offer. Since the value of being in the employed state with a high wage offer does not increase much upon a rise in assets, the value of this prospect does not rise too much either. The result is that the probability of getting the prospect needs to be sufficiently small in order to be able to prove that search effort is decreasing in assets *for all values of* w. Appendix C gives a graphical overview of the model predictions.

3 Comparison to Existing Literature

3.1 Previous Theoretical Results

In Section 2, a model is presented that predicts reservation wages to increase and search effort to decrease upon a rise in wealth. This Section argues that the result concerning search effort is sensitive to the way search costs enter the model.

The theoretical model outlined above assumes that search costs are measured as a utility loss and that this loss is additively separable from the utility gain associated with a rise in consumption. In general the relation between wealth and search effort in any model is influenced by (Lentz and Tranaes, 2005a):

- search costs specified either in the utility function or as monetary costs
- in case of search costs in the utility function: separable or nonseparable from consumption
- the functional form of the utility function (CARA, DARA)
- the existence of a liquidity constraint

In the baseline model described above, search costs are considered exogenous. In particular, they are not affected by wealth. However, consider the case where search costs enter the budget constraint (i.e. monetary search costs). Wealthier individuals are able to consume more. Since search costs are measured via a consumption loss in the budget constraint, wealthier individuals face lower marginal search costs (under the common assumption that the utility function is concave in consumption), and so their search intensity increases. This mitigates the negative relation between wealth and search effort. However, since a decrease in marginal costs of search raises the reservation wage, the positive relation between wealth and reservation wages becomes stronger in case of monetary search costs. In reality search costs usually represent a mix of time and monetary investments.

Nonseparable search costs specified in the utility function have a similar effect as monetary search costs: an increase in wealth increases consumption, which decreases marginal search costs. Note that this is true whenever $\upsilon''_{cs} > 0$ i.e. for high values of c, the marginal disutility associated with search decreases. Separable search costs induce only an income effect of a wealth increase: individuals search less since they can increase consumption also in state of unemployment. With nonseparable search costs, the substitution effect also plays a role: since it becomes less costly to 'buy' search, search effort increases.

Apart from separability or nonseparability of the utility function in its arguments, the effect of wealth on reservation wages and search behaviour is also affected by risk aversion. In particular, Flemming (1978) presents a model which assumes a CARA utility function and monetary search costs. In this case, search effort is not affected by wealth since the effect of wealth on the marginal benefits of search and marginal costs of search exactly cancel. Note again that when search costs are specified in the budget constraint, search costs are measured as a loss in consumption. The choice of search effort can therefore be regarded as a gamble: an individual needs to give up some consumption now in order to get a higher chance to increase consumption in the future. Since Arrow (1971) and Pratt (1964) it is known that the risk premium (i.e. the amount of consumption you are willing to give up now) is independent of the initial consumption level (i.e. wealth) in case of a CARA utility function. The results in Flemming (1978) can be considered an application of this general result. Berloffa and Simmons (2003) prove that in case of a CARA utility function and no search costs, the reservation wage is unaffected by wealth.[7] However, Blundell et al. (1997) show that the reservation wage is increasing in wealth in case of a concave utility function and no search costs. This discrepancy in model predictions is the result of a liquidity constraint (at the terminal period

[7] Again, this is a result specific to their model and the use of a CARA utility function. Without a decision on search, the gamble is to continue in unemployment (with a probability of getting a better wage/higher wealth in the future) versus accepting the value of employment at the offered wage. With a CARA utility function, initial wealth does not influence the decision whether or not to gamble. Therefore the reservation wage is independent of wealth in their model.

T) in Blundell et al. (1997). Since a borrowing constraint is more binding in the unemployment state, a wealth increase is more valuable in case of unemployment than in case of employment. Consequently, the relative value of unemployment versus employment rises, such that the negative (positive) relation between wealth and search effort (reservation wages) is magnified. In Lise (2011), the reservation wage is always equal to unemployment benefits b and therefore unaffected by wealth. This result directly follows from the assumption that on-the-job-search is just as efficient as unemployed search in his model, i.e. $\lambda^U = \lambda^E$.

Table 1 gives an overview of known theoretical and simulation results. Over all different model specifications, the reservation wage is nondecreasing in wealth. This is because all possible effects of wealth on reservation wages are positive. The effect of wealth on search effort is inconclusive, due to the opposite effects of a change in marginal benefits and (marginal) costs of search on search effort.

3.2 Previous Empirical Results

There are few empirical papers testing the effects of wealth on search and reservation wages. Bloemen and Stancanelli (2001) set up a simultaneous-equation model for the effect of wealth on reservation wages and transitions into (un)employment. Making use of the Dutch Socio-Economic Panel, they find that reservation wages are increasing in wealth. In a similar study using U.S. data, Alexopoulos and Gladden (2004) allow for wealth to affect both reservation wages and search behaviour.[8] They find a positive effect of wealth on reservation wages, and a negative though insignificant effect on search effort.

Other predictions from job-search models with asset accumulation have also been tested. Algan et al. (2003) set up a piecewise constant exponential hazard model with a gamma mixture distribution, including indicators for the amount of wealth as regressors. Not taking endogeneity of wealth into account, they indeed find that wealth increases unemployment duration. A similar procedure is followed in Stancanelli (1999). Using UK data, she finds a hazard rate out of unemployment that is significantly increasing for negative wealth holdings, whereas it decreases for positive quantities of wealth. Bloemen (2002) concludes that the probability of transition into employment is lower for wealthier individuals using a random effects probit model. Algan et al. (2003) test another prediction of the theoretical literature: wealthier individuals *choose* to be unemployed more often.[9] Estimating a probit model of voluntary and involuntary quits on wealth, they predict that wealthier individuals indeed more often tend to experience voluntary layoffs. The assertion that reservation wages decline over time is empirically tested by Kiefer and Neumann (1979). Adding a time trend in a regression on reservation wages, they conclude that a declining reservation wage over time is confirmed by the data.

[8] Alexopoulos and Gladden (2004) do not allow the reservation wage to directly affect search effort.

[9] Rendon (2006) shows that in a period of employment, when individuals increase their wealth holdings and thereby their reservation wages, it can happen that the reservation wage rises above the previously accepted wage. For high enough asset holdings, therefore, employed workers quit into unemployment.

Table 1. REVIEW OF THEORETICAL LITERATURE

	liquidity constraint	search costs	functional form of u(.)	reservation wage	end. search	conclusion
Danforth (1979)	yes	monetary	DARA	reservation wage	no	reservation wage increasing in wealth
Rendon (2006)	yes	no	CRRA	reservation wage	no	reservation wage increasing in wealth
Algan et. al (2003)	yes	in nonseparable utility function	CRRA	reservation asset level	no	reservation wage increasing in wealth
Blundell et al. (1997)	yes - at time T	no	(strictly) concave	reservation asset level	no	reservation wage increasing in wealth
Berloffa and Simmons (2003)	no	no	CARA	reservation wage	no	reservation wage not influenced by wealth
Lentz and Tranaes (2005a)	yes	in separable utility function	(strictly) concave	no	yes	search effort increasing in wealth
Flemming (1978)	no	monetary	CARA	no	yes	search effort not influenced by wealth
Lise (2011)	no	in separable utility function	concave	reservation wage	yes	search effort decreasing in wealth, reservation wage constant

Note: CRRA implies DARA

4 Data

We use data from the DNB Household Survey (formerly known as the CentER Savings Survey and as the VSB Panel) collected by CentERdata in Tilburg, the Netherlands, during the period 1993-2008. Once a year an Internet panel of about 2800 households is asked questions regarding work, pensions, accommodation, mortgages, income, assets, liabilities and health.[10] Within the households, every member of at least 16 years of age is interviewed. The advantage of using this particular dataset is that it contains subjective information about reservation wages, a proxy for search intensity, and detailed information on wealth components. This data therefore provides us with the means to study the interrelations among wealth, income, reservation wages and search behaviour empirically.

In 1993, about 1900 out of 2800 households form the representative panel of the DHS. The other 900 households represent the so called 'high-income panel'. These are households sampled from the top 10 percent of the Dutch income distribution. This sampling scheme is chosen since several papers using American data show that an overrepresentation of rich households is necessary to get a truthful representation of the actual wealth distribution (e.g. Avery and Kennickell, 1991; Sheiner and Weil; 1992). However, in the year 2000 no new members enter the high-income panel anymore. From that year onwards, the number of individuals taken from the high end of the income distribution decreases. In order to take into account that wealthy individuals are overrepresented in early waves, we include year dummies in the empirical model specification. These year dummies are also meant to correct for differences in the design of the questionnaire across waves, and (together with a variable indicating regional unemployment rates) to capture macro-economic effects on reservation wages and search intensity. In terms of our theoretical model, the time dummies capture the variation over time in the parameter λ_t. The members of the high-income panel comprise only 5% of the final sample. Excluding these observations in the empirical estimations does not change signs or significance levels of the estimates, and they are therefore included.

Table D.1 gives an overview on the selection of the sample. Non-employed individuals are selected when they report to be actively searching for a job, and when they report reservation wages and other relevant background characteristics.[11] Starting with a sample of 33,734 household heads and 24,614 spouses, only those individuals that were non-employed and searching for a job are selected.[12] We also exclude individuals over 65. This leaves 739 observations on heads and 694 observations on spouses for analysis, which is about 2.5% of the initial sample.[13] After dropping observations for which not all relevant background

[10] It is not required for the panel members to have Internet access or even a computer. For households that do not own a computer, CentERdata installs a Net.Box, which makes connection to the Internet via the television set possible. For households without a television, CentERdata installs one.

[11] I follow Schweitzer (2003) by selecting individuals that are looking for a job instead of individuals receiving unemployment benefits. Blackaby et al. (2007) find that those traditionally labeled as inactive react to benefit increases in the same way as the unemployed.

[12] In determining whether an individual is the head of a household or his/her spouse, we rely on self-reported data. In case the question regarding position in the household is not answered, the answer to the same question from other years of the questionnaire is used. In case the question is never answered, the oldest male is taken to be the household head.

[13] The retained percentage of individual differs somewhat from the aggregate unemployment statistics. During the period 1993-2008, an average of 3.3% of the total population aged 15 and older was registered at the unemployment office (CWI) as

characteristics are observed, 699 observations on heads and 652 observations on spouses remain. Of this sample, 37 observations on household heads and 35 observations on spouses had missing or extreme values of the reservation wage. Six more observations are dropped after inspection of the studentized residuals from the reservation wage regression specified in Section 5. Unfortunately, information on income and wealth variables is quite often missing. Around 100 observations on income-variables used in the empirical analysis are therefore imputed. The imputation process uses a flexible regression equation on the logarithm of the income variable. The regressors in the imputation equation include a polynomial in age, the year of the survey, the individual's education, gender, whether the individual is single, the family size, and interaction effects of gender with the age and education variables. A regressor indicating whether the individual came from the high income panel and individual random effects are also included. The distribution of the predicted values and the distribution of the actual (non-imputed) values look similar, providing some confidence in the imputation process. The final sample consists of 572 (heads) and 483 (spouses) observations of unemployed job searchers, over a period of 16 years. These observations are pooled together for analysis. The sample therefore contains multiple observations for some of the individuals. Appendix D gives an overview of the sample selection process. Table D.2 presents information on the number of individuals with more than 1 observation. As is shown, around 5% of the individuals included in the sample are observed more than three times. Excluding individuals that are observed more than three times or limiting the number of observations per individual to a maximum of three does not change sign or significance of the reported results. In the regression analysis in Section 5, all standard errors are adjusted for clustering of individuals.

4.1 Descriptive Statistics

Means, medians and standard deviations of the income and individual level wealth variables are shown in Table 2 for household heads and in Table 3 for spouses. Wealth is defined on the individual level, and constructed by adding several categories of assets and liabilities. The asset categories included are: balance on checking, savings and deposit accounts; deposit books and savings certificates; single premium annuity insurance policies and savings of endowment insurance policies; the value of options, bonds and shares; money lent out; and the value of cars, motorbikes, boats, and caravans. The categories of liabilities included are private loans and loans from family or friends; extended lines of credit; outstanding debts on hire-purchase contracts or from shops; credit card debt; study loans and other loans. The alternative wealth measure, total net worth, includes all before-mentioned asset and liabilities components, but also adds the value of the respondent's house(s) and other real estate, and subtracts the value of mortgage(s). In the main empirical analysis described in Section 5, the wealth variable is defined as total (individual) net worth. The wealth data is further examined in Table D.3, which shows that the 10% quantile of the wealth distribution is negative for both the full sample and for household heads. This is unlikely to be due to underreporting: Bloemen and Stancanelli (2001) find not only a negative 10% quantile, but also a negative 25% quantile of the wealth

looking for a job. There are two reasons why our unemployed sample comprises only 2.5% of the population. First, we only select household heads and spouses. Second, the aggregate unemployment statistics also contain individuals which are employed (for less than 12 hours per week).

Table 2. WEALTH, INCOME AND RESERVATION WAGES, HEADS

Variable	Number of observations	Median	Mean	Std. Dev.	Min	Max
Wealth	572	837.1	7016.9	17095.5	-10648.8	180235.6
Total net worth	572	1773.8	24196.5	47570.8	-38100.7	498383.4
Reservation wage, hourly	572	6.7	7.3	3.0	2.2	27.7
Reservation wage, monthly	572	1155.3	1271.8	528.1	379.6	4807.3
Unemployment benefits, net	572	716.4	749.8	580.6	0.0	4349.7
Unemployment* benefits, net	479	810.2	895.4	521.5	2.1	4349.7
Other income	572	0.0	136.2	624.0	-1115.3	7313.1
Other income*	186	82.1	419.0	1040.6	-1115.3	7313.1
Spouse's income	572	0.0	372.6	761.9	0.0	5827.1
Spouse's income*	192	837.1	1107.3	957.4	0.3	5827.1
Age	572	46.0	44.3	10.9	20.0	65.0

Note: Income variables are given in euros per month, real terms at 1992 prices.

Price indices are obtained from Statistics Netherlands' yearly statistics, available from http://statline.cbs.nl/statweb/.

* Indicates the figures recomputed excluding the zero observations.

Wealth variables are calculated at the individual level, the contruction is explained in the text.

Total net worth= wealth+value of house(s) and other real estate-value of mortgage(s).

Table 3. WEALTH, INCOME AND RESERVATION WAGES, SPOUSES

Variable	Number of observations	Median	Mean	Std. Dev.	Min	Max
Wealth	483	338.0	2953.4	9155.5	-9574.4	96862.0
Total net worth	483	10092.6	17714.2	33509.4	-8082.5	462489.4
Reservation wage, hourly	483	6.2	6.5	2.1	2.0	17.3
Reservation wage, monthly	483	1078.2	1125.6	366.3	345.2	2998.0
Unemployment benefits, net	483	494.9	490.0	387.3	0.0	3377.1
Unemployment* benefits, net	366	614.9	644.9	312.1	21.1	3377.1
Other income	483	0.0	14.5	82.8	-70.7	1286.3
Other income*	58	50.5	120.9	211.9	-70.7	1286.3
Spouse's income	483	1670.4	2075.3	1615.6	0.0	11239.5
Spouse's income*	471	1691.7	2128.2	1601.2	0.0	11239.5
Age	483	40.0	41.0	8.8	21.0	62.0

Note: Income variables are given in euros per month, real terms at 1992 prices.

Price indices are obtained from Statistics Netherlands' yearly statistics, available from http://statline.cbs.nl/statweb/.

* Indicates the figures recomputed excluding the zero observations.

Wealth variables are calculated at the individual level, the contruction is explained in the text.

Total net worth= wealth+value of house(s) and other real estate-value of mortgage(s).

Table 4. DISCRETE BACKGROUND VARIABLES

Variable	% of heads	% of spouses
Education level 1	8.4	5.8
Education level 2	30.2	34.8
Education level 3	33.4	37.9
Education level 4	28.0	21.3
Female	33.7	92.5
Single	33.7	0.0
Any children	35.0	70.8

Note: The total number of observations is 572 for heads, 483 for spouses.

distribution for Dutch household heads in their sample. For example, individuals with a mortgage which is higher than the value of their house can have negative wealth holdings.Table D.3 also reports the quantiles of the individual wealth distribution for all spouses and heads in the full DNB data (employed, unemployed and out-of-the-labour-force). Not surprisingly, the wealth level of unemployed individuals is lower as compared to the full sample. Including the value of houses and other real estates shifts the wealth-distribution to the right.

Unemployment benefits consist of all income components that are lost when a person accepts a job, including social insurance and social assistance. Other income denotes the state-independent income of the household: it adds interest on real estate and bank accounts, alimony, pension benefits, subsidies on renting or buying a house and social security benefits not lost when accepting a job offer. Mortgage interest payments are subtracted in the construction of this income variable. Spouse's income indicates monthly (wage) income of the spouse of the unemployed individual.

Table 4 shows statistics on the discrete background variables used in the empirical analysis. Education is defined in 4 levels, from lowest (level 1, no or primary education) to highest (level 4, higher vocational training or University). As can be seen from the t, there are more male than female household heads and more couples than singles in the sample. Most heads report not having any children in their household. In contrast, those identifying themselves as being a spouse are almost all female and most have children. This indicates that separate regression equations for household heads and spouses might be necessary.

Search effort is proxied by the number of job applications made in the two months prior to filling in the questionnaire. Table D.4 shows the frequency distribution of search effort. About one third of the household heads made no job applications, as opposed to over one half of the sample of spouses. Around 8% of heads and 2% of spouses made more than 15 applications. Spouses might have the opportunity to be more selective in the kind of job they apply to, since they are less likely to be the main income provider.

4.2 Reliability of reservation wage data

This study relies on subjective data on reservation wages. Several questions in the survey can be used to construct the (log) hourly reservation wages as a dependent variable in the regressions of Section 5. First, individuals are asked how many hours a week they would be willing to work at a new job. Then they are asked what would be the minimum net wage for which they would be willing to work, if a job with the preferred number of hours is offered to them. Finally, individuals are asked to indicate if this minimum wage was meant to be received per week, per 4 weeks, per month or per year. Hourly reservation wages are constructed by taking the net wage and converting it to an hourly reservation wage.[14]

A number of critiques on the use of subjective data for the calculation of reservation wages have been put forward in the past (e.g. Hofler and Murphy, 1994). Response bias could arise because individuals do not have clear ideas on what the 'right' answer is to a question asking them about the minimum wage for which they would accept a job offer. Alternatively, it can be unclear to an individual which kind of job they should be thinking of: a person imagining himself in his preferred job might report a lower reservation wage than an individual having a less preferred occupation in mind. Moreover, individuals might answer differently according to whether they think the answer to the question will affect their taxes or credit. This could be the case, for example, when the questionnaire is set up by a government agency. This sort of bias does not greatly affect results in an independent Internet Panel like the one used here. A fourth and final source of bias in subjective (reservation wage) data is non-response bias. In our sample, non-response on reservation wages is probably of minor concern: only 37 (35) out of 572 (483) individuals that are looking for work and for whom the relevant background characteristics are observed either did not report a reservation wage, or reported an unreasonable value for this variable.[15] The procedure outlined in Bloemen and Stancanelli (2001) is used to further check the reliability of the reservation wage data. First, reservation wages should in theory be higher than unemployment benefits (unless the model incorporates on-the-job-search that is more efficient than search for unemployed workers). From Table 2, we see that mean unemployment benefits for household heads are 895 euro month, whereas monthly reservation wages average at 1272 euro. For spouses, these figures are 695 and 1126 euro respectively. Moreover, the median monthly unemployment benefits are 810 (615) euro, whereas the median for reservation wages is quite a bit higher: 1155 (1078) euro a month. This gives a first indication that reported reservation wages are in accordance with theory.

Second, the distribution of reservation wages for the unemployed is compared with the distribution of wages for the employed. Because the reservation wage is defined as the lowest wage for which an individual would be willing to accept a job offer, the wage distribution should first-order stochastically dominate the reservation wage distribution. The value on every quantile of the wage distribution should be higher than the value of the reservation wage distribution. Tables D.6 and D.7 show that this is true for both household heads and spouses. Of course it could be argued that unemployed individuals are facing a less favorable

[14] The three questions needed to construct the (log) hourly reservation wage are listed on a single screen to the respondents.

[15] A reservation wage is considered unreasonable when two conditions apply: (1) the reservation wage is below 1.5 euros or above 40 euros an hour, and (2) the reservation wage is out of line with the reservation wages reported by the same individual in other years of the survey.

wage distribution since workers tend to experience wage growth over the time that they have been employed. This will lead to an overestimation of the wage distribution faced by the unemployed job searchers, thereby making the comparison biased in the direction of finding favorable results. It is therefore reassuring that the difference between reservation wage and observed wage is at least 30% for all quantiles of the wage distribution.[16]

As a final check the individual reservation wages are compared with respectively the wage earned before the unemployment spell and the accepted wage after the unemployment spell ends. Theoretically, the accepted wage should always be greater than the reservation wage. However, since accepted wages are observed a year later than the reported reservation wages, not all reservation wages need to be lower. As mentioned before, this is the case when reservation wages have the tendency to decline as the unemployment spell progresses, as they do in job-search models that include a wealth-decision. Alternatively, declining reservation wages over time could be the consequence of deterioration of human capital during an unemployment spell, discouraged individuals (e.g. Calmfors and Lang, 1995) or stigma. Despite these counteracting forces, 60% percent of accepted wages are higher than the previously reported reservation wage. Both the median and mean of the difference between accepted wage and the reservation wage are positive, thereby providing more confidence in the reservation wage data. Repeating the analysis for the difference between the wage a year before the reservation wage is observed and the reservation wage, similar conclusions cam be obtained. Both the mean and median differences are positive, and 70% of individuals report a reservation wage that is lower than their previously earned wage. Although in theory, there is no reason to believe that a previously earned wage should be higher than the reservation wage while looking for the next job, the result does strengthen faith in the reliability of the reservation wage data.

The conclusion from comparing wage, unemployment benefits, and reservation wage data in the various ways outlined above is that the reservation wage data used is at least not subject to response biases in a way that make the data violate logical and theoretical restrictions.

5 Estimation Results

This Section presents estimation results from regressions on reservation wages and on search effort. It starts by estimating single equation regressions and subsequently considers wealth to be an endogenous variable. Home-ownership and regional housing prices are the instruments for wealth. For most regression equation specifications exogeneity of wealth cannot be rejected, thereby approving the single equation estimation results as the preferred ones. Finally, a joint model for wealth, reservation wages and search is estimated by Maximum Likelihood. The joint model improves on the single equation estimation results.

[16] In contrast to Bloemen and Stancanelli (2001), we choose not to split the sample according to education, age *and* year, since that results in a number of observations that is too small to get an accurate view of the reservation wage distribution. However, splitting the sample only by year, the result that the distribution of reservation wages is first order stochastically dominated by the wage distribution is retained.

5.1 Single equation estimates on reservation wages

Table 5. RESERVATION WAGE EQUATION, ESTIMATION BY OLS

	Full sample	SE	Heads	SE	Spouses	SE
wealth	0.016**	(0.006)	0.012*	(0.007)	0.021**	(0.010)
wealth^2/100	-0.029**	(0.015)	-0.002	(0.002)	-0.005**	(0.002)
other income	0.054**	(0.024)	0.051**	(0.023)	-0.060	(0.089)
receives unemployment insurance	-0.010	(0.029)	0.009	(0.035)	-0.054	(0.049)
unemployment benefits	0.025	(0.015)	0.008	(0.016)	0.033	(0.045)
income spouse	0.006	(0.007)	0.034*	(0.020)	0.016	(0.008)
log age	0.178***	(0.062)	0.218***	(0.084)	0.080	(0.089)
education level 2 and 3	0.016	(0.044)	0.035	(0.052)	0.020	(0.083)
education level 4	0.244***	(0.053)	0.296***	(0.064)	0.198**	(0.095)
any kid	0.133***	(0.046)	0.156***	(0.042)	-0.130	(0.188)
female	-0.054	(0.037)	-0.016	(0.053)	-0.042	(0.093)
female×any kid	-0.070	(0.058)	-0.062	(0.075)	0.185	(0.194)
regional unemployment rate	-0.018	(0.013)	-0.033*	(0.017)	-0.004	(0.018)
constant	1.282***	(0.240)	1.212***	(0.320)	1.512***	(0.369)
N	1055		572		483	
adj. R^2	0.221		0.282		0.105	

Heteroscedasticity robust and clustered standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Note: the dependent variable is the log of the (net) hourly reservation wage in real terms, 1992 euros.

Wealth and income variables given in real terms (1992) in 10.000 euros and 1.000 euros respectively.

Data on regional unemployment rates is obtained from Statistics Netherlands: www.statline.nl.

Coefficients on year dummies suppressed.

The regression equation for reservation wages reads:

$$\ln(R_{it}) = f(A_{it})'\gamma + K_{it}'\eta + \varepsilon_{it}R_i \tag{9}$$

Where A_{it} indicates wealth of individual i in period t, and K_{it} are other individual characteristics that affect the value of the reservation wage. The function f allows wealth to affect the reservation wage in a nonlinear way. In the empirical specification f is assumed to be quadratic. For the OLS estimate γ to be unbiased A_{it} needs to be exogenous. Therefore all regressors that are correlated with both wealth and the reservation wage should be included. Several such regressors are included, such as unemployment benefits b and other non-labour income μ.[17]

The theory outlined in Section 2 suggests another regressor that can affect the reservation wage, namely unemployment duration. A high unemployment duration diminishes wealth reserves, which in turn leads to a declining reservation wage. Unemployment duration does not have any direct effect on the reservation wage in our theoretical model. As a consequence, adding unemployment duration as a separate regressor in the reservation wage equation cannot be justified by our theory.

[17] The aim of including these regressors is only to adjust for the endogeneity of the wealth variable. Possible endogeneity of the income variables is therefore not relevant in a linear model.

Table 6. PERCENTAGE INCREASE IN RESERVATION WAGE FROM A RISE IN WEALTH

Wealth distribution	Full sample	Heads	Spouses
10%	0.02	0.03	0.00
25%	0.02	0.00	0.39
50%	0.11	0.21	2.10
75%	3.50	3.62	4.44
90%	6.46	8.96	7.99
mean	3.00	2.87	3.67
N	1055	572	483

Note: The given wealth effect is calculated as a percentage increase in the reservation wage upon a 100% rise in wealth

In case a longer unemployment duration implies a declining reservation wage for reasons other than a wealth decline, γ is biased upward. On the other hand, a higher reservation wage causes individuals to be unemployed for a longer time period (Mortensen and Pissarides, 1999). This reverse causality causes γ to be biased downward. Taken together, the absence of an indication for unemployment duration in the reservation wage equation puts a bias of unknown sign on the estimate of the wealth-effect. If available, information on unemployment duration could correct for the before-mentioned biases. Unfortunately, the number of months in unemployment could not be determined for 570 our of 1055 individuals. In empirical work it is found that the wealth-effect does not significantly change when dummies for unemployment duration are included in the reservation wage equation (Bloemen and Stancanelli, 2001). Addison et al. (2010) show that parameter estimates on elapsed unemployment duration in a reservation wage equation are insignificant. Omitted variable bias and reverse causality bias cancel out approximately.

Inclusion of other regressors is also inspired by theory: year dummies and yearly regional unemployment rates are included in order to account for differences in λ_t over time and place of residence. The remaining regressors, such as age, educational level and marital status, are added to control for differences in the discount factor β, the differences in costs of search $e(.)$ and the wage distribution facing the individual $f(w)$.

Estimation results are presented in Table 5.[18] A Chow test indicates that the differences between household heads and spouses cannot be captured by the same model (F=1.97, p=0.02). Therefore the results are presented separately for the two groups. Specifying one model for males and females is not rejected (F=1.55, p=0.13). The findings indicate that reservation wages are increasing in wealth, as predicted by the theoretical model described in Section 2. Table 6 shows that a 100% increase in wealth increases reservation wages by about 2.9% for heads, and 3.7% for spouses at the mean value of wealth. The found effect is in between the 1.1% (heads) and 7.2% (spouses) increase at the mean value of wealth found by Bloemen and Stancanelli (2001) in their single equation estimation,[19] but much less than the 12.6% (heads) increase in reservation wages at the mean value of wealth found by Alexopoulos and Gladden (2004) using U.S. data.

[18] The presented model specification is the preferred one, based on theoretical considerations, (individual) significance and overall model fit.

[19] Part of this difference can be due to the fact that Bloemen and Stancanelli (2001) do not include the value of the house and mortgages in their wealth measure.

Although for household heads the squared term on wealth is not significant by itself, a test on the joint significance of wealth and squared wealth shows that these variables were jointly significant at the 5% level (F-test, p=0.02).

The other regression coefficients also show plausible signs. The results, again, are very similar to the ones found in Bloemen and Stancanelli (2001). For heads, a higher non-wage income and a higher income of the spouse influence reservation wages positively. For spouses, unemployment benefits or other income does not seem to affect the reservation wage. The height of unemployment benefits does not seem to have a significant effect on the reservation wage for household heads either, though the point estimate has the expected positive sign. Higher educated individuals have higher reservation wages, which is plausible since education is expected to influence the (expected) wage distribution and the discount factor positively.

Age also has a positive effect on reservation wages. In theory, age has an ambiguous effect on the reservation wage: on the one hand, older individuals might face a better wage distribution, increasing their reservation wage. Moreover, older individuals may have longer unemployment benefit entitlements, also leading to a rise in the reservation wage. On the other hand, if older individuals have a lower probability to get a job offer, they are willing to accept lower wages. Also, older people are left with less future (working) periods so they will be less picky about which wage to accept: the effect of reaching a terminal retirement period T is analogous to a decrease in the discount factor.[20] This decreases reservation wages for the elderly. In the data, the first group of factors seems to dominate. A squared term on age was not included, since it was not (jointly) significant. An indicator for being single is also not included since all spouses are married by definition, and since it was not significant and did not affect other estimation results in the model for household heads. After individuals are classified into household heads and their spouses, females and males have similar reservation wages. Having a child increases the reservation wage for male household heads. For female household heads, having a child increases the reservation wage as well, but less than for men. For spouses, having a kid or not does not influence reservation wages. A higher regional unemployment rate (λ_t) has the expected theoretical effect: individuals adjust their reservation wage downwards in times and places of higher unemployment.

5.2 Single equation estimates on search effort

In order to investigate the empirical relation between wealth and search effort, the equation for search effort reads:

$$S^*_{it} = g(A_{it}) + H'_{it}\beta + \lambda R_{it} + \tau_{it} \tag{10}$$

Where the H_{it} are individual characteristics, and R_{it} denotes the reservation wage in period t. Wealth A_{it} is allowed to enter in a nonlinear way in this equation. Search effort is not directly observed and is therefore treated as a latent variable. It is proxied by the number of job applications made in the two months prior to

[20] For example, Berloffa and Simmons (2003) prove that "in general, the individual is less willing to work if the number of periods over which a certain income gain can be spread increases." Less willing to work is captured by an increase in the reservation wage in their model, since they do not consider search effort.

filling in the questionnaire. The number of job applications S_i is assumed to be related to unobserved search effort S_i^* by means of V threshold values, in the sense that:

$$
\begin{aligned}
S_i &= 0 \quad if \quad -\infty < S_i^* \leq v_1 \\
S_i &= j \quad if \quad v_j < S_i^* \leq v_{j+1} \qquad j = 1, ..., V-1 \\
S_i &= V \quad if \quad v_V < S_i^* \leq \infty
\end{aligned}
$$

In the empirical estimation, $V = 8$ in order to keep a sufficient number of observations per category. The definition of the search categories is shown in Table D.4.[21] Assuming a normal distribution on the error term $\boldsymbol{\tau}_i$, an ordered probit model can be estimated by Maximum Likelihood. Since the proxy for search effort is a count data variable, the search equation can alternatively be estimated using negative binomial regression. Use of a negative binomial distribution shows very similar results in terms of sign, significance, and magnitude of the coefficient estimates. The preponderance of zeros in the empirical distribution does not impose a problem: adjusting for the skewness of the search variable by applying an inverse hyperbolic sine transformation[22] did not affect sign or significance of the results. These alternative estimations therefore provide an indication that the results presented here are not very sensitive to the distributional specification.

The reservation wage has the expected negative effect on search effort for household heads (Table 7). For spouses, the effect of the reservation wage is insignificantly different from zero.[23] Table 8 presents an overview of the magnitude of the reservation wage effect by reporting the predicted number of applications for different values of the reservation wage. Table D.4 shows the average predicted probabilities of applying 1,2,...n times for a job in the previous two months (in parentheses). The predicted probabilities follow the empirical distribution closely.

Wealth has an insignificant effect on search effort, both for household heads and for spouses. As explained in Sections 2 and 3, the effect of wealth on search effort is theoretically ambiguous. From these regression results, it appears that a model with nonseparable utility or search costs in the budget constraint can better describe the empirical results than a model in which utility is separable in consumption and search costs; wealth does not influence search effort. Almost all control variables show the expected signs. The effects of age and education are positive. This supports the presumption that both age and education proxy for a right shift in the wage distribution. Females exert lower search effort, especially when having a child. For male household heads, search effort is higher when they have at least one child to feed. A higher expected wage also increases search effort for household heads. The expected wage is excluded in the reservation wage equation because it is likely to be endogenous to the reservation wage: the questionnaire asks individuals which wage they expect to earn in their new job, thereby effectively asking individuals to put a value on E(w|R). An individual with a high reservation wage will therefore answer this question by stating a high expected wage. This also provides the main reasons to include expected wage as a regressor in the search equation: there is a

[21] The point estimates are not sensitive to this specific distribution of classes: similar results are obtained using 15 categories.

[22] The inverse hyperbolic sine transformation is similar to the log-transformation and can be written as: $\sinh^{-1}(applications) = \ln(applications + \sqrt{applications^2 + 1})$, see e.g. Burbidge et al. (1988).

[23] In fact, quite a few of the covariates in the search equation for spouses are insignificant. Apparently, monetary incentives do not influence search behaviour of spouses too much. Alternatively, any effect on spouses' search behaviour can be difficult to identify since more than half of the spouses report a zero number of searches.

Table 7. SEARCH EQUATION, ORDERED PROBIT ESTIMATION BY ML

	Full sample	SE	Heads	SE	Spouses	SE
wealth	-0.030	(0.022)	-0.018	(0.033)	-0.034	(0.042)
$wealth^2/100$	0.005	(0.006)	-0.010	(0.014)	0.010	(0.009)
reservation wage	-0.047*	(0.026)	-0.087**	(0.034)	0.006	(0.031)
other income	-0.021	(0.073)	0.015	(0.075)	- 0.004	(0.504)
receives unemployment insurance	0.641***	(0.102)	0.726***	(0.124)	0.492***	(0.185)
unemployment benefits	-0.012	(0.062)	-0.081	(0.070)	0.004	(0.127)
income spouse	-0.164***	(0.061)	-0.078	(0.072)	-0.251*	(0.133)
female×income spouse	0.122*	(0.070)			0.263*	(0.137)
log age	8.35	(5.361)	14.69**	(6.306)	-0.602*	(0.349)
log age^2	11.61	(7.331)	-19.73**	(8.600)		
education level 2 and 3	0.253	(0.195)	0.379	(0.259)	0.106	(0.310)
education level 4	0.397*	(0.215)	0.548*	(0.281)	0.237	(0.340)
any kid	0.449***	(0.164)	0.375**	(0.175)	0.382	(0.441)
female	-0.288**	(0.134)	-0.152	(0.155)	-0.009	(0.375)
female×any kid	-0.822***	(0.199)	-0.831***	(0.288)	-0.705	(0.468)
unemployment rate	-0.044	(0.043)	0.047	(0.060)	-0.137**	(0.059)
expected wage	0.010**	(0.004)	0.015**	(0.006)	0.006	(0.005)
N	1055		572		483	
Log Likelihood	-1807.1		-1073.3		-692.9	

Heteroscedasticity robust and clustered standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Note: the dependent variable is the number of job applications made in the past two months.

Wealth and income variables given in real terms (1992) in 10.000 euros and 1.000 euros respectively.

Coefficients on year dummies suppressed.

Table 8. PREDICTED MEAN NUMBER OF JOB APPLICATIONS IN 2 MONTHS

Reservation wage (in euros)	Full sample	Heads	Spouses
3	4.09	6.19	1.93
7	3.44	4.78	1.99
11	2.86	3.53	2.05
15	2.34	2.5	2.1
19	1.89	1.69	2.16
23	1.51	1.09	2.22
27	1.19	0.66	2.29
N	1055	572	483

Note: Calculated using observed values of covariates, only varying the value of the reservation wage positive correlation both between expected wages and search effort and between expected wages E(w|R) and reservation wages. The (negative) effect of the reservation wage on search effort is therefore underestimated in case expected wage is not included. Another reason to include expected wage as a regressor in the search equation is that individuals with a higher expected wage are expected to have higher wealth holdings. Since the expected wage is highly correlated with the previous wage of an individual, those with high (expected) wages have had a better opportunity to build a large wealth stock. Moreover, those with high expected wages are more likely to be the short-term unemployed[24] who did not run down their wealth yet. Both mechanisms create a positive correlation between wealth and search effort. The estimated effect of wealth on search effort is therefore biased toward zero in case expected wage is not included.

In the search equation, the dummy variable whether or not the person was receiving social insurance has a significant positive effect. Since social assistance in the Netherlands is means-tested, individuals with higher unemployment benefits that are unemployed for a short period and therefore still enjoy their social insurance, face the possibility that they have to run down their private wealth in the near future when they do not find a job. Therefore these individuals have a higher motivation to start searching for a job. The positive sign on the dummy indicates that indeed individuals that receive social insurance search more than individuals who are paid social assistance.

An interesting result of this regression is that, whereas income of the spouse influences search effort for male spouses negatively, it is practically zero for female spouses. This suggests that male spouses face a longer unemployment when their spouse has a high income (in the regression for heads and in the reservation wage equation, the interaction term was insignificant and therefore excluded).These results contradict the results in Lentz and Tranaes (2005b), who find that unemployment duration is decreasing in spouse's income for males (and increasing for females).

5.3 Endogeneity of wealth

For the parameter estimates from the single equations (9) and (10) to be unbiased, all regressors need to be exogenous. In particular, it is assumed that wealth is exogenous to both reservation wages and search effort. The theoretical model provided in Section 2 indicates one reason why this might not be: since wealthy individuals have higher reservation wages and lower search effort, they are expected to be unemployed for a longer period of time. However, long term-unemployed are expected to be less wealthy since they had more time to run down their assets. Therefore, individuals that search less or have a higher reservation wage and thus have a longer unemployment duration, generally have lower wealth (see also the graphical representation in Appendix C). Thus both the (positive) effect of wealth on reservation wages and the (negative) effect of wealth on search effort could be underestimated. Indeed, excluding individuals that we observe more than three times in the data (and are therefore likely to be long-term unemployed), point estimates of the effect of wealth on reservation wages increase. The effect of wealth on search is also found to be slightly larger using this subsample, though it is still insignificant.

In order to correct for possible endogeneity of wealth, wealth is instrumented with a dummy for home

[24] A high expected wage increases search effort, and therefore decreases unemployment duration.

ownership and an index for yearly regional housing prices.[25] The information on regional housing prices was taken from the index of housing wealth ('Woningwaardeindex') of the Dutch land register ('Kadaster') and is shown in Table D.9. An index on the least liquid component of wealth arguably represents an exogenous wealth shock. Unemployed individuals cannot anticipate on a change in housing prices, since they cannot easily run down their housing wealth when unemployed. However, the housing price index could also pick up general economic conditions that affect search behaviour of the unemployed. A yearly regional unemployment rate attempts to correct for these economic conditions. Similarly, the polynomial in other income could be catching up shocks in stock prices and the value of other assets such as cars and motorbikes. The F-statistic of the first stage regression indicates that the instruments used are not weak (F=16.5 for the full sample, F=15.4 for heads and F=18.5 for spouses). Note that contrary to intuition, higher regional housing prices tend to decrease wealth for individuals owning a house. The negative effect of housing prices for home owners remains if a level effect for housing prices is included. The interaction therefore does not pick up some regional or time-specific economic conditions that are not taken into account by the year dummies, the unemployment index and the polynomial in other income. An explanation for the negative sign on the housing price index is as follows: the housing prices in the land register are used to determine property taxes to be paid to the government. When respondents do not update the value of their house according to the price changes listed in the land register when they answer the survey, but they do face increased property taxes, reported wealth declines for an increase in the list value of the house. The coefficient on the housing price index may therefore be interpreted as an unavoidable shock to property taxation, which is likely exogenous for the same reasons as a shock to housing wealth can be considered exogenous to both reservation wages and search effort.

The IV-method used on the search equation is composed of two stages. In the first-stage equation, the wealth variable has undergone an inverse hyperbolic sine transformation. This transformation makes the normality assumption on the error terms in the regression more plausible, since the wealth distribution, just as the distribution of reservation wages, is right-skewed. However, other than the log-transformation, the inverse hyperbolic sine transformation can take care of zero and negative values of a variable as well. In the IV-regressions for the search-effort proxy, the standard error of the search equation is normalized to 1. LR-tests for $\rho_{\tau\omega} = 0$ cannot reject exogeneity of wealth in the search equation for the full sample ($\chi^2(1) = 2.8$, $p = 0.09$), household heads ($\chi^2(1) = 0.4$, $p = 0.53$) or spouses ($\chi^2(1) = 0.4$, $p = 0.51$).

The reservation wage equation is estimated by Maximum Likelihood for both household heads and spouses. Although for the full sample ($\chi^2(1) = 1.4$, $p = 0.23$) and for household heads ($\chi^2(1) = 0.2$, $p = 0.62$) we cannot reject the hypothesis that $\rho_{\varepsilon\omega} = 0$ for spouses it does seem that wealth is endogenous to the reservation wage equation ($\chi^2(1) = 17.7$, $p = 0.00$). In accordance with the theoretical argument, the point estimate on the wealth variable increases (Table D.8).

Another critique to single-equation analysis of the reservation wage decision is that individuals do not only care about the hourly wage of a job offer, but also about the number of hours that they need to work.

[25] Being a home-owner is, of course, endogenous to being wealthy, explaining the large coefficient on this variable. However, as long as being a home-owner does not influence reservation wages/search effort directly, it is a valid instrument. Moreover, including the home-owner dummy makes it more straightforward to interpret the interaction of this dummy with the regional housing prices index.

Estimating a simultaneous hourly wage/number of hours decision is beyond the scope of the current paper. However, if it is indeed true that unemployed job searchers care about the number of hours a week they need to work, this only affects the single equation results presented in the previous subsections when individuals that choose a different hourly reservation wage have *systematically* different preferences for hours worked *and* the hours-work decision is correlated with wealth. For example, if wealthier individuals choose to work a lower number of hours in exchange for a lower wage.[26]

5.4 Simultaneous estimation

As described in Sections 2 and 3, the individual choices for search effort and reservation wages are strongly interrelated. It is therefore likely that there are some unobservables in the error terms of equations (9) and (10) that cause a correlation between these errors. On the one hand, if these unobservables affect only the absolute difference between the value of employment and unemployment, the error terms will be negatively correlated. On the other hand, if the unobservables primarily have a large effect on search costs, the error terms will be positively correlated. If, for example, the correlation between v_{it} and τ_{it} is positive, this counteracts the negative effect of reservation wages on search effort. In this case the reservation wage effect will be underestimated. Endogeneity of the reservation wage will affect the point estimates of all regressors in the nonlinear search equation (10).

An exclusion restriction needs to be imposed in order to be able to identify the three-equation system. Wealth and other own income variables were excluded from the search equation both on theoretical grounds and because single equation results indicate no direct effect of wealth and own income variables on search effort on the 5% significance level. Assuming joint normality of the error term, the three equations are jointly estimated using Full Information Maximum Likelihood. Results of the estimation can be found in Tables 9, 10 and 11.

The system of equations consists of the reservation wage equation (9), the search equation (10) and an equation for wealth:

$$A_{it} = Q'_{it}\kappa + \omega_{it} \tag{11}$$

For the full sample and for household heads, the estimation of the system gives (very) similar results to the single equation estimation. In particular, wealth affects the reservation wage positively and the reservation wage affects search effort negatively.[27]

For spouses, the magnitude of the wealth-effect is close to the single equation estimation, but quite different from the magnitude of the two equation estimation results. However, a significant positive (nonlinear) effect

[26] There are many other reasons that one could come up with to claim endogeneity of the wealth variable in these regressions. Another example would be the exclusion of a health variable in the equation: if healthier people are assumed to be more wealthy and also to search more/have higher reservation wages, wealth is again an endogenous variable. The effect taking place via the duration of unemployment, however, is the only one that follows from the theoretical model outlined in section 2.

[27] The correlation coefficient between the wealth and the reservation wage equation, $\rho_{\omega\varepsilon}$ was set to zero since an LR-test showed that this restriction was not rejected ($\chi^2(1) = 1.2$, $p = 0.28$ for the full sample, $\chi^2(1) = 0.2$, $p = 0.68$ for heads). Also, when estimating an unrestricted model $\rho_{\omega\varepsilon}$ turns out to be close to 0 and insignificant in both estimations.

Table 9. SYSTEM OF EQUATIONS FOR THE FULL SAMPLE, ESTIMATION BY ML

	Res. wage	SE	Search effort	SE	Wealth	SE
wealth	0.015**	(0.006)				
wealth^2/100	-0.028*	(0.015)				
reservation wage			-0.040*	(0.055)		
other income	0.054**	(0.024)	0.530***	(0.160)	1.659***	(0.610)
other income^2/100					-20.276**	(9.904)
female×other income					0.309	(0.563)
receives unemployment insurance	-0.010	(0.029)	0.032	(0.065)		
unemployment benefits	0.024*	(0.015)	-0.129*	(0.068)	0.296	(0.235)
income spouse	0.006	(0.0007)	0.103	(0.064)	0.314***	(0.108)
log age	0.179***	(0.062)	7.407	(5.312)	5.244***	(0.915)
log age^2			-98.67	(73.78)		
education level 2 or 3	0.016	(0.044)	0.245	(0.171)	2.218***	(0.726)
education level 4	0.244***	(0.053)	0.765***	(0.268)	2.319***	(0.812)
female	-0.054	(0.037)	-0.339**	(0.134)	0.021	(0.490)
any kid	0.134***	(0.045)	0.616***	(0.186)		
female×any kid	-0.070	(0.057)	-0.823***	(0.221)		
unemployment rate	-0.018	(0.012)	-0.069	(0.045)	-0.214	(0.196)
home owner					6.784***	(0.911)
home owner×housing index					-0.018	(0.012)
expected wage			0.009**	(0.004)		
constant	1.281***	(0.237)			-16.774***	(3.858)
$\rho_{\omega\epsilon}$	restricted to 0.0					
$\rho_{\epsilon\tau}$	0.523*	(0.213)				
σ_{ϵ}	0.301***	(0.011)				
σ_{ω}	4.712***	(0.213)				
Log Likelihood	-5168.8					
N	1055					

Heteroscedasticity robust and clustered standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Note: ω refers to the wealth equation, ϵ refers to the reservation wage equation, τ refers to the search equation.

The dependent variable on the reservation wage equation is the log of the (net) hourly reservation wage in real terms, 1992 euros.

The dependent variable on the search equation is the number of job applications in the last two months.

The dependent variable on the wealth equation is an inverse hyperbolic sine transformation of the wealth variable described in the text.

Wealth and income variables given in real terms (1992) in 10.000 euros and 1.000 euros respectively.

Coefficients on year dummies suppressed.

Table 10. SYSTEM OF EQUATION FOR HEADS, ESTIMATION BY ML

	Res. wage	SE	Search effort	SE	Wealth	SE
wealth	0.009	(0.007)				
wealth^2/100	-0.0005	(0.003)				
reservation wage			-0.054	(0.055)		
other income	0.052**	(0.024)	0.142	(0.140)	1.364**	(0.632)
other income^2/100					-15.766	(10.034)
female×other income					0.406	(0.624)
receives unemployment insurance	0.011	(0.034)	0.488	(0.474)		
unemployment benefits	0.008	(0.016)	-0.030	(0.095)	0.369	(0.226)
income spouse	0.025*	(0.020)	0.048	(0.126)	0.787***	(0.251)
log age	0.224**	(0.089)	9.642	(14.598)	7.143***	(1.222)
log age^2			-1.213	(2.038)		
education level 2 or 3	0.036	(0.051)	0.339	(0.239)	2.313**	(0.977)
education level 4	0.298***	(0.066)	1.135***	(0.337)	2.803**	(1.102)
female	-0.016	(0.052)	-0.143	(0.181)	0.285	(0.686)
any kid	0.158***	(0.042)	0.659***	(0.183)		
female×any kid	-0.066	(0.073)	-0.697	(0.449)		
unemployment rate	-0.033*	(0.017)	-0.058	(0.114)	-0.189	(0.282)
home owner					6.190***	(1.229)
home owner×housing index					-0.013	(0.015)
expected wage			0.009	(0.010)		
constant	1.194***	(0.334)			-23.88***	(5.265)
$\rho_{\omega\epsilon}$	restricted to 0.0					
$\rho_{\epsilon\tau}$	0.781	(0.488)				
σ_{ϵ}	0.298***	(0.016)				
σ_{ω}	5.005***	(0.225)				
Log Likelihood	-2925.3					
N	572					

Heteroscedasticity robust and clustered standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Note: ω refers to the wealth equation, ϵ refers to the reservation wage equation, τ refers to the search equation.

The dependent variable on the reservation wage equation is the log of the (net) hourly reservation wage in real terms, 1992 euros.

The dependent variable on the search equation is the number of job applications in the last two months.

The dependent variable on the wealth equation is an inverse hyperbolic sine transformation of the wealth variable described in the text.

Wealth and income variables given in real terms (1992) in 10.000 euros and 1.000 euro's espectively.

Coefficients on year dummies suppressed.

Table 11. SYSTEM OF EQUATIONS FOR SPOUSES, ESTIMATION BY ML

	Res. wage	SE	Search effort	SE	Wealth	SE
wealth	0.027***	(0.010)				
$wealth^2/100$	-0.005***	(0.002)				
reservation wage			0.003	(0.031)		
other income	-0.065	(0.088)	-0.019	(0.503)	3.620	(2.951)
other $income^2/100$					-3.920	(2.635)
female×other income					3.632	(2.745)
receives unemployment insurance	-0.050	(0.047)	0.501***	(0.184)		
unemployment benefits	0.033	(0.043)	0.043	(0.130)	-0.264	(0.772)
income spouse	0.015**	(0.008)	-0.264**	(0.133)	0.206**	(0.103)
female×income spouse			0.277**	(0.138)		
log age	0.066	(0.087)	-0.674**	(0.331)	2.518**	(1.163)
education level 2 or 3	0.020	(0.082)	0.081	(0.306)	2.156**	(1.007)
education level 4	0.196**	(0.092)	0.211	(0.336)	1.521	(1.196)
female	-0.036	(0.091)	-0.013	(0.375)	-0.907	(0.791)
any kid	-0.122	(0.182)	0.397	(0.447)		
female×any kid	0.173	(0.188)	-0.732	(0.472)		
unemployment rate	-0.004	(0.017)	-0.133**	(0.060)	-0.222	(0.239)
home owner					7.308***	(1.338)
home owner*housing index					-0.031*	(0.016)
expected wage			0.006	(0.005)		
constant	1.553***	(0.360)			-5.783	(4.619)
$\rho_{\omega\epsilon}$	-0.083	(0.067)				
$\rho_{\epsilon\tau}$	restricted to 0.0					
σ_ϵ	0.292***	(0.012)				
σ_ω	4.151***	(0.389)				
Log Likelihood	-2155.2					
N	483					

Heteroscedasticity robust and clustered standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Note: ω refers to the wealth equation, ϵ refers to the reservation wage equation, τ refers to the search equation.

The dependent variable on the reservation wage equation is the log of the (net) hourly reservation wage in real terms, 1992 euros.

The dependent variable on the search equation is the number of job applications in the last two months.

The dependent variable on the wealth equation is an inverse hyperbolic sine transformation of the wealth variable described in the text.

Wealth and income variables given in real terms (1992) in 10.000 euros and 1.000 euros respectively.

Coefficients on year dummies suppressed.

of wealth on the reservation wage remains also for spouses. The influence of the reservation wage on spouses' search effort remains insignificant.[28]

6 Conclusions

This paper investigates the relations among wealth, reservation wages and search effort both theoretically and empirically. A theoretical model predicts wealth to influence search effort negatively, and reservation wages positively. Moreover, the model shows that the reservation wage has a negative effect on search effort. The model therefore also predicts an *indirect* negative effect of wealth on search intensity. Theoretical results show that the direct negative effect of wealth on search effort is not preserved for alternative formulations of the utility function and the way search costs enter the utility function. In contrast, the positive effect of wealth on reservation wages is robust to different model specifications. In fact, factors driving up the costs of search have a negative effect on search and factors driving up the marginal benefits of search have a positive effect on search. In many cases wealth decreases both the marginal benefit of search and the marginal cost of search, for example if search costs are (also) monetary. In these cases theory cannot unambiguously sign the effect of wealth on search intensity.

The theoretical results are tested by estimating a simultaneous-equation model for reservation wages and search intensity using Dutch survey-data. This data provides information on individual wealth and income, subjective reservation wages and a proxy for search effort, making it possible to empirically estimate the effects of wealth on reservation wages and search intensity. The main single equation results show that wealth has a significantly positive effect on reservation wages (in particular, a 100% increase in wealth at the mean of the wealth distribution raises the reservation wage by 2.9% for household heads, and 3.7% for spouses). However, a significant negative effect of the reservation wage on search effort cannot be found. Accounting for possible endogeneity of the wealth variable, wealth is instrumented using a polynomial in income, a dummy for ownership of a house and a housing index that indicates the relative price of a house in a given region and year. Endogeneity of wealth is rejected for the search equation, but cannot be rejected for the reservation wage equation for spouses. In a two equation system, the wealth-effect on the reservation wage is greatly magnified for spouses: a 100% increase in wealth at the mean of the wealth distribution is predicted to raise the reservation wage by 26.7%. A three-equation system takes into account that the reservation wage decision is endogenous to the search effort decision. Since a direct significant effect on search effort is not found in the single equation estimations, and since the effect of wealth on search effort is theoretically unsigned, wealth and income variables are used as exclusion restrictions in order to identify the effect of the reservation wage on search effort. The positive correlation coefficient between the search and the reservation wage equation indicates that the omitted factors in both equations mainly affect the costs of search, and not the (marginal) benefits of search. The system of three equations gives point estimates that are very similar to the single equation systems: a 100% increase in wealth at the mean of the wealth distribution

[28] The correlation coefficient between the wealth and the search effort equation, $\rho_{\varepsilon\tau}$ was set to zero since an LR-test showed that this restriction was not rejected ($\chi^2(1) = 0.9$, $p = 0.35$). Also, when estimating an unrestricted model $\rho_{\varepsilon\tau}$ turns out to be close to 0 and insignificant in the estimation.

raises the reservation wage by 3% for heads, and 4.4% for spouses. Moreover, a significant negative effect of the reservation wage on search effort is found for household heads. Therefore, under the assumption that wealth does not influence the incentive to search directly, there is still an indirect wealth-effect on search, via an increased reservation wage.

The empirical finding that reservation wages and search effort are (in)directly influenced by asset holdings has some implications for policy. In general, any policy affecting savings decisions should take into account the negative effects of savings on unemployment duration. For example, suppose a policy maker would like to decrease unemployment duration by decreasing unemployment protection. It is important to realize that decreased unemployment protection leads to a higher probability of getting fired and risk-averse individuals will therefore start to save more in periods of employment. This in turn results in higher reservation wages (and less search) at the moment an individual enters unemployment. The final effect of the decrease in unemployment protection on unemployment duration is unknown.

A venue for further research is to extend the (empirical) model to investigate the job search behaviour of employed individuals. In the data at hand, there are more than 2400 observations on employed household heads that are looking for a job and who report reservation wages and the number of job applications made in the last two months. It would be interesting to empirically test whether the job-search behaviour of employed and unemployed workers are affected by the same factors and, in particular, if the role of wealth on search behaviour differs over the employment status of the individual.

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Appendices

A Proof of proposition 2

The proof closely follows the proof of the main result in Lentz and Tranaes (2005a). Here we repeat some equations also given in the main text.

The Bellman equation for unemployment is:

$$V^U(A_t) = \max_{\{A_{t+1}^U \in [\underline{A},\overline{A}], s_t\}} \left\{ \begin{array}{c} u(A_t(1+r)+b+\mu-A_{t+1}^U)-e(s_t) \\ +\beta\lambda_t s_t \int_0^\infty \max[V^E(A_{t+1}^U,w),V^U(A_{t+1}^U)]dF(w)+\beta(1-\lambda_t s_t)V^U(A_{t+1}^U) \end{array} \right\} \quad (12)$$

While the Bellman equation for the value of employment reads:

$$V^E(A_t,w) = \max_{\{A_{t+1}^E \in [\underline{A},\overline{A}]\}} \left\{ \begin{array}{c} u(A_t(1+r)+w+\mu-A_{t+1}^E) \\ +\beta[(1-\eta)V^E(A_{t+1}^E,w)+\eta V^U(A_{t+1}^E)] \end{array} \right\} \quad (13)$$

Taking first order conditions w.r.t. s_t, A_{t+1}^U and A_{t+1}^E:

$$\begin{aligned} e'(s_t) &= \beta\lambda_t \int_{R_t}^\infty [V^E(A_{t+1}^U,w)-V^U(A_{t+1}^U)]f(w)dw, \quad \text{as } s_t^*(A_t)>0 \\ e'(s_t) &\geq \beta\lambda_t \int_{R_t}^\infty [V^E(A_{t+1}^U,w)-V^U(A_{t+1}^U)]f(w)dw, \quad \text{as } s_t^*(A_t)=0 \end{aligned} \quad (14)$$

$$\begin{gathered} u'(c_t^U) = \beta\lambda_t s_t \int_{R_t}^\infty \left[V^{E\prime}(A_{t+1}^U)-V^{U\prime}(A_{t+1}^U)\right] f(w)dw + \beta V^{U\prime}(A_{t+1}^U)+\rho_U \\ \rho_U[A_{t+1}^U-\underline{A}]=0 \end{gathered} \quad (15)$$

$$\begin{gathered} u'(c_t^E) = \beta[(1-\eta)V^{E\prime}(A_{t+1}^E)+\eta V^{U\prime}(A_{t+1}^E)]+\rho_E \\ \rho_E[A_{t+1}^E-\underline{A}]=0 \end{gathered} \quad (16)$$

where R_t denotes the reservation wage in period t, that is, the reservation wage that is decided upon in period t. Furthermore,ρ_U and ρ_E are the Lagrange multipliers on the constraint that wealth cannot be smaller than a lower bound $\underline{A}$.

Letting S denote the space of continuous and bounded functions, equations (12) and (13) together define the mapping $T : S\times S \to S\times S$, i.e. $V^U, V^E = T(V^U,V^E)$ or more explicitly: $V^U = T_U(V^U,V^E)$ and $V^E = T_E(V^U,V^E)$. Equations (12) and (13) are readily seen to be continuous and bounded functions, defined on a compact set, which implies their solution is continuous and bounded.

It can further be proved that there is a unique solution to this set of equations by showing that T is a contraction mapping. This can be seen by checking Blackwell's sufficient conditions for a contraction mapping (see for example Stokey and Lucas, 1989). Blackwell's sufficient conditions refer to monotonicity and discounting of the mapping. The monotonicity condition states that, if we choose some $V_1^E \geq V_2^E$ and some $V_1^U \geq V_2^U$, it must be that $T(V_1^E,V_1^U) \geq T(V_2^E,V_2^U)$. This can be seen to directly from equations

(12) and (13). The discounting condition holds if for some $\psi \geq 0$ and some $0 < k < 1$ it is true that $T(V^E+\psi, V^U+\psi) \leq T(V^E, V^U)+\psi k$. It can be seen from (12) that $T(V^E+\psi, V^U+\psi) = T(V^E, V^U)+\psi\beta$. Similarly, (13) shows that $T(V^E + \psi, V^U + \psi) = T(V^E, V^U) + \psi\beta$. Since $0 < \beta < 1$ by definition of the discount factor, discounting also holds. This establishes $T(V^E, V^U)$ as being a contraction mapping. Being a contraction mapping, $T(V^E, V^U)$ has a unique fixed point (V^{E*}, V^{U*}).

By property of the contraction mapping, for some closed set $X_1 \subseteq X$, if $T(X_1) \subseteq X_1$then $(V^{E*}, V^{U*}) \in T(X_1)$. It will be shown that the closed set X_1

$$X_1 = \left\{ (V^E, V^U) \in X \;\middle|\; \frac{\partial}{\partial A} \int_{R_t}^{\infty} [V^E(A,w) - V^U(A)] f(w)dw \leq 0 \;\forall A \right\}$$

is mapped into the set $T(X_1)$ which has characteristics:

$$T(X_1) = \left\{ (V^E, V^U) \in X \;\middle|\; \frac{\partial}{\partial A} \int_{R_t}^{\infty} [V^E(A,w) - V^U(A)] f(w)dw < 0 \;\forall A \right\}$$

By using Leibniz' rule and the definition of the reservation wage $V^E(A,R) = V^U(A)\ \forall A$, we can define $\frac{\partial}{\partial A} \int_{R_t}^{\infty} [V^E(A,w) - V^U(A)] f(w)dw = \int_{R_t}^{\infty} \left[V^{E\prime}(A) - V^{U\prime}(A)\right] f(w)dw$.

That is, I will show that when $\int_{R_t}^{\infty} \left[T^{E\prime}(A_t) - T^{U\prime}(A_t)\right] f(w)dw \leq 0\,\forall A$ the contraction mapping has the property that $\int_{R_t}^{\infty} \left[T^{E\prime}(A_t) - T^{U\prime}(A_t)\right] f(w)dw < 0\ \forall A$.

First define the derivatives of the mapping:

$$T^{U\prime}(A_t) = (1+r)[u'(c_t^U)] = \beta(1+r)\left[\lambda_t s_t \int_{R_t}^{\infty} \left[V^{E\prime}(A_{t+1}^U) - V^{U\prime}(A_{t+1}^U)\right] f(w)dw + V^{U\prime}(A_{t+1}^U)\right] + (1+r)\rho_U \tag{17}$$

$$T^{E\prime}(A_t) = (1+r)[u'(c_t^E)] = \beta(1+r)[(1-\eta)V^{E\prime}(A_{t+1}^E) + \eta V^{U\prime}(A_{t+1}^E)] + (1+r)\rho_E \tag{18}$$

Now assume that $\int_{R_t}^{\infty} \left[V^{E\prime}(A_t) - V^{U\prime}(A_t)\right] f(w)dw \;\leq 0\ \forall A$.There are two cases. First, suppose that the marginal utility of relaxing the lower bound on wealth is higher for employed than for unemployed, $\rho_E(A_t) > \rho_U(A_t)$. Since the Lagrange multiplier cannot be negative here, this implies $\rho_E(A_t) > 0$ so in the state of employment, the liquidity constraint is binding, $A_{t+1}^E = \underline{A}$. In the state of unemployment, the liquidity constraint may or may not bind: $A_{t+1}^U \geq \underline{A}$. Thus it follows that $A_{t+1}^E \leq A_{t+1}^U$, which means that $c_t^E > c_t^U$ since $w \geq R > b$. Strict concavity of u and equations (17) and (18) then imply that $\int_{R_t}^{\infty} \left[T^{E\prime}(A_t) - T^{U\prime}(A_t)\right] f(w)dw < 0 \; \forall A \in [\underline{A}, \overline{A}]$. In general, whenever $A_{t+1}^E \leq A_{t+1}^U$, it follows directly that $\int_{R_t}^{\infty} \left[T^{E\prime}(A_t) - T^{U\prime}(A_t)\right] f(w)dw < 0 \; \forall A \in [\underline{A}, \overline{A}]$.

Now consider the other case in which $A_{t+1}^E > A_{t+1}^U$ which means that $\rho_E(A_t) \leq \rho_U(A_t)$ (by negation of the logical relation $\rho_E(A_t) > \rho_U(A_t) \Rightarrow A_{t+1}^E \leq A_{t+1}^U$, which was established before). Under which condition does $\int_{R_t}^{\infty} \left[T^{E\prime}(A_t) - T^{U\prime}(A_t)\right] f(w)dw < 0$ hold? Subtracting (18) from (17) and integrating over the wage distribution:

$$
\begin{aligned}
&\int_{R_t}^{\infty} \left[T^{E\prime}(A_t) - T^{U\prime}(A_t)\right] f(w)dw \\
&= \int_{R_t}^{\infty} \left\{ T^{E\prime}(A_t) - \beta(1+r)\lambda_t s_t \int_{R_t}^{\infty} \left[V^{E\prime}(A_{t+1}^U) - V^{U\prime}(A_{t+1}^U)\right] f(w)dw - \beta(1+r)V^{U\prime}(A_{t+1}^U) - (1+r)(\rho_U) \right\} f(w)dw \\
&< \int_{R_t}^{\infty} \left\{ T^{E\prime}(A_t) - \beta(1+r)\lambda_t s_t \int_{R_t}^{\infty} \left[V^{E\prime}(A_{t+1}^E) - V^{U\prime}(A_{t+1}^E)\right] f(w)dw - \beta(1+r)V^{U\prime}(A_{t+1}^E) - (1+r)(\rho_U) \right\} f(w)dw \\
&= \int_{R_t}^{\infty} \left\{ \begin{array}{c} \beta(1+r)[1-\eta]\left[V^{E\prime}(A_{t+\triangle t}^E) - V^{U\prime}(A_{t+\triangle t}^E)\right] - \beta(1+r)\lambda_t s_t \int_{R_t}^{\infty} \left[V^{E\prime}(A_{t+\triangle t}^E) - V^{U\prime}(A_{t+\triangle t}^E)\right] f(w)dw \\ +(1+r)(\rho_E - \rho_U) \end{array} \right\} f(w)dw \\
&= \beta(1+r)[1-\eta-\lambda_t s_t[1-F(R_t)]] \int_{R_t}^{\infty} \left[V^{E\prime}(A_{t+\triangle t}^E) - V^{U\prime}(A_{t+\triangle t}^E)\right] f(w)dw + [1-F(R_t)](1+r)(\rho_E - \rho_U) \\
&\leq 0
\end{aligned}
$$

Where the first strict inequality follows from strict concavity of V^E and V^U and $A_{t+1}^E > A_{t+1}^U$.[29] Finally, the weak inequality follows from our assumption that $\frac{\partial}{\partial A} \int_{R_t}^{\infty} [V^E(A,w) - V^U(A)] f(w)dw \leq 0 \forall A$, that $\rho_E \leq \rho_U$ and $\lambda_t s_t[1-F(R_t)] \leq [1-\eta]$. In words, the last assumption states that the time-horizon of an individual is such that the probability to be employed in period $t+1$ is regarded to be higher when you are employed, than when you are unemployed at time t.

[29] Proof of strict concavity of V^E and V^U would require inclusion of a source of randomness in the model. Lentz and Tranaes (2005a) use a wealth lottery to this aim.

B Derivation of the likelihood function for the three-equation system

The system of equations is:

$$A_i = Q_i'\kappa + \omega_i$$

$$R_i = f(A_i)'\gamma + K_i'\eta + \varepsilon_i$$

$$S_i^* = A_i{}'\theta + H_i'\beta + \lambda R_i + \tau_i$$

Here, R_i denotes the log of the hourly reservation wage. K_i', H_i' are vectors of individual characteristics expected to influence reservation wages and search effort respectively and A_i indicates the inverse hyperbolic sine transformation of wealth for individual i. Search effort S_i^* is a latent variable, an indicator for which (i.e. the amount of job applications in the past 2 months) is observed only categorically. The observed variable, S_i, is assumed to be related to S_i by means of V threshold values, in the sense that:

$$\begin{aligned} S_i &= 0 \quad if \quad -\infty < S_i^* \leq v_1 \\ S_i &= j \quad if \quad v_j < S_i^* \leq v_{j+1} \quad j = 1, ..., V-1 \\ S_i &= V \quad if \quad v_V < S_i^* \leq \infty \end{aligned}$$

In order to allow for correlation between the error terms ω_i, ε_i and τ_i, I estimate the system of equations assuming joint normality of the error terms (and normalizing $\sigma_\tau = 1$):

$$\begin{bmatrix} \omega \\ \varepsilon \\ \tau \end{bmatrix} \sim N \left(\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \begin{bmatrix} \sigma_\omega^2 & \sigma_{\omega\varepsilon} & \sigma_{\omega\tau} \\ \sigma_{\varepsilon\omega} & \sigma_\varepsilon^2 & \sigma_{\varepsilon\tau} \\ \sigma_{\tau\omega} & \sigma_{\tau\varepsilon} & 1 \end{bmatrix} \right)$$

The likelihood function maximizes the sum over all unemployed individuals of the probability that the values for wealth A_i, reservation wage R_i and search effort S_i are in fact the way that they are observed in the data:

$$L = \prod_{i=1}^{N} h(S_i^*, R_i, A_i) = \prod_{i=1}^{N} \Phi(S_i^*|R_i)\varphi(R_i|A_i)\varphi(A_i)$$

Since joint normality is assumed, the conditional distribution of S^* is also normal, with conditional mean $\mu_{S^*|R}$ and standard deviation $\sigma_{S^*|R}$ (see Greene, 2008):

$$\mu_{S^*|R} = (A'\theta + H'\beta + R'\lambda) + \frac{\sigma_{\varepsilon\tau}}{\sigma_\varepsilon^2}\varepsilon = (A'\theta + H'\beta + R'\lambda) + \frac{\rho_{\varepsilon\tau}\sigma_\tau}{\sigma_\varepsilon}\varepsilon$$

$$\sigma_{S^*|R} = \left\{ 1 - \left(\frac{\sigma_{\varepsilon\tau}^2}{\sigma_\varepsilon^2} \right) \right\}^{\frac{1}{2}} = \left\{ 1 - \rho_{\varepsilon\tau}^2 \sigma_\tau^2 \right\}^{\frac{1}{2}}$$

Since S_i^* is observed as a categorical variable the likelihood contribution of an observation for observed search effort can be written in terms of the standard normal cdf Φ:

$$f(S_i|\ln(R_i)) = \left\{ \begin{array}{c} \Phi\left(\frac{v_1-\mu_{S^*|\ln(R)}}{\{1-\rho\}^{\frac{1}{2}}}\right)^{Ii0} + \left[\Phi\left(\frac{v_2-\mu_{S^*|\ln(R)}}{\{1-\rho\}^{\frac{1}{2}}}\right) - \Phi\left(\frac{v_1-\mu_{S^*|\ln(R)}}{\{1-\rho\}^{\frac{1}{2}}}\right)\right]^{Ii1} \\ +....+\left[1-\Phi\left(\frac{v_T-\mu_{S^*|\ln(R)}}{\{1-\rho\}^{\frac{1}{2}}}\right)\right]^{Iiv} \end{array} \right\}$$

Where I_{i0} is an indicator function equal to 1 when $S_i = j$ and 0 otherwise. The likelihood contribution of the observed reservation wage is captured by the conditional distribution of R given A:

$$\varphi(R_i|A_i) = (2\pi)^{-\frac{1}{2}} \left\{(1-\rho_{\omega\varepsilon}^2)\sigma_\varepsilon^2\right\}^{-\frac{1}{2}} \exp\left\{-\frac{1}{2}\frac{(\varepsilon_i - \frac{\rho_{\omega\varepsilon}\sigma_\varepsilon}{\sigma_\omega}\omega)^2}{(1-\rho_{\omega\varepsilon}^2)\sigma_\varepsilon^2}\right\}$$

Where the conditional mean $\mu_{R|A}$and standard deviation $\sigma_{R|A}$ are already substituted for. The marginal distribution of (the inverse hyperbolic sine transformation of) wealth is also assumed to be normal and reads:

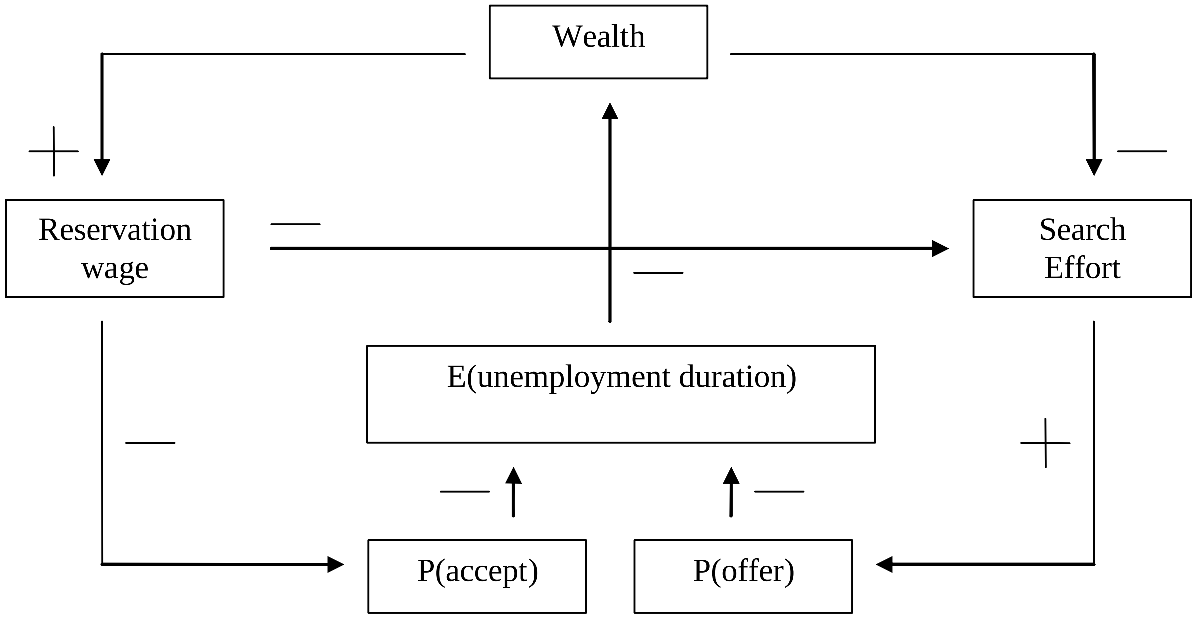
$$\varphi(A_i) = (2\pi)^{-\frac{1}{2}} \left\{\sigma_\omega^2\right\}^{-\frac{1}{2}} \exp\left\{-\frac{1}{2}\frac{\omega_i^2}{\sigma_\omega^2}\right\}$$

Multiplying the contributions and taking logs yields the loglikelihood:

$$\ln L = \sum_{i=1}^{N}\left(-\ln(2\pi) - \ln(\sigma_\omega) - \frac{1}{2}\frac{\omega_i^2}{\sigma_\omega^2} - \frac{1}{2}\ln\{(1-\rho_{\omega\varepsilon}^2)\sigma_\varepsilon^2\} - \frac{1}{2}\frac{(\varepsilon_i - \frac{\rho_{\omega\varepsilon}\sigma_\varepsilon}{\sigma_\omega}\omega)^2}{(1-\rho_{\omega\varepsilon}^2)\sigma_\varepsilon^2} + \sum_{j=0}^{V} I_{ij}\log p_{ij}\right)$$

Where $p_{ij} = P[S_i = j] = \Phi\left(\frac{v_{j+1\,i}-\mu_{S^*|\ln(R)}}{\{1-\rho\}^{\frac{1}{2}}}\right) - \Phi\left(\frac{v_j-\mu_{S^*|\ln(R)}}{\{1-\rho\}^{\frac{1}{2}}}\right)$ and we denote $v_0 = -\infty$ and $v_{V+1} = \infty$

C An overview of theoretical causalities



D Extra tables and figures

Table D.1. SAMPLE SELECTION

	Household heads	**Spouses**
1. all individuals	33734	24614
2. without a job	7762	7036
3. unemployed (looking for a job)	764	708
4. not self-employed, working age	739	694
5. reservation wage observed	711	666
6. covariates observed, except income, wealth	699	652
7. all covariates observed	441	386
8. imputing income variables	577	484
9. dropping outliers	572	483

Table D.2. MULTIPLE OBSERVATIONS ON THE SAME INDIVIDUAL

	Household heads		**Spouses**	
	# Individuals (%)	# Obs	# Individuals (%)	# Obs
Observed once	175	175	186	186
	(44.6)		(60.6)	
Observed twice	95	190	88	176
	(24.2)		(28.7)	
Observed three times	37	111	19	57
	(9.4)		(6.1)	
Observed four times	13	52	11	44
	(3.3)		(3.6)	
Observed five times	5	25	1	5
	(1.3)		(0.3)	
Observed more than five times	3	19	2	15
	(0.7)		(0.6)	
Total	328	572	307	483
	(100)		(100)	

Table D.3. DISTRIBUTION OF WEALTH-VARIABLES

	All Unempl.		Unempl. Heads		Unempl. Spouses		Total DNB sample	
	Wealth	Net worth	Wealth	Net worth	Wealth	Net worth	Wealth	Net worth
10%	-274.8	-122.6	-309.4	-290.6	-43.1	0.0	0.0	19.0
25%	0	118.6	0.0	2.5	0.0	1878.8	131.1	3415.8
50%	55.3	6802.0	837.1	1773.8	338.0	10092.6	2544.6	19033.1
75%	4218.2	25367.5	6058.1	30655.5	2859.6	21482.8	8577.1	51370.4
90%	13222.9	59781.7	19963.8	77683.2	9215.9	39152.4	21565.5	106278.0
Min	-10648.8	-3800.7	-10648.8	-38100.7	-9574.4	-8082.5	-512261.5	-512261.5
Max	180235.6	498383.4	180235.6	498383.4	96862.0	462489.4	1254949.0	3088198.0
# obs	1055	1055	572	572	483	483	35840	35840

Table D.4. SPECIFICATION OF CATEGORIES

Category	# Job applications in the past two months	**Full sample** Fraction of Observations	**Household heads** Fraction of Observations	**Spouses** Fraction of Observations
0	0	0.41 (0.41)	0.30 (0.30)	0.55 (0.54)
1	1	0.11 (0.11)	0.10 (0.11)	0.12 (0.12)
2	2	0.10 (0.10)	0.09 (0.10)	0.10 (0.11)
3	3-4	0.09 (0.09)	0.11 (0.11)	0.07 (0.07)
4	5-6	0.06 (0.06)	0.06 (0.06)	0.06 (0.06)
5	7-8	0.06 (0.06)	0.08 (0.08)	0.03 (0.03)
6	9-10	0.07 (0.07)	0.10 (0.10)	0.03 (0.03)
7	11-15	0.04 (0.04)	0.07 (0.06)	0.01 (0.01)
8	>15	0.05 (0.05)	0.08 (0.08)	0.02 (0.02)

Note: Average predicted fraction of observations in parentheses

Number of observations is 572 for household heads, 483 for spouses.

All individuals reported to be unemployed and searching for a job.

Table D.5. RELIABILITY OF RESERVATION WAGE DATA

Difference between reported reservation wages and the wage earned before and after the unemployment spell

	Household Heads Number of Observations	Mean	Median	**Spouses** Number of Observations	Mean	Median
Previous wage-reservation wage	105	5.3	1.2	56	3.8	1.2
Fraction previous wage>reservation wage	105	0.7	0.7	56	0.7	0.7
Accepted wage-reservation wage	58	3.4	0.4	38	2.3	1.2
Fraction accepted wage>reservation wage	58	0.6	0.6	38	0.6	0.6

Note: (Reservation) wages are hourly net (reservation) wages and reported in real terms, 1992 euros.

Table D.6. RELIABILITY OF RESERVATION WAGE DATA, HEADS

Distribution of (reservation) wages for different ages and education categories

	Number of observations	10%	25%	50%	75%	90%
Wage, all	11894	6.7	8.1	9.9	12.4	15.7
Reservation wage, all	572	4.7	5.5	6.7	8.3	10.6
Wage, education 1	416	6.0	7.3	8.7	10.8	14.6
Reservation wage, education 1	48	4.0	5.2	6.2	7.0	9.9
Wage, education 2	2272	6.3	7.3	8.6	10.3	12.7
Reservation wage, education 2	173	4.9	5.4	6.3	7.4	8.6
Wage, education 3	3572	6.4	7.8	9.2	11.2	14.3
Reservation wage, education 3	191	4.2	5.4	6.2	7.7	10.0
Wage, education 4	5605	7.6	9.2	11.3	13.7	16.9
Reservation wage, education 4	160	5.6	6.6	8.3	10.3	12.9
Wage, age<=35	2978	5.7	6.9	8.2	9.9	12.3
Reservation wage, age<=35	142	4.2	5.2	6.1	7.0	8.7
Wage, 35<age<=45	3926	7.2	8.4	10.0	12.0	14.87
Reservation wage, 35<age<=45	143	4.7	5.4	6.2	7.7	9.8
Wage, age>45	4990	7.5	9.1	11.1	13.9	17.4
Reservation wage, age>45	287	5.2	6.0	7.4	9.1	11.7

Note: (Reservation) wages are hourly net (reservation) wages and reported in real terms, 1992 euros. Observations are pooled over all years, numbers on reservation wages reported using individuals for whom reservation wages are observed.

Table D.7. RELIABILITY OF RESERVATION WAGE DATA, SPOUSES

Distribution of (reservation) wages for different ages and education categories

	Number of observations	10%	25%	50%	75%	90%
Wage, all	5354	5.3	6.7	8.2	10.1	13.1
Reservation wage, all	483	4.2	5.2	6.2	7.5	9.1
Wage, education 1	278	3.8	5.8	7.3	9.1	11.8
Reservation wage, education 1	28	4.2	4.6	5.6	7.1	9.9
Wage, education 2	1398	4.4	5.9	7.4	9.1	11.5
Reservation wage, education 2	168	4.1	5.0	6.0	6.8	7.9
Wage, education 3	1812	5.5	6.6	7.9	9.7	12.3
Reservation wage, education 3	182	4.3	5.2	6.2	7.3	8.5
Wage, education 4	1855	6.3	7.9	9.3	11.3	14.2
Reservation wage, education 4	104	4.1	5.8	7.2	9.1	12.0
Wage, age<=35	1750	5.2	6.4	7.9	9.7	12.5
Reservation wage, age<=35	139	4.1	5.1	6.1	7.3	8.5
Wage, 35<age<=45	1855	5.2	6.7	8.2	10.2	13.3
Reservation wage, 35<age<=45	190	4.2	5.1	6.2	7.5	9.5
Wage, age>45	1749	5.5	7.0	8.5	10.4	13.3
Reservation wage, age>45	154	4.2	5.3	6.3	7.6	9.2

Note: (Reservation) wages are hourly net (reservation) wages and reported in real terms, 1992 euros. Observations are pooled over all years, numbers on reservation wages reported using individuals for whom reservation wages are observed.

Table D.8. RESERVATION WAGE AND WEALTH EQUATIONS FOR SPOUSES, ESTIMATION BY ML

	Res. wage	SE	Wealth	SE
wealth	0.153***	(0.028)		
wealth^2/100	-0.032***	(0.007)		
other income	-0.158	(0.164)	2.493	(2.652)
other income^2/100			-2.366	(2.393)
female×other income			3.351	(2.401)
receives social insurance	0.023	(0.090)		
unemployment benefits	0.032	(0.058)	-0.329	(0.785)
income spouse	-0.003	(0.013)	0.222**	(0.103)
log age	-0.239**	(0.119)	2.683**	(1.155)
education level 2 and 3	0.010	(0.110)	2.218**	(1.025)
education level 4	0.157	(0.123)	1.630	(1.222)
female	0.038	(0.213)	-0.864	(0.800)
any kid	0.090	(0.128)		
female×any kid	-0.063	(0.232)		
unemployment rate	0.011	(0.021)	-0.237	(0.234)
home owner			6.967***	(1.332)
home owner×housing index			-0.034**	(0.015)
constant	2.372***	(0.472)	-6.037	(4.514)
$\rho_{\omega\epsilon}$	-0.631***	(0.109)		
σ_{ω}	1.640***	(0.163)		
Log Likelihood	-1873.3			
N	483			

Heteroscedasticity robust and clustered standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Note: The dependent variable on the reservation wage equation is the log of the (net) hourly reservation wage in real terms, 1992 euros.

The dependent variable on the wealth equation is an inverse hyperbolic sine transformation of the wealth variable described in the text.

Wealth and income variables given in real terms (1992) in 10.000 euros and 1.000 euros respectively.

Coefficients on year dummies suppressed.

Table D.9. REGIONAL HOUSING PRICES

	Groningen	Friesland	Drenthe	Flevoland	Overijssel	Gelderland	N-Holland	Z-Holland	Utrecht	Zeeland	N-Brabant	Limburg
1993	27.8	25.8	35.2	38.0	31.6	41.9	43.9	38.9	43.7	30.8	41.4	36.3
1994	30.5	28.6	39.0	43.4	37.4	47.8	49.4	44.2	48.8	34.2	47.0	42.3
1995	33.2	30.7	40.7	47.7	40.1	50.6	52.9	47.5	53.8	38.3	50.1	46.5
1996	35.6	38.9	45.4	51.8	44.8	58.4	58.6	51.9	59.2	39.8	56.1	49.9
1997	40.1	42.2	50.8	61.2	52.3	64.7	66.5	58.2	68.3	43.6	63.4	56.8
1998	42.0	47.2	55.8	59.9	56.6	73.8	75.3	63.8	76.0	48.9	71.9	61.9
1999	48.2	55.9	63.5	68.2	66.6	83.3	88.4	73.3	91.4	56.0	82.5	70.8
2000	58.1	65.0	76.2	82.3	79.5	98.7	106.5	83.7	107.9	62.3	96.4	82.8
2001	68.1	73.0	88.4	92.2	88.4	112.7	117.5	94.2	117.7	70.0	106.6	87.5
2002	75.7	81.1	98.6	101.4	96.7	121.6	128.1	103.0	120.3	77.3	120.6	92.3
2003	79.1	85.5	101.5	108.4	100.2	124.7	132.9	109.5	127.8	86.4	125.5	95.6
2004	83.5	95.5	109.0	105.9	103.0	128.5	136.0	114.5	136.4	93.3	131.5	99.4
2005	87.0	101.2	108.0	108.3	107.9	131.6	141.2	120.1	144.0	100.5	137.6	105.5
2006	96.0	104.1	116.4	113.3	114.3	141.1	148.7	123.1	150.7	101.4	141.9	108.8
2007	100.0	108.5	116.7	117.4	119.2	146.5	157.9	129.0	157.9	110.4	150.6	113.2
2008	102.4	110.8	115.1	122.8	122.1	148.1	168.2	134.5	161.7	117.2	154.2	111.9

Authors own calculations on basis of data from the Dutch land register, available from http://www.kadaster.nl/kadaster/

Note: indexed regional housing prices, 100=price of a house in Groningen in 2007.