

# Disability Disadvantage: Experimental Evidence of Hiring Discrimination against Wheelchair Users

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## Abstract

Disability is associated with persistent labour market disadvantages. What is not clear is the extent to which these disadvantages result from employers' discriminatory hiring decisions. Although observational research and laboratory experiments provide indicative evidence of its existence, few studies have used randomized field experiments such as correspondence studies to investigate the occurrence of disability discrimination. This article extends current knowledge by presenting the results of a correspondence study used to measure discrimination against wheelchair users in a new context: the Norwegian labour market. In the experiment, 1,200 fictitious applications with randomly assigned information about the applicants' disability status were sent in pairs to 600 private sector employers with job openings. The experiment documents negative effects of disability on callbacks from employers across various occupations. The findings suggest that discrimination in hiring processes is a mechanism through which disability-related inequality in employment outcomes is perpetuated.

Disability is associated with persistent labour market disadvantages (OECD, 2010; Schur, Kruse and Blanck, 2013). Field experiments in which fictitious job applications are sent in response to real job openings suggest a role of discrimination in explaining disability-differentiated employment outcomes (Baert, 2018). Two such recent studies investigate discrimination against persons with mobility impairments in the United States (Ameri *et al.*, 2018) and Canada (Bellemare *et al.*, 2019). As levels of discrimination are likely to vary across countries (cf. Quillian *et al.*, 2019), the present study contributes to this literature by using a field experiment to measure discrimination against wheelchair users in a novel context: the Norwegian labour market.

As a social-democratic welfare state, Norway is associated with universalism and egalitarianism (Esping-Andersen, 1990); principles presumably conducive to

equality of opportunity and an inclusive labour market. However, compared with other OECD countries, Norway has a high general employment rate (74 per cent) and low unemployment (2.7 per cent), whereas the employment rate of persons with disabilities (44 per cent) is approximately on the OECD average (OECD, 2010).<sup>1</sup> While lower educational attainment and the impact of impairment and health status on the ability to work are factors that contribute to the employment gap, there are reasons to assume that disability discrimination rates could be high in Norway. The Norwegian labour market is well regulated, with high minimum wages and relatively strict employment protection legislation. Compared with liberal market economies, such as the United States and Canada, where institutional constraints on employers are weaker, these conditions might accentuate the perceived risk involved in hiring

applicants whose productivity employers are uncertain about (Halvorsen, Hvinden and Schoyen, 2016).

The present research is based on the first field experiment on hiring discrimination against wheelchair users in a Nordic labour market. Wheelchair users participate in the labour market at clearly lower rates than the general population.<sup>2</sup> However, if the work environment is adapted to wheelchairs, their productivity should not be limited in all occupations. We sent 1,200 applications to 600 advertised jobs in the private sector, including only jobs where being a wheelchair user would be unlikely to affect the ability to perform the job.<sup>3</sup> By randomly assigning information about disability to the applications, all observable confounding factors between applicants with and without a disability are held constant. We therefore attribute differences in response from employers to the disclosure of being a wheelchair user and interpret this as direct evidence of disability discrimination.

### Measuring Disability Discrimination

Previous studies conducted in Norway, Canada, the United States and the United Kingdom suggest that persons with disabilities are subject to labour market discrimination. Statistical analyses document disability-related gaps in employment and wages that are unexplained by other observable factors relevant to employment (Baldwin and Johnson, 2006), while persons with disabilities themselves report subjective experiences with discrimination in surveys and qualitative interviews (Lindsay, 2011; Vedeler, 2014; Namkung and Carr, 2019). Results from qualitative and survey-based research on employers are mixed and show that employers express reluctance towards hiring persons with disabilities, yet also report positive attitudes towards workers with disabilities (Lengnick-Hall, Gaunt and Kulkarni, 2008; Ju, Roberts and Zhang, 2013). These studies delineate a disability hierarchy, whereby employers prefer individuals with physical and sensory impairments over those whose impairments are psychological or intellectual. Experimental research documenting negative effects of disability on hypothetical hiring decisions in laboratory settings have found similar moderating effects of impairment type (Ren, Paetzold and Colella, 2008).

Despite providing indicative evidence on disability discrimination, previous research based on the above methodological approaches is limited by biases that researchers cannot effectively control for, including social desirability, misperception and selection effects (Quillian, 2006; Pager and Shepherd, 2008).

Correspondence studies represent a main type of field experiment that circumvent challenges associated with other types of data.<sup>4</sup> Compared to observational data, the randomized experimental design provides direct causal evidence of how a treatment variable, such as disability status, affects employers' hiring decisions (Pager, 2007). Correspondence studies also have greater external validity than laboratory experiments because they measure behavioural outcomes in employment situations where employers believe they are making decisions about actual job applicants.<sup>5</sup> Historically, correspondence studies have focused on ethnicity or race and gender (for recent reviews, see Zschirnt and Ruedin, 2016; Baert, 2018; Neumark, 2018). Even though disabled people constitute a population that is often comparable, and overlapping, with ethnic minorities both in terms of size and their poor employment prospects, few correspondence studies have examined disability discrimination.

To our knowledge, only four of these have investigated discrimination against wheelchair users. Thirty years ago, Ravaud, Madiot and Ville (1992) documented discrimination of wheelchair users by sending unsolicited applications that differed in whether the applicant indicated being paraplegic and using a wheelchair or not to 2,228 companies in France. In the United Kingdom, Stone and Wright (2013) sent trios of applications differing in whether the applicants mentioned a facial disfigurement or that they were wheelchair users to 144 employers advertising jobs. Wheelchair users were discriminated against at similar rates in occupations with both high and low levels of customer contact. Given the sample size, the study might have been underpowered to detect such occupational differences.

In a US study, Ameri *et al.* (2018) sent 6,016 applications in response to job advertisements for accounting positions using an unmatched design, in which only one application was sent to each employer. The fictitious applicants randomly disclosed Asperger's syndrome, a spinal cord injury or no disability. For applicants disclosing a spinal cord injury and applicants without a disability, the average callback rates, defined as any expression of employer interest, were 4.8 per cent and 6.6 per cent respectively. Disclosing a spinal cord injury thus reduced the probability of receiving any expression of employer interest by 26 per cent. Overall, however, they found no statistically significant difference between applicants with and without disabilities when comparing explicit invitations to job interviews. Ameri *et al.* (2018: p. 359) note that the external validity of their study is restricted by only including male applicants and one occupation. Indeed, previous correspondence

studies suggest that occupational differences in discrimination rates could be large due to factors such as labour market tightness and the degree to which hiring procedures are formalized (e.g. Bursell, 2014; Midtbøen, 2015; Carlsson, Fumarco and Rooth, 2018). There is also evidence that women are advantaged in female-dominated and integrated occupations and disadvantaged in male-dominated occupations (Koch, D’Mello and Sackett, 2015; Birkelund, Janz and Larsen, 2019; Di Stasio and Larsen, 2020), which might result from perceived incongruity (Eagly and Karau, 2002) or ‘lack of fit’ (Heilman, 1983) between gender stereotypes and the masculine or feminine traits associated with gender-typed jobs. Considering disability discrimination, women with disabilities may, due to their gender and impairment, be ‘twice penalized’ in the labour market (O’Hara, 2004). However, studies suggest that because there is a discrepancy between disability stereotypes and stereotypical masculinity, men with disabilities might experience stronger penalties (Stone and Colella, 1996; Mik-Meyer, 2015; Ballo, 2020).

In a Canadian study using an unmatched design, Bellemare *et al.* (2019) submitted 1,477 applications from both male and female applicants who randomly disclosed being wheelchair users due to an accident for positions as computer programmers, accounting clerks, secretaries and receptionists. They found that average callback rates, defined as invitations to job interviews, for applicants with and without a disability were 7.2 per cent and 14.4 per cent respectively. The probability of being invited to a job interview was thus reduced by 50 per cent for applicants with a disability. Importantly, Bellemare *et al.* (2019) also documented the wheelchair accessibility of the premises of a subset of the firms. This provided no empirical support for the assumption that differential treatment of applicants with a disability might be due to inaccessibility rather than direct discrimination. They also varied the duration of the disability, that is, time since the accident, and whether a subset of the disabled applicants informed about the availability of a wage subsidy and government financial assistance to adapt the workplace. There was no statistically significant effect of these variables interacted with disability. However, their relatively small sample suggests that the statistical power for the tests of interaction effects might have been low.

## Theories of Discrimination

Explanations of discrimination often rely on economic models suggesting that unequal treatment is either ‘taste-based’ or ‘statistical’. According to the first explanation, employers with a prejudicial ‘taste for

discrimination’ are willing to forgo profits to avoid hiring members from disliked groups (Becker, 1957). This model is supported by studies showing that disability-differentiated wage differentials are larger for impairments subject to greater prejudice after controlling for productivity characteristics (Baldwin and Johnson, 2006). The second explanation, focusing on the implications of imperfect information, suggests that because the productivity of applicants is unobserved pre-hire, employers statistically discriminate against members from groups whose productivity they perceive as lower on average (Phelps, 1972; Arrow, 1973). The statistical discrimination model may apply given employers’ reported perceptions of persons with disabilities as less productive, concerns about potential costs of accommodation and extensive administrative procedures (Lengnick-Hall *et al.*, 2008; Burke *et al.*, 2013).<sup>6</sup>

Sociological and social-psychological perspectives on discrimination suggest that the distinction between taste-based and statistical discrimination could be less clear if employers’ estimates of group productivity are based on more or less consciously acknowledged stereotypes and attitudes than on correct information (Bielby and Baron, 1986; Tomaskovic-Deve and Skaggs, 1999). These explanations assume that automatic stereotypical associations link specific groups to sets of characteristics that bias perception, judgement and behaviour (Fiske, 1998). Whereas explicit stereotypes can be actively used as simplifying screening devices (Allport, 1954), implicit attitudes and stereotypes are thought to influence perception, emotions and behaviour in unconscious ways (Greenwald and Banaji, 1995). Implicit stereotypes are assumed to be influential under time pressure and when the degree of automaticity is high (Bertrand, Chugh and Mullainathan, 2005), such as when employers make quick initial screenings of a large number of job applications (Birkelund, 2016).

Previous research shows that employers often lack accurate information about the productivity of persons with disabilities (Burke *et al.*, 2013) and ‘that perceptions are often formed with little objective knowledge’ (Lengnick-Hall *et al.*, 2008: p. 261). While disability stereotypes are not exclusively negative but ambivalent (Fiske *et al.*, 2002), negative stereotypes include perceiving persons with disabilities as passive, incompetent, dependent and unproductive (Nario-Redmond, 2010; Rohmer and Louvet, 2012). Such implicit or explicit associations may explain employers’ low performance expectations of disabled applicants (Lengnick-Hall *et al.*, 2008). For example, employers could expect that workers with disabilities will put constraints on co-workers based on the belief that they are dependent and

need assistance (Kaye, Jans and Jones, 2011). Employers' expectations may also be contingent on the perceived fit between disability stereotypes and the nature of the job (Heilman, 1983; Stone and Colella, 1996), that is, some jobs might be perceived as less suitable than others for persons with disabilities. Studies have, for instance, found that jobs involving contact with customers are perceived as a particularly poor fit for persons with visible impairments (Louvet, 2007; Lyons *et al.*, 2018). In such cases, employers might also act as if customers discriminate (Becker, 1957), which could be based on assumptions about customers' discomfort in such interactions (cf. Dovidio, Pagotto and Hebl, 2011).

Based on the mechanisms outlined above, we expect that *wheelchair users will be less likely to be invited to job interviews than equally qualified applicants without disabilities*. We also explore whether *wheelchair users are less likely to be invited to job interviews for jobs involving customer contact than in jobs without customer contact*.

## The Norwegian Context

Although Norwegian disability policy has been geared for several decades towards societal participation and equal opportunities, particularly in the labour market (Tøssebro, 2016), there could be high levels of disability discrimination. First, the Working Environment Act prohibits disability discrimination in the labour market and incorporates the principle that inaccessibility is considered discrimination to the extent that providing adjustments do not impose an 'undue burden' on employers (regulated by the Equality and Anti-Discrimination Act). Although the impact of disability discrimination legislation on hiring is unclear (e.g. Acemoglu and Angrist, 2001; Bell and Heitmueller, 2009), it could affect the general awareness of disability-related issues and by extension employers' hiring behaviour towards persons with disabilities (Button, 2018). Since Norway introduced this legislation later than countries, such as Canada and the United States, in addition to the relative comprehensiveness of the Americans with Disabilities Act, Norwegian employers could be less affected by such legislation.

Second, employment protection legislation covering all employees is relatively strong in Norway (OECD, 2013). Permanent employment is the main rule and there are restrictions on the use of temporary contracts. The maximum length of trial periods for permanent contracts is 6 months during which dismissals must be made on the grounds of a lack of suitability for the job, a lack of

proficiency or reliability. The regulations governing the individual dismissal of permanent employees are moderately strict, that is, above the OECD average. Stringent employment protection might discourage employers from hiring persons with disabilities (e.g. Holden and Rosén, 2014; Gebel and Giesecke, 2016). Since applicants' productivity is unobserved in the hiring process, employers sometimes hire workers who do not perform as well as expected to make up for labour costs. Stronger employment protection legislation increases the cost of dismissing such workers. If the employee does not terminate the relationship voluntarily, the firm incurs continued economic loss. Thus, the perceived risk involved in hiring applicants whose productivity employers are uncertain about might be higher in countries such as Norway. A recent correspondence study on ethnic discrimination conducted in Norway and the United Kingdom suggests such a pattern (Larsen and Di Stasio, 2019).<sup>7</sup> In addition, Norway has low income inequality, with wages that are high at the bottom end of the earnings distribution, which could exacerbate the assumed impact of employment protection on employers' hiring behaviour by increasing the anticipated gap between low productivity and labour costs (Halvorsen *et al.*, 2016).

## Field Experiment Design

To investigate the effect of disability on hiring probabilities, we use data from a randomized correspondence study conducted between January 2019 and January 2020.<sup>8</sup> In response to job advertisements in the Oslo area, we sent pairs of applications that were similar in content except in terms of disability status. We decided to send pairs of applications, thus following a matched approach, for reasons of feasibility. First, by allowing for the collection of more than one observation per vacancy, the matched design offers an advantage in smaller labour markets, such as the Norwegian one, where there are fewer job advertisements available (Larsen, 2020). Second, the matched approach is more statistically efficient when the concordance of outcomes, that is, the proportion of cases where both applications in a pair receive the same response, is high, thus requiring smaller samples to reach a satisfactory level of statistical power (Vuolo, Uggen and Lageson, 2018; Hipp, 2019).

## Signalling Disability

In correspondence studies, it is essential to signal the characteristic of interest in a realistic way that does not compromise external validity (Lahey and Beasley, 2018). For persons with disabilities, the question of

whether to disclose their disability is a challenge when applying for work (Lindsay, Cagliostro and Carafa, 2018). Actual applicants might not mention their disabilities in the application to avoid discrimination. However, persons whose disabilities are visible might want to be upfront about this because the employer will notice it at a job interview. Additionally, persons whose disabilities require accessible premises must disclose their disability at least before an interview to ensure that they can access the premises.

To create a signal that would appear realistic to employers, we consulted disability organizations and career counsellors about the advice they give about disability disclosure. We also conducted a survey in which we asked persons with disabilities whether they mentioned their disabilities in their applications and, if so, how they conveyed such information (see [Supplementary Material](#)). This information supported our assumption that wheelchair users sometimes mention this in their applications. Further, we decided to signal disability in a direct way that emphasized its positive aspects. Lastly, the information about disability was based on variants of signals used in prior correspondence studies (Ameri *et al.*, 2018; Bellemare *et al.*, 2019).

Thus, we signalled disability by using the following sentences in the section of the cover letter where, in Norway, it is customary to convey personal characteristics: ‘Due to a congenital back injury, I use a wheelchair. This does not affect my ability to do the job [...]. In being a wheelchair user, I have learned to look for solutions, rather than limitations’. We made minor adjustments to the signal according to occupation-specific application templates in order to justify the inclusion of the information on disability. For the applications not mentioning a disability, a willingness to find solutions was also included as a personal characteristic but formulated in a different way (i.e. ‘I am solution-oriented...’). We strengthened the disability signal to ensure that employers would notice it by listing voluntary work on behalf of an organization arranging sports events for children and young people with disabilities in the CVs, including the wording: ‘As a wheelchair user, it has been important for me to facilitate activities for children and young people with disabilities’. We also included tasks that they performed at the event that were relevant to the occupation in question. For the non-disabled applicants, we listed voluntary work for the annual Oslo Marathon in their CVs.

Although some employers might appreciate the openness of applicants disclosing their disability in the application, other may perceive it as lacking ‘business savvy’, parallel to the point made by Weichselbaumer (2003)

about signalling sexual orientation (see also Tilcsik, 2011). Potentially, this might introduce a confounding factor into the analysis. However, given that actual persons with disabilities convey such information in their applications, we did not consider it as disproving discrimination.

### Selection of Occupations and Advertised Jobs

In 2019, 62 per cent of Norwegian firms and 70 per cent of firms in Oslo reported that they publicly advertised their last vacancy, such as posting it on the website of the firm or on an online job search engine (Kalsto, 2019). We sampled all jobs that met certain criteria from the main private recruitment website in Norway. First, occupations in the experiment were restricted to those for which we expected that being a wheelchair user would not affect one’s ability to do the job, possibly after reasonable accommodations. Second, we only included jobs where we could apply by e-mail or through the application system on the recruitment website. Consequently, the study is limited to jobs in the private sector because public-sector employers use a recruiting platform that require applicants to create user profiles, which renders the randomization procedure impossible. Third, the number of job openings within an occupational category needed to be large enough to ensure progress in the experiment by enabling us to sample the required number of jobs within a reasonable timeframe, preferably no longer than a year.

Given these criteria, we included the following occupations: software developers, information and communications technology (ICT) operations and user support technicians, administrative assistants, accountants, graduate sales representatives, sales representatives, customer service representatives and medical assistants. These occupations cover different levels and types of educational attainment, gender compositions and degrees of customer contact. Two of the occupations, administrative assistants and software developers, are among the top 10 most common in Norway, whereas sales representatives and accountants are among the top 25.<sup>9</sup>

Jobs within all occupations in the experiment could involve contact with clients or customers. Therefore, we coded the job postings according to whether the job was described as involving in-person customer contact or by telecommunication and include interaction terms in the analysis to explore whether the level of customer contact shapes the hiring chances of wheelchair users. These analyses should be considered exploratory as our study was not designed to formally test such differences.



Moreover, this approach is contingent on the information provided in the job postings and potential coding errors.

### Creating Application Templates

To create application pairs that were equivalent in qualifications, we consulted career counsellors, recruiters, researchers who have conducted correspondence studies, and persons working in the occupations selected for advice and revision. The application templates consist of a CV and a cover letter (example in [Supplementary Material](#)). For each occupation, we reviewed job postings in order to incorporate qualifications and personal characteristics frequently required or requested by employers. Then, we created two pairs of application templates with occupation-relevant work experience and education: one of the pairs of applications was given three years' work experience, the other pair five years. We randomly varied whether we sent a pair that had three or five years of work experience in response to any given job opening. The two levels of work experience were intended to ensure a more representative picture of job-seeking wheelchair users. All application templates listed education that matched the typical requirements for each occupation.<sup>10</sup>

Applicants were given an age that matched their employment history, that is, 23–27 years. Further, we randomly assigned a home address in Oslo and male or female names. Applicant pairs for each individual job opening always had the same gender. In contrast to [Bellemare et al. \(2019\)](#) who sent only female applicants in response to positions as receptionists and secretaries, we randomly varied whether we sent a male or female pair across all occupations to ensure a fully randomized design.

### Conducting the Field Experiment

We sent 1,200 applications to 600 employers advertising for jobs.<sup>11</sup> The risk of employer suspicion and detection of the experiment might depend on the overall number of applications the employers receive. Notwithstanding large variations across firms and occupations, a Swedish study found that a majority of employers typically received, on average, more than 20 applications per job opening ([Eriksson and Rooth, 2014](#): note 8). While correspondence studies often send matched applications with an interval of one hour to half a day ([Rich, 2014](#)), we sent the applications with a time-lag of one or two days to minimize employer suspicion. Before we sent each pair, we randomly assigned the disability signal to one of them to ensure that there was no relationship

between the application template and disability status. The employers responded by e-mail, text or voice messages, which we registered by matching them with the application to which they responded. We then declined invitations to job interviews or requests for additional information.

The callbacks from employers included invitations to job interviews, requests for more information, that the applicant complete a test or contact the employer in addition to explicit rejections, confirmation receipts and missed phone calls. We distinguish between two measures of callbacks from employers. In our main analyses, the outcome variable, *invitation to job interview*, measures the strongest indication of employer interest, which is explicit invitations to job interviews. The variable is coded as 1 if the employer has invited the applicant to an interview, otherwise as 0. However, employers who are uncertain about hiring wheelchair users might be inclined to request more information before inviting the applicant to an interview. Thus, we constructed the variable *any employer interest* that measures any positive response from employers, including not only interview invitations, but also requests for more information, that the applicant contact the employer or complete a test. The variable is coded 1 if the applicant received any positive response, otherwise as 0.

As a sensitivity analysis, we exclude cases where the workplace is inaccessible to wheelchair users and adaptations would likely represent a 'disproportionate burden' for the employer.<sup>12</sup> Taking advantage of the matched design, we visited or searched online to determine whether the offices of the firms that invited only the non-disabled applicant to an interview were housed in buildings accessible to wheelchair users. We considered buildings accessible if they had lifts, wheelchair ramps or if wheelchair ramps could be easily installed. We were unable to check other facilities, such as accessible lavatories. In 5 of the 76 cases where only the applicant without a disability was invited to an interview ([Table 2](#)), the applicant with a disability received some expression of employer interest. Of the buildings in which the 76 firms' offices were housed, 58 were accessible to wheelchair users, 10 were inaccessible, while we were unable to determine the accessibility of eight buildings.

[Table 1](#) presents the number of applications sent within each occupation and their respective callback rates (invitation to job interview). The differences in the number of applications sent within each occupation, ranging from 50 to 254, reflect the varying number of vacancies in each occupation at the time we collected the data. [Table 1](#) also shows that callback rates vary

**Table 1.** Descriptive statistics

Occupation	Number of applications (per cent)	Callback rate
Medium-/high skill occupations		
Software developers	184 (15.3)	35.9
ICT operations and user support technicians	82 (6.8)	29.3
Accountants	254 (21.2)	9.8
Administrative assistants	170 (14.2)	5.3
Graduate sales representative	132 (11.0)	6.8
Low skill occupations		
Sales representative	222 (18.5)	20.7
Customer service representatives	106 (8.8)	10.4
Medical assistants	50 (4.2)	24.0
All	1200 (100)	16.8

Notes: Number (per cent) of applications and overall callback rates (invitation to job interview) by occupation.

**Table 2.** Distribution of callback rates (invitation to job interview) by disability status and occupation

	Callback for neither	Callback for both	Callback only for applicant without disability	Callback only for applicant with disability	Percentage callback applicant without disability	Percentage callback applicant with disability	Callback ratio
All occupations	455	57	76	12	22.2	11.5	1.93 <sup>***</sup>
Software developers	48	22	19	3	44.6	27.2	1.64 <sup>*</sup>
ICT operations/user support technicians	24	7	9	1	39.0	19.5	2.00 <sup>^</sup>
Accountants	108	6	11	2	13.4	6.3	2.13 <sup>^</sup>
Administrative assistants	77	1	5	2	7.1	3.5	2.03
Graduate sales representative	58	1	7	0	12.1	1.5	8.07 <sup>*</sup>
Sales representative	79	14	16	2	27.0	14.4	1.88 <sup>*</sup>
Customer service representatives	46	4	1	2	9.4	11.3	0.83
Medical assistants	15	2	8	0	40.0	8.0	5.00 <sup>**</sup>

$P < 0.1$ ,  $*P < 0.05$ ,  $**P < 0.01$ ,  $***P < 0.001$ .

between 5.3 per cent for positions as administrative assistants and 35.9 per cent for positions as software developers. We interpret such occupation-specific differences in the number of applications and callback rates as indicating variation in labour demand. However, the callback rates might also reflect the quality level of the application templates across occupations.<sup>13</sup>

## Findings

Descriptive statistics on the distribution of invitations to job interviews by disability status are reported in [Table 2](#). Neither the wheelchair user nor the non-disabled applicant received an interview invitation in 455 of the 600 cases, while in 57 cases, both applicants

were invited. A total of 76 cases resulted in an interview invitation only for the non-disabled applicant, whereas only the wheelchair user was invited to an interview in 12 cases.

Thus, wheelchair users received fewer invitations to job interviews than non-disabled applicants (22.2 per cent vs 11.5 per cent), and the difference is statistically significant. Disclosing a disability reduced the probability of being invited to an interview with 48 per cent. The callback ratio, which is the ratio of the percentage of callbacks to non-disabled applicants to the percentage of callbacks to wheelchair users, is 1.93. This indicates that in order to be invited to an interview, wheelchair users must apply for approximately twice the number of jobs as an identical non-disabled applicant. [Table 2](#) also

**Table 3.** Probability of receiving an invitation to a job interview

	(1)	(2)	(3)	(4)
Constant	0.222*** (0.017)	0.225*** (0.020)	0.183*** (0.040)	0.204*** (0.026)
Disability	-0.107*** (0.015)	-0.107*** (0.015)	-0.081* (0.034)	-0.091*** (0.021)
Customer contact (telecom)			0.065 (0.048)	
Customer contact (in-person)			0.042 (0.044)	
Disability*Customer contact (telecom)			-0.047 (0.042)	
Disability*Customer contact (in-person)			-0.022 (0.040)	
Female				0.042 (0.034)
Disability*Female				-0.032 (0.030)
Occupation fixed effects			×	
Controls				
Application template		×	×	×
Order of applications		×	×	×
Number of observations	1,200	1,200	1,200	1,200

Notes: Robust standard errors (parentheses) are clustered at the job advertisement level.  
 $P < 0.10$ , \* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ .

shows that there is occupational variation. For instance, the differences in callbacks for applicants to graduate sales representative and software developer jobs are statistically significant with a callback ratio of 8.07 and 1.64, respectively. However, these results should be interpreted with caution due to the small size of the subsamples.<sup>14</sup>

Linear probability model estimates of having received an invitation to an interview is reported in Table 3. Model 1 includes only an indicator for being a wheelchair user, which reduces the probability of receiving an invitation to an interview by 10.7 percentage points. Model 2 includes control variables for the type of application template and the order in which the applications in a pair were submitted. These controls do not alter the results, which rules out the possible influence such design and implementation factors might have on employer response. Model 3 explores whether wheelchair users are discriminated more in jobs involving customer contact by including interactions between disability and indicators of customer contact, and fixed effects for occupation. The coefficients for the customer contact interactions are small and not statistically significant, indicating that the negative effect of disability does not seem to be larger in jobs involving customer contact. Model 4 explores whether disability

discrimination varies with gender. However, we find no such statistically significant gender differences.

Analogous regressions to those in Table 3 show that the disability coefficient is slightly lower when we exclude cases where the workplace is inaccessible to wheelchair users (or we were unable to determine its accessibility) and adaptations would likely represent an 'undue burden' for the employer (Table A3 in the Appendix). Moreover, we performed the same analyses using any employer interest as the outcome variable (Table A4 in the Appendix). These results show that disclosing a disability reduces the probability of receiving any reaction from employers by 14 percentage points. These analyses also show that there are no statistically significant interactions between disability and customer contact or gender on the probability of receiving any expression of employer interest.

## Concluding Discussion

In this study, we have investigated hiring discrimination against wheelchair users by measuring employers' responses to fictitious applicants that differed only by whether they mentioned being wheelchair users in their job applications. The main finding is that wheelchair users are 48 per cent less likely to be invited to job



interviews than non-disabled applicants. This is consistent with previous correspondence studies that document disability discrimination in the hiring process for various types of impairments (for an overview, see [Baert, 2018](#)).

Our results extend previous research findings by documenting that discrimination against wheelchair users is not limited to so-called flexible labour market contexts where institutional constraints on employers' decision-making are weaker, that is, in the United States and Canada. However, our results contradict the logic outlined earlier, that stricter employment protection would increase discrimination rates because employers become more sceptical towards potentially unproductive applicants due to greater firing difficulties. Compared to Norway, where employment protection is relatively strict, both the United States and Canada are liberal market economies in which such legislation is among the least strict in the OECD countries ([OECD, 2013](#)). Despite such structural differences, the results suggest that wheelchair users in Norway and Canada ([Bellemare et al., 2019](#)) experience discrimination at similar rates. In contrast, [Ameri et al. \(2018\)](#) found lower levels of discrimination in the United States and that discrimination was concentrated among employers who were not covered by anti-discrimination laws. While this points to national differences in such legislation as a factor that might explain varying disability discrimination rates, cross-national comparisons should be made with caution due to differences in design and other circumstances under which the correspondence studies were conducted. The observed differences could be due to structural factors that differ between countries, but they could also be the products of methodological differences, such as the occupations targeted in the experiments.

The descriptive analyses in the present study show that there is occupational variation in discrimination rates. This heterogeneity might at least partly be due to variation in the perceived fit between disability stereotypes and the nature of the job. The large relative callback rate for applicants to graduate sales representative jobs (8.07), for instance, could suggest that stereotypical perceptions of wheelchair users are in particular conflict with traits associated with sales representatives, such as competitiveness and confidence. However, it might also be that jobs involving customer contact generally are perceived as a poor fit for wheelchair users. If so, this could also be due to employers assuming that customers have discriminatory preferences. In the exploratory analysis, however, we found no significant differences in the effect of disability depending on whether the job involved customer contact. Although these results

should be cautiously interpreted due to the sample size and potential coding errors in the customer contact variable, they suggest that wheelchair users are discriminated against at similar rates regardless of whether the job involves customer contact.

That unequal treatment of wheelchair users appears not to result from inaccessibility issues corroborates the result in the Canadian experiment. However, when we excluded cases where inaccessibility would likely be an issue, the negative effect of disability was slightly lower. This is unsurprising because we only documented the accessibility of firms that invited only the non-disabled applicant to a job interview. Nonetheless, the sensitivity analysis excluding inaccessible workplaces may represent more precise estimates of *employer* discrimination of wheelchair users because the disability differentials documented in the main analysis ([Table 3](#)) are in part constituted by inaccessibility issues for which no single employer can be held accountable. From the perspective of job-seeking wheelchair users, however, the main analysis more precisely represents the labour market in which they operate. That is, the analysis takes into account that disabled people are subject to discrimination not only at an individual level, for instance through employers' hiring decisions, but that structural conditions, such as physical barriers, also prevent their equal participation in society.

Although our study contributes new knowledge to the literature on challenges persons with disabilities face in the labour market, it has limitations. Other researchers have cautioned against interpreting differential treatment of applicants with disabilities as discrimination in correspondence studies, arguing that there may still be disability-related differences in productivity between applicants (e.g. [Riach and Rich, 2002](#)). We attempted to address this challenge by selecting occupations where being a wheelchair user should have a minimal impact on job performance, in addition to screening job advertisement texts for tasks a wheelchair user could have been less productive in executing. However, some job tasks might not have been listed in the job postings. We have neither been able to account for potential lack of accessibility at, for instance, clients' offices. The level of discrimination might thus be lower, given that there could be productivity issues at play that we have not been able to solve experimentally. On the other hand, discrimination rates could be higher as a recent study documents considerable additional (racial) discrimination *after* the callback stage of the hiring process, that is, in job offers ([Quillian, Lee and Oliver, 2020](#)).

Furthermore, we only applied to private-sector jobs in the Oslo area that were advertised on the main private

recruitment website in Norway and within the selected occupations. We are therefore unable to examine whether employers elsewhere in Norway, in the public sector or in other occupations would respond differently to job-seeking wheelchair users. Although the majority of Norwegian employers publicly advertise their job openings, 38 per cent relied exclusively on informal hiring strategies in 2019 (Kalstø, 2019). While our findings are valid for formal methods of recruitment, discriminatory mechanisms in informal channels of recruitment can also contribute to disability-differentiated labour market disparities. Persons with disabilities might, for instance, have unequal access to strategically placed networks due to homophily and social neglect. Additionally, the applicants in our study were all below 30 years of age and our results might not generalize to older applicants. Another disadvantage is that our study only focuses on wheelchair users. Hence, the results are not transferable to persons with other impairments that might elicit other levels of discrimination.

Notwithstanding these limitations, the present study demonstrates that employers limit access to employment opportunities for wheelchair users in Norway. Hiring discrimination is thus likely to contribute to produce and perpetuate disability-related inequality in labour market outcomes. Such unequal employment opportunities have consequences for the sustainability of a welfare state that depends on high labour market participation and, most importantly, for individuals' life chances.

## Supplementary Data

Supplementary data are available at *ESR* online.

## Notes

- 1 *Source*: The Norwegian labour force survey (LFS) (2019), respondents aged 15–66 years.
- 2 Employment rates vary by impairment type, ranging from 70–82 per cent (hearing impairment, asthma, allergies, diabetes), to 45–59 per cent (mobility and speech impairment, cardiovascular diseases), and less than 45 per cent (psychiatric, cognitive and intellectual impairment) (Tøssebro, 2012). Figures are from the Swedish LFS as the Norwegian LFS do not present data by impairment type. The disability employment level is higher in Sweden than in Norway.
- 3 Job performance should not be affected in the selected occupations because the essential functions of the jobs do not include physical requirements such as heavy lifting, standing or walking.
- 4 See Heckman and Siegelman (1993) and Heckman (1998) for a critique of field experiments.
- 5 For a discussion of ethical concerns regarding correspondence studies, see Riach and Rich (2004) and Zschirnt (2019).
- 6 Alternatively, employers could believe that the variance in productivity is greater for persons with disabilities and therefore be more uncertain about their potential performance.
- 7 See Midtbøen (2016) and Birkelund, Heggebø and Rogstad (2016) for other correspondence studies on ethnic discrimination in Norway.
- 8 This research project was reviewed and approved by the Norwegian Centre for Research Data and the National Committee for Research Ethics in the Social Sciences and the Humanities.
- 9 *Source*: <https://www.ssb.no/en/statbank>
- 10 All templates included upper-secondary education from schools in Oslo with similar admission requirements. Application templates for positions as software developers, ICT operations and user support technicians, administrative assistants, accountants and graduate sales representatives included relevant bachelor's degrees. For customer service representatives and sales representatives, the applications included an office assistant course taken part time while working.
- 11 Before collecting the data, *a priori* simulation-based power analyses were performed to determine the minimum sample size required to detect a main effect of disability of 7.5 percentage points with a baseline callback rate of 30 per cent with power set to 80 per cent.
- 12 Although employers are obliged to provide accommodations to ensure equal employment opportunities for persons with disabilities, corrections of inaccessibility sometimes entail interventions that represent an 'undue burden' on the employer. In these cases, inaccessibility would not legally count as discrimination.
- 13 Heckman (1998) shows that if employers act upon perceived differences in the variance of unobserved characteristics across applicant groups, the estimate of discrimination can be biased in either direction depending on the level at which the characteristics included in the applications are standardized.
- 14 For analogous descriptive statistics using any employer interest as the outcome variable, see Table A2 in the Appendix.

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## Appendix

**Table A2.** Distribution of callback rates (any employer interest) by disability status and occupation

	Callback for neither	Callback for both	Callback only for applicant without disability	Callback only for applicant with disability	Percentage callback applicant without disability	Percentage callback applicant with disability	Callback ratio
All occupations	379	103	101	17	34.0	20.0	1.70***
Software developers	32	37	20	3	62.0	43.5	1.42*
ICT operations/user support technicians	16	10	14	1	58.5	26.8	2.18**
Accountants	92	13	18	4	24.4	13.4	1.82*
Administrative assistants	75	2	6	2	9.4	4.7	2.00
Graduate sales representative	46	8	9	3	25.8	16.7	1.54
Sales representative	63	25	21	2	41.4	24.3	1.70**
Customer service representatives	40	6	5	2	20.8	15.1	1.38
Medical assistants	15	2	8	0	40.0	8.0	5.00**

$P < 0.1$ , \* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ .

**Table A3.** Probability of receiving an invitation to a job interview (excluding inaccessible workplaces)

	(1)	(2)	(3)	(4)
Constant	0.198*** (0.017)	0.203*** (0.020)	0.184*** (0.040)	0.188*** (0.026)
Disability	-0.079*** (0.014)	-0.080*** (0.014)	-0.082* (0.034)	-0.070*** (0.020)
Customer contact (telecom)			0.039 (0.048)	
Customer contact (in-person)			0.014 (0.044)	
Disability*Customer contact (telecom)			-0.011 (0.041)	
Disability*Customer contact (in-person)			0.012 (0.040)	
Female				0.031 (0.033)
Disability*Female				-0.019 (0.028)
Occupation fixed effects			×	
Controls				
Application template		×	×	×
Order of applications		×	×	×
Number of observations	1,164	1,164	1,164	1,164

Notes: Robust standard errors (parentheses) are clustered at the job advertisement level.  
 $P < 0.10$ , \* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ .

**Table A4.** Probability of any employer interest

	(1)	(2)	(3)	(4)
Constant	0.340 <sup>***</sup> (0.019)	0.344 <sup>***</sup> (0.023)	0.302 <sup>***</sup> (0.045)	0.325 <sup>***</sup> (0.030)
Disability	-0.140 <sup>***</sup> (0.017)	-0.141 <sup>***</sup> (0.017)	-0.113 <sup>**</sup> (0.038)	-0.127 <sup>***</sup> (0.024)
Customer contact (telecom)			0.051 (0.054)	
Customer contact (in-person)			0.049 (0.050)	
Disability*Customer contact (telecom)			-0.025 (0.047)	
Disability*Customer contact (in-person)			-0.038 (0.045)	
Female				0.038 (0.039)
Disability*Female				-0.028 (0.035)
Occupation fixed effects			×	
Controls				
Application template		×	×	×
Order of applications		×	×	×
Number of observations	1,200	1,200	1,200	1,200

Notes: Robust standard errors (parentheses) are clustered at the job advertisement level.  
<sup>\*</sup> $P < 0.10$ , <sup>\*</sup> $P < 0.05$ , <sup>\*\*</sup> $P < 0.01$ , <sup>\*\*\*</sup> $P < 0.001$ .