

MAGNUS CARLSSON, LUCA FUMARCO &
DAN-OLOF ROTH
2015:1

Does Labor Market Tightness Affect Ethnic Discrimination in Hiring?



Does Labor Market Tightness Affect Ethnic Discrimination in Hiring?^{*}

Magnus Carlsson[†]

Luca Fumarco[‡]

Dan-Olof Rooth[§]

Abstract. In this study, we investigate whether ethnic discrimination depends on labor market tightness. While ranking models predict a negative relationship, the prediction of screening models is ambiguous about the direction of the relationship. Thus, the direction of the relationship is purely an empirical issue. We utilize three (but combine into two) correspondence studies of the Swedish labor market and two distinctly different measures of labor market tightness. These different measures produce very similar results, showing that a one percent increase in labor market tightness increases ethnic discrimination in hiring by 0.5-0.7 percent, which is consistent with a screening model. This result stands in sharp contrast to the only previous study on this matter, Baert et al. (forthcoming), which finds evidence that supports a ranking model.

Keywords: Hiring discrimination, ethnic discrimination, labor market tightness, field experiments, ranking models, screening models.

JEL-codes: C93, J15, J21, J71.

^{*} We appreciate the valuable comments from Marianne Bitler, Patrick Button, David Neumark, Paul Nystedt and seminar participants at the Centre for Labor Market and Discrimination Studies at Linnaeus University, the PSI Talks at the University of California, Irvine, and the SWEGPEC Workshop in 2013.

[†] Corresponding author. Linnaeus University Center for Labor Market and Discrimination Studies, Linnaeus University, e-mail: Magnus.Carlsson@lnu.se

[‡] Linnaeus University, e-mail: Luca.Fumaco@lnu.se

[§] Linnaeus University Center for Labor Market and Discrimination Studies, Linnaeus University, e-mail: Dan-Olof.Rooth@lnu.se

1. Introduction

In many Western countries, there are substantial ethnic employment gaps, and research has shown that these gaps can be attributed, at least partly, to ethnic discrimination in the labor market.¹ These ethnic employment gaps also tend to widen during recessions and narrow during booms, suggesting that ethnic discrimination varies with the business cycle.² However, this body of research uses survey or administrative data in which ethnic discrimination is unidentified, and therefore, it is impossible to separate the effect of ethnicity from the effect of unobserved individual characteristics. As a result, it is not possible to conclude that there is a relationship between ethnic discrimination and labor market tightness.

In this study, we employ correspondence studies³ to investigate whether ethnic discrimination depends on labor market tightness.⁴ Correspondence studies solve the problem

¹ A number of recent correspondence studies show that ethnic minorities are discriminated against in hiring. For example, Carlsson and Rooth (2007) study the Swedish labor market and find that job applicants with a Swedish-sounding male name have a fifty-percent higher probability of receiving a callback for a job interview compared to job applicants with a Middle Eastern-sounding male name. Similar results have been found for ethnic minorities in the Australian, Belgian, Norwegian, UK, and US labor markets, to name a few (Booth et al. (2012), Baert et al. (forthcoming), Kaas and Manger (2012), Drydakis and Vlassis (2010), Midtbøen (forthcoming), Fibbi et al. (2006), Woods et al. (2009), Riach and Rich (2002), and Bertrand and Mullainathan (2004)).

² See Biddle and Hamermesh (2013), Bratsberg, Barth and Raaum (2006), and Dustman, Glitz and Vogel (2010). This research mainly finds that the ethnic wage/employment gap is increasing in unemployment.

³ In correspondence studies, researchers send fictitious written job applications to employers with a job vacancy. The job applications are designed to be qualitatively identical except for the applicant's name, which is randomly assigned and chosen to signal ethnicity. Discrimination is then measured as the difference in the share of job interview invitations between the majority and minority.

⁴ A common definition of labor market tightness, which we also use in this paper, is the vacancy-unemployment ratio, where a higher ratio means a tighter labor market. In a tight labor market, there are many vacancies and few unemployed workers looking for jobs, meaning that vacancies are difficult to fill. In a slack labor market,

of unobserved individual variables by introducing random assignment of the signal of ethnicity, thereby solving the identification problem associated with analysis of administrative data.⁵

There are (at least) two categories of theories that help explain why and how ethnic discrimination may depend on labor market tightness (a more detailed explanation is given in Section 2). Ranking models (e.g., Blanchard and Diamond, 1994) predict a negative relationship between the degree of ethnic discrimination and labor market tightness, while in screening models (e.g., Vishwanath, 1989), the prediction could go in both directions, depending on differences in the distribution of unobserved characteristics between majority and minority workers. Hence, determining the direction and the strength of the relationship between the degree of ethnic discrimination and labor market tightness is purely an empirical issue.

One previous study, Baert et al. (forthcoming; henceforth, BCGV), is especially relevant to our study.⁶ BCGV is a correspondence study of the Belgian labor market, which focuses on how the hiring of ethnic minorities is affected by labor market tightness. They find evidence that is supportive of a ranking model because ethnic discrimination is lower when labor market tightness is higher. In fact, when they divide their occupations into two categories

the opposite is true, i.e., there are few vacancies and many unemployed workers looking for jobs, meaning that vacancies are easy to fill.

⁵ Although a correspondence study identifies the level of discrimination in the market, Heckman and Siegelman (1993) and Heckman (1998) show that correspondence studies cannot distinguish between preference-based and statistical discrimination.

⁶ Another study that is related to ours is Kroft et al (2013), which (without considering ethnic dimension) analyzes whether the general hiring behavior of employers varies with labor market tightness. They find that the signaling value of an unemployment spell is stronger in a tighter labor market, which is consistent with a screening model.

defined by the degree of labor market tightness, they find no evidence of discrimination in the tighter labor market, which suggests that labor market tightness explains the entire ethnic gap in hiring in the Belgian labor market.

However, a closer look at the results of the BCGV study puts into question their empirical measure of labor market tightness and, hence, their main result. Intuitively, a necessary property of a valid measure of labor market tightness is that it has a positive general effect on the likelihood of finding a job: the probability of finding a job should be higher when vacancies are difficult to fill. However, the measure of labor market tightness in the BCGV study lacks such a main effect. In fact, the callback rate of natives is even lower in the tighter labor market.⁷ Hence, it is uncertain whether their results truly arise from labor market tightness.

Our main contribution is to test the relationship between ethnic discrimination and labor market tightness in a situation where the measure of labor market tightness has the necessary property in terms of a general positive effect on the probability of finding a job. An additional contribution is that we put great effort into measuring labor market tightness and employ two quite different measures. The most obvious measure of labor market tightness is the vacancy-unemployment ratio. However, such a measure is not available at the local level. Instead, our

⁷ The authors realize this shortcoming and address it in two ways. First, as a sensitivity check of their main analysis, they discard potentially problematic data, excluding almost half of their observations in *bottleneck* occupations (an occupation for which vacancies are difficult to fill, as established by the Flemish Public Employment Service), but even then, the native callback rate in bottleneck occupations is not significantly higher than for non-bottleneck occupations. Second, they aggregate their data into twelve occupation groups and then adopt an alternative approach similar to ours and to the approach of Kroft et al. (2013), calculating the correlation between the occupation callback rate and level of discrimination. However, also this analysis appears uncertain since the data have at least one extreme outlier, which potentially drives their result (see their Figure A1).

first measure of labor market tightness is taken from an additional correspondence study in which we sent job applications with a native female name, and we simply use the callback rate of applicants with a female name as the measure of labor market tightness. This measure should closely mimic the degree of occupation specific labor market tightness, especially because other studies have shown that females are not discriminated against in hiring in the Swedish labor market (see, e.g., Carlsson, 2011, and Eriksson and Lagerström, 2012). For the second measure, we collect the actual number of applicants for each job vacancy in the correspondence testing experiment through a telephone survey. Importantly, both these measures are found to have a general effect on the callback rate because they have a strong association with the callback rate for native Swedish men. For example, if we simply divide the occupations into tight and slack labor markets around the median of labor market tightness using the female callback rate, then the callback rate of native Swedish males is 75 percent higher in the tighter labor market.

Our study also makes an important contribution in terms of arriving closer to a causal interpretation of the results. Because labor market tightness is not randomly assigned, it could potentially pick up other characteristics related to labor market tightness and ethnic differences in the callback rate, leading to biased inferences. Due to the data at hand, we are able to address such potential omitted variable bias by incorporating occupation fixed effects into the regression model. A remaining issue, which also could lead to biased inferences, is whether there are unobserved variables that are correlated with the change in the occupational labor market tightness over time and the change in the ethnic callback rate gap. To address this problem, we add control variables at the firm level.

The next section discusses the theoretical background with a focus on ranking and screening models. Section 3 describes the correspondence studies and construction of the labor market tightness variables. Section 4 presents the main results, and section 5 concludes.

2. Theoretical background

There are (at least) two categories of theories stating that labor market tightness should affect ethnic difference in callback rates, providing different expectations.

The first category of models is ranking models (e.g., Blanchard and Diamond, 1994), which do not consider an ethnic dimension but can be applied to our case with a slight modification. In these models, employers consider the length of the unemployment spell as a signal of low unobserved productivity, and employers then rank the job applicants according to the length of their unemployment spells. One can then exchange the long-term unemployed signal with the ethnic minority signal. Now, the ethnic minority name sends a signal about low unobserved productivity. In a tight labor market, there is less competition for jobs, meaning that the ethnic minority is ranked higher. As a result, the ethnic difference in callbacks is lower in a tight labor market. The opposite pattern holds in a slack labor market.

The second category of models is screening models (Vishwanath, 1989; Lockwood 1991). Screening models also consider the relationship between long-term unemployment and hiring without an explicit ethnic dimension. In these models, it is assumed that some productive characteristics of a worker are unobserved to the employer. However, the employers learn from their own experience of hiring and from other firms, that long-term unemployed workers tend to have worse unobserved skills. Rational employers then use long-term unemployment as a signal of unobserved productivity in the hiring decision. As a result, the probability of being hired will be lower for long-term unemployed workers, implying a duration dependency.

In screening models, duration dependency varies by labor market tightness. Duration dependency will be stronger in a tight labor market, where mostly low-skilled workers are long-term unemployed, and, as a result, unemployment duration is a stronger signal of productivity. In contrast, duration dependency will be weaker in a slack labor market, where

both low- and high-skilled workers are long-term unemployed, and, as a result, unemployment duration is a weaker signal of productivity

Similarly, variation in duration dependency over the business cycle could depend on ethnic group belonging. Intuitively, if minority and majority workers have different skill distributions, the skill composition of long-term unemployed workers may vary differently for the two groups over the business cycle. As a result, the strength of the long-term unemployment signal varies differently for minority and majority workers, and we observe a cyclical pattern in the degree of discriminatory treatment by ethnicity.

To illustrate this cyclical pattern in a more formal way, imagine a bell-shaped distribution of unobserved skills where the variance is relatively larger for ethnic minority workers (while the mean is the same as for the majority). In a tight labor market, only low-skilled minority and majority workers, located far to the left in the skill distribution, are long-term unemployed. The left tail of the skill distribution is more stretched out for the minority group, and this results in an ethnic difference in skill composition among the long-term unemployed, implying that job seeking minority and majority workers in this situation send signals about their group's productivity of different strengths.

Now, imagine that the labor market weakens. Consequently, slightly better skilled workers, who were previously on the margin of being long-term unemployed, become long-term unemployed. Due to the ethnic difference in the variance of the skill distribution, the density of workers at the margin is different for minority and majority workers. As a result, the compositional skill change among long-term unemployed workers changes differently for minority and majority workers. This is why the strength of the long-term unemployment signal varies differently for minority and majority workers over the business cycle, and why the degree of discriminatory treatment changes with labor market tightness.

Notice that the direction of the change in discriminatory treatment depends on the shape of the skill distribution for majority and minority workers. In our example, we assumed that the variance of the skill distribution is relatively larger for minority workers, but the opposite can be true as well, leading to reversed expectations.

Finally, if we find a negative empirical relationship between ethnic discrimination and labor market tightness, we cannot distinguish between ranking and screening models. However, a positive relationship in which ethnic discrimination increases when the labor market tightens can only be explained by screening models.

3. Data

This section describes the correspondence studies and both measures of labor market tightness that we use to test the relationship between the degree of ethnic discrimination and labor market tightness.⁸

3.1 The correspondence studies

The data are taken from three correspondence studies, Carlsson and Rooth (2007), Carlsson (2010), and Rooth (2011). These experiments were conducted between 2005 and 2007 in the Swedish labor market.⁹ In Carlsson and Rooth (2007), we applied to 1,552 job advertisements; in Carlsson (2010), to 1,314 job advertisements; and in Rooth (2011), to 3,821 job advertisements. These studies posed somewhat different research questions but were similar enough to allow us to pool the data. The most important similarity is that all three experiments studied ethnic discrimination against applicants with Middle Eastern-

⁸ We also analyzed an additional measure of labor market tightness: the local unemployment rate. However, this analysis does not produce a statistically significant main effect, that is, the association between the local unemployment rate and the native callback rate, and is therefore not reported.

⁹ The interested reader should turn to these sources for further detail.

sounding names. The experiments are also similar in that, for the most part, the same occupations were included and the same procedures for applying to jobs and receiving responses were used.

The occupations included shop sales assistants, construction workers, computer professionals, motor vehicle drivers, business sales assistants, teachers (math/science and language teachers in upper level compulsory school and secondary school teachers), accountants, restaurant workers, and nurses.¹⁰ These are among the most common occupations in the Swedish labor market and include skilled, semiskilled and unskilled occupations employing varying shares of immigrants (see Eriksson and Rooth, 2014).

The job applications were designed to be realistic but not represent real persons. In addition, because competition from other applicants was considerable, the fictitious applications were constructed to signal well-qualified applicants. The applications consisted of quite general biographies on the first page and detailed CVs listing education and work experience on the second page. To signal ethnicity, common Swedish- and Middle Eastern-sounding male names were randomly assigned to resumes.

In all three experiments, the same procedures were used to apply for jobs and measure callbacks for job interviews. All vacancies in the chosen occupations found on the webpage of the Swedish employment agency were collected. The majority of vacancies were found in the two major cities of Sweden: Stockholm and Gothenburg. Callbacks for job interviews were received via telephone or email.

¹⁰ In addition, Carlsson and Rooth (2007) included preschool teachers, and Rooth (2011) included cleaners and mechanics. However, as we explain below, we pool the data from these experiments in the analysis and utilize variation within occupations between experiments, which implies that the observations in these occupations do not contribute to identification. Therefore, these occupations are excluded from the beginning. In addition, Carlsson (2010) included preschool teachers. In this case, we keep the observations for preschool teachers because, here, we utilize variation between firms (see details below).

In Table A1 in the Appendix, we report the main result for ethnic discrimination observed in the experiments. When the individual probability of receiving a callback for a job interview is regressed on the ethnic minority indicator, we find that ethnic discrimination in hiring is on average about ten percentage points in all three experiments.

Beyond the data on callbacks, we have access to a number of firm characteristics, such as firm size, sex ratio of the employees, and sex of the recruiter.

3.2 Measures of labor market tightness

As stated previously, the most obvious measure of labor market tightness is the vacancy-unemployment ratio, but this measure is not available at the local level. Instead, we employ two other measures that are expected to reflect labor market tightness: the native female callback rate at the occupational level and the actual number of job applicants to each vacancy in the correspondence testing experiment.

Occupational-level female callback rate

Our first measure of labor market tightness is the callback rate for native Swedish female applicants. It is possible to construct this measure because, in connection to the experiments in Carlsson and Rooth (2007) and Rooth (2011), additional applications with a native female name were sent to the employers. The resulting data enable us to construct occupation-specific native female callback rates, which constitute our measure of labor market tightness. The distribution of the female callback rate is shown in Figure A1 in the Appendix. From this figure, it is evident that the female callback rate varies between occupations and within occupations over time.

The native female callback rate is our preferred measure of labor market tightness for several reasons. First, it measures labor market tightness directly and precisely in the

occupations for which we study ethnic discrimination. Second, the female callback rate is likely to be a fair measure of labor market tightness because there is convincing evidence that this group is not discriminated against in hiring in the Swedish labor market (see, e.g., Carlsson, 2011 and Eriksson and Lagerström, 2012). To see that this is an important requirement, imagine that female applicants were discriminated against in the same occupations as the ethnic minority. Then, our measure of labor market tightness would be endogenous because it also captures the degree of ethnic discrimination. Third, as we will show in the empirical section, this measure of labor market tightness has the important property that it shows a strong general positive effect on the callback rate of native men.

Number of job applicants

Our second measure of labor market tightness is the actual number of job applicants per vacancy. The number of job applicants per vacancy is available for a subsample of firms in the Carlsson (2010) data and was collected through a short telephone survey. This measure is available for 196 applications sent to 98 firms. The frequencies for the number of applicants per job vacancy are shown in Figure A2 in the appendix. There is a fair amount of variation in the received number of job applications per vacancy, varying between 3 and 80 applications, with a mean of 31.

In theory, the number of job applications is a sensible measure of labor market tightness because it should be closely related to the vacancy-unemployment ratio in the local labor market in which the firm operates. In contrast to the previous measure of labor market tightness, which varies by occupation, this measure varies across firms that operate in different local labor markets defined by geography and by the type of job. As we will show in the empirical section, this measure also shows a strong general positive effect on the callback rate of native men.

Although this measure seems ideal in theory, the manner in which it was collected creates concern. Due to insufficient resources at the time of the data collection, we only collected information on the number of applicants for a subsample of firms, and hence, there may be a problem with selective participation. Of the 1,314 firms that were part of the correspondence experiment, 824 were sampled to participate. After trying to reach the firms over a period of two weeks, we had only contacted 402 of these firms. Unfortunately, in the end, only 98 firms had this information readily available and could report the number of job applicants for the vacancy, which yielded a sample of 196 applications for the empirical analysis.¹¹ Table A2 in the appendix shows that the average callback rate is much higher in the survey sample, which is mainly due to a higher response rate in the survey for occupations characterized by a high callback rate (teachers, pre-school teachers and nurses). When comparing the occupational distributions of the original and survey samples, the χ^2 is statistically significant at the one percent level ($\chi^2(10)=26.8$). However, an ocular inspection indicates quite small differences, and the statistic is mainly driven by math/science teachers and restaurant workers and is insignificant at the five-percent level when these occupations are excluded ($\chi^2(8)=13.6$). In addition, as the analysis in section 3 will reveal, the measured degree of ethnic discrimination for the firms in the survey sample is approximately eight percentage points and is similar to the corresponding estimate for the full experiment (i.e., ten percentage points).

Another issue of concern is that the number of applicants per vacancy is self-reported, and hence, we cannot exclude the possibility of classical measurement error in the data.

¹¹ There could be several reasons for not reporting this number. Some employers stated that they did not remember that particular vacancy. In other cases, we could not locate the person responsible for recruitment. In others, the employer did not want to participate. A significant number of employers reported an imprecise number, such as “many.” All non-number answers were discarded.

However, as previously mentioned, we find that this measure has a strong main effect on the callback rate.

4. Results

In this section, we first introduce the model specification and then proceed with the empirical analysis using both measures of labor market tightness.

4.1 Model Specification

To test the relationship between ethnic discrimination and labor market tightness, we estimate the following simple model as our main specification:

$$Callback_i = \beta_0 + \beta_1 Minority_i + \beta_2 Tightness_i + \beta_3 [Minority_i * Tightness_i] + \varepsilon_i$$

$Callback_i$ is a dummy variable indicating whether application i resulted in a job interview, $Minority_i$ is a dummy variable indicating whether application i was assigned an ethnic minority name, and $Tightness_i$ is a continuous (mean adjusted) variable measuring either of our two measures of labor market tightness. The constant β_0 gives the callback rate for the ethnic majority, while β_1 is the difference in the callback rate between minority and majority job applicants measured at the mean value of labor market tightness. β_2 is the general effect of labor market tightness on the callback rate of native men. For any sensible measure of labor market tightness, β_2 is positive because an increase in labor market tightness should increase the probability of being invited for a job interview. β_3 is the main parameter of interest, measuring whether the ethnic minority is differently affected by labor market tightness compared to native men. A negative coefficient β_3 says that ethnic discrimination increases with labor market tightness, meaning that an increase in labor market tightness does not help

the minority as much as the majority in getting a callback for a job interview, while a positive coefficient says that ethnic discrimination decreases with labor market tightness. In light of the theoretical discussion in the introduction, and in section 2, on how labor market tightness impacts upon ethnic discrimination, we have ambivalent expectations about the sign of this coefficient.

While the ethnic dummy is exogenous by design, this is not true for labor market tightness. Therefore, we are worried that the estimate of labor market tightness captures a spurious correlation due to omitted variables. To address this potential problem, and to arrive at an estimate with a causal interpretation, we include occupation fixed effects in the model. For our preferred measure of labor market tightness (the female callback rate), which is measured at the occupational level, this is possible because this measure is available for two separate correspondence studies conducted at different times and containing the same occupations. For the second measure of labor market tightness (the number of job applications), this is possible because the measure is collected at the firm level. Adding occupation fixed effects neutralizes the influence of unobserved factors that relate to labor market tightness, ethnic discrimination and the callback rate for a job interview operating at the occupational level. Hence, if employers in certain occupations are discriminating more, or less, in unobserved ways, then this will be controlled for. A remaining issue that may cause bias is that the interaction term may be correlated with some time-variant unobserved characteristics of the occupations. To address this potential bias, we include a number of firm characteristics that vary within occupations across experiments.

4.2 Results: occupational female callback rate

In this section, we focus on our first measure of labor market tightness – the occupation specific female callback rate. We start by regressing the callback dummy on the ethnic

minority indicator and the measure of labor market tightness. The results in the first column of Table 1 reveal that applications assigned a Middle Eastern sounding male name have a 9.5 percentage points lower probability of receiving a callback for a job interview compared to applications assigned a Swedish sounding male name. The results also show that the return to labor market tightness is positive and statistically significant at the one-percent level. An increase of one percentage point in the occupation specific callback rate of native females increases the probability of receiving a callback for a job interview by approximately 0.8 percentage points for native men.

Next, we add the main variable of interest, the interaction between the measure of labor market tightness and the ethnic minority indicator (see column 2). Interestingly, we find that the estimate is negative and significant at the one percent level, which is opposite the result found in BCGV. This result implies that when labor market tightness increases, the probability of receiving a callback for a job interview increases more slowly for the ethnic minority relative to the majority, that is, ethnic discrimination increases. The interpretation of the estimate is that a ten percentage point increase in the callback rate for female applicants is associated with a 1.5 percentage point increase in ethnic discrimination. If we instead express this result in terms of standard deviations, then the level of discrimination increases from ten to twelve percentage points (that is, by 20 percent) when labor market tightness increases by one standard deviation, which amounts to a 13 percentage point increase (that is, a 43 percent increase from a mean of .30) in the female callback rate.¹² The estimate can also be expressed as an elasticity of approximately 0.5 ($0.20/0.43$), that is, a one-percent increase in labor market tightness is associated with a 0.5-percent increase in ethnic discrimination.

¹² The estimated increase in discrimination by 2 percentage points is obtained multiplying the estimate of the interaction effect by .13 (the standard deviation).

*** Table 1 about here ***

In column 3, we add occupation fixed effects to approach a causal interpretation by relying on variation within occupations over time. This is an important extension of BCGV, who rely on cross sectional variation. Interestingly, despite using a quite different type of variation, we arrive at almost identical estimates, as reported in the previous column.

Although the occupation fixed effects analysis captures many of the most likely biases, we cannot rule out that the characteristics of firms are different across experiments (within occupations). Such differences could lead to biased results if the firm characteristics are correlated with labor market tightness and also affect discrimination. In an attempt to address such potential bias, we control for the firm characteristics that are available from the experiment: firm size, female share at the firm, and sex of the recruiter¹³. However, the estimates in column 4 are unaffected by these control variables.

4.3 Results: Number of job applicants

Before turning to the results in this section, notice that if the number of job applicants per vacancy increases, then labor market tightness decreases because it becomes easier for firms to fill vacancies. Therefore, we must multiply the number of job applications by (-1) to obtain a measure of labor market tightness, which we do for all regressions in this section. This transformation also makes the interpretation of the labor market tightness parameter consistent with the previous section.

¹³ For a small number of firms, information on these variables is missing. We do not exclude these firms from the regressions. Instead, we include a dummy variable that indicates whether the information is missing. For continuous variables, we also impute the mean value for variables with missing information.

We start by establishing that our measure of labor market tightness has a general positive effect on the callback rate. As in the previous section, we first regress the callback dummy on the ethnic minority indicator and the measure of labor market tightness. The first column of Table 2 reveals a very similar picture to the previous analysis. First, we find that applications assigned a Middle Eastern-sounding male name have an approximately eight percentage point lower probability of receiving a callback for a job interview compared to applications assigned a Swedish-sounding male name. Moreover, this second measure of labor market tightness provides a sensible estimate because the return to labor market tightness is positive and statistically significant at the five-percent level. The estimate reveals that a decrease of ten job applications to a vacancy increases the probability of receiving a callback for a job interview by five percentage points.

**** Table 2 about here ****

In the second column, we add the interaction between the measure of labor market tightness and the ethnic minority indicator, which produces the estimate of main interest. Again, we find that the return to labor market tightness is lower for the ethnic minority than for the majority, and, hence, ethnic discrimination is larger when the labor market is tighter. The interpretation of the estimate is that an increase of ten job applications to a vacancy is associated with an approximately 1.7-percentage point increase in discrimination. In terms of standard deviations, the estimate means that if labor market tightness increases by one standard deviation, corresponding to a 71-percent increase in the number of job applications from the mean, then the level of discrimination increases from eight to twelve percentage

points (or by 50 percent).¹⁴ In this case, the elasticity of ethnic discrimination with respect to labor market tightness is approximately 0.7 (0.50/0.71), that is, a one-percent increase in labor market tightness is associated with a 0.7-percent increase in ethnic discrimination.

Next, we add firm-level characteristics to the regression model. These variables control for firm size, which we expect to be correlated with the number of applicants for a job if a vacancy at a large firm attracts more job applicants, share of women at the firm, and sex of the recruiter¹⁵. The estimates are unaffected by their inclusion (see column 3).

As stated previously, we would ideally also control for occupation and only use variation in the number of job applications to a vacancy within occupations. However, after adding occupation fixed effects to the regression reported in column 3, the positive association between the callback rate and labor market tightness no longer exists (see column 4). Although the estimate of the interaction variable is unaffected, which is still negative and statistically significant, we believe that this specification is likely asking too much of the data and should be interpreted with caution.

To sum up, we obtain similar results in this section compared to the previous section, and the elasticities of discrimination with respect to labor market tightness are found to be similar, at 0.5 and 0.7, for the first and second measures of labor market tightness, respectively. Hence, two rather different measures of labor market tightness used in two different

¹⁴ The increase in ethnic discrimination of -0.037, or four percentage points, is produced by multiplying the estimate of the interaction effect by 2.2 (the standard deviation is 22 and the estimate reported in the table is multiplied by 10). The mean number of job applications is 31, which facilitates the 71-percent increase in labor market tightness.

¹⁵ For these variables, data are missing for a small number of cases. As before, we do not exclude these firms from the regressions. Instead, we include a dummy variable that indicates whether the information is missing. For continuous variables, we also impute the mean value for variables with missing information.

correspondence studies produce similar results for how labor market tightness effects ethnic discrimination in hiring.

5. Conclusion

The strength of correspondence studies compared to other methods of measuring ethnic discrimination is their ability to identify discrimination. However, it has proven difficult to understand some of the more subtle patterns in the results of a typical correspondence study, such as variation in ethnic discrimination across occupations. A potential explanation for variation in ethnic discrimination across occupations is that ethnic discrimination depends on labor market tightness, which may vary by occupation.

Using two quite different measures of labor market tightness, we find that in Sweden, ethnic discrimination in hiring increases with labor market tightness, that is, an improving labor market produces more job opportunities for natives than for the ethnic minority. This result stands in sharp contrast to the only previous study that has investigated this issue, Baert et al. (forthcoming). On a more general note, our results hint that a screening model of hiring better explains the data than a ranking model, which is consistent with the results reported in Kroft et al (2013).

Finally, our result points to an important fact for policy makers – ethnic discrimination increases when the labor market improves, which conflicts with research on ethnic employment gaps and the business cycle. Therefore, one piece of advice for policy makers is to maintain measures to reduce ethnic discrimination even when the business cycle improves.

References

- Baert, S., Cockx, B., Gheyle, N., & Vandamme, C. (Forthcoming). Is there Less Discrimination in Occupations where Recruitment is Difficult? *Industrial and Labor Relations Review*.
- Bertrand, M., & Mullainathan, S. (2004). Are Emily and Greg More Employable than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination. *American Economic Review*, 94(4), 991-1013.
- Biddle, J. E., & Hamermesh, D. S. (2013). Wage discrimination over the business cycle. *IZA Journal of Labor Policy*, 2(1), 1-19.
- Blanchard, O. J., & Diamond, P. A. (1994). Ranking, Unemployment Duration, and Wages. *Review of Economic Studies*, 61(3), 417-434.
- Booth, A. L., Leigh, A., & Varganova, E. (2012). Does ethnic discrimination vary across minority groups? Evidence from a field experiment. *Oxford Bulletin of Economics and Statistics*, 74(4), 547-573.
- Bratsberg, B., Barth, E. & Raaum, O. (2006). Local Unemployment and the Relative Wages of Immigrants: Evidence from the Current Population Surveys. *Review of Economics and Statistics*, 88(2): 243–263.
- Carlsson, M. (2010). Experimental Evidence of discrimination in the Hiring of First- and Second-generation Immigrants. *Labour* , 24 (3), 267-278.
- Carlsson, M. (2011). Does hiring discrimination cause gender segregation in the Swedish labor market? *Feminist Economics*, 17(3), 71-102.
- Carlsson, M., & D.-O., R. (2007). Evidence of Ethnic Discrimination in the Swedish Labor Market Using Experimental Data. *Labor Economics* , 14 (4), 716-729.

- Drydakis, N., & Vlassis, M. (2010) Ethnic Discrimination in the Greek Labour Market: Occupational Access, Insurance Coverage and Wage Offers. *The Manchester School*, 78(3), 201-218.
- Dustman, C., Glitz, A. & Vogel, T. (2010) "Employment, Wages, and the Economic Cycle: Differences between Immigrants and Natives", *European Economic Review*, 54: 1–17.
- Eriksson, S., & Lagerström, J. (2012). Detecting discrimination in the hiring process: evidence from an Internet-based search channel. *Empirical Economics*, 43(2), 537-563.
- Eriksson, S., & Rooth, D.-O. (2014). Do employers use unemployment as a sorting criterion when hiring? Evidence from a field experiment. *The American Economic Review*, 104(3), 1014-1039.
- Fibbi, R., Lerch, M., & Wanner, P. (2006). Unemployment and discrimination against youth of immigrant origin in Switzerland: when the name makes the difference. *Journal of International Migration and Integration/Revue de l'integration et de la migration internationale*, 7(3), 351-366.
- Heckman, J.J. & Siegelman P. (1993). The Urban Institute audit studies: Their methods and findings. In: Fix M., Struyk R. (eds.) *Clear and convincing evidence: Measurement of discrimination in America*, 187-258. Washington DC: The Urban Institute.
- Heckman, J. J. (1998). Detecting Discrimination. *The Journal of Economic Perspectives*, 12(2), 101-116.
- Kaas, L., & Manger, C. (2012). Ethnic Discrimination in Germany's Labour Market: A Field Experiment. *German Economic Review*, 13(1), 1-20.
- Kroft, K., Lange, F., Notowidigdo, M. J., & Katz, L. F. (2013). Duration Dependence and Labor Market Conditions: Evidence from a Field Experiment. *The Quarterly Journal of Economic*, 128(3), 1123-1167.

- Lockwood, B. (1991). Information externalities in the labour market and the duration of unemployment. *The Review of Economic Studies*, 58(4), 733-753.
- Midtbøen, A. H. (forthcoming), Discrimination of the Second Generation: Evidence from a Field Experiment in Norway. *Journal of International Migration and Integration/Revue de l'integration et de la migration internationale*.
- Riach, P. A., & Rich, J. (2002). Field Experiments of Discrimination in the Market Place. *Economic Journal*, 112(483), F480-F518.
- Rooth, D.-O. (2011). Work Out or Out of Work - The Labor Market Return to Physical Fitness and Leisure Sports Activities. *Labour Economics*, 18 (3), 399-409.
- Vishwanath, T. (1989). Job Search, Stigma Effect, and Escape Rate from Unemployment. *Journal of Labor Economics*, 7(4), 487-502.
- Woods, M., Hales, J., Purdon, S., Sejersen, T., & Hayllar, O. (2009). A test for racial discrimination in recruitment practice in British cities. Department for Work and Pensions. Research Report No 607.

Tables:

Table 1. The probability of a job interview. Labor market tightness measured by the female callback rate.

	(1)	(2)	(3)	(4)
Constant	.275*** (.015)	.275*** (.014)	.270*** (.016)	.250*** (.024)
Minority	-.095*** (.011)	-.095*** (.010)	-.095*** (.010)	-.095*** (.010)
Labor market tightness	.831*** (.070)	.905*** (.081)	.772*** (.093)	.786*** (.104)
Labor market tightness * Minority	-	-.150*** (.035)	-.150*** (.035)	-.150*** (.036)
Occupation FEs	No	No	Yes	Yes
Firm characteristics	No	No	No	Yes
Number of observations	8,514	8,514	8,514	8,514

Notes: The dependent variable is an indicator of whether the applicant was invited to a job interview. Labor market tightness is measured by the occupation specific callback rate of native females. The regressions that include occupation fixed effects also include an experiment fixed effect. The firm characteristics are firm size, share of females at the firm, and sex of the recruiter. The estimates are from a linear probability model. Standard errors are clustered at the occupational level in all models. *** p <.01, ** p <.05, * p <.1.

Table 2. The probability of a job interview. Labor market tightness measured by applicants per vacancy.

	(1)	(2)	(3)	(4)
Constant	.592*** (.048)	.592*** (.048)	.461*** (.138)	.288* (.164)
Minority	-.082*** (.028)	-.082*** (.028)	-.082*** (.029)	-.082*** (.029)
Labor market tightness (estimate multiplied by 10)	.054*** (.020)	.062*** (.021)	.051** (.023)	.026 (.023)
Labor market tightness * Minority (estimate multiplied by 10)	-	-.017** (.009)	-.017* (.009)	-.017* (.009)
Firm characteristics	No	No	Yes	Yes
Occupation FEs	No	No	No	Yes
Number of observation	196	196	196	196

Notes: The dependent variable is an indicator of whether the applicant was invited to a job interview. Labor market tightness is measured by the number of job applications. To facilitate the interpretation of the estimates of labor market tightness, the measure has been multiplied by 10, and is interpreted as the change in the probability of a callback when labor market tightness increases by ten job applicants. The firm characteristics are firm size, share of females at the firm, and sex of the recruiter. The estimates are from a linear probability model. Standard errors are clustered at the job level in all models. *** p < .01, ** p < .05, * p < .1.

Appendix

Table A1. The probability of a job interview across experiments.

	Carlsson and Rooth (2007)	Carlsson (2010)	Rooth (2011)
Minority	-.102*** (.026)	-.098*** (.011)	-.094*** (.008)
Number of observations	3,104	2,628	5,636

Notes: The number of observations is the number of job advertisements multiplied by two, which is the number of applications sent to each job advertisement. In columns 1 and 2, the number of observations is $2 \times 1,552 = 3,104$ and $1,314 \times 2 = 2,628$, respectively. In Rooth (2011), only one job application was sent to a job advertisement in some instances, which explains why we in this case have fewer observations than 7,642 ($2 \times 3,821$). The dependent variable is an indicator of whether the applicant was invited to a job interview. The estimates are from a linear probability model. *** $p < .01$, ** $p < .05$, * $p < .1$.

Table A2. The distribution of occupations for the original field experiment and the sub-sample survey data.

	Carlsson (2010)	Survey data
Shop sales assistants	.114	.051
Construction workers	.036	.031
Computer professionals	.059	.071
Motor-vehicle drivers	.059	.041
Business sales assistants	.196	.214
Math/science teachers	.023	.061
Secondary school teachers	.037	.071
Accountants	.105	.061
Restaurant workers	.114	.031
Nurses	.114	.153
Pre-school teachers	.143	.215
Mean callback rate	.325	.551
Number of observations	2,628	196

Notes: For information on the full sample, see Carlsson (2010).

Figure A1. The callback rate for female applicants by occupation

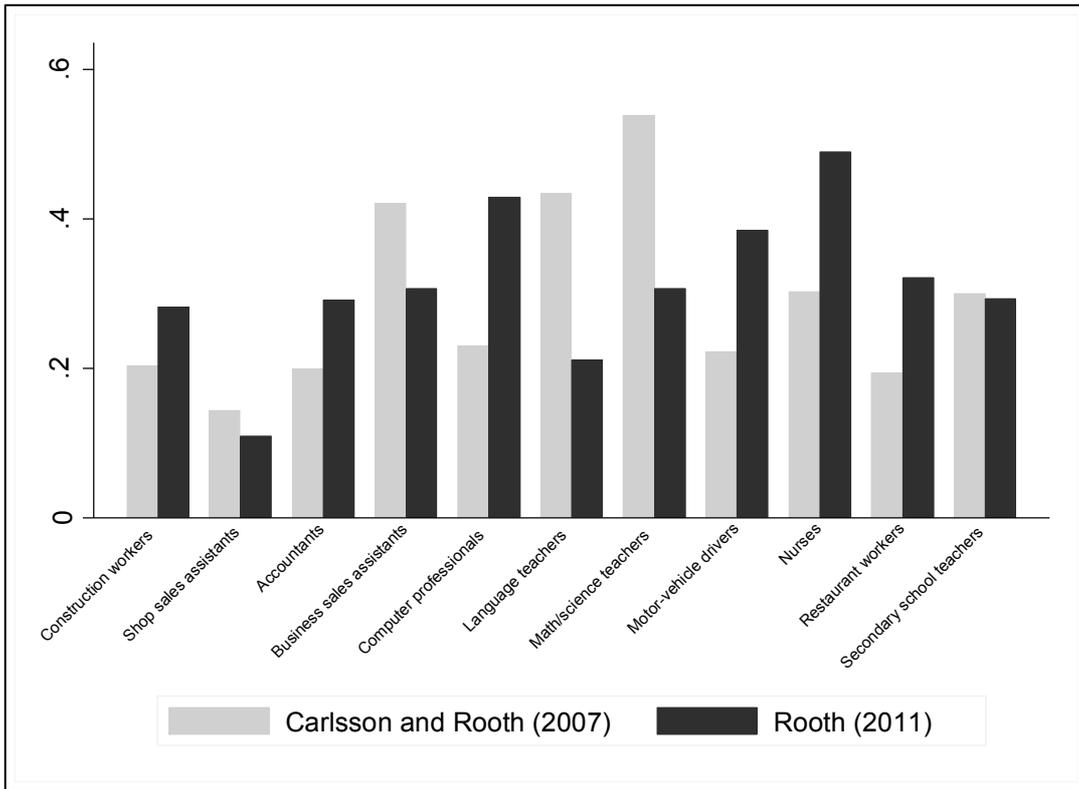


Figure A2. The number of job applications per vacancy. N=98 firms.

