

DO EMPLOYERS USE UNEMPLOYMENT  
AS A SORTING CRITERION WHEN HIRING?  
EVIDENCE FROM A FIELD EXPERIMENT\*

by

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**Abstract**

In this study, we use unique data from a field experiment in the Swedish labor market to investigate how past and contemporary unemployment affect a young worker's probability of being invited to a job interview. In contrast to studies using administrative/survey data, we have complete control over the information available to the employers and there is no scope for unobserved heterogeneity. We find no evidence that recruiting employers use information about past unemployment to sort workers. This suggests that the scarring effects of unemployment may not be as severe as has been indicated by previous studies. Overall, our results suggest that recruiting employers, when confronted with a pile of job applications, follow a strategy of picking applicants with positive characteristics ('diamonds') rather than eliminating applicants with negative characteristics ('lemons').

**Keywords:** Scarring, Unemployment, Field Experiment

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"This has never happened in the post-war period in the United States. They are losing the skills they had, they are losing their connections, their attachment to the labor force."

–Ben Bernanke, *Chairman of the Federal Reserve*.

## **1. Introduction**

Recently, the US labor market has started to resemble European labor markets with high unemployment and long unemployment spells. In 2010, the US unemployment rate was 9.6 percent and close to 30 percent had been unemployed for more than one year (OECD, 2011). This rise in long-term unemployment is remarkable and the current fraction is more than two and a half times higher than in 2008. Also worrying, is the rise in youth unemployment. In many European countries, unemployment is close to ten percent and up to 50 percent are long-term unemployed.

For an individual worker, periods of unemployment may have important social and economic consequences, especially if recruiting employers use information about past or contemporary unemployment to sort workers. If employers prefer not to hire jobseekers with a history of unemployment, unemployed workers will have a hard time finding jobs, it will be very difficult to bring down high unemployment, and there will be scope for policy measures to help unemployed workers compete for jobs. Hence, it is crucial for policymakers to be informed about the causal effects of experiencing unemployment.

In this study, we analyze to what extent employers use information about the job applicants' employment history to sort workers when hiring. Specifically, we investigate if they use information about past unemployment immediately after graduation, past unemployment between jobs, contemporary unemployment and/or work experience as sorting criteria. To this end, we use unique data from a large field experiment conducted in the

Swedish labor market where fictitious job applications were designed and randomly sent to employers advertising for workers in a number of selected occupations.

There are two main reasons why employers may use information about the workers' history of unemployment to sort workers: Employers may believe that the workers' skills deteriorate during the unemployment spell or that unemployment is a signal of unattractive worker characteristics (c.f. Phelps, 1972). If many employers use unemployment as a sorting criterion, this implies that severe long-term *scarring* effects of unemployment may arise.<sup>1</sup>

The risk of scarring effects has received a lot of attention from both economists and policymakers.<sup>2</sup> These effects are typically studied using administrative/survey data on individual labor market outcomes. Most of these studies find that a worker's history of unemployment has a clear association with both wages and employment. However, identifying the causal effects of past or contemporary unemployment on labor market outcomes is very difficult due to problems with unobserved heterogeneity. In studies using administrative/survey data, it is difficult to separate the effects of unemployment from the effects of other important worker characteristics which are observed by the recruiting firms but not included in the datasets. Thus, the risk of biased estimates is substantial. There are a number of approaches which can be used to handle this problem; e.g. making distributional assumptions about unobserved factors, or using instrumental variable techniques (e.g. Gregg, 2001). However, these approaches have inherent weaknesses; e.g. requiring strong

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<sup>1</sup> The effects of past unemployment on labor market outcomes are often referred to as *scarring* or *state dependence*. Heckman and Borjas (1990) distinguish between several types of state dependence; *occurrence dependence*, *lagged duration dependence*, and *duration dependence*. By these concepts, they mean that the probability of remaining unemployed depends on the number of past unemployment spells, the length of past unemployment spells, and the length of the current unemployment spell, respectively.

<sup>2</sup> In 2001, scarring was even the topic of a special issue of the Economic Journal; see Arulampalam *et al.*, 2001.

distributional assumptions or the existence of appropriate instruments.<sup>3</sup> To obtain better identification, some recent studies rely on exogenous events or sibling data (e.g. Åslund and Rooth, 2007, and Nordström Skans, 2011), but there are some problems with these approaches as well.<sup>4</sup> To further improve our understanding of the importance of scarring effects, there is a need for studies which use new approaches to eliminate unobserved heterogeneity.

In order to identify the causal effects of past and contemporary unemployment, we use a different approach compared to previous studies and focus explicitly on how the recruitment behavior of employers affects the potential for scarring to occur. Scarring may take many forms, but clearly one of the most important factors determining its importance is the extent to which employers use information about the job applicants' employment history to sort workers.

The key advantage of using data from a field experiment instead of administrative/survey data is that it becomes much easier to identify the causal effects of scarring. Since the employers make their choice of which applicants to invite to job interviews based only on the information in the applications, we can isolate the effect of each of the characteristics included in the applications. Hence, using this approach we have complete control over the information available to the employers and there is no scope for unobserved heterogeneity. In addition, the worker attributes are randomly assigned to the applications so there are no interdependencies among the regressors. A limitation of our approach is that we only study the early stages of the hiring process since we do not know

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<sup>3</sup> Heckman and Borjas (1990), Lancaster (1990), and Machin and Manning (1999) discuss these issues in detail.

<sup>4</sup> Such studies use exogenous events only affecting a particular subgroup (e.g. refugees), or use sibling data that take care of problems with unobserved characteristics which are common to the siblings but not other unobserved characteristics.

whom the employers eventually decide to hire. However, it is likely that easily observable characteristics, such as past or contemporary unemployment, should matter most in the early stages of the hiring process when employers want to get a shortlist of applicants to evaluate more carefully.

Our results show no evidence that recruiting employers use information about past unemployment, immediately after graduation or between jobs, to sort workers. This suggests that the scarring effects of unemployment may not be as severe as has been indicated before. For contemporary unemployment, our results show that employers, in general, do not reject unemployed job applicants. However, we find some evidence that employers view long periods of contemporary unemployment unfavorably. In contrast, we find clear evidence that employers use information about work experience as a sorting criterion. Moreover, we analyze some important subgroups, i.e. native Swedish men and women and ethnic minority men (with a Middle Eastern background), separately, and find that most of the results are similar to the results for the full sample. Overall, our results suggest that, when employers screen a pile of job applications, they follow a ‘picking diamonds strategy’; i.e. they try to pick applicants with positive characteristics (‘diamonds’) rather than eliminating applicants with negative characteristics (‘lemons’).

As already mentioned, there are a number of empirical studies using administrative/survey data on individual labor market outcomes to analyze the importance of scarring effects. Examples of studies investigating the effects of the workers’ history of unemployment on wages and/or employment are Ellwood (1982), Concoran (1982), Heckman and Borjas (1990), and Mroz and Savage (2006) using US data, Narendranathan and Elias (1993), Arulampalam *et al.* (2000), Arulampalam (2001, 2002), Gregory and Jukes (2001), Gregg (2001), Burgess *et al.* (2003), Gregg and Tominey (2005), and Bell and Blanchflower (2011) using UK data, Muhleisen and Zimmermann (1994) using German data,

and Raaum and Røed (2006) using Norwegian data. Two studies using Swedish data are Åslund and Rooth (2007) that analyze an exogenous placement policy for refugees, and Nordström Skans (2011) that use sibling data. Most of these studies find evidence of scarring effects, but the size of the effects varies. Examples of studies investigating the effects of contemporary unemployment include Blau and Robbins (1990), Belzil (1996), and Eriksson and Lagerström (2006, 2011), which all find strong evidence of negative effects. Moreover, there is evidence from survey- and interview-based studies that some employers view unemployment as a negative signal (e.g. Atkinson *et al.*, 1996, and Bewley, 1999). It should be noted that studies using Swedish administrative data find similar evidence of scarring as studies for other countries. For example, Nordström Skans (2011) show that unemployment for more than 51 days after graduation, much shorter than the spell lengths we consider, increases the probability of unemployment five years later by three percentage points.

We believe that our study offers several important contributions to the existing literature. In particular, it is the first study which uses data from a field experiment to analyze the effects of past or contemporary unemployment on labor market outcomes. This is important since this approach, as explained above, offers clear advantages in terms of identifying causal effects. Also, we explicitly separate the effects of different types of past and contemporary unemployment, and analyze the effects in important subgroups.

The rest of the paper is organized as follows. Section 2 presents the field experiment and gives some descriptive statistics. Section 3 discusses identification and estimation issues, and presents the results. Section 4 concludes the paper.

## **2. The field experiment<sup>5</sup>**

The data we use is from a field experiment conducted in the Swedish labor market between March and November 2007. During this period all employment advertisements in selected occupations found on the website of the Swedish Public Employment Service were collected. A clear majority of the employers posting vacancies on this site states that they prefer to get job applications by e-mail. In total, 8,466 job applications were sent by e-mail to 3,786 employers. Invitations to job interviews were received by telephone (voice mailbox) and e-mail. To minimize any inconvenience to the employers, all invitations were promptly declined. In this section, we describe how the occupations/regions included in the study were chosen and how the applications were designed. Then, we present some descriptive statistics.

### **2.1 The choice of occupations and regions**

The objective when choosing which occupations and regions to include in the study was to get a representative picture of the labor market, while at the same time getting a design that was feasible to implement in practice.

For the occupations, we wanted to include both high skill and low/medium skill occupations. Also, to get a high response rate, we chose to include only occupations with a relatively high demand for labor. In total thirteen occupations were included. We chose seven occupations which typically require primary or secondary education (low/medium skill jobs): Business sales assistant, cleaner, construction worker, machine operator, motor-vehicle driver, restaurant worker, and shop sales assistant. We chose six occupations which typically require university education (high skill jobs): Accountant, computer professional, nurse,

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<sup>5</sup> The field experiment was designed for a larger research project on discrimination in hiring and is also used in Rooth (2011) to study the importance of other characteristics.

math/science teacher in upper compulsory school, language teacher in upper compulsory school, and teacher in secondary school. Finally, we chose to apply for jobs in cities all over Sweden, but the majority of the jobs were located in the two biggest metropolitan areas, Stockholm (59 percent) and Gothenburg (24 percent).

## **2.2 The design of the job applications**

The job applications were designed with the following considerations: First, the applications were constructed to appear realistic for a typical jobseeker looking for the advertised type of job. Second, to get a reasonably high response rate, the applications were designed to signal a well-qualified applicant. To implement this strategy in practice, we used a number of examples of applications on the website of the Swedish Public Employment Service as templates and adjusted them to suit our purposes. The applications consisted of a quite general biography on the first page and a detailed CV on the second page (see the Appendix for an example). Hence, Swedish job applications typically contain more information than what is common in countries such as the UK and the US, thus making Sweden an ideal country for conducting this type of field experiment in.

The typical approach in field experiments using the correspondence testing methodology is to vary only one characteristic in the applications, e.g. the ethnicity or gender of the applicant (c.f. Rich and Riach, 2002, and Carlsson and Rooth, 2007). However, in our experiment, we used a more general approach by randomly varying a number of characteristics. This allows us to measure the labor market return of different skills and attributes (c.f. Bertrand and Mullainathan, 2004, and Rooth, 2011).

The job applications were designed for young workers who search for a job a few years after graduating from secondary school or university. The applicants were randomly given a number of attributes which typically are included in (Swedish) job applications and are

expected to be important for the probability of being invited to a job interview. These attributes included past and contemporary unemployment, work experience, education, characteristics intended to capture important personality traits, leisure activities, gender, and ethnicity.

In this study, we focus on the effects of the first three of these attributes, i.e. the applicants' employment history, and do not explicitly analyze how the other attributes affect the probability of being invited to a job interview.<sup>6</sup> To investigate how employers respond to different types of information about the job applicants' employment history, five variables were randomly assigned to the job applications: Unemployment for a year immediately after graduating from secondary school or university (0/1), unemployment between jobs for a total of one year (0/1), contemporary unemployment (0, 3, 6 or 9 months), years of work experience (1, 2, 3, 4 or 5 years), and number of employers (1 or 3).

The first and third variables – the spells that start and end a worker's employment history – were randomly assigned irrespective of the other variables. Hence, these variables are, by construction, independent of all other attributes. Concerning the randomization of the other three variables, the applications were first randomly given one or three employers. If given one employer, 'years of work experience' was randomly given a value between one and five, while 'unemployment between jobs' was always given the value zero. If given three employers, 'years of work experience' was randomly given a value between three and five, while 'unemployment between jobs' was randomly given the value zero or one.<sup>7</sup> This means

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<sup>6</sup> Since these attributes are randomly assigned to the applications, they should not affect the estimates which we focus on. However, we include these variables in the regressions as a robustness check (c.f. Section 3.2).

<sup>7</sup> Hence, the difference between 1 and 2, and 2 and 3, years of work experience is identified by applicants having one employer, while the difference between 3 and 4, and 4 and 5, years of work experience is identified by all applicants.

that these three variables, by construction, are correlated. However, conditional on the variable ‘number of employers’, the variables ‘unemployment between jobs’ and ‘years of work experience’ are also independent of all other attributes. This is illustrated in Table 1, which shows the correlation matrix for the employment history variables.

Information about the workers’ history of unemployment was not explicitly stated in the applications, but could be extracted from the information given in the CV, i.e. unemployment was signalled by time gaps between the year of graduation<sup>8</sup>, employment spells etc. (see the Appendix for an example).<sup>9</sup> Figures 1a-c illustrate the applicants’ employment history for the three types of unemployment spells we focus on.

Our choices of unemployment spell lengths were made to include signals which are both strong and realistic. Nordström Skans (2011) shows that 22 percent of his sample of Swedish youth had unemployment spells longer than 51 days after graduation. For unemployment between jobs and contemporary unemployment, we used data on average unemployment spells as a guide. In 2007, the average completed spell length was 10 weeks for 16-24 year olds and 16 weeks for 25-54 year olds, while the corresponding uncompleted spell lengths were 13 and 27 weeks, respectively (SCB, 2011). Hence, since our choices of spell lengths are longer than the average duration for all types of unemployment we consider, they correspond to important margins and should induce strong signals in the CVs.<sup>10</sup> However, in order to focus on typical unemployment spells, we did not include very long durations, such as e.g. contemporary unemployment of more than nine months.

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<sup>8</sup> In Sweden, the school year for both secondary schools and universities ends in June.

<sup>9</sup> In another project, we interviewed employers about their hiring practices. Anecdotal evidence from that project indicates that employers look for time gaps in job applicants’ CVs when they screen applications.

<sup>10</sup> The total history of the unemployment spells in the CVs varies between zero and 33 months.

Given the design of the experiment, the applicants' age could not be randomly assigned. Instead, the applicants were given an age which fitted with their employment history.<sup>11</sup> This means that applicants applying for high skill jobs were 23-32 years old, and applicants applying for low/medium skill jobs were 20-31 years old. However, most of the applicants' were in a narrower age range.<sup>12</sup> As will be discussed below, this design implies that age cannot be included as a variable in the regressions since it is perfectly linearly correlated with the employment history variables (c.f. Section 3.1).

Concerning the workers' other characteristics, formal education was chosen to match the requirements of the advertised jobs. The workers' place of residence was chosen so that workers applying for jobs in all cities except Gothenburg were given an address in Stockholm, while applicants applying for jobs in Gothenburg were given an address in Gothenburg. The applicants were randomly assigned a male or a female name, which could be either a Swedish- or a foreign-sounding name (Middle Eastern). The names signaled a native Swedish male (one third of the applications), a native Swedish female (one third of the applications) and an ethnic minority male (one third of the applications).<sup>13</sup> The rest of the attributes were randomly assigned. For personality traits, two measures were used; agreeable and extrovert.<sup>14</sup> For leisure activities, a number of activities were included; individual sports

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<sup>11</sup> The age of the applicant can be found by calculating backwards from the date when the application was constructed, using time spent in employment, time spent in unemployment, time spent in university education and time spent abroad during secondary school.

<sup>12</sup> 95 percent of the applicants for high skill jobs were 24-30 years old, and 93 percent of the applicants to low/medium skill jobs were 20-27 years old.

<sup>13</sup> The names used were Erik, Anna and Mohamed. In previous experiments, we included more names without finding any name effects, and we therefore decided upon using only these names in this experiment to simplify the experimental procedure.

<sup>14</sup> This was signalled by a short text in the biography; c.f. Rooth (2011) for the details.

(tennis, golf, running and swimming) and team-sports (soccer and basketball) at the competitive or recreational level, and other activities (socializing and cultural activities). We also included experience as a visiting high school student in the US, work experience during the summer breaks, and having more education than required.<sup>15</sup> A more detailed description of these attributes can be found in Rooth (2011).

### **2.3 Descriptive statistics**

In total, 8,466 job applications were sent to 3,786 employers. Each employer was sent either one or three applications. When three applications were sent to the same employer, one signaled a native Swedish male, one a native Swedish female and one an ethnic minority male. Moreover, the applications were given different layouts (randomly assigned) and were sent to employers over a period of a few days (in random order).<sup>16</sup>

Table 2 presents descriptive statistics for the jobs which applications were sent to. Approximately 37 percent of the applications were sent to firms with high skill jobs and 63 percent were sent to firms with low/medium skill jobs. The clear majority of the jobs were located in Stockholm or Gothenburg.

Table 3 presents the distribution of the attributes which are the focus in this paper; i.e. past and contemporary unemployment, and work experience. Around 20 percent of the job applicants were assigned a period of unemployment immediately after graduation, 23 percent a period of unemployment between jobs, and 50 percent a period of contemporary unemployment.

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<sup>15</sup> More education than required is that a worker with a university education applies for a low/medium skill job.

<sup>16</sup> Employers in Stockholm and Gothenburg were sent three applications, while employers in the rest of Sweden were sent one application.

In total, the applicants got 2,083 invitations to interviews from employers. Table 4 presents some descriptive statistics for the probability of getting an invitation to an interview for workers with different attributes. The overall response rate is 0.25, but the response rate is higher for high skill jobs (0.30) than for low/medium skill jobs (0.21). There are some differences between workers depending on their employment history: Workers with past or contemporary spells of unemployment have received fewer responses, but the differences are rather small; i.e. in the range 0.01 to 0.02. Also, workers with more work experience have, in general, received more responses.

### **3. Estimation and results**

Our objective is to analyze the importance of the workers' employment history for their probability of being invited to a job interview. In this section, we describe the identification/estimation strategy and present the results.

#### **3.1 Identification and estimation**

Due to the design of the field experiment, identification of the causal effect of the workers' employment history on their probability of being invited to a job interview is very straightforward. First, we have complete control over the information available to the employers. This is the key advantage of using data from a field experiment: The employers' choices are based only on the information in the written applications and there is, by construction, no unobserved heterogeneity. Second, the worker attributes are randomly assigned to the applications meaning that there are no interdependencies among the regressors (c.f. Section 2.2). These features imply that we can estimate the model with the measures of the applicants' employment history as the only explanatory variables. However, we include gender and ethnicity in all regressions to highlight these important characteristics.

Since we have a finite sample, we also estimate models which include all other worker characteristics included in the applications. Both of these approaches should give us unbiased estimates of how a worker's employment history affects his or her probability of being invited to a job interview.

An important issue is how we should handle the fact that age, by construction, is highly correlated with the employment history variables. The key to identification of the employment history variables is that they were randomly assigned to the applications. Then, the applicants' age was calculated given their employment history (c.f. Section 2.2). Therefore, identification of all the employment history variables is ensured as long as we do not include age in the regressions. The underlying assumption is that employers do not consider the applicants' age as an important variable beyond its effect on their employment history.<sup>17</sup> In the case of our unemployment variables, applicants with and without a particular unemployment spell will always differ less than a year in age. As an example, consider two applications with the same work experience, but where one signals one year of unemployment and the other no unemployment. Then, the first applicant must be one year older than the second, but we assume that employers do not consider this small difference in age as important when hiring.

We do the estimation on two separate subsamples; jobs typically requiring a university education (high skill jobs) and jobs typically requiring a primary or secondary education (low/medium skill jobs). The reason for this division is that the design of the applications

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<sup>17</sup> In studies using administrative/survey data, age is often used as a proxy variable for work experience. In our experiment, we randomly assign a worker with both work experience and spells of past and contemporary unemployment. Therefore, age should only be an important worker characteristic if employers view it as important for given levels of work experience and unemployment spells.

differs somewhat between high skill and low/medium skill jobs. Also, the labor market may function differently for workers with different skill levels.

We estimate the following equation using the Probit model (reporting marginal effects<sup>18</sup>, and clustering standard errors on the job advertisement level):<sup>19</sup>

$$Callback_i = \alpha + \beta_1 U_i^{\text{After graduation}} + \beta_2 U_i^{\text{Between jobs}} + \beta_3 U_i^{\text{Contemporary}} + \beta_4 X_i + \varepsilon_i, \quad (1)$$

where  $Callback_i$  is an indicator which equals one if application  $i$  resulted in an invitation to a job interview,  $\alpha$  is the intercept,  $\beta_1$  gives the difference in the callback rate for applicants with one year of unemployment immediately after graduation relative to applicants who were employed immediately after graduation,  $\beta_2$  gives the difference in the callback rate for applicants with a year of unemployment between jobs relative to applicants without such unemployment spells,  $\beta_3$  gives the difference in the callback rate for contemporary unemployed applicants relative to employed applicants<sup>20</sup>, and  $\beta_4$  is a vector with the coefficients of the explanatory variables included in  $X$ .

We estimate two main specifications: In the first,  $X$  contains only years of work experience, the number of employers (as a 0/1 variable for 1 or 3 employers), an ethnic minority indicator, and a female indicator. In the second,  $X$  also contains all the other worker attributes described in Section 2.2 as well as a fixed effect for each of the occupations and regions.

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<sup>18</sup> The marginal effects are estimated using the `dprobit` command in Stata11.

<sup>19</sup> Using the linear probability model yields almost identical estimates.

<sup>20</sup> We focus on the comparison between employed applicants and all contemporary unemployed applicants, but also consider the effects of 3, 6 and 9 months of contemporary unemployment separately.

## 3.2 Results

In this section, we analyze how past unemployment, contemporary unemployment, and work experience affects the probability of being invited to a job interview (the callback rate). The results are presented in Tables 5, 6 and 7.

### *Past unemployment*

Table 5 presents the results for the full samples of high and low/medium skill job applicants. The results show that none of the measures of past unemployment – immediately after graduation or between jobs – have a statistically significant effect on the callback rate in any of the regressions: The coefficients are mostly negative, but far from statistically significant. The results do not change when we include all the other worker attributes included in the applications (column B). This confirms that the sample is big enough for the randomization of worker attributes to work as intended. Table 6 shows that the results for the three subgroups are similar to the results for the full sample.

Overall, these results demonstrate that recruiting employers do not seem to use information about past unemployment as a sorting criterion. This suggests that the scarring effects of unemployment may not be as severe as has been indicated by previous studies.

### *Contemporary unemployment*

Table 5 shows that being contemporary unemployed when applying for the job has no statistically significant effect on the callback rate in any of the regressions for the full samples. Table 6 confirms that this result holds for all three subgroups. However, although none of the estimates of contemporary unemployment are statistically significant, most of them are negative. Therefore, we investigate if the effect differs depending on the length of the unemployment spell. When we include separate measures for 3, 6 and 9 months of

contemporary unemployment (c.f. Table A1 in Appendix B), we find that 9 months of contemporary unemployment has a statistically significant negative effect on the callback rate for low/medium skill jobs. Somewhat surprisingly, we do not find any evidence of a similar effect for high skill jobs. These results suggest that some employers view long periods of contemporary unemployment unfavourably, but we cannot analyze this issue further since the experiment does not include searchers with very long spells of contemporary unemployment.

Overall, these results demonstrate that employers, in general, do not seem to prefer employed job applicants, but that some employers may view long periods of contemporary unemployment unfavourably.

#### *Work experience*

In contrast to the non-importance of the applicants' history of unemployment, the results in Tables 5 and 6 show that work experience has a positive, although not always statistically significant, effect on the callback rate. To analyze the importance of work experience further, we divide this variable into three separate measures; 1, 2 and 3-5 years of experience (all applicants have at least one year of experience). We use these categories both because the descriptive statistics indicate that these are the important margins (c.f. Table 3), and because the results get less precise when we divide the last category into three separate categories.

The results of the estimation are in Table 7. For high skill jobs, there is a strong positive effect of experience. In particular, having two instead of one year of experience has a strong positive effect: The effect is similar in size to the negative effect of being an ethnic minority male (c.f. Table 5). The effect of going from two to three to five years of experience is also positive, but smaller in size. One interpretation of these results is that applicants must 'reach a hurdle', in terms of experience, to be considered as attractive to hire for high skill jobs.

Somewhat surprisingly, we do not find the same pattern for low/medium skill jobs. The experience estimates are positive, but less precise. One interpretation of this finding is that the margins of experience that we consider are not as informative of productivity for low skill jobs as for high skill jobs. It may be that low skill jobs do not require that much experience, and thus that employers care more about whether applicants have zero or some experience. In light of these results, it would have been interesting to include the 0-1 experience margin in the experiment.

In the subgroups, the estimates are less precise and the coefficients vary more, but, in general, the results are similar to the results for the full samples. However, this is not the case for ethnic minority males. Compared to native Swedish workers more experience is required for this group to be considered as attractive to hire. This indicates that employers find it more difficult to assess the productivity of ethnic minority applicants, and therefore require more experience before picking them.

Overall, these results suggest that, when employers screen a pile of job applications, they look for applicants with positive characteristics ('diamonds'), such as experience. This is not surprising given the fact that an employer posting a vacancy typically receives many applications and, therefore, must find a strategy for getting a shortlist of applicants to evaluate more carefully since it is too costly and time-consuming to interview all applicants.<sup>21</sup>

### *Robustness*<sup>22</sup>

To check the robustness of the results, we have considered a number of alternatives and

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<sup>21</sup> In a previous study, we asked Swedish employers how many job applications they typically receive per job opening: Approximately two thirds reported that they, on average, received more than 20 applications. For the US, studies show that firms often receive 10-30 applications per job opening (e.g. Barron *et al.*, 1997).

<sup>22</sup> Detailed results are available from the authors upon request.

extensions. First, we have investigated if there are any correlations between the employment history variables and other applicant attributes. Such correlations should not exist since all applicant attributes are randomly assigned, but may arise in small samples. An analysis of this issue shows no sign of the existence of any such correlations. Moreover, we have experimented with including interaction effects between the applicants' attributes, especially between the employment history variables. However, we find no statistically significant interaction effects. Second, we have investigated if differences in local labor market conditions between different occupational groups may affect the results. In Tables 5, 6 and 7, fixed effects for each occupation and region were included, but we can extend this analysis by including interaction effects between the occupations and the regions in the regressions. Including such interactions do not affect the results. This indicates that differences in labor demand (i.e. unemployment) between occupations and regions are not affecting the results. Third, we have investigated what happens if we include firm characteristics in the regressions. This should not affect the results since the applications are randomly assigned to the advertised jobs, still, we have tried including variables for some potentially important firm characteristics – sector, size and gender composition – in the regressions. Including these variables do not affect any of the results. Finally, we have run separate regressions for each of the occupations. For some occupations the samples are very small, and therefore the precision of the estimates is low. Therefore, these estimates should be interpreted with caution, but the results indicate that none of the occupations differ significantly from the others.

Overall, we find no evidence that the employers' decision of whom to invite to a job interview is negatively affected by past unemployment, but clear evidence that it is positively affected by work experience.

#### **4. Concluding remarks**

In the US, unemployment, especially youth and long-term unemployment, is reaching levels comparable to European countries. Economists have for a long time warned that unemployment may have long-term consequences by creating *scars* negatively affecting workers' future labor market careers. For policymakers, it is important to know if workers experiencing unemployment suffer serious negative long-term consequences and how serious these *scars* are. The existing empirical literature analyzing the effects of past and contemporary unemployment indicates that these scarring effects may be substantial. However, many of the existing studies may be affected by serious problems with unobserved heterogeneity exaggerating the impact of past and contemporary unemployment.

In this paper, we use unique data from a large field experiment in the Swedish labor market to take a new look at this important issue. Scarring effects may take many forms, but clearly one of the most important factors determining its importance is the extent to which employers use information about the job applicants' employment history as a sorting criterion. To investigate this, fictitious job applications were designed and sent to a large number of employers advertising for workers. The applications were randomly assigned spells of past and/or contemporary unemployment in order to capture their causal impacts. The spell lengths were chosen to send strong and realistic signals of unemployment.

Most importantly, our results show no evidence of a negative effect of past unemployment immediately after graduation or between jobs. This suggests that the scarring effects of unemployment may not be as severe as has been indicated before. Moreover, employers, in general, do not seem to prefer employed applicants, but there is some evidence that they view long periods of contemporary unemployment unfavorably. In contrast, we find a clear positive effect of work experience. These results suggest that recruiting employers follow a strategy of picking 'diamonds' rather than eliminating 'lemons'. This seems like a

reasonable strategy given the fact that employers typically receive many applications for each posted vacancy and, therefore, cannot interview all applicants.

If many employers use a ‘picking diamonds strategy’ when hiring, this could potentially help us understand other labor market features, such as e.g. why the ethnic gap in Sweden is larger for employment than for wages (c.f. Nordin and Rooth, 2010). Our results suggest that employers require more experience to hire ethnic minority workers. This implies that ethnic minority workers who are employed actually are a positively selected group compared to native Swedish workers.

A limitation of our analysis is that we can only investigate the effects of unemployment in the early stages of the hiring process. Hence, we do not know if the workers’ history of unemployment matter in the later stages of the hiring process in terms of hiring and/or wages. However, it is likely that easily observable characteristics, such as past or contemporary unemployment, should matter most in the early stages of the hiring process when the employers want to get a shortlist of applicants to evaluate more carefully.

Our results suggest that unemployment do not leave serious scars on workers. Workers with a history of unemployment may suffer from having less work experience, but employers do not seem to avoid contacting them because they have been unemployed. One explanation of why we find less evidence of scarring effects than previous studies may be problems with unobserved heterogeneity in studies using administrative/survey data. Another explanation may be that scarring matters more for wages than for employment. Also, scarring may affect other important variables, such as labor force participation and job search. Clearly, more studies are needed to analyze the importance of scarring effects. From a methodological perspective, it would be beneficial if future studies use unconventional methods, such as field experiments, to bypass some of the problems with unobserved heterogeneity and better identify causal effects.

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Table 1 Correlation matrix for the employment history variables

Variable	1	2	3	4	5
1. Unemployment after graduation	1.000	-0.013	0.020	-0.034	-0.007
2. Unemployment between jobs		1.000	-0.020	0.312	0.602
3. Contemporary unemployment			1.000	0.002	-0.017
4. Work experience				1.000	0.523
5. Number of employers					1.000

Notes: The matrix includes all 8,466 applications. ‘Unemployment between jobs’, ‘work experience’ and ‘number of employers’ is, by construction, correlated. However, conditional on the ‘number of employers’ these variables are uncorrelated. Conditional on having three employers, the correlation between ‘unemployment between jobs’ and ‘work experience’ is -0.009. Conditional on having one employer, the correlation is, by construction, zero since these workers cannot be unemployed between jobs.

Table 2. The jobs included in the field experiment

Occupation	Number of applications	Fraction of all applications (%)
All	8,466	100
<i>High skill jobs:</i>	3,158	37
Accountant	624	7
Computer professional	988	12
Nurse	443	5
Math-science teacher in upper compulsory school	344	4
Language teacher in upper compulsory school	312	4
Teacher in secondary school	447	5
<i>Low/medium skill jobs:</i>	5,308	63
Business sales assistant	1,511	18
Cleaner	553	7
Construction worker	471	6
Machine operator	368	4
Motor vehicle driver	701	8
Restaurant worker	574	7
Shop sales assistant	1,130	13
<i>Location:</i>		
Stockholm	5,032	59
Gothenburg	1,989	24
Rest of Sweden	1,445	17

Note: High skill jobs refer to jobs typically requiring a university education, while low/medium skill jobs refer to jobs typically requiring primary or secondary education.

Table 3. The job applicants' employment history

	High skill jobs (%)	Low/medium skill jobs (%)
<i>Past unemployment after graduation:</i>		
No	79	81
Yes	21	19
<i>Past unemployment between jobs:</i>		
No	76	78
Yes	24	22
<i>Contemporary unemployment:</i>		
No	49	50
3 months	21	20
6 months	14	15
9 months	16	15
<i>Work experience:</i>		
1 year	14	15
2 years	20	19
3 years	30	30
4 years	21	21
5 years	15	15
<i>Number of employers:</i>		
1 employer	54	56
3 employers	46	44

Note: High skill jobs refer to jobs typically requiring a university education, while low/medium skill jobs refer to jobs typically requiring primary or secondary education.

Table 4. The callback rates for workers' with different attributes

	All	High skill jobs	Low/medium skill jobs
All	0.25	0.30	0.21
<i>Past unemployment after graduation:</i>			
No	0.25	0.30	0.22
Yes	0.24	0.29	0.21
<i>Past unemployment between jobs:</i>			
No	0.24	0.30	0.21
Yes	0.26	0.30	0.24
<i>Contemporary unemployment:</i>			
No	0.25	0.30	0.22
3 months	0.25	0.30	0.23
6 months	0.25	0.29	0.23
9 months	0.23	0.31	0.18
<i>Work experience:</i>			
1 year	0.21	0.25	0.19
2 years	0.24	0.30	0.20
3 years	0.25	0.31	0.22
4 years	0.27	0.31	0.24
5 years	0.25	0.30	0.22
<i>Number of employers:</i>			
1 employer	0.24	0.30	0.20
3 employers	0.26	0.30	0.23
<i>Ethnicity and gender:</i>			
Native Swedish male	0.27	0.32	0.24
Native Swedish female	0.29	0.36	0.26
Ethnic minority male	0.17	0.22	0.15

Notes: The callback rate is the number of invitations to job interviews divided by the number of applications in each group. High skill jobs refer to jobs typically requiring a university education, while low/medium skill jobs refer to jobs typically requiring primary or secondary education. Workers who have '3 employers' always have 3-5 years of work experience, while workers with '1 employer' have 1-5 years of work experience (c.f. Section 2.2).

Table 5. The effects of the workers' attributes on the callback rate (marginal effects)

Variable	High skill jobs		Low/medium skill jobs	
	Model A	Model B	Model A	Model B
Past unemployment after graduation	-0.012 [0.020]	-0.017 [0.020]	-0.006 [0.014]	-0.006 [0.014]
Past unemployment between jobs	0.010 [0.025]	0.005 [0.025]	0.011 [0.017]	0.012 [0.017]
Contemporary unemployment	0.001 [0.016]	-0.002 [0.016]	-0.003 [0.011]	-0.006 [0.011]
Work experience	0.014* [0.008]	0.017** [0.008]	0.008 [0.005]	0.009* [0.005]
Number of employers	-0.018 [0.024]	-0.016 [0.024]	0.019 [0.016]	0.016 [0.015]
Native Swedish female	0.036** [0.015]	0.039** [0.016]	0.016 [0.010]	0.018* [0.011]
Ethnic minority male	-0.098*** [0.015]	-0.100*** [0.016]	-0.095*** [0.010]	-0.095*** [0.010]
Other attributes	No	Yes	No	Yes
Number of observations	3,158	3,158	5,308	5,308

*Notes:* The table reports marginal effects for the probability of being invited to a job interview based on Probit regressions estimated with the `dprobit` command in Stata11. Model A includes only the variables included in the table, while Model B also includes control variables for personality traits, leisure activities, foreign-high school, work experience during the summer breaks, having more education than required, and fixed effects for each of the occupations and regions. The reference category is a native Swedish male with no history of past unemployment, no contemporary unemployment and one employer. The standard errors (in brackets) are clustered at the job advertisement level. \*\*\*, \*\* and \* denote statistical significance at the 1, 5 and 10 percent levels, respectively.

Table 6. The effects of the workers' attributes on the callback rate (marginal effects), subgroups

Variable	Native Swedish males		Native Swedish females		Ethnic minority males	
	Model A	Model B	Model A	Model B	Model A	Model B
<i>High skill jobs:</i>						
Past unemployment after graduation	-0.031 [0.035]	-0.023 [0.036]	-0.035 [0.035]	-0.052 [0.035]	0.030 [0.034]	0.031 [0.034]
Past unemployment between jobs	0.031 [0.043]	0.029 [0.044]	0.012 [0.045]	0.011 [0.046]	-0.014 [0.037]	-0.021 [0.036]
Contemporary unemployment	-0.036 [0.029]	-0.041 [0.029]	0.034 [0.030]	0.026 [0.030]	0.002 [0.026]	-0.001 [0.025]
Work experience	0.010 [0.013]	0.011 [0.014]	0.022 [0.014]	0.025* [0.014]	0.010 [0.012]	0.010 [0.012]
Number of employers	-0.007 [0.041]	0.010 [0.042]	-0.080* [0.042]	-0.076* [0.043]	0.029 [0.038]	0.027 [0.037]
Number of observations	1,058	1,058	1,055	1,055	1,045	1,045
<i>Low/medium skill jobs:</i>						
Past unemployment after graduation	0.006 [0.026]	0.011 [0.026]	-0.018 [0.025]	-0.025 [0.025]	-0.005 [0.021]	-0.004 [0.020]
Past unemployment between jobs	0.030 [0.032]	0.029 [0.031]	0.006 [0.031]	0.004 [0.031]	-0.001 [0.025]	-0.001 [0.024]
Contemporary unemployment	-0.020 [0.020]	-0.028 [0.020]	-0.002 [0.021]	-0.003 [0.021]	0.010 [0.017]	0.009 [0.016]
Work experience	0.001 [0.009]	0.006 [0.009]	0.009 [0.010]	0.007 [0.010]	0.013* [0.007]	0.014** [0.007]
Number of employers	0.015 [0.028]	0.008 [0.028]	0.033 [0.030]	0.034 [0.029]	0.010 [0.023]	0.008 [0.022]
Number of observations	1,774	1,774	1,775	1,775	1,759	1,759

Notes: The table reports marginal effects for the probability of being invited to a job interview based on Probit regressions estimated with the dprobit command in Stata 11. Model A includes only the variables included in the table, while Model B also includes control variables for personality traits, leisure activities, foreign-high school, work experience during the summer breaks, having more education than required, and fixed effects for each of the occupations and regions. The reference category is a worker with no history of past unemployment, no contemporary unemployment and one employer. The standard errors (in brackets) are clustered at the job advertisement level. \*\*\*, \*\* and \* denote statistical significance at the 1, 5 and 10 percent levels, respectively.

Table 7. The effect of the workers' work experience on the callback rate (marginal effects)

Variable	All	Native Swedish males	Native Swedish females	Ethnic minority males
<i>High skill jobs:</i>				
2 years of experience	0.079*** (0.030)	0.076 (0.054)	0.133** (0.054)	0.019 (0.051)
3-5 years of experience	0.088*** (0.027)	0.083* (0.048)	0.069 (0.048)	0.096** (0.044)
Number of observations	3,158	1,058	1,055	1,045
<i>Low/medium skill jobs:</i>				
2 years of experience	0.008 (0.020)	0.050 (0.038)	0.011 (0.037)	-0.018 (0.028)
3-5 years of experience	0.028 (0.018)	0.030 (0.033)	0.007 (0.035)	0.048* (0.025)
Number of observations	5,308	1,774	1,775	1,759

*Notes:* The table reports marginal effects for the probability of being invited to a job interview based on Probit regressions estimated with the `dprobit` command in Stata11. All regressions also includes all measures of past and contemporary unemployment as well as control variables for personality traits, leisure activities, foreign-high school, work experience during the summer breaks, having more education than required, and fixed effects for each of the occupations and regions. The reference category is a worker with one year of work experience. The standard errors (in brackets) are clustered at the job advertisement level. \*\*\*, \*\* and \* denote statistical significance at the 1, 5 and 10 percent levels, respectively.

Figure 1a. A worker's employment history if only one employer

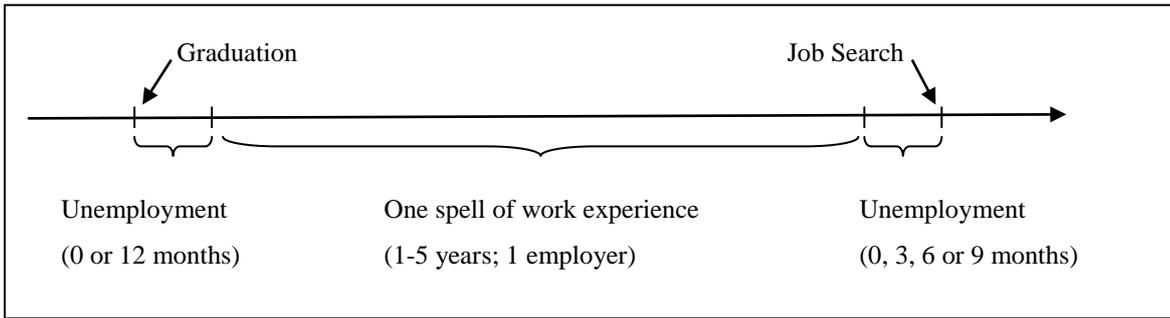


Figure 1b. A worker's employment history if no unemployment spells between jobs

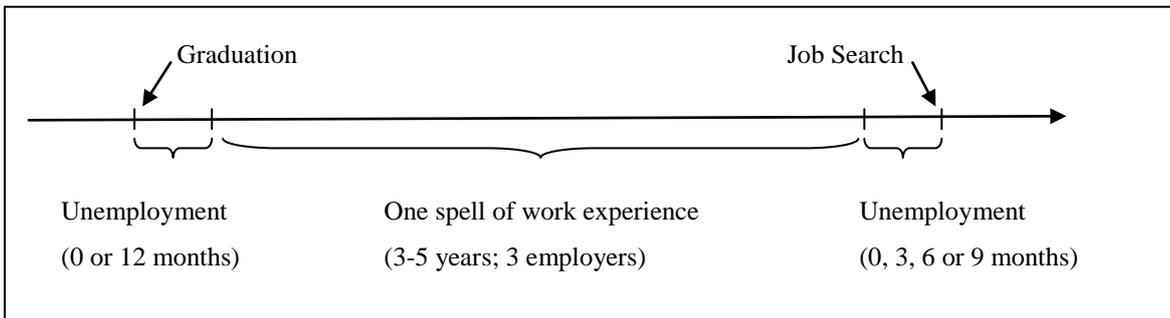
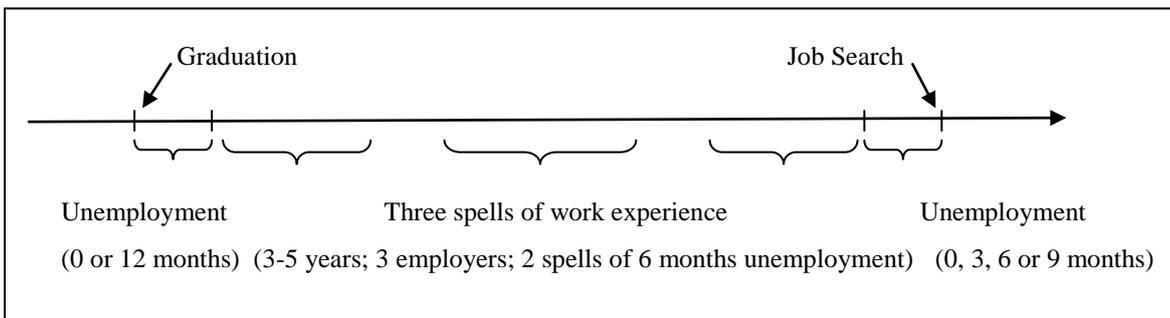


Figure 1c. A worker's employment history if unemployment spells between jobs



## **Appendix A: Example of an application (translated from Swedish)**

Hi,

My name is Karl Johansson and I am 27 years old. I live in Stockholm with my girlfriend Anna. I work as a system designer at Telenor AB in an environment based on win2000/SQL Server. I participate in three different projects and my work involves development, maintenance and everyday problem-solving. Development work is done in ASP, C++ and Visual Basic and we use the development platform .Net and MS SQL. In addition, I have experience in HTML, XML, J2EE and JavaScript.

I enjoy working on development and problem-solving, and I now hope that I will develop further at your company. To my personal characteristics one could add that I find it easy to work both on my own and in a group. I am a dynamic person who likes challenges. I really like my occupation, which I think is mirrored in the work I do. I have a degree in computer engineering. I graduated with good grades from Stockholm University.

I also like running. It is important for me to keep my body in shape by exercising regularly. Anna and I also like to socialize with our friends during weekends.

I look forward to being invited to an interview and I will then have my certificates and diplomas with me.

Best regards

Karl Johansson

## CV

Name: Karl Johansson  
Address: Eiravägen 4 F  
18260 Djursholm  
Telephone: 08 - 208 127  
E-mail: KarlJohansson4@hotmail.com

### Education:

1998 - 2002 Stockholm University, Stockholm, Computer Engineering, Masters Degree

1995 – 1998 Blackeberg High School, Stockholm, Natural Science Program

### Job history:

0506 - 0704 Telenor AB, system designer

0306 - 0411 Dynacom AB, system designer

0204 - 0301 Freba AB, system designer

### Other:

Languages: Swedish and English

Driving License: Yes

Operating Systems: Win 95/98/ME/2000/XP

Programming Languages: JSP, C++, Visual Basic, Erlang, Small Talk, ASP

Applications: Word, Excel, Microsoft Visual Studio 6.0, .Net, MatLab

Databases: SQL, ODBC

Note: From the information in this CV we conclude the following: He ended his university studies in June 2002 and started his first employment already in April the same year, that is, he had no unemployment spell immediately after graduation. He had three jobs from April 2002 until 'today' and was unemployed for a total of one year between these jobs. Finally, since he (we) applied for the new job in April 2007, he is currently employed, which is also mentioned in the biography.

## Appendix B: Additional results

Table A1. The effect of the workers' contemporary unemployment on the callback rate (marginal effects)

Variable	High skill jobs		Low/medium skill jobs	
	Model A	Model B	Model A	Model B
Contemporary unemployment 3 months	-0.001 [0.021]	-0.001 [0.022]	0.009 [0.015]	0.007 [0.015]
Contemporary unemployment 6 months	-0.010 [0.025]	-0.015 [0.025]	0.014 [0.017]	0.007 [0.016]
Contemporary unemployment 9 months	0.013 [0.023]	0.008 [0.024]	-0.039** [0.016]	-0.039** [0.015]
Number of observations	3,158	3,158	5,308	5,308

*Notes:* The table reports marginal effects for the probability of being invited to a job interview based on Probit regressions estimated with the `dprobit` command in Stata11. Model A only includes the employment history variables, gender and ethnicity, while Model B also includes control variables for personality traits, leisure activities, foreign-high school, work experience during the summer breaks, having more education than required, and fixed effects for each of the occupations and regions. The reference category is a worker with no contemporary unemployment. The standard errors (in brackets) are clustered at the job advertisement level. \*\*\*, \*\*, and \* denote statistical significance at the 1, 5 and 10 percent levels, respectively.