

Locus of Control and Job Search Strategies

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Abstract

Standard job search theory assumes that unemployed individuals have perfect information about the effect of their search effort on the job offer arrival rate. In this paper, we present an alternative model which assumes instead that each individual has a subjective belief about the impact of his or her search effort on the rate at which job offers arrive. These beliefs depend in part on an individual's locus of control, i.e., the extent to which a person believes that future outcomes are determined by his or her own actions as opposed to external factors. We estimate the impact of locus of control on job search behavior using a novel panel data set of newly-unemployed individuals in Germany. Consistent with our theoretical predictions, we find evidence that individuals with an internal locus of control search more and that individuals who believe that their future outcomes are determined by external factors have lower reservation wages.

Keywords: job search behavior, search effort, reservation wage, locus of control, unemployment duration

JEL codes: J64

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1 Introduction

Standard job search theory assumes that unemployed individuals have perfect information about the effect of their search effort on the job offer arrival rate. In this paper, we present an alternative model which assumes instead that each individual has a subjective belief about the impact of his or her search effort on the rate at which job offers arrive. This subjective belief depends in part on individuals' 'locus of control', which is defined as a generalized expectation about the internal versus external control of reinforcement (Rotter, 1966). A person whose external locus of control dominates tends to believe that much of what happens is beyond his or her control. Life's outcomes are instead attributed to other forces, like fate or luck, rather than to one's own actions. In contrast, a person with an internal locus of control sees future outcomes as being contingent on his or her own decisions and behavior.

It is quite intuitive that people who believe that success in life largely depends on their own actions and efforts rather than on luck or other "external" forces in turn expect different returns to their own behavior—particularly with respect to investment decisions like educational choices—than individuals with a more external locus of control. Given this, it seems sensible to expect that locus of control will have an important effect on many economic outcomes and in particular, that internality will be positively correlated with economic success.

In fact, several empirical studies do conclude that locus of control is correlated with labor market success, in particular wages. An early example is Andrisani (1977, 1981) who examines National Longitudinal Survey data and finds that individuals with an internal locus of control in 1968 had significantly higher hourly wages two years later. Similarly, Osborne Groves (2005) analyzes data from the National Longitudinal Survey of Young Women and concludes that women with an internal locus of control earn more than women with an external locus of control. Semykina and Linz (2007) also find a positive association between the locus of control and wages for Russian women, though not for Russian men. The evidence from studies based on the Panel Study of Income Dynamics (PSID) is more mixed. For example Duncan and Morgan's (1981) replication study of Andrisani (1977) fails to produce evidence of a strong link between locus of control and wage rates¹, though Duncan and Dunifon (1998) find that an internal locus of control is positively related to wages some 20-25 years later. Using German data Anger and Heineck (2010) find a wage penalty for individuals with a highly external locus of control.

Investment decisions also appear to be linked to individuals' locus of control. In particular, Coleman and Deleire (2003) conclude that locus of control affects education decisions primarily by influencing teenagers' expectations regarding the return to human capital investments.² Cebi (2007), however, is not able to replicate these results using a different data set. Still, the potential link between individuals' locus of control and their human capital investments raises questions about the extent to which locus of control affects

¹In a reply to this article Andrisani (1981) argues that Duncan and Morgan actually failed to disprove his results and cites several other studies that confirm his findings.

²Hansemark (2003) finds evidence for a positive impact of internal locus of control on the probability of starting a new business for men, but not for women.

wages directly via productivity versus indirectly through skills acquisition. Piatek and Pinger (2010), for example, conclude that locus of control affects wages only indirectly through the schooling decision. Heckman et al. (2006) use indicators of self-esteem and locus of control to construct a one-dimensional, latent factor representing noncognitive skills. They find that noncognitive skills have both a direct wage effect (via productivity) and an indirect wage effect (via schooling and work experience).

To our knowledge, there exist only three previous studies that assess the effect of locus of control on transitions from unemployment to employment.³ Gallo et al. (2003) and Uhlendorff (2004) analyze the German Socio Economic Panel (SOEP) and conclude that a higher sense of internal control is associated with a higher probability of reemployment and with shorter spells of unemployment, respectively.⁴ Neither study, however, analyzes the association between locus of control and the search behavior directly. In independent work, McGee (2010) takes a similar approach to ours to investigate job search among respondents in the 1979 National Longitudinal Survey of Youth (NLSY) and finds that young unemployed men with an internal locus of control search more and have higher reservation wages. Although he lacks a direct measure of individuals' beliefs about the payoffs to job search, McGee estimates models of the propensity to receive a job offer conditional on having made contact with an employer and finds results that are consistent with his assumption that locus of control influences search behavior through beliefs about the efficacy of job search rather than productivity per se.

Our paper advances this previous literature in two important ways. First, unlike McGee (2010), we directly examine the link between individuals' locus of control and their beliefs about the payoffs to job search. Second, we develop a job search model which incorporates individuals' subjective beliefs about the effect of their search effort on the job offer arrival rate. Specifically, individuals with an internal locus of control believe that job search is associated with a relatively large increase in the probability of finding a job, while those with an external locus of control believe that search has little effect on the job offer arrival rate. Unemployed individuals who believe that labor market success depends on their own efforts are consequently expected to search more and have higher reservation wages. We contrast these predictions to those from an alternative model in which individuals with a more internal locus of control have a higher subjective job arrival rate independent of their search effort, perhaps because they are simply more optimistic. They are expected to have higher reservation wages, but to search less. Thus, we are able to use our theoretical model to generate empirically testable predictions and to distinguish between these alternative explanations for the link between locus of control and job search.

We test the implications of our model by estimating the impact of an individual's locus of control on his or her search intensity and reservation wage using a novel panel data set of newly unemployed individuals in Germany. Specifically, our data are from the first wave of the IZA Evaluation Data Set (see Caliendo et al., 2010, for details). This data set is based on approximately 17,000 individuals who became unemployed between late

³Job search strategies have been linked to workers' impatience, however, see DellaVigna and Paserman (2005).

⁴Uhlendorff (2004) finds this effect only for West Germany.

2007 and early 2008. This large number of observations allows us to apply non-parametric matching methods in addition to standard regression techniques. This is an advantage compared to data sources like the SOEP or the NLSY which usually contain a relatively small number of unemployment spells per year. The data are unique in providing us with detailed information about search behavior, reservation wages and different psychological traits including locus of control. Moreover, our survey data can be linked to administrative data containing detailed information about previous employment histories including previous wages and time spent in unemployment. This information goes a long way towards capturing unobserved individual characteristics which might be correlated with both locus of control and current job search behavior.

Our interviews were conducted approximately two months after individuals entered unemployment. The data allow us to observe the impact of the locus of control on job search behavior directly and thereby to discriminate between alternative mechanisms through which locus of control affects job search. In addition, all individuals are interviewed at the same point in their unemployment spell. Thus concerns about potential reverse causality between noncognitive skills and labor market outcomes are reduced substantially. In contrast, the point of an individual's unemployment spell at which locus of control is measured often varies dramatically in surveys like the SOEP and the NLSY.

We find that the marginal effect of an additional job application on individuals' propensity to report that they are very likely to get a job in the next period is higher among those job seekers with an internal locus of control. Moreover, individuals with a more external locus of control have lower reservation wages and search less intensively. These results are consistent with locus of control affecting search behavior through individuals' subjective beliefs about the payoff to job search.

The outline of this paper is as follows. Section 2 presents the theoretical model, while Section 3 describes the data in detail. In Section 4 we present our estimation strategy and the results before Section 5 concludes.

2 Theoretical Framework

We begin by assuming that each unemployed individual searches sequentially for a job in a stationary environment. Job offers arrive for a given search effort s with arrival rate $\lambda(s)$. This arrival rate depends positively on individuals' search effort and the marginal return to search effort is decreasing (i.e. $\lambda' > 0$ and $\lambda'' < 0$). Job offers represent independent draws from a wage distribution $F(w)$ which is known by the unemployed. Each unemployed individual receives unemployment benefits b and faces search costs $c(s)$ which are increasing in search effort (i.e. $c' > 0$ and $c'' > 0$).

Each time a job offer arrives, individuals must decide whether to accept the offer or to reject it and to search further. The optimal search strategy will rest in part on choosing a reservation wage, i.e., the wage at which the benefits of continued search are just equal to the additional search costs.⁵ Any wage offer above the reservation wage is accepted, while

⁵For a description of job search models see for example Mortensen and Pissarides (1999) or Cahuc and Zylberberg (2004). An overview of the empirical research is given by Eckstein and van den Berg (2007).

any offer below the reservation wage is rejected.

2.1 Locus of Control and the Return to Search Effort

Unlike the standard search model, we assume that individuals do not know the exact relationship between their own search effort s and the job offer arrival rate $\lambda(s)$. Instead, we assume that each individual has a subjective belief—given by $(\lambda^*(s, loc))$ —about the effect of s on λ which depends on the extent to which an individual has an internal locus of control (loc).⁶ Individuals with an internal locus of control believe that increased search effort results in a relatively large increase in the job offer arrival rate. In contrast, individuals who feel that their own behavior does not influence future outcomes believe that additional search effort has little effect on the rate at which job offers arrive. In other words, $\frac{\partial \lambda^*(s, loc)}{\partial s}$ is assumed to be higher for those with a more internal locus of control than for those with a more external locus of control, i.e., $\frac{\partial^2 \lambda^*(s, loc)}{\partial s \partial loc} > 0$. Our objective is to adopt a straightforward, parsimonious specification of the relationship between individuals' beliefs about the job arrival rate and the degree to which they have an internal locus of control which is consistent with this assumption. Consequently, we model individuals' locus of control to have a multiplicative impact on the subjective beliefs about arrival rates: $\lambda^*(s, loc) = \lambda(s)f(loc)$, with $f'(loc) > 0$.

If a job-seeker receives no job offer at time t , he or she continues searching. If, however, a job offer with wage w is received, he or she accepts that job offer so long as the corresponding discounted expected utility associated with being hired at that wage ($V_e(w)$) exceeds the discounted expected utility (V_u) of remaining unemployed and continuing to search. It is important to note that individuals maximize their subjectively perceived expected utilities. The perception of future utility flows for a given search effort and a specific reservation wage depends on the locus of control. The reservation wage ϕ defines the stopping rule and corresponds to the wage offer for which $V_u = V_e(\phi)$ implying that every wage offer above ϕ will be accepted while every wage offer below ϕ will be rejected.

More specifically, the utilities associated with accepting a job offer and with continued search are given by the following:

$$V_e(w) = \frac{1}{1 + rdt} [w dt + (1 - qdt)V_e(w) + qdt V_u] \quad (1)$$

$$V_u = \frac{1}{1 + rdt} [(b - c(s))dt + \lambda(s)f(loc)dt \left(\int_0^\phi V_u dF(w) + \int_\phi^\infty V_e(w) dF(w) \right) + (1 - \lambda(s)f(loc)dt)V_u] \quad (2)$$

where r is the real instantaneous rate of interest, dt describes a short interval of time t , and the job separation rate is q . The discounted expected utility of being hired is equal to the income received in the period ($w dt$) plus the discounted expected future income stream. With probability $(1 - qdt)$ this is $V_e(w)$ and with probability qdt this is V_u . The

⁶In other words, we measure locus of control such that higher values of loc are associated with a more internal locus of control.

discounted expected utility of continuing to search is the net income $((b - c(s))dt)$ received in the period plus the discounted expected utility of receiving a future job offer. Taken together the discounted expected utilities associated with being unemployed (V_u) and with being hired at wage w ($V_e(w)$) implicitly define the reservation wage for a given search effort s . In particular, using equations (1) and (2) we can show that the reservation wage offer ϕ at which $V_u = V_e(\phi)$ is given by

$$\phi = b - c(s) + \frac{\lambda(s)f(loc)}{r + q} \int_{\phi}^{\infty} (w - \phi) dF(w). \quad (3)$$

Unemployed individuals choose both their search effort s and reservation wage ϕ so as to maximize their discounted expected utility V_u over an infinite horizon. Substituting the constraint that $V_u - V_e(\phi) = 0$ into this optimization problem, we can show that optimal search behavior is determined by the maximization of $V_u = \phi/r$ with respect to s . This implies that we can solve for the optimal search effort s^* by differentiating the relation (3) with respect to s and solving for s^* such that $\partial\phi/\partial s = 0$. Specifically,

$$c'(s^*) = \frac{\lambda'(s^*)f(loc)}{r + q} \int_{\phi}^{\infty} (w - \phi) dF(w). \quad (4)$$

Equation (4) implies that individuals choose their optimal search effort by equating the marginal cost of job search with the marginal benefits associated with additional search, i.e., an increased probability of receiving a job offer paying more than their reservation wage.

Combining equations (3) and (4) we can solve for individuals' reservation wage at the optimal level of search s^* as follows:

$$\phi = b - c(s^*) + \frac{\lambda(s^*)}{\lambda'(s^*)} c'(s^*). \quad (5)$$

Reservation wages are increasing in unemployment benefits and the job offer arrival rate, but decreasing in the costs of job search. Finally, higher marginal search costs raise reservation wages, while reservation wages are lower the greater is the marginal effect of job search on the job offer arrival rate.

We now consider the effect that individuals' beliefs about the offer arrival rate have on their optimal search behavior. In particular, we are interested in the effect of a change in individuals' locus of control on ϕ and s^* . It can be shown that individuals who have a more internal locus of control, i.e., those who believe that their own efforts have relatively large effects on future outcomes, have higher reservation wages and search more intensively than those with a more external locus of control. Specifically, we find that

$$\frac{\partial\phi}{\partial loc} > 0 \quad \text{and} \quad \frac{\partial s^*}{\partial loc} > 0. \quad (6)$$

See Appendix B for details.⁷ The implications are quite intuitive. Conditional on search

⁷These implications correspond to the theoretical results given by van den Berg and van der Klaauw (2006). They show in the context of a job search model with multiple search channels that an increase in search productivity—which corresponds to an increase in the subjective returns to search in our model—leads to a higher reservation wage and an increase in search effort.

intensity, individuals with a highly internal locus of control expect more future job offers. For them remaining unemployed and waiting for new job offers has a higher expected utility, which leads to a higher reservation wage. For a given amount of search and a specific reservation wage, the subjective marginal returns of search are also higher for individuals with a highly internal locus of control. So, in order to equalize the marginal returns and marginal costs of search, they search more.

For simplicity, the model is based on the assumption that the locus of control is stable over time, i.e., that the unemployment duration itself does not have any impact on $f(loc)$ and that individuals do not update their beliefs about the impact of their search effort on the probability of receiving a job offer. This simplifying assumption allows us to maintain tractability and focus attention on the key relationships of interest. In the empirical analysis, we analyze the effect of locus of control on job search behavior by comparing only individuals who are at the same point in the unemployment spell. Thus, our estimates are unaffected by any subsequent updating of beliefs as individuals' unemployment spells progress.

2.2 Locus of Control Independent of Search Effort

Thus far we have assumed that locus of control affects individuals' search behavior through their perceptions of the effect of job search on the probability of finding a job. Specifically, we have assumed that $\frac{\partial \lambda^*(s^*, loc)}{\partial s^*}$ is higher for those with a more internal locus of control than for those with a more external locus of control.

The implications of this can be compared to the case when locus of control affects the probability of receiving a job offer independent of search effort. We investigate this possibility by specifying an alternative model in which the relationship between job offer arrivals and an individual's locus of control is given by $\lambda_a(s, loc) = \lambda(s) + f(loc)$ with $f'(loc) > 0$. In this case, individuals with an internal locus of control have a higher subjective probability of receiving a job offer for any given search intensity perhaps because they are more optimistic. This implies that – in contrast to the model above – the expected effect of search on the probability of receiving a job offer is independent of an individuals' locus of control, i.e. $\frac{\partial \lambda_a(s, loc)}{\partial s} = \frac{\partial \lambda(s)}{\partial s}$.

Solving for the optimal search effort implies that

$$c'(s^*) = \frac{\lambda'(s^*)}{r + q} \int_{\phi}^{\infty} (w - \phi) dF(w). \quad (7)$$

Reservation wages are given by:

$$\phi = b - c(s^*) + \frac{\lambda(s^*)}{\lambda(s^*)'} c'(s^*) + \frac{f(loc)}{r + q} \int_{\phi}^{\infty} (w - \phi) dF(w). \quad (8)$$

Unlike the case when locus of control operates through beliefs about the payoff to additional search effort (see equation (4)), here an individual's locus of control affects his or her optimal search level only through the effect that it has on his or her reservation wage ϕ . Reservation wages are higher the more internal an individual's locus of control is because, for a given search effort s^* , the probability of receiving an acceptable job offer

is higher. This implies that – unlike the previous case – individuals with a more internal locus of control are expected to search less because their internal locus of control leads to a uniformly higher job offer arrival rate no matter how hard they search. Specifically, we find that

$$\frac{\partial \phi}{\partial loc} > 0 \quad \text{and} \quad \frac{\partial s^*}{\partial loc} < 0. \quad (9)$$

See Appendix B for details. The intuition behind the reservation wage result is the same as before. For a given search effort, remaining unemployed and waiting for new job offers has a higher expected utility for individuals with a highly internal locus of control leading them to have a higher reservation wage. However, unlike the previous case, the effect of search in increasing the rate at which job offers arrive is the same as for those with an external locus of control. This implies that the chances that a given search intensity will result in an acceptable wage offer are lower for individuals with a highly internal locus of control because they receive job offers at the same rate, but their reservation wages are higher. This leads to a lower optimal search intensity for them.⁸

Having a more internal locus of control has an ambiguous effect on the length of time an individual spends being unemployed irrespective how we model the link between locus of control and the returns to search effort. In particular, the expected unemployment duration is given by $T_u = 1/[\lambda(s^*)(1 - F(\phi))]$. Having a more internal locus of control increases the reservation wage in both models which tends to increase the duration of unemployment. When locus of control is related to subjective beliefs about the payoff to search, individuals with a highly internal locus of control search more, which leads to a higher job arrival rate and decreases the time spent in unemployment. When locus of control is independent of search returns, those with an internal locus of control search less, but have a higher probability of receiving a job offer conditional on their search intensity. Neither model implies a clear prediction on the impact of the locus of control on unemployment duration. This underscores the importance of observing job search behavior directly.

3 The IZA Evaluation Data Set

The data come from the IZA Evaluation Data Set which targets a sample of individuals entering unemployment between June 2007 and May 2008. In particular, from the monthly unemployment inflows of approximately 206,000 individuals identified in the administrative records, a nine percent random sample is selected for interview. These individuals constitute the gross sample from which representative samples of approximately 1,450 individuals are interviewed each month, so that after one year twelve monthly cohorts are gathered. These survey data are then matched to administrative employment records of

⁸The additive model and its implications are similar to the one presented by Fougere, Pradel, and Roger (2009). In their study the unemployed workers receive job offers via own search and via public employment service (PES), the latter is costless and independent of own search effort. They show that search effort is a decreasing function of the exogenous PES rate of job contacts, similar to our results with search being a decreasing function of the locus of control.

the Public Employment Services.⁹ The IZA Evaluation Data Set is ideal for our purposes because individuals are interviewed shortly after they become unemployed and are asked a variety of non-standard questions about attitudes, expectations, and different personality traits including locus of control (see Caliendo et al., 2010, for details). Unlike other researchers, we are able to compare a large number of individuals with similar, short unemployment durations which reduces concerns about the potential for reverse causality to affect the analysis. Moreover, access to administrative data on employment histories including previous wages and time spent in employment allows us to carefully control for differences in human capital endowments which affect individuals' reservation wages and the likelihood of receiving a job offer.

We restrict our sample to individuals who are 16 to 54 years old, and who receive or are eligible to receive unemployment benefits.¹⁰ In wave 1, 17,396 interviews were completed with individuals each of whom had begun an unemployment spell approximately two months earlier. We restrict our analysis to individuals who were still unemployed and actively searching for a job at the time of interview. That is, we exclude individuals who had already found a job or were not searching for other reasons. We further exclude those individuals whose reported hourly reservation wages and benefit levels were in the lowest or highest percentile of the distribution and who had missing values in key variables. This leaves us with an estimation sample of roughly 7,900 individuals.

3.1 Measuring Locus of Control

We measure an individual's locus of control using his or her responses to ten separate items from the Rotter (1966) scale. Locus of control refers to a general expectation about internal versus external control of reinforcement (Rotter, 1966). People with a more external locus of control believe that much of what happens in life is beyond their control, while people with an internal locus of control see life's outcomes as dependent on their own decisions and behavior. Psychologists argue that these beliefs are central to understanding a person's motivation and the way that he or she makes decisions and sets goals. Those with an external locus of control are more likely to avoid situations in which they feel unable to cope, while those with an internal locus of control tend to set higher goals, persevere in challenging situations, and be more likely to achieve successful outcomes (Strauser, Ketz, and Keim, 2002).

The ten separate items underlying the Rotter scale are summarized in Table 1. For each item respondents were asked to respond on a scale from '1: I do not agree at all' to '7: I fully agree'. As a first step in creating a measure of individuals' locus of control, we used factor analysis to identify the number of common factors underlying our ten items. Our factor analysis (see upper part of Figure 1) indicated that items 1, 6 and 9

⁹For those individuals who gave us their permission we are able to link the survey data with administrative records based on the 'Integrated Labour Market Biographies' of the Public Employment Services, containing relevant register data from four sources: employment history, unemployment support recipience, participation in active labor market programs, and job seeker history.

¹⁰To generate a claim for unemployment benefits workers have to be employed for at least 12 months in the last three years before entering unemployment.

load onto one factor (interpretable as ‘internal’), while items 2, 3, 5, 7, 8, and 10 load onto another factor (interpretable as ‘external’). Item 4 did not load on to either factor and was discarded. We conducted a parallel factor analysis for a representative sample of respondents in the German Socio-Economic Panel (SOEP, see lower part of Figure 1). We found that these ten items load onto two factors in exactly the same way in the two samples indicating that our distinction between internal and external control is not specific to unemployed individuals, but rather is representative of the German population more generally. The presence of two common factors suggests that ‘internal’ and ‘external’ locus of control may represent two separate concepts. At the same time, our theoretical model is consistent with the early psychological literature in conceptualizing internal and external locus of control as being opposite ends of the same spectrum (see Rotter, 1966). Moreover, Rotter (1975) argues that factor analysis in and of itself is not useful in identifying whether the true structure of locus of control is uni- or multi-dimensional. Consequently, we follow others in the literature by constructing a continuous, uni-dimensional measure of locus of control with higher values corresponding to a more internal perspective and lower values corresponding to a more external perspective.¹¹ We do this by reversing the order of responses to the six items loading onto the external factor, averaging responses to all nine items, and then standardizing the result so that it has mean 0 and variance 1. Figure 2 shows the distribution of the index. We use this index to then categorize individuals as being ‘internal’ whenever they have index scores above the median and ‘external’ whenever they have index scores below the median (Indicator 1).

INSERT TABLE 1 ABOUT HERE
 INSERT FIGURES 1, 2 ABOUT HERE

Table 2 compares the demographic, human capital, and personality characteristics of individuals with an internal as opposed to external locus of control. Women, immigrants, married individuals, and older workers are significantly more likely than others to believe that much of what happens in life is outside their control. Having higher educational attainment on the other hand is associated with a more internal locus of control. Interestingly, there also appears to be a relationship between personality traits and locus of control. Those with an internal locus of control report significantly higher levels of openness, conscientiousness, extraversion, and significantly lower levels of neuroticism. These differences imply that it will be important to carefully control for individual characteristics when evaluating the effects of locus of control on job search outcomes.

INSERT TABLES 2 ABOUT HERE

One of the advantages of the IZA Evaluation Data Set is that we have detailed information about individuals’ previous labor market experiences making it apparent that those with an internal locus of control have somewhat more favorable employment histories. Those with an internal locus of control, for example, are significantly less likely to

¹¹Piatek and Pinger (2010) also extract a single factor when measuring locus of control in the SEOP data.

have entered unemployment from employment (or subsidized employment) and are significantly more likely to have entered from education or other pathways. Since turning 18, those with an internal locus of control have spent on average 0.68 months per year in unemployment, while those with an external locus of control have spent 0.87 months per year being unemployed. Moreover, an internal locus of control is associated with significantly higher months in employment in the years before entering unemployment, higher pre-unemployment wages and therefore also higher unemployment benefits. These relationships are consistent with previous evidence that having an internal locus of control is correlated with labor market success (Andrisani, 1977, 1981; Osborne Groves, 2005; Semykina and Linz, 2007; Duncan and Dunifon, 1998). In terms of the intergenerational transmission of noncognitive skills, we see that having a father with A-level qualifications or an employed father at age 15 is associated with a more internal locus of control. Finally, individuals with an internal locus of control are also significantly more likely to have access to a number of communication modes including mobile phones, computers, the internet, and e-mail. This, along with their advantaged employment history, is expected to facilitate job search.

Importantly, there are no significant differences across the two groups in either the month of entry into the sample or in the period between entry and first interview which is consistent with random sample selection.

3.2 Locus of Control and Job Search Behavior

Table 3 provides information about the reservation wages and search strategies for individuals in our sample. The results indicate that people with an internal locus of control have higher reservation wages and send out more job applications. In particular, those with an internal locus of control report a reservation wage of €7.18/hour on average, while those with an external locus of control have a reservation wage that is on average €0.47 lower. Individuals who believe that much of what happens in life is under their own control search more intensively sending out nearly two (11 percent) additional applications on average than individuals who think that events are outside their control. The corresponding distributions of the reservation wage and the search intensity are reported in Figure A.1 in the Appendix.

INSERT TABLE 3 ABOUT HERE

Interestingly, individuals with an internal locus of control are more optimistic about their chances of finding a job in the next period despite having higher reservation wages. Fully, 51 percent of those with an internal locus of control report that it is very likely that they will take up a job within the next six months, while only 38 percent of those with an external locus of control report the same. This degree of optimism is perhaps not surprising given that those with an internal locus of control also have more favorable job histories and are less likely to be in a disadvantaged labor market group (i.e. women, migrants, low educated).

4 Estimation Approach and Results

Our interest is in understanding whether individuals’ beliefs about the extent to which they control life’s outcomes affect the way they search for jobs. We are particularly interested in understanding whether any effect of locus of control operates through individuals’ perceptions of the return to their own search efforts. Our strategy to address this issue is twofold: First, we directly analyze the effect of locus of control on individuals’ beliefs about the probability of receiving an acceptable job offer. This allows us to assess whether those with an internal locus of control do in fact perceive a higher return to their job search investments. Second, we formally test the empirical predictions of the two competing models discussed in Sections 2.2 and 2.3 using both OLS and propensity score matching methods.

4.1 The Probability of Receiving an Acceptable Wage Offer

Coleman and Deleire (2003) conclude that locus of control affects individuals’ education decisions primarily by altering their expectations regarding the return to investments in human capital. If a similar process operates here, we should expect to see a relationship between a person’s locus of control and the return that he or she expects from greater search effort. We test this proposition by using probit regression to estimate the effect of search intensity (as measured by the number of applications submitted) on the likelihood that an individual believes the probability that he or she will receive an acceptable job offer is ‘very high’.¹² Our model includes controls for the number of applications submitted, an indicator for whether or not the individual has an internal locus of control, and the interaction between them. This interaction term allows the relationship between search intensity and the perceived pay off to job search (i.e. the probability of finding a job) to differ between those with an internal locus of control and those without. In this model we control for other personality traits like openness, extraversion and neuroticism as well as the reservation wage.¹³

INSERT TABLE 4 ABOUT HERE

The main results in Table 4 show that the effect of an additional application on the belief that one is ‘very likely’ to receive a job offer is significantly higher amongst those with an internal locus of control.¹⁴ In particular, the marginal effect of each additional application is 0.2 percentage points higher for those individuals with an internal locus of control than for those with an external locus of control. Our results are virtually identical whether we use our continuous locus of control index (column 1) or whether we use include a simple dummy variable for being internal (column 2). As a robustness check, we also consider a more restrictive indicator of an internal locus of control. Specifically, only those individuals scoring high (above the median) on the three items underlying the

¹²Probit estimation on the probability that an individual believes getting a job is ‘likely’ or ‘very likely’ and OLS estimation on all four response categories lead to very similar results.

¹³The model also includes controls for demographic characteristics, human capital endowments, and previous employment histories.

¹⁴Full estimation results are available in Table A.1 in the Appendix.

internal factor and low (below the median) on the six items underlying the external factor are categorized as being ‘internal’ (Indicator 2). This categorization takes seriously the notion that internal and external locus of control may be separate concepts and classifies individuals as being ‘internal’ only if they score high on the internal and low on the external factor. These individuals are then compared to those ‘external’ individuals who score low on the three internal items and high on the six external items.¹⁵ Using this more restrictive measure, we find that the marginal effect of one additional application is 0.3 percentage points higher for individuals who believe that future outcomes are determined by their own actions (see column 3).

Having an internal locus of control therefore appears to be associated with the belief that there is a higher return (in terms of reemployment probabilities) to investments in job search. This suggests that locus of control may influence economic decisions by affecting the perceived returns to various sorts of investments. Individuals, however, simultaneously choose their search effort and their reservation wage both of which affect the expected probability of finding an acceptable job. Consequently, this analysis—while suggestive—does not allow us to test the different implications of the two models directly. We turn to this issue below.¹⁶

4.2 Reservation Wages and Search Intensity

4.2.1 OLS Estimation

We begin by using OLS regression to estimate the effect of locus of control on both reservation wages and the number of applications that each individual has submitted. We consider three specifications each of which corresponds to an alternative measure of locus of control. Table 5 summarizes the main OLS results, full estimation results are available in Tables A.2 and A.3 in the Appendix.

INSERT TABLE 5 ABOUT HERE

We find that reservation wages increase as individuals’ locus of control becomes more internal everything else equal (see upper part of Table 5). Specifically, a one standard deviation increase in the extent to which an individual has an internal locus of control is associated with a 1.6 percent increase in his or her reservation wage. The magnitude of this effect is consistent with McGee (2010) who finds that a one standard deviation increase in internality is associated with a 2.0 percent increase in young unemployed men’s first reported reservation wage and with a 1.3 percent increase in reservation wages over all. On balance, individuals who are in the top half of the locus of control distribution have reservation wages that are 2.7 percent higher than their counterparts with an external locus of control (see column 2). Results are similar when we consider our more restricted

¹⁵Individuals scoring either high or low on both the internal and external items are disregarded.

¹⁶It is also interesting that, in models 1 and 2, the overall number of applications submitted is negatively related to the probability that an individual believes finding a job is very likely. This seems to point to some reverse causality highlighting the correlational nature of the estimates. Full results are available upon request.

definition of internal and external locus of control (see column 3). It is important to note that all of these effects are highly significant and are net of a number of other variables (e.g. human capital characteristics, employment history, etc.) which serve to control for disparity in individuals' ability.

There is also evidence that individuals with a more internal locus of control also search for jobs more intensively (see lower part of Table 5). Each standard deviation increase in the degree to which an individual sees life's events as under his or her own control results in the submission of 0.15 additional job applications, while individuals in the top half of the locus of control distribution submit 0.54 more applications than do those in the bottom half of the distribution. Neither effect is statistically significant. However, when we focus on our more restricted locus of control measure, we find large differences in the search intensity of those who are clearly internal relative to those who are clearly external in their perspectives. Individuals scoring high on the internal factor and low on the external factor submit 2.30 applications more than their counterparts who score the reverse. This is an increase of 14.5 percent. In comparison, McGee (2010) estimates that a one standard deviation increase in internality increases the hours of job search by more than 19 percent, but has no significant effect on the number of search methods utilized. This diversity of results across alternative measures of search intensity indicates that individuals' locus of control may affect not only how intensively they search for new jobs, but also the way they go about finding them.

4.2.2 Propensity Score Matching

In order to improve the efficiency and precision of our estimates we also use propensity score matching (PSM) to assess the impact of the locus of control on job search behavior. The primary motivation for applying PSM in this context is to make internal and external individuals as comparable as possible in all other characteristics so that we can more directly compare differences in their search behavior.¹⁷

To this end, we use our two binary locus of control indicators to categorize individuals into two groups – external and internal – based on their locus of control. We then estimate two separate logit models of the probability of being classified as 'internal' (see Table A.4 in Appendix A). In order to isolate the effect of locus of control we need to include as many relevant variables in our model as possible. In addition to socio-demographic information, we also include human capital, personality characteristics and intergenerational variables (analogous to our OLS estimation in Tables A.2 and A.3). Based on these estimations we predict the propensity scores (i.e. the probability of having an internal locus of control) and use these scores in the subsequent matching process. Figure A.2 shows the distribution of the propensity scores in the different groups. For example, the first graph shows the propensity score distribution when 'internal' is defined as being above the median of the continuous locus of control distribution, while the second graph shows the distribution when 'internal' is defined to have a high score on the three items underlying the internal factor and a low score on the six items underlying the external factor. Individuals who are

¹⁷See Caliendo and Kopeinig (2008) or Imbens and Wooldridge (2009) for more details on the method.

internal are depicted in the upper half of each graph, individuals who are more external are depicted in the lower half. The figures show that, with the exception of very few cases in the upper tail, the common support condition is satisfied, i.e., we find for nearly every individual in our sample who is internal a comparable unemployed who is external in his or her perspectives.

INSERT TABLE 6 ABOUT HERE

Propensity score matching results are presented in Table 6.¹⁸ We find that people who are more internal have much higher reservation wages. The marginal effect on reservation wages of being in the top half of the continuous locus of control distribution (internal) versus the bottom half (external) is 3.3 percent. This effect falls slightly to 3.1 percent when we consider our more restrictive definition of being internal versus external. Both effects are highly significant and economically important. Moreover, the matching statistics show that the matching procedure was very successful in balancing the distribution of covariates in both groups. To be more specific, the mean and median standardized differences (biasaft and mdbaft) in the covariates after matching are reduced to below 1.5 (and even 1.0 in most of the cases).

Individuals with a more internal locus of control also submit more applications everything else equal. The effect is clearest when we use our more restrictive categorization to compare individuals who are clearly internal in their perspective with those who are clearly external. People who score high on the internal factor and low on the external factor submit an additional 2.6 applications over those who score the opposite a 16.4 percent increase.

Overall, the propensity score matching results confirm our OLS results which is reassuring since we allow here for non-linearities in the outcome equation and more importantly assign different weights to each individual. Whereas OLS assigns all individuals the same weight in the estimation, the matching procedure allows a finer comparison between individuals in different categories by adjusting for differences in the distribution of covariates in a more efficient way (see, e.g., Abadie, Diamond, and Hainmueller, 2010).

5 Conclusions

Designing sensible public policy to assist unemployed individuals requires that we know more about their own job search decisions. In particular, why do some unemployed individuals invest more than others in finding new employment? Does believing that life's events are outside one's control lead to a relative lack of search effort? If so, can we design policies to promote self-efficacy among the unemployed?

This paper analyzes the link between individuals' locus of control and their decisions to invest in job search. We advance standard job search theory by developing search

¹⁸Results presented here are based on a kernel matching algorithm with an epanechnikov kernel function, a bandwidth of 0.06 and common support; standard errors are based on 100 bootstrap replications. Results are not sensitive to the choice of the matching algorithm. Sensitivity analysis are available on request from the authors.

models which incorporate individuals' subjective beliefs about the effect of their job search effort on the job offer arrival rate. These subjective beliefs depend on individuals' locus of control, i.e., the extent to which they believe that their actions affect future outcomes. We empirically estimate the impact of locus of control on job search behavior using novel linked survey and administrative data for a large sample of newly-unemployed Germans. We find that having an internal locus of control is associated with the belief that investments in job search have a higher payoff in terms of reemployment probabilities. Moreover, those who believe that they have control over what happens in their lives set higher reservation wages and search more intensively than those who feel little control over their lives. Taken together, these results are consistent with a model of job search in which locus of control affects offer arrival rates through individuals' subjective beliefs about the payoffs to job search. They cannot be explained by a model in which an internal locus of control simply increases the probability of receiving a job offer no matter how hard an individual searches.

These results advance our understanding of the role that individuals' self-efficacy plays in human capital investments generally, and job search in particular. At the same time, there are a number of issues yet to be resolved. In particular, while we have argued that locus of control affects search behavior through its effect on individuals' subjective beliefs about the returns to search investments, we cannot rule out the possibility that locus of control instead operates by altering the productivity of search itself. Those with an internal locus of control may simply be able to generate more job offers at every level of search. Our theoretical framework is certainly consistent with this alternative explanation, however, our estimates of the link between individuals' locus of control and their expectations about finding an acceptable job offer certainly suggest that beliefs about the returns to search are important. Moreover, if locus of control operates through search productivity, rather than through the perceived returns to search, our modeling exercise makes it clear that this cannot occur in a simple linear way.

There is a need for additional empirical research which estimates these relationships for different labor market groups across a number of countries so that we can begin to understand how the institutional arrangements underpinning the unemployment benefits system might interact with individuals' sense of self-efficacy in driving job search. Finally, it would be useful to incorporate locus of control into dynamic models of the job search process. This would allow us to begin to understand the way that individuals' self-efficacy evolves over time in response to labor market events.

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Tables and Figures

Table 1: Components of Locus of Control

Variable	Mean	SD	Median
N	7,878		
Components of Locus of Control (1: I do not agree at all, 7: I agree fully) ^(a)			
Q1. How my life takes course is entirely dependent on me	6.08	(1.27)	[7.00]
Q2. Compared to others, I have not achieved what I deserved	3.63	(1.94)	[4.00]
Q3. What one achieves is, in the first instance, a question of destiny and luck	3.45	(1.93)	[3.00]
Q5. I often experience that others make decisions about my life	2.82	(1.86)	[2.00]
Q6. Success is gained through hard work	6.26	(1.15)	[7.00]
Q7. When I encounter difficulties in life, I often doubt my abilities	3.37	(1.86)	[3.00]
Q8. The possibilities I have in life are dependent on social circumstances	4.49	(1.66)	[5.00]
Q9. More important than all efforts is to exercise one's own abilities	5.24	(1.40)	[5.00]
Q10. I have little control over things which happen in my life	2.67	(1.78)	[2.00]

Source: *IZA Evaluation Data Set*, own calculations.

^(a) Individuals were asked the following question: "The following statements characterize different attitudes towards life and the future. To what extent do you personally agree with these statements? Please answer on the basis of a scale of 1 to 7."

Table 2: Selected Descriptive Statistics by Locus of Control

Variable	Indicator 1 ^(a)		t-test p-value
	External	Internal	
N	4020	3858	
<i>Socio-Demographic Variables</i>			
West Germany	0.68	0.69	0.72
Female	0.53	0.48	0.00
German citizenship	0.94	0.96	0.00
Age	36.80	34.36	0.00
Married (or cohabiting)	0.41	0.38	0.00
One child	0.19	0.18	0.20
Two (or more) children	0.15	0.14	0.64
School Leaving Degree			
None, Special needs, other	0.03	0.02	0.00
Lower secondary school	0.33	0.25	0.00
Middle secondary school	0.42	0.44	0.28
Specialized upper secondary school	0.21	0.29	0.00
Higher Education			
None	0.11	0.08	0.00
Internal or external professional training, others	0.73	0.70	0.01
Technical college or university degree	0.16	0.22	0.00
<i>Employment History</i>			
Months in Unemployment (div. by age-18)	0.87	0.68	0.00
Months in Employment (div. by age-18)	8.25	8.10	0.32
Unemployment Benefit Recipient (yes)	0.79	0.79	0.84
Level of Unemployment Benefit in €/month (missings=0)	504.68	547.34	0.01
Employment status before Unemployment			
Employed	0.67	0.64	0.01
Subsidized employment	0.07	0.06	0.06
School, apprentice, military, etc.	0.12	0.18	0.00
Maternity leave	0.05	0.05	0.15
Other	0.09	0.06	0.00
Months in regular employment in Year $t - x$ Before Unemployment			
t-1	7.39	7.44	0.65
t-2	7.07	7.45	0.00
t-3	6.59	6.95	0.00
Ln(Wage) in Euro in Year $t - x$ Before Unemployment			
t-1	3.04	3.01	0.51
t-2	2.82	2.90	0.05
t-3	2.58	2.68	0.02
<i>Other Personality Traits and Intergenerational Transmission</i>			
Big-5 (7 = completely applies, 1 = does not apply) ^(b)			
Openness	4.97	5.07	0.00
Conscientiousness	6.14	6.38	0.00
Extraversion	4.94	5.40	0.00
Neuroticism	4.11	3.42	0.00
Intergenerational: Father has A-Level qualifications?			
Not known	0.06	0.06	0.13
Yes	0.13	0.16	0.00
No	0.80	0.78	0.02
Intergenerational: Father in employment when interviewee was 15 years old?			
Not known (or already dead)	0.11	0.10	0.09
Yes	0.83	0.85	0.02
No	0.06	0.05	0.13
<i>Other Variables</i>			
Available Means of communication:			
Landline Phone	0.85	0.86	0.30
Mobile	0.92	0.94	0.00
Computer	0.82	0.88	0.00
Printer	0.74	0.80	0.00
Internet	0.73	0.78	0.00
Email	0.69	0.77	0.00
Regional Unemployment Rate :			
below 5%	0.16	0.14	0.15
5-10%	0.44	0.45	0.42
10-15%	0.27	0.28	0.10
15+%	0.13	0.12	0.07

Source: IZA Evaluation Data Set, own calculations.

Note: All numbers are shares unless stated otherwise; p-value refers to a two-sided t-test of mean equality between both groups. Descriptive statistics for all variables are available on request from the authors.

^(a) The Locus of Control index aggregates all standardized answers in the following way: “Q1 + Q6 + Q9 - (Q2 + Q3 + Q5 + Q7 + Q8 + Q10)” (see also Figure 1). Individuals are coded as having an internal (external) locus of control if they score higher (lower) than average on the standardized index.

^(b) The fifth BIG-5 item “agreeableness” is not observed for all of the individuals.

Table 3: Job Search Behavior by Locus of Control

Variable	Indicator 1		t-test p-value
	External	Internal	
N	4,020	3,858	
Hourly Reservation Wage (in Euro)	6.71	7.18	0.00
Log(Reservation Wage)	1.86	1.92	0.00
Number of Own Applications (Mean)	14.91	16.80	0.00
0	0.05	0.04	0.00
1-4	0.20	0.19	0.09
5-9	0.21	0.21	0.88
10-19	0.25	0.24	0.59
20-29	0.14	0.15	0.31
30+	0.13	0.17	0.00
Expected probability of finding a job in the next 6 month (1=very probable, 4=very improbable) ^(a)	1.78	1.57	0.00
very probable	0.38	0.51	0.00
probable	0.38	0.30	0.00
improbable	0.11	0.06	0.00
very improbable	0.04	0.03	0.10

Source: *IZA Evaluation Data Set*, own calculations.

Note: All numbers are shares unless stated otherwise; p-value refers to a two-sided t-test of mean equality between both groups.

^(a) This information is observed for 3,622 individuals with external locus of control and 3,468 individuals with internal locus of control.

Table 4: Probit Estimation Results: Probability of Finding a Job is Very High (Marginal Effects)

	(1)	(2)	(3)
Number of Own Applications	-.002***	-.002***	-.002***
Log(Reservation wage)	0.077***	0.079***	0.095***
Number of Own Applications x LOC	0.002***	0.002***	
Number of Own Applications x Interaction			0.003***
Locus of Control (Standardized)	0.047***		
LOC: Indicator 1 (Dummy, 1 = High)		0.08***	
LOC: Indicator 2 (High Internal and Low External) ^(c)			0.112***
Including Control Variables ^(a)	Yes	Yes	Yes
Including Personality Traits ^(b)	Yes	Yes	Yes
Including Variables potentially determined by LOC ^(c)	Yes	Yes	Yes
Obs.	7,090	7,090	3,268
Pseudo R-2	0.089	0.088	0.108
log-Likelihood	-4475.54	-4482.74	-2015.43

Note: ***/**/* indicate significance at the 1%/5%/10%-level. Indices are standardized in the following way: $Index_i^{st} = (Index_i - Mean(Index))/SD(Index)$.

^(a) Full estimation results are available in Table A.1 in the Appendix.

^(b) Openness, Conscientiousness, Extraversion, Neuroticism.

^(c) Previous Employment Outcomes and Educational Attainment

^(d) Dummy variable for individuals with High Internal LOC (loc-int 50+) and Low External LOC (loc-ext6 50-)

Table 5: OLS Estimation Results: Log(Reservation Wage) and Search Intensity (Number of Own Applications)

	(1)	(2)	(3)
<i>(A) Log Reservation Wage</i>			
Locus of Control (Standardized)	0.016***		
LOC: Indicator 1 (Dummy, 1 = High)		0.027***	
LOC: Indicator 2 (High Internal and Low External) ^(d)			0.029***
Obs.	7878	7878	3,639
Adjusted R-2	0.324	0.323	0.313
<i>(B) Search Intensity (Number of Own Applications)</i>			
Locus of Control (Standardized)	0.145		
LOC: Indicator 1		0.543	
LOC: Indicator 2			2.298**
Obs.	7878	7878	3639
Adjusted R-2	0.027	0.027	0.024
Including Control Variables ^(a)	Yes	Yes	Yes
Including Personality Traits ^(b)	Yes	Yes	Yes
Including Variables potentially determined by LOC ^(c)	Yes	Yes	Yes

Note: ***/**/* indicate significance at the 1%/5%/10%-level. Indices are standardized in the following way: $Index_i^{st} = (Index_i - Mean(Index))/SD(Index)$.

^(a) Full estimation results are available in Tables A.2 and A.3 in the Appendix.

^(b) Openness, Conscientiousness, Extraversion, Neuroticism.

^(c) Previous Employment Outcomes and Educational Attainment

^(d) Dummy variable for individuals with High Internal LOC (loc-int 50+) and Low External LOC (loc-ext6 50-)

Table 6: Propensity Score Matching Results

Index	Effect	s.e.	t	TN ²	NT ²	Off ²	biasaft ²	mdbaft ²
Outcome Variable: Log(Reservation Wage)								
LOC: Indicator 1 ^a	0.0331	0.0079	4.1863	3858	4020	11	0.9919	0.7486
LOC: Indicator 2 ^b	0.0311	0.0137	2.2703	1566	2073	4	2.3731	2.1648
Outcome Variable: Search Intensity								
LOC: Indicator 1 ^a	0.4527	0.6433	0.7038	3858	4020			
LOC: Indicator 2 ^b	2.6103	1.0904	2.3939	1566	2073	4	2.3731	2.1648

Note: Results presented here a based on a kernel matching algorithm with an epanechnikov kernel function, a bandwidth of 0.06 and imposition of common support; standard errors are based on 100 bootstrap replications.

^(a) Individuals are coded as having an internal locus of control if they are above the median on the standardized locus of control index; we compare the ‘high’ and the ‘low’ groups.

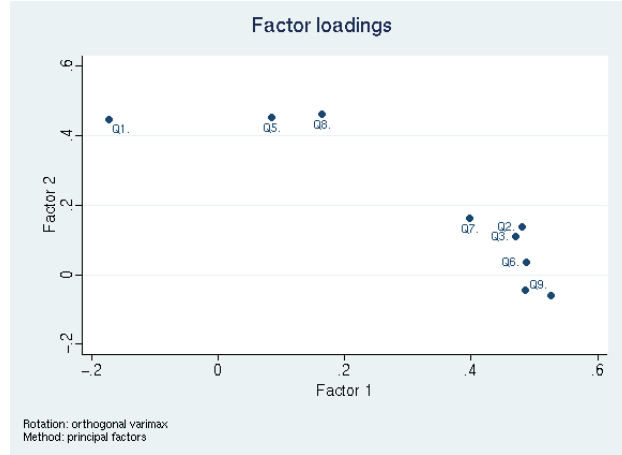
^(b) Dummy variable for individuals with High Internal LOC (loc-int 50+) and Low External LOC (loc-ext6 50-)

⁽¹⁾ The first specification does not include other personality traits as explanatory variables in the propensity score estimation; the second specification does (see Table A.4 for details and Figure A.2 for score distributions).

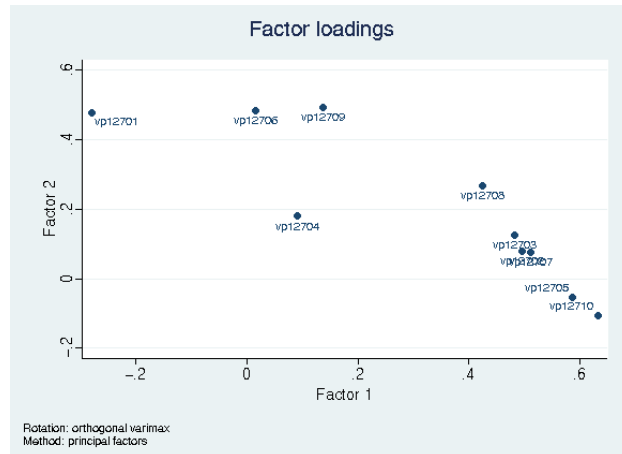
⁽²⁾ TN and NT indicate the number of individuals in the ‘high’ and ‘low’ group; Off counts the number of individuals outside the common support region. biasaft and mdbaft summarize the mean and median standardized bias after matching.

Figure 1: Factor Loadings of the LOC Variables

Our Sample



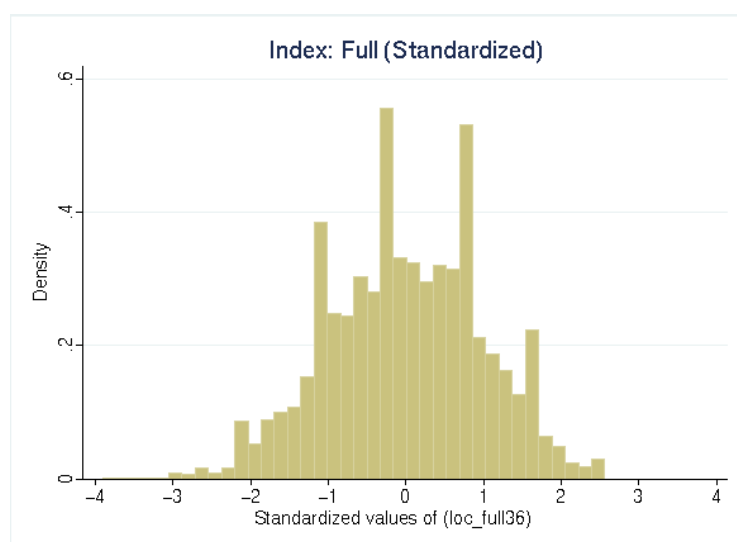
Representative Population Sample (SOEP)



Note: Factor 1 is interpreted as ‘External Locus of Control’; Factor 2 as ‘Internal Locus of Control’.

- The ‘Internal Index’ aggregates the standardized answers in the following way: “Q1 + Q6 + Q9”.
- The ‘External Index’ aggregates the standardized answers in the following way: “Q2 + Q3 + Q5 + Q7 + Q8 + Q10”.
- Finally, the ‘Full Index’ aggregates all standardized answers in the following way: “Q1 + Q6 + Q9 - (Q2 + Q3 + Q5 + Q7 + Q8 + Q10)”.

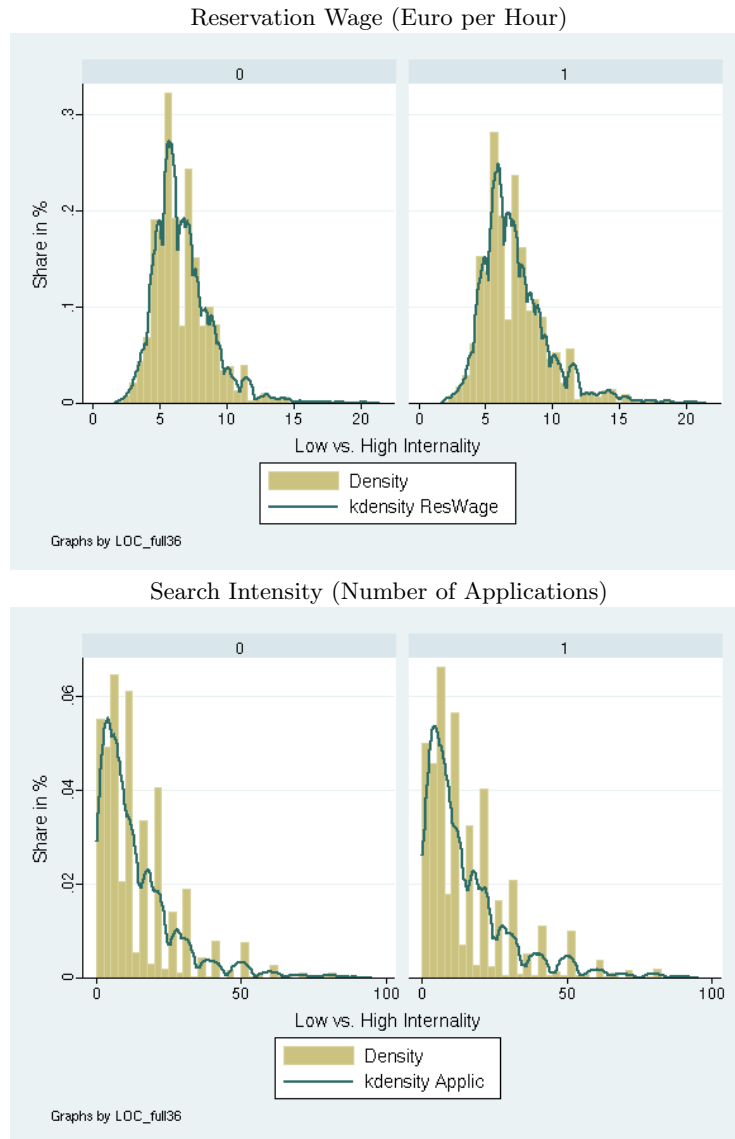
Figure 2: Distribution of the Locus of Control Indices



Note: See Figure 1 for a definition of the index.

A Supplementary Tables and Figures

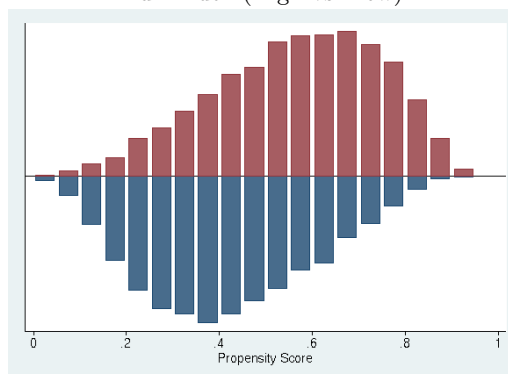
Figure A.1: Distribution of Reservation Wages and Number of Applications by Locus of Control



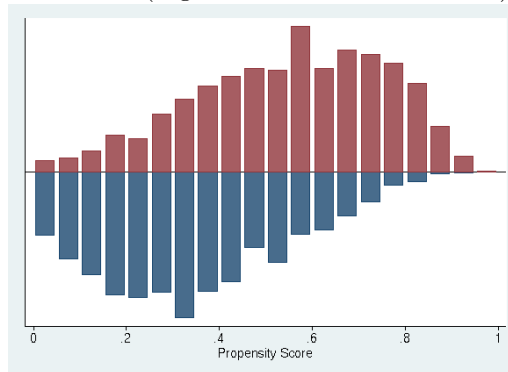
Source: *IZA Evaluation Dataset*, own calculations.
 People with internal (external) locus of control based on Indicator 1 are depicted on the right (left) hand side.

Figure A.2: Propensity Score Distribution

Full Index (High vs. Low)



Interaction (High Internal and Low External)



Note:

Table A.1: Probit Estimation Results: Probability of Finding a Job is Very High (Marginal Effects)

test	(1)	(2)	(3)
Number of own applications (mean)	-.002***	-.002***	-.002***
searchown-full36	0.002***	0.002***	
searchown-intext36			0.003***
LOC Full Index (36, standardized)	0.047***		
LOC Full Index (36, 1 = High)		0.08***	
LOC (Int6(50+)=1 and Ext6(50-)=0)			0.112***
Log(Reservation wage)	0.077***	0.079***	0.095***
sm-openness-st	0.029***	0.028***	0.023**
sm-conscient-st	0.007	0.009	0.007
sm-extraversion-st	0.023***	0.026***	0.037***
sm-neuroticism-st	-.010	-.014**	-.014
West Germany	-.004	-.003	-.028
Female	-.088***	-.090***	-.100***
German citizenship	-.026	-.022	-.020
Married (or cohabiting)	-.055***	-.054***	-.084***
Children (Ref.: No children)			
One child	0.006	0.006	0.024
Two (or more) children	-.035	-.035	-.040
Age (Ref.: 17-24 years)			
Age (25-34 years)	0.027	0.027	0.043
Age (35-44 years)	-.036	-.039*	-.031
Age (45-55 years)	-.159***	-.163***	-.124***
Father has A-level qualifications?			
Not known (ref.)			
Yes	-.025	-.023	-.0009
No	-.004	-.002	0.013
Father employed at age 15?			
Not known or already dead (ref.)			
Yes	0.0002	-5.72e-06	-.013
No	-.014	-.014	-.078
Living Situation			
Own appartement/house (ref.)			
Rent	-.007	-.006	-.032
Subletting	0.051	0.05	0.016
Other	0.136	0.146*	0.109
Without	-.049	-.025	-.026
Available means of communication:			
Landline telephone	-.037*	-.036*	-.001
Personal mobile phone	0.036	0.039	0.105***
Computer	-.016	-.018	-.032
Printer	-.033	-.032	-.025
Internet	0.011	0.008	-.031
Email	0.019	0.024	0.017
Local UE Rate at Entry			
below 5% (ref.)			
5-10%	-.042**	-.041**	-.040
10-15%	-.061**	-.059**	-.067*
15+%	-.117***	-.116***	-.130***
School leaving degree			
None, special needs, other (Ref.)			
Lower secondary school	0.022	0.022	0.059
Middle secondary school	0.03	0.032	0.057
Specialized upper secondary school	0.045	0.045	0.056
Vocational training			
None (Ref.)			
Int. or ext. prof. training, others	-.003	-.001	-.007
Technical college or university degree	-.0008	0.001	-.015
Months in unemployment (div. by age-18)	-.019***	-.019***	-.021***
Months in employment (div. by age-18)	0.0009	0.0009	0.0005
Unemployment benefit recipient (1=yes)	-.0007	0.0001	-.025
Level of UB (log(ben+1),mis=0)	0.002	0.002	0.005
Seeking self-employment	0.009	0.011	0.025
Employment status before UE (Ref.: Employed)			
Subsidized employment	-.029	-.030	-.019
School, apprentice, military, etc.	0.012	0.011	0.016
Maternity leave	-.156***	-.155***	-.148***
Other	-.065***	-.065***	-.058
Months in regular employment in			
t-1	-.006***	-.006***	-.001
t-2	0.0006	0.0005	-.001
t-3	-.009***	-.009***	-.013***
Ln(Wage) in Euro in			
t-1	0.022***	0.022***	0.004
t-2	0.024***	0.025***	0.035***
t-3	0.025***	0.025***	0.036***
Obs.	7090	7090	3268
Pseudo-R ²	0.09	0.089	0.11
log-Likelihood	-4470.356	-4477.229	-2011.881

Note: Additional control variables used in the estimation: Months of entry into unemployment (June 2007 - April 2008) and time between entry and interview (in weeks). Full estimation results are available on request by the authors.

*** / ** / * indicate significance at the 1%/5%/10%-level.

Table A.2: OLS Estimation Results: Log(Reservation Wage)

	(1)	(2)	(3)
LOC Full Index (36, standardized)	0.016***		
LOC Full Index (36, 1 = High)		0.027***	
LOC (Int6(50+)=1 and Ext6(50-)=0)			0.029***
sm-openness-st	0.017***	0.017***	0.011**
sm-conscient-st	-.0009	-.0004	0.0008
sm-extraversion-st	0.005	0.006	0.009
sm-neuroticism-st	-.013***	-.014***	-.011**
West Germany	0.131***	0.132***	0.143***
Female	-.103***	-.104***	-.118***
German citizenship	-.014	-.012	0.0002
Married (or cohabiting)	-.003	-.002	0.005
Children (Ref.: No children)			
One child	0.03***	0.031***	0.024**
Two (or more) children	0.069***	0.069***	0.065***
Age (Ref.: 17-24 years)			
Age (25-34 years)	0.085***	0.085***	0.072***
Age (35-44 years)	0.133***	0.132***	0.126***
Age (45-55 years)	0.145***	0.144***	0.128***
Father has A-level qualifications?			
Not known (ref.)			
Yes	0.033**	0.033**	0.025
No	-.0009	-.0003	-.018
Father employed at age 15?			
Not known or already dead (ref.)			
Yes	0.007	0.006	0.003
No	0.018	0.018	-.018
Living Situation			
Own appartement/house (ref.)			
Rent	-.008	-.007	-.005
Subletting	-.033**	-.033**	-.020
Other	0.001	0.003	-.041
Without	0.02	0.026	-.009
Available means of communication:			
Landline telephone	-.025**	-.024**	-.033**
Personal mobile phone	0.03**	0.031***	0.036**
Computer	-.004	-.005	-.014
Printer	-.003	-.002	-.001
Internet	0.022	0.021	0.021
Email	0.028**	0.029**	0.034*
Local UE Rate at Entry			
below 5% (ref.)			
5-10%	-.028***	-.028***	-.033**
10-15%	-.036***	-.036***	-.046**
15+%	-.032**	-.032**	-.029
School leaving degree			
None, special needs, other (Ref.)			
Lower secondary school	0.037*	0.037*	0.003
Middle secondary school	0.045**	0.045**	0.037
Specialized upper secondary school	0.125***	0.125***	0.099***
Vocational training			
None (Ref.)			
Int. or ext. prof. training, others	0.072***	0.073***	0.069***
Technical college or university degree	0.217***	0.218***	0.22***
Months in unemployment (div. by age-18)	-.015***	-.015***	-.011***
Months in employment (div. by age-18)	0.0003	0.0003	0.0004
Unemployment benefit recipient (1=yes)	-.068***	-.068***	-.056**
Level of UB (log(ben+1),mis=0)	0.01***	0.01***	0.008**
Seeking self-employment	0.039***	0.04***	0.044**
School, apprentice, military, etc.	-.008	-.008	-.026
Maternity leave	0.039**	0.04**	0.051**
Other	0.018	0.018	0.015
Months in regular employment in			
t-1	-.005***	-.005***	-.005***
t-2	-.0001	-.0002	0.002
t-3	-.0005	-.0005	-.0002
Ln(Wage) in Euro in			
t-1	0.017***	0.017***	0.021***
t-2	0.016***	0.016***	0.013***
t-3	0.014***	0.014***	0.014***
Obs.	7878	7878	3639
R ²	0.33	0.329	0.326
Adjusted R ²	0.324	0.323	0.313

Note: Additional control variables used: Month of entry into unemployment (June 2007-May2008) and time between unemployment entry and interview (7-14 weeks). Full estimation results are available on request by the authors.

*** / ** / * indicate significance at the 1% / 5% / 10%-level.

(a) Indices are standardized in the following way: $Index_i^{st} = (Index_i - Mean(Index)) / SD(Index)$.

Table A.3: OLS Estimation Results: Search Intensity (Number of Own Applications)

	(1)	(2)	(3)
LOC Full Index (36, standardized)	0.143		
LOC Full Index (36, 1 = High)		0.543	
LOC (Int6(50+)=1 and Ext6(50-)=0)			2.298**
sm-openness-st	0.333	0.335	0.346
sm-conscient-st	1.259***	1.245***	1.130**
sm-extraversion-st	0.651**	0.641**	0.75
sm-neuroticism-st	-0.555*	-0.529*	-0.409
West Germany	1.899*	1.904*	2.541
Female	-0.748	-0.749	-1.210
German citizenship	-0.686	-0.681	-2.908
Married (or cohabiting)	-0.824	-0.828	-1.194
Children (Ref.: No children)			
One child	-0.927	-0.919	-1.419
Two (or more) children	-1.606*	-1.598*	-1.702
Age (Ref.: 17-24 years)			
Age (25-34 years)	-3.250***	-3.245***	-2.994**
Age (35-44 years)	-4.250***	-4.229***	-4.075**
Age (45-55 years)	-4.435***	-4.401***	-4.027**
Father has A-level qualifications?			
Not known (ref.)			
Yes	1.147	1.149	2.864
No	0.26	0.266	1.460
Father employed at age 15?			
Not known or already dead (ref.)			
Yes	0.475	0.472	-0.649
No	1.390	1.391	-1.149
Living Situation			
Own appartement/house (ref.)			
Rent	1.047*	1.057*	0.716
Subletting	1.421	1.436	0.619
Other	-4.018	-3.964	-6.354
Without	1.844	1.863	3.427
Available means of communication:			
Landline telephone	-1.309	-1.303	-1.475
Personal mobile phone	2.461**	2.466**	2.801
Computer	-1.813	-1.826	-0.863
Printer	2.420**	2.425**	2.049
Internet	2.480*	2.476*	0.839
Email	-0.140	-0.138	1.483
Local UE Rate at Entry			
below 5% (ref.)			
5-10%	0.762	0.759	0.206
10-15%	1.622	1.620	2.294
15+%	1.617	1.628	0.989
School leaving degree			
None, special needs, other (Ref.)			
Lower secondary school	0.068	0.068	1.534
Middle secondary school	-0.479	-0.488	0.792
Specialized upper secondary school	-1.181	-1.199	0.02
Vocational training			
None (Ref.)			
Int. or ext. prof. training, others	0.034	0.032	-0.791
Technical college or university degree	1.626	1.609	2.801
Months in unemployment (div. by age-18)	0.286	0.289	1.084***
Months in employment (div. by age-18)	0.045	0.045	0.05
Unemployment benefit recipient (1=yes)	-1.361	-1.339	-2.632
Level of UB (log(ben+1),mis=0)	0.261	0.257	0.535*
Seeking self-employment	0.2	0.203	-0.914
School, apprentice, military, etc.	0.616	0.6	0.892
Maternity leave	-3.413**	-3.424**	-3.562
Other	0.854	0.868	2.062
Months in regular employment in			
t-1	-0.238**	-0.238**	-0.242
t-2	-0.030	-0.031	0.14
t-3	-0.050	-0.049	0.051
Ln(Wage) in Euro in			
t-1	0.417	0.421	0.237
t-2	0.197	0.196	0.0008
t-3	-0.137	-0.139	-0.732
Obs.	7878	7878	3639
R ²	0.035	0.035	0.043
Adjusted R ²	0.027	0.027	0.024

Note: Additional control variables used: Month of entry into unemployment (June 2007-May2008) and time between unemployment entry and interview (7-14 weeks). Full estimation results are available on request by the authors.

*** / ** / * indicate significance at the 1% / 5% / 10%-level.

(a) Indices are standardized in the following way: $Index_i^{st} = (Index_i - Mean(Index)) / SD(Index)$.

Table A.4: Propensity Score Estimation Results

Index:	High vs. Low	
	Full Index (1)	Interaction (2)
West Germany	-.021	-.159
Female	-.096*	-.257***
German citizenship	0.13	0.287
Married (or cohabiting)	0.091	0.236**
Children (Ref.: No children)		
One child	-.079	-.069
Two (or more) children	-.085	-.201
Unemployment benefit recipient (1=yes)	-.309**	-.159
Level of UB (log(ben+1),mis=0)	0.052***	0.038
Internal Locus of Control		
Local UE Rate at Interview		
below 5% (ref.)		
5-10%		
10-15%		
15+%		
sm-openness-st	-.060**	-.0007
sm-conscient-st	0.3***	0.62***
sm-extraversion-st	0.264***	0.5***
sm-neuroticism-st	-.589***	-.485***
Yes	0.033	0.18
No	0.0002	0.144
Father has A-level qualifications?		
Not known (ref.)		
Yes	0.025	-.136
No	-.033	-.084
-Iv63a-3		
Father employed at age 15?		
Not known or already dead (ref.)		
Living Situation		
Own appartement/house (ref.)		
Rent	-.119**	-.146*
Subletting	-.246*	-.200
Other	-.553	0.069
Without	0.652	1.053
Available means of communication:		
Landline telephone	-.032	-.087
Personal mobile phone	0.076	0.132
Computer	0.08	-.122
Printer	-.024	-.148
Internet	-.067	0.071
Email	0.193*	0.02
Age (Ref.: 17-24 years)		
Age (25-34 years)	-.061	-.089
Age (35-44 years)	-.417***	-.548***
Age (45-55 years)	-.705***	-.795***
School leaving degree		
None, special needs, other (Ref.)		
Lower secondary school	0.017	-.096
Middle secondary school	0.208	-.159
Specialized upper secondary school	0.312*	-.411
Vocational training		
None (Ref.)		
Int. or ext. prof. training, others	0.187**	0.094
Technical college or university degree	0.382***	0.167
Months in unemployment (div. by age-18)	-.065***	-.052*
Months in employment (div. by age-18)	0.004	0.005
Months of entry		
June (ref.)		
July	-.105	-.257
August	0.099	-.057
September	-.153	-.134
October	0.005	-.193
November	-.047	-.082
December	-.117	-.215
January	-.160	-.298
February	-.134	-.156
March	-.233	-.449**
April	-.159	-.405*
May	-.145	-.606***
-Idauint-0		
Time between UE and interview:		
7 weeks (ref.)		
8	0.002	0.034
9	-.048	-.111
10	-.016	-.109
11	-.010	-.030
12	-.296	-.305
13	-.007	-.149
14 or more	-.049	-.140
Employment status before UE (Ref.: Employed)		
Subsidized employment	-.092	-.117
School, apprentice, military, etc.	0.243***	0.143
Maternity leave	0.233*	0.376*
Other	-.202**	-.334**
Months in regular employment in		
t-1	0.004	-.006
t-2	0.014	0.027*
t-3	-.007	-.002
Ln(Wage) in Euro in		
t-1	-.058**	-.034
t-2	0.028	0.015
t-3	0.033	-.012
Obs.	7878	3639
Pseudo-R ²	0.114	0.163
log-Likelihood	-4834.431	-2080.634
e(hitrate)	66.882	32.673

Note: The propensity score is estimated using a logit model. The groups are defined according to having a high (treated) or low (control) index value. See Figure 2 for the relevant thresholds. Columns 4-6 include other personality traits as explanatory variables; columns 1-3 do not.

Additional control variables used in the estimation: Months of entry into un-

B Notes on Theoretical Framework

Proposition 1. *Individuals with a more internal locus of control have higher reservation wages and search more intensively than those with a more external locus of control, i.e., $\frac{\partial s^*}{\partial loc} > 0$ and $\frac{\partial \phi}{\partial loc} > 0$.*

Proof. Equation (5) gives the relationship between the reservation wage ϕ and the optimal level of search effort s^* . Differentiating equation (5) with respect to loc gives:

$$\begin{aligned} \frac{\partial \phi}{\partial loc} &= \frac{\partial}{\partial loc} \left[\frac{\lambda(s^*)}{\lambda'(s^*)} c'(s) \right] - c'(s^*) \frac{\partial s^*}{\partial loc} \\ &= \frac{\lambda(s^*)}{\lambda'(s^*)} c''(s^*) \frac{\partial s}{\partial loc} + \frac{\lambda'(s^*)^2 \frac{\partial s^*}{\partial loc} - \lambda(s^*) \lambda''(s) \frac{\partial s^*}{\partial loc}}{\lambda'(s^*)^2} c'(s^*) - c'(s^*) \frac{\partial s^*}{\partial loc} \\ &= \left[\frac{\lambda(s^*)}{\lambda'(s^*)} c''(s^*) - \frac{\lambda(s^*) \lambda''(s^*) c'(s^*)}{\lambda'(s^*)^2} \right] \frac{\partial s^*}{\partial loc} \end{aligned} \quad (10)$$

The job arrival rate depends positively on an individual's search effort, but at a decreasing rate, i.e., $\lambda' > 0$ and $\lambda'' < 0$, while search costs are increasing in search effort, i.e., $c' > 0$ and $c'' > 0$. Thus, the expression in square brackets is positive which implies that $\partial \phi / \partial loc$ and $\partial s^* / \partial loc$ have the same sign.

Equation (4) shows that individuals choose their optimal search effort by equating the marginal cost of job search with the marginal benefits of additional search. Differentiating (4) with respect to loc gives:

$$\begin{aligned} c''(s^*) \frac{\partial s^*}{\partial loc} &= \frac{\lambda'(s^*) f'(loc)}{r+q} \int_{\phi}^{\infty} (w - \phi) dF(w) + \frac{\lambda''(s^*) f(loc)}{r+q} \frac{\partial s^*}{\partial loc} \int_{\phi}^{\infty} (w - \phi) dF(w) \\ &\quad + \frac{\lambda'(s^*) f(loc)}{r+q} \frac{\partial}{\partial loc} \int_{\phi}^{\infty} (w - \phi) dF(w) \\ &= \frac{\lambda'(s^*) f'(loc)}{r+q} \int_{\phi}^{\infty} (w - \phi) dF(w) + \frac{\lambda''(s^*) f(loc)}{r+q} \frac{\partial s^*}{\partial loc} \int_{\phi}^{\infty} (w - \phi) dF(w) \\ &\quad - \frac{\lambda'(s^*) f(loc)}{r+q} [1 - F(\phi)] \frac{\partial \phi}{\partial loc} \end{aligned} \quad (11)$$

Rearranging the above expression yields:

$$\begin{aligned} \frac{\partial s^*}{\partial loc} \left[c''(s^*) - \frac{\lambda''(s^*) f(loc)}{r+q} \int_{\phi}^{\infty} (w - \phi) dF(w) \right] &= - \frac{\lambda'(s^*) f(loc)}{r+q} [1 - F(\phi)] \frac{\partial \phi}{\partial loc} \\ &\quad + \frac{\lambda'(s^*) f'(loc)}{r+q} \int_{\phi}^{\infty} (w - \phi) dF(w) \end{aligned} \quad (12)$$

The right-hand-side term in square brackets is positive. This implies that in order for equation (12) to hold $\frac{\partial s^*}{\partial loc}$ and $\frac{\partial \phi}{\partial loc}$ must both be positive. If they were both negative, the left-hand side of equation (12) would be negative while the right-hand side would be positive.

B.1 Alternative Model

We now consider an alternative model, in which a function of the locus of control contributes to the job arrival rate additively: $\lambda_a(s, loc) = \lambda(s) + f(loc)$. As before, we continue to assume that $f'(loc) > 0, c' > 0, c'' > 0, \lambda' > 0$ and $\lambda'' < 0$.

In this case, the utilities of accepting a job offer at wage w , $V_e(w)$ and of continuing job search, V_u , are given by:

$$V_e(w) = \frac{1}{1 + rdt} [wdt + (1 - qdt)V_e(w) + qdtV_u] \quad (13)$$

$$V_u = \frac{1}{1 + rdt} [(b - c(s))dt + (\lambda(s) + f(loc))dt (\int_0^\phi V_u dF(w) + \int_\phi^\infty V_e(w) dF(w)) + (1 - (\lambda(s) + f(loc))dt)V_u] \quad (14)$$

The reservation wage is given by:

$$\begin{aligned} \phi &= b - c(s) + \frac{\lambda(s) + f(loc)}{r + q} \int_\phi^\infty (w - \phi) dF(w) \\ &= b - c(s) + \frac{\lambda(s)}{r + q} \int_\phi^\infty (w - \phi) dF(w) + \frac{f(loc)}{r + q} \int_\phi^\infty (w - \phi) dF(w) \end{aligned} \quad (15)$$

Unemployed individuals choose their search effort and reservation wage so as to maximize V_u over an infinite horizon. The reservation wage defines the search stopping rule and thus satisfies the condition that $V_u = V_e(w)$. Substituting this constraint into the optimization problem, we can show that the optimal search behavior is determined by the maximization of $V_u = \phi/r$ with respect to s . This implies that we can solve for the optimal search effort s^* by differentiating the previous equation with respect to (s) and solving for the s^* such that $\partial\phi/\partial s = 0$. Specifically, we find that

$$c'(s) = \frac{\lambda'(s)}{r + q} \int_\phi^\infty (w - \phi) dF(w) \quad (16)$$

Substituting this expression into equation 15 we get:

$$\phi = b - c(s) + \frac{\lambda(s)}{\lambda'(s)} c'(s) + \frac{f(loc)}{r + q} \int_\phi^\infty (w - \phi) dF(w) \quad (17)$$

Proposition 2. *In this alternative model, individuals with a more internal locus of control have higher reservation wages, but search less intensively than those with a more external locus of control, i.e., $\frac{\partial s^*}{\partial loc} < 0$ and $\frac{\partial \phi}{\partial loc} > 0$.*

Proof. Differentiating 16 with respect to loc gives:

$$\begin{aligned} c''(s) \frac{\partial s}{\partial loc} &= \frac{\lambda''(s)}{r + q} \frac{\partial s}{\partial loc} \int_\phi^\infty (w - \phi) dF(w) + \frac{\lambda'(s)}{r + q} \frac{\partial}{\partial loc} \int_\phi^\infty (w - \phi) dF(w) \\ &= \frac{\lambda''(s)}{r + q} \frac{\partial s}{\partial loc} \int_\phi^\infty (w - \phi) dF(w) - \frac{\lambda'(s)}{r + q} [1 - F(\phi)] \frac{\partial \phi}{\partial loc} \end{aligned} \quad (18)$$

Rearranging the above expression yields:

$$\frac{\partial s}{\partial loc} \left[c''(s) - \frac{\lambda''(s)}{r+q} \int_{\phi}^{\infty} (w - \phi) dF(w) \right] = \left[-\frac{\lambda'(s)}{r+q} [1 - F(\phi)] \right] \frac{\partial \phi}{\partial loc} \quad (19)$$

Given that $c'' > 0$, $\lambda' > 0$ and $\lambda'' < 0$, the expression in square brackets on the right-hand side is positive, while the expression in square brackets on the left-hand side is negative. Thus, equation (19) shows that $\frac{\partial s}{\partial loc}$ and $\frac{\partial \phi}{\partial loc}$ must have opposite signs. Moreover, differentiating the expression for the reservation wage in equation (17) with respect to loc gives:

$$\begin{aligned} \frac{\partial \phi}{\partial loc} &= \frac{\partial}{\partial loc} \left[\frac{\lambda(s)}{\lambda'(s)} c'(s) \right] - c'(s) \frac{\partial s}{\partial loc} \\ &+ \frac{f'(loc)}{r+q} \int_{\phi}^{\infty} (w - \phi) dF(w) + \frac{f(loc)}{r+q} \frac{\partial}{\partial loc} \int_{\phi}^{\infty} (w - \phi) dF(w) \\ &= \frac{\lambda(s)}{\lambda'(s)} c''(s) \frac{\partial s}{\partial loc} + \frac{\lambda'(s)^2 \frac{\partial s}{\partial loc} - \lambda(s) \lambda''(s) \frac{\partial s}{\partial loc}}{\lambda'(s)^2} c'(s) - c'(s) \frac{\partial s}{\partial loc} \\ &+ \frac{f'(loc)}{r+q} \int_{\phi}^{\infty} (w - \phi) dF(w) + \frac{f(loc)}{r+q} \frac{\partial}{\partial loc} \int_{\phi}^{\infty} (w - \phi) dF(w) \\ &= \left[\frac{\lambda(s)}{\lambda'(s)} c''(s) - \frac{\lambda(s) \lambda''(s)}{\lambda'(s)^2} \right] \frac{\partial s}{\partial loc} \\ &+ \frac{f'(loc)}{r+q} \int_{\phi}^{\infty} (w - \phi) dF(w) - \frac{f(loc)}{r+q} [1 - F(\phi)] \frac{\partial \phi}{\partial loc} \end{aligned} \quad (20)$$

Rearranging the above expression yields:

$$\frac{\partial \phi}{\partial loc} \left[1 + \frac{f(loc)}{r+q} [1 - F(\phi)] \right] = \left[\frac{\lambda(s)}{\lambda'(s)} c''(s) - \frac{\lambda(s) \lambda''(s)}{\lambda'(s)^2} \right] \frac{\partial s}{\partial loc} + \frac{f'(loc)}{r+q} \int_{\phi}^{\infty} (w - \phi) dF(w) \quad (21)$$

In equation (21) the terms in square brackets are both positive. Thus, equation (21) only holds if $\frac{\partial s}{\partial loc} < 0$ and $\frac{\partial \phi}{\partial loc} > 0$.