



Is the disability wage gap a gendered inequality? Evidence from a 13-year full population study from Norway

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ABSTRACT

Recent research has confirmed the employment disadvantages of disabled people, but disability wage gaps in interaction with gender have not been sufficiently explored. This article asks how the disability wage gap can be accounted for, how the unexplained disability wage gap has evolved over time and how the intersections of disability and gender relate to wage penalties. Norwegian nation-wide annual registry data from the period 2005–2017 (N = 8.5 million) are used to estimate longitudinal pay gaps of disabled men and women in relation to nondisabled workers. The analyses arrive at a persistent residual wage gap for disabled employees. Results confirm that gender is a defining predictor for income, and that disabled women are especially disadvantaged. Implications for intersectional theory are discussed. The current study is a reminder that antidiscrimination legislation and implementation of regulations has not been successful in levelling out injustices experienced by disabled people in the labour market.

1. Introduction

The Sustainable Development Goals (SDGs) adopted by all UN members in 2015, lay out strategies to achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value, by 2030 (Goal 8). The SDGs build upon international developments since the 1980s to promote non-discrimination and inclusion in society for people with disabilities. Despite local and global initiatives, labour market disadvantages of disabled people are widely documented and persistent (Maroto and Pettinicchio, 2014; Pettinicchio and Maroto, 2017; Longhi and Platt, 2012; Kim et al., 2019; Ballo, 2020; Foster and Wass, 2013; Schur et al., 2017; Kruse et al., 2018). Previous studies of inequalities of income have found wage gaps between disabled and nondisabled workers, both before and after controlling for education, occupation, and other personal characteristics (Maroto and Pettinicchio, 2014; Schur et al., 2017; Pettinicchio and Maroto, 2017; Longhi and Platt, 2012). However, quantitative longitudinal research is limited and in part outdated (see DeLeire, 2001; Thoursie, 2004; Pagán-Rodríguez, 2012; Wagner et al., 2005; Kim et al., 2019; Brown and Moloney, 2019). Most of these studies rely on survey data that define disability through self-reporting and as activity limiting conditions. Particularly, longitudinal studies exploring intersectional hierarchies of disability and gender, are scarce. Disability is increasingly

viewed as intersectional in nature since disabling processes are essentially intertwined with other social dimensions of inequality, such as gender (Goodley, 2014). The use of intersectional perspectives in studying wage gaps of disabled men and women has the potential to reveal economic inequalities and provide the empirical knowledge needed to improve policy (Robinson, 2018; Hancock, 2007). Nevertheless, the application of intersectionality to quantitative data is uncommon in the disability literature (with few exceptions such as Ballo, 2020; Kim et al., 2019; Brown and Moloney, 2019), due to a persistent tension between the endeavour to expose power inequities between social groups versus the sensitivity to variation within social categories (Robinson, 2018; McBride et al., 2015; McCall, 2005; Hancock, 2007; Naples et al., 2019).

The objective of this paper is twofold. First, the paper addresses limitations of extant literature by employing rich Norwegian full population annual register data (N ≈ 8 500 000) to predict the disability wage gap for men and women over a 13-year period. Analyses apply an administrative operationalization of disability, which does not condition disability on activity limiting impairments. Thus, the current study avoids bias of self-reporting and includes disabled people who may have equal productivity potential as non-disabled people.

Second, the current study contributes theoretically to intersectional research on gender and disability as social categories of structural inequality and power. The study provides novel empirical evidence on

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the collective level about the inequality shaping structures affecting overlapping and interactive social categories of disability and gender.

This study explores the following research questions:

- 1) Which factors contribute to explain the gross disability wage gap?
- 2) How has the *unexplained* disability wage gap changed over time?
- 3) How is the *unexplained* disability wage gap affected by intersectional processes and the gendered structures of the labour market?

Full-population data are not subject to the same insecurities as sampled data. Results from statistical analyses in this article reflect the *actual* working population between 20 and 40 years of age, not a constructed sample. Observable characteristics of individuals are used to explain as much as possible of the disability and gender wage gaps. Explanatory and control variables include own education and parents' education at age 16, years of previous work experience (since 1993), weekly workload, occupation (264 categories), migration background, age, marital status, and parenthood. Thus, the findings of the current study are not just of less uncertainty than previous studies, but also suited to arrive at insights about variations within the disabled population that are otherwise hard to reach with survey data due few observations. Due to the extensive data applied in the analysis, both in terms of number of individuals, length of time-period and detail of explanatory variables, findings provide robust empirical evidence of longitudinal structural inequalities.

As inequalities are expected to rise in the coming years following the covid-19 pandemic, the invasion of Ukraine and its effects on labour markets (e.g., Perry et al., 2021; Qian and Fuller, 2020), disabled people are likely to be particularly vulnerable (Maroto et al., 2021). Thus, targeting explanations for trends in disability-related employment penalties is particularly important. Understanding how disability related disadvantages change over time is essential for the appropriate adaption of policy and regulation aimed to mitigate social injustices.

2. Theoretical and empirical background

This study relies on the idea that disability is socially constructed (Oliver, 1990, 2013). In distinguishing between the medical individual-oriented approach and the social collective-approach to disability, this study acknowledges that it is not the disabled individual who needs fixing. Instead, the way forward is believed to go through policy designed to alleviate the structural disadvantages and injustices of disabled people (Oliver, 1990; Oliver and Barnes, 2012). The implication of the social approach to disability is also "a basic political commitment to improving the lives of disabled people, by promoting social inclusion and removing barriers that oppress disabled people" (Shakespeare, 2013, 2).

2.1. Disability and gender wage gaps

Theories of social inequality as well as extant empirical research describe both disabled people and women as holding disadvantaged positions in the labour market. Previous research has shown that disabled people may encounter barriers to participation in education, in occupations and in sectors of the economy, which may impact their wages negatively compared to their peers (Pettinicchio and Maroto 2017; Maroto and Pettinicchio 2014). Several non-experimental studies suggest that a residual disability wage gap can be attributed to discrimination (see for example Baldwin et al., 2014; Kruse et al., 2018; Longhi and Platt, 2012; Malo et al., 2012). Additionally, experimental studies have documented direct discrimination (although in hiring, not wage setting) using correspondence experiments (see Baert, 2017). In these studies, which have been performed in several countries, fictitious job applications with randomly assigned information on the disability status of applicants—with otherwise equal qualifications—are sent in pairs to employers with job vacancies. Variation in call-back rates

between disabled and non-disabled applicants are then measured as discrimination (Bjørnshagen and Ugreninov 2021; L'Horty et al., 2022; Ameri et al., 2018; Stone and Wright, 2013). Discrimination is a key finding from all these studies, and "discrimination in hiring processes is a mechanism through which disability-related inequality in employment outcomes is perpetuated" (Bjørnshagen and Ugreninov 2021, 818). The sum of previous findings indicates the presence of a residual disability wage gap, and that disabled workers are subject to both horizontal segregation (i.e., unequal access to types of occupations) and vertical segregation (i.e., unequal career and wage opportunities within occupations) (Charles, 2003).

Similarly, gender is one of the strongest predictors for high and low-status occupations, stable and unstable employment as well as wage levels (Wagner et al., 2020; Blau and Kahn, 2017). Experimental evidence also strongly suggests the presence of discrimination against women (Blau and Kahn, 2017). Applying a gender perspective to disabled people's income inequalities is therefore inevitable to understand the injustice-promoting structures of the labour market.

2.2. Intersectionality

The analytical framework of intersectionality is well suited to disentangle the intersecting positions of disability and gender as it "recognizes how multiple systems of oppression, [...] interact to disseminate disadvantage to and institutionally stratify different groups" (Robinson, 2018, 69). The question remains how these overlapping statuses of disability and gender unfold in relation to wage penalties. Intersectionality theory (Crenshaw, 1989) originally proposed a hierarchy of disadvantages proportional to intersecting statuses of minority and privilege. However, responses to original intersectional conceptualisations suggest that gendered performances may "break down" or become "distorted" when they coincide with other minority statuses such as disability (Connell, 2005; Ridgeway and Kricheli-Katz, 2013). The well-documented gender bias in the labour market suggests that disabled women are subjects of "twice penalization" (O'Hara, 2004) or even "two handicaps plus" (Hanna and Rogovsky, 1991), as they confront both sexism, ableism and a female/disabled plus factor. On the other hand, qualitative intersectional research has demonstrated how disability breaks down gendered performances jeopardising traditional expectations to gender in the labour market, producing "disabling masculinities" (Kavanagh et al., 2015; Mik-Meyer, 2015; Shuttleworth et al., 2012).

These two contradicting processes lead to two main hypotheses. First, theories of gendered structures of work propose that gender is the dominating structure of inequity, overruling disabling processes, rendering disabled women with lower wages compared with disabled men. Second, theories of disabling masculinities suggest that disability penalties are stronger for men than women. These two hypotheses do in fact not contradict one another, as it is possible that disabled women have lower predicted earnings than disabled men, while at the same time the disability wage gap is larger among men than women.

When considering evidence from both international and Nordic research about segmentation of women in the labour market and the attached disadvantages (Charles and Grusky, 2004; Blau and Kahn, 2017), including the motherhood penalty and its consequences on wages (Sieppi and Pehkonen, 2019; Correll et al., 2007) as well as women's opportunities to negotiate own salaries (Babcock and Laschever, 2003), the current study expects to find disabled women on the bottom of the wage ladder. However, whether men experience a stronger disability penalty than women, remains an open empirical question.

2.3. Longitudinal trends

There are two long-term structural trends that are important in shaping expectations to how the residual disability wage gap has developed over time. The first is the international development of anti-

discrimination legislation and social regulation (Clayton et al., 2012b; Tøssebro, 2016). The second is the changing nature of work, away from manual labour towards new technology and digitalization (Jones and Wass, 2013), and related theories of post-industrialization (Holland et al., 2011). International bodies such as UN, EU and OECD have in recent decades developed initiatives, policies, regulation, and legislation aimed to improve the social inclusion of disabled people and mitigate discrimination (Clayton et al., 2012b; Tøssebro, 2016).

Although anti-discrimination legislation is designed to eliminate injustices against disabled people, some scholars argue that the increased costs associated with requirements to offer adequate accommodations have made employers more reluctant to hire disabled people (Acemoglu and Angrist, 2001). Others have argued that the effectiveness of legislation is largely dependent on individuals enforcing their rights – a capacity not evenly distributed in the population (Dickens, 2007). In Scandinavia, however, systematic evidence of regulation effectiveness is lacking (Tøssebro, 2016).

Paralleling the implementation of anti-discrimination regulation has been the changing nature of work from manual labour towards increasing digitalization of work and increasing work hour flexibility. It has been suggested that this shift is especially beneficial for disabled workers (Jones and Wass, 2013), improving productivity and access to occupations that were previously out of reach. Recent pandemic research proposes a potential “silver lining” for workers with disability in the pandemic induced reformations of workplaces such as increased access to home office and new ways of thinking about the performance of work tasks (Schur et al., 2020). On the other hand, theories of post-industrialization (i.e., higher demands for flexibility, skills, credentials, performance, capacity, and productivity) suggest that people with productivity limitations are more vulnerable to labour market exclusion because they are less able to meet demands and requirements. This hypothesis has been partially supported by results indicating growing employment polarization between nondisabled and disabled people (Whitehead et al., 2009).

Taken together, the gradual implementation of anti-discrimination regulation, post-industrialization and the digitalization of working life leads to an expectation that the residual disability wage gap is narrowing over the study period. However, trends are likely to differ by gender, since men and women to a large extent work in different sectors with differing opportunities for career and wage progression. Given the polarization of the wage distribution (Asplund et al., 2011), it is likely that workers in higher wage brackets – mostly men – experienced a widening of the disability wage gap, since discretion in wage setting is larger at the top of the wage distribution than at the bottom.

2.4. Study context

The Norwegian welfare state is known for its generous social benefits and comprehensive activation policies aimed at supporting and incentivising labour market participation (Hvinden, 2004). Generous social benefits lower the opportunity cost of work and may disincentivise employment, but in a setting of compressed wage structure the lowest wages are likely to be high enough for people to seek work. On the other hand, the relatively high wages at the bottom may still make employers reluctant to hire jobseekers that come with a risk of low productivity (Halvorsen et al., 2016). In an international comparative study, the Nordic welfare model was not found “systematically worse” in terms of employment of disabled people, than other types of welfare regimes (Halvorsen et al., 2016, 69).

Additionally, the Norwegian model is characterized by gender equality policies and high rates of female labour force participation. Norway is together with Finland and Iceland among the countries with the smallest gender gaps in the workforce (World Economic Forum, 2022), but the Norwegian labour market is highly gender segregated and gender wage gaps persist (Ellingsæter, 2013; Reisel et al., 2019).

3. Methodology

3.1. Data

The analyses rely on nation-wide Norwegian administrative data from various population registries (such as tax, income, welfare benefits, education, and demographics) and matched on a personal identification number. Thus, providing exact individual level observed information across registries. The use of administrative data in the current study was approved in compliance with the general data protection regulation (GDPR) of the EU, by the Norwegian Agency for Shared Services in Education and Research (SIKT).

The dataset consists of all working individuals from cohorts 1974 to 1997 who were between the ages 20 and 40 between 2005 and 2017 residing in Norway with a registered annual income of at least 0.5 price-based amounts (PBA). Employees with income from sheltered work were excluded. Income is calculated in terms of PBA to adjust for changes in inflation and growth of wages. PBA is a fixed annual amount used to calculate applicability and level of welfare benefits, pensions, and student allowances in Norway. The amount is adjusted annually to reflect expected wage growth and adjusted for discrepancies between expected and actual growth during the last year. The cut-off at 0.5 PBA used here for labour market participation is considered the limit for economic marginalisation in several existing studies (Bäckman and Nilsson, 2016; Vogt et al., 2020; Widding-Havnerås, 2016).

The operationalization of disability is done by a binary proxy variable of recipients of at least one of two disability related benefits; basic benefit and attendance benefit. Basic benefits are entitlements meant to cover necessary additional expenses incurred due to permanent injuries, illness, disabilities, or congenital malformations. They cover expenses related to assistive technology, transport, guide dog, prostheses and special bandages, extra food costs due to dietary restrictions and additional wear on clothes, bed linen and shoes. Attendance benefits are entitlements for people requiring long-term private care and supervision due to illness, injury, or congenital disability. They cover personal assistance, including training and stimulation, but do not cover assistance with household chores. These benefits are not connected to activity limitations or requirements and are not meant to cover ordinary living expenses or be an alternative to employment. Entitlements are not mutually exclusive, and they cover both physical and mental illnesses and impairments. The most common diagnoses include, but are not limited to, mental illnesses and behavioural disorders, illnesses of the digestive, skeletal, and muscular systems, skin diseases, congenital malformations including chromosomal mutations, as well as injuries.

To filter out persons who acquired disability because of their work arrangement, or due to old age, only individuals who started receiving disability benefits before the age of 20 were defined as disabled for as long as they continued to receive benefits. Thus, the dataset was limited to young age and long-term disabled. Persons who migrated to Norway after turning 20 years are excluded from the dataset because of missing information on disability status before the age of 20. Persons who died or emigrated before or during 2017 were excluded altogether.

3.2. Analytical approach

The empirical analysis was initiated by a presentation of descriptive statistics of dependent, independent and control variables.

Log-linear regression models were estimated on income observed between 2005 and 2017 to test the relationship between disability and income, explore the explanatory power of variation in education and occupation, while controlling for relevant background characteristics. Control variables include age, year, work hours per week (intervals), number of years with work experience since 1993, migration background, parents' education at age 16, marital status and parenthood. Table 1 displays operationalizations of all dependent and independent variables.

Table 1
Operationalisations of variables.

Variables	Operationalization	Values
<i>Dependent variable</i>		
Annual labour market income	Sum of wages, taxable benefits, sick pay and parental benefits	Natural logarithm of amount in NOK
<i>Independent variables</i>		
Disability	Long-term recipients of basic and/or attendance benefits since before age 20	0/1
Education	Highest completed educational level. Higher education (MA/PhD) (1), higher education (BA or lower) (2), secondary school (3) and primary school (4), no education (5), unknown education (9), (Statistics Norway, 2006).	Categorical: 1–5, 9
Occupation	Categorical variable of occupations based on the International Standard Classification of Occupations (ISCO-98), (Statistics Norway, 2011)	Three-digit categorical variable, 279 categories
<i>Control variables</i>		
Women	Women 1, men 0	0/1
Parenthood	One or more children below 18 living in the same household	0/1
Marital status	Persons with a registered spouse or cohabitant	0/1
Migration background	Individuals themselves or both of their parents born outside of EU/EEA, USA, Canada, Australia and New Zealand	0/1
Workload	Weekly hours agreed upon in a person's work contract. Overtime, sick leave, holidays excluded. 4–19,9 (1), 20–29,9 (2), 30+ (3)	Categorical: 1–3
Work experience	Total number of years with income above 0.5 PBA annually since 1993	0–25
Age	Continuous in years	20–40
Parents education at age 16	Highest level of education of mother, father, or both. Higher education (MA/PhD) (1), higher education (BA or lower) (2), secondary education (3) and primary school (4), no education (5), unknown education (9), (Statistics Norway, 2006)	Categorical: 1–5, 9

Log-linear regression means that the dependent variable income is transformed to its natural logarithm, whereas the independent variables are in their original form. This has the advantage that the usual right skewed distribution of income is accounted for, but also that regression coefficients can be interpreted as change in percentage probabilities when the formula e^b-1 is applied (Stock and Watson, 2020).

An interaction between disability and time using year as a continuous variable, served to test whether a longitudinal change in wage gap could be observed. Additionally, a final model with a three-way interaction between disability, time and gender was estimated to test whether longitudinal trends in the disability wage gap differed between men and women. The disability wage gap was visualized over time by plotting the predicted log of income between 2005 and 2017 with independent variables at means first by disability, and then by disability and gender.

4. Results

4.1. Descriptive results

Table 2 displays descriptive statistics of the study data. The number of observations defined as disabled was 23 508, amounting to 0.28 percent of the total dataset of 8.5 million observations. Disabled workers in general were characterized by lower educational levels. Only seven percent had higher education beyond a bachelor's degree (BA), as

opposed to ten percent in the general population. Twenty-four percent of the disabled population had higher education at the BA level as their highest educational level, as opposed to 31 percent in the general population. This is surprising since higher education in Norway is tuition free, as opposed to countries such as the UK and USA. Thus, higher education in Norway is not an expensive investment followed by the potential risk of unemployment, which may cause disabled people to opt out of higher education due to potential double burden of having educational debt and no income. The educational level of parents was approximately the same for disabled and nondisabled people. Disabled workers to a greater degree hold part-time (as opposed to full-time) jobs compared to nondisabled. Among the disabled, 64 percent work 30 h or more per week, while the share among nondisabled was 75 percent.

4.2. Log-linear regression models

Model 1 (Table 3) estimates the unadjusted disability related income gap, which is 26 percent (e^b-1). In model 2 education is added as explanatory variable, reducing the income gap to 23 percent, and increasing adjusted R^2 from 0.001 to 0.065. Education is categorical with long higher education as the reference category. The education coefficients indicate that long higher education is related to higher income than any lower educational levels.

Model 3 (Table 4) includes absorbed occupation dummies (264 categories) in addition to education, which reduces the disability wage gap to 18 percent and increases adjusted R^2 from 0.065 to 0.301. In model 4, control variables are added to adjust for time and differences in individual background characteristics. The adjusted disability wage gap is estimated to five percent in model 4. Comparatively, the gender wage gap is estimated to eight percent. Substantially, the adjusted disability wage gap entails that a disabled person earns 95 percent of the nondisabled person's salary in the same occupation with the same educational level, everything else held constant. In other words, the five percent disability wage gap cannot be explained by variations in occupation, education, gender, previous work experience, weekly workload, migration background, age, marital status, parenthood, or parental educational level.

To estimate the longitudinal trend in the unexplained disability wage gap, an interaction term between disability and year is added in model 5 (see Table 5). The disability coefficient represents the adjusted wage gap in the starting year 2005. The coefficient for year represents the annual increase in wages for every individual in the model. The interaction term represents the difference in annual change in income between the nondisabled and the disabled individuals. The interaction term is positive and statistically significant ($p < 0.05$). However, since the estimate is negligible (0.2 percent per year), the substantial interpretation is that the disability wage gap is stable and persistent. The longitudinal trend is plotted in Fig. 1.

Finally, due to the strong gender-related inequalities of the labour market, the log-linear interaction model is fitted with a three-way interaction between disability, year, and gender. The three-way interaction serves two purposes: 1) to estimate differences in wage levels between disabled and non-disabled men and women, and 2) to test whether there is a gender difference in the stability of the disability wage gap. Results are displayed in Table 6 and plotted in Fig. 2. The results show that the disability pay gap is larger among men, than women. Model 6 confirms that the disability wage gap remains stable over the study period, and the three-way interaction estimate with a p-value of 0.525 demonstrates that the disability wage gap remains substantially unchanged for both men and women (i.e., there is no gender difference in change over time). Further, men's predicted income is at an overall higher level than both disabled and nondisabled women, as shown in Fig. 2.

Table 2
Descriptive statistics of dataset.

	Disabled		Nondisabled					
	N	%	N	%				
Total	23 508	0,28%	8 489 594	99,78%				
Education								
Higher education (MA/PhD)	1576	7%	876 111	10%				
Higher education (BA)	5736	24%	2 629 084	31%				
Secondary school	9632	41%	3 608 666	43%				
Primary school	6480	28%	1 368 371	16%				
Unknown education	84	0%	7362	0%				
Parents' education at age 16								
Higher education (MA/PhD)	1935	8%	769 965	9%				
Higher education (BA)	6673	28%	2 248 270	26%				
Secondary school	12 399	53%	4 461 367	53%				
Primary school	2479	11%	980 991	12%				
Unknown education	22	0%	29 001	0%				
Weekly workload								
4-19,9 h	6425	27%	1 369 406	16%				
20-29,9 h	2156	9%	730 463	9%				
30 h or more	14 928	64%	6 362 725	75%				
Female	11 418	49%	4 113 514	48%				
Married/cohabitant	2687	11%	1 756 790	21%				
Parenthood	8366	36%	3 814 954	45%				
Migration background	1412	6%	546 637	6%				
	Mean	St. dev	Min	Max	Mean	St. dev	Min	Max
Log of income	12.44	0.73	10.32	15.22	12.75	0.66	10.32	17.45
Years of work exp. since 1993	7.15	4.59	0	24	10.22	5.22	0	25
Age	26	5.12	20	40	29	5.44	20	40

Table 3
Log-linear regression models of income.

	Model 1			Model 2 + education		
	b	Adjusted R2	p	b	Adjusted R2	p
Disabled	-0.303	<0.001	<0.001	-0.295	-0.260	<0.001
Education (ref. Higher education (MA/PhD))						
Higher education (BA)				-0.394	<0.001	-0.400
Secondary school				-0.479	<0.001	-0.480
Primary school				-0.643	<0.001	-0.645
Unknown education				-0.760	<0.001	-0.774

5. Discussion

The objective of this study was threefold: 1) to investigate explanatory factors of the disability wage gap; 2) explore how the unexplained residual wage gap has developed over time; and 3) to study how the unexplained disability wage gap is affected by intersectional processes and the gendered inequalities of the labour market. To answer these questions, log-linear regression analyses were applied to longitudinal full-population registry data. The investigations arrived at three main findings:

- 1) Educational attainment, occupational representation, and other individual characteristics contributed to reducing the gross disability wage gap, but a statistically significant unexplained disability pay gap remained.
- 2) The unexplained pay gap persisted over the study period for both men and women.
- 3) The disability related pay gap was larger for men, in relation to women.

The first finding relates to the determinants of the disability wage gap. Regression models confirm that lower educational attainment is a precursor for lower wages among disabled workers, which echoes earlier

findings (Kruse et al., 2018; Jones and Wass, 2013). The reduction of the disability pay gap when adding occupational fixed effects to the regression models indicated an occupational segmentation of disabled workers in low-income jobs, a concern that has been raised in previous research (Raskin, 1994; Jain and Verma, 1996; Fawcett, 2000; Shuey and Jovic, 2013). Nevertheless, the unexplained disability pay gap supports initial expectations that observed variables provide insufficient explanation for the inequalities experience by disabled workers. The implication of these findings is that income inequality exists both between occupations and within occupations and confirm that disabled people experience both horizontal segregation (i.e., unequal access to types of occupations) and vertical segregation (i.e., unequal career opportunities within occupations) (Charles, 2003; Player et al., 2019). This finding concurs with research produced two decades ago, which concluded that disabled workers were more likely to remain in non-managerial positions with low potential for upward social mobility, compared to nondisabled workers (England, 2003; Stevens, 2002). Similar tendencies were found more recently by Richards and Sang (2019) who revealed that disabled people were given minimal workplace adjustments but at the same time measured against able-bodied co-workers. Additionally, disabled workers were less likely to be encouraged into better quality and better paid jobs and they benefited very little from long-term employment experiences, mainly because of

Table 4
Log-linear regression models of income.

	Model 3 + occupation				Model 4 + individual background			
	N		8 513 102		N		8 513 102	
	Adjusted R2		0.301		Adjusted R2		0.580	
	Absorbed occupation dummies (264 categories)				Absorbed occupation dummies (264 categories)			
	b	p	CI (95%)		b	p	CI (95%)	
Disabled	-0.200	<0.001	-0.208		-0.046	<0.001	-0.051	
Year					0.026	<0.001	0.026	
Education (ref. higher education (MA/PhD))								
Higher education (BA)	-0.232	<0.001	-0.234		-0.180	<0.001	-0.181	
Secondary school	-0.167	<0.001	-0.168		-0.165	<0.001	-0.166	
Primary school	-0.260	<0.001	-0.262		-0.207	<0.001	-0.209	
Unknown education	-0.328	<0.001	-0.341		-0.173	<0.001	-0.183	
Female					-0.079	<0.001	-0.079	
Years of work exp. since 1993					0.042	<0.001	0.042	
Weekly workload (ref 4–19,9 h)								
20–29,9 h					0.365	<0.001	0.364	
30 h or more					0.615	<0.001	0.614	
Migration background					-0.006	<0.001	-0.008	
Age					0.001	<0.001	0.001	
Married/cohabitant					0.044	<0.001	0.043	
Parenthood					-0.018	<0.001	-0.019	
Parents' educational level at age 16 (ref. higher education (MA/PhD))								
Higher education (BA)					0.021	<0.001	0.020	
Secondary school					0.048	<0.001	0.047	
Primary school					0.053	<0.001	0.052	
Unknown education					0.075	<0.001	0.070	

Table 5
Log-linear regression model of income.

	Model 5 + interaction with year			
	N		8 513 102	
	Adjusted R2		0.580	
	Absorbed occupation dummies (264 categories)			
	b	p	CI (95%)	
Disabled	-0.058	<0.001	-0.071	
Year	0.026	<0.001	0.026	
Disabled X Year	0.002	0.026	0.000	
Education (ref. higher education (MA/PhD))				
Higher education (BA)	-0.180	<0.001	-0.181	
Secondary school	-0.165	<0.001	-0.166	
Primary school	-0.207	<0.001	-0.209	
Unknown education	-0.173	<0.001	-0.183	
Female	-0.079	<0.001	-0.080	
Years of work exp. since 1993	0.042	<0.001	0.042	
Weekly workload (ref 4–19,9 h)				
20–29,9 h	0.365	<0.001	0.364	
30 h or more	0.615	<0.001	0.614	
Migration background	-0.006	<0.001	-0.008	
Age	0.001	<0.001	0.001	
Married/cohabitant	0.044	<0.001	0.043	
Parenthood	-0.018	<0.001	-0.019	
Parents' educational level at age 16 (ref. higher education (MA/PhD))				
Higher education (BA)	0.021	<0.001	0.020	
Secondary school	0.048	<0.001	0.047	
Primary school	0.053	<0.001	0.052	
Unknown education	0.075	<0.001	0.070	

employer barriers (Richards and Sang, 2019).

The presence of an unexplained disability wage gap in current results, indicates – though it does not prove – the presence of wage discrimination. Since models control for previous work experience, it is probable that disabled workers are subject to valuation discrimination both in terms of current work and past work. Qualitative research on disabled workers in high-ranking positions found a lack of acknowledgment and feedback on contributions and existing performance of workers, which the authors claim, “jeopardizes chances to improve performance and therefore access to promotion” (Wilson-Kovacs et al., 2008, 714). Claims of wage discrimination is further supported by recent

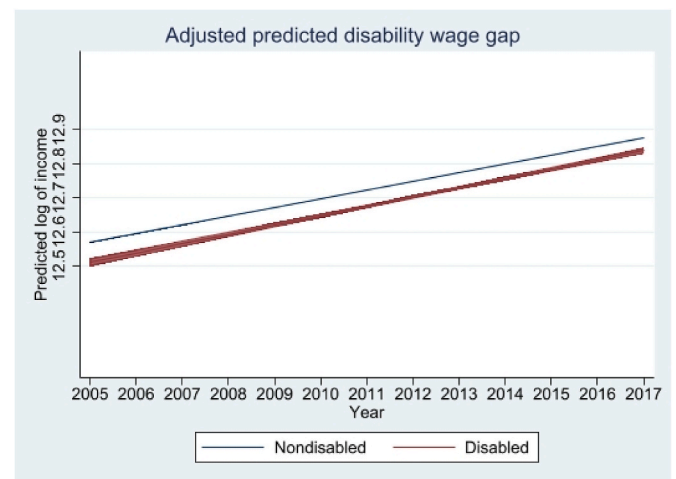


Fig. 1. Predicted log of income for nondisabled and disabled between 2005 and 2017.

experimental research from the Norwegian context, as well as other welfare contexts, revealing the presence of discrimination in hiring processes (Bjørnshagen and Ugreninov 2021; Østerud, 2022; L’Horty et al., 2022; Ameri et al., 2018; Stone and Wright, 2013), which may have bearing on earnings.

Another factor related to discrimination is the possibility that the cost of accommodations in the workplace may be allocated to the individuals in the form of lower wages, as discussed by Blanck et al. (2003, 267): “the individual, more than the employer, will pay for her own accommodation. If the cost of the accommodation to the individual is too large, she is unlikely to enter the labour market”. A likely consequence is that disabled workers may be less firm in salary negotiations if their employment entails costly accommodations for the employer.

The second finding relates to the gender differentials in the disability wage gap. The disability wage penalty was stronger for disabled men, in relation to disabled women. Similar results were reported by Jones and Wass (2013) who found that the employment gap of disabled men

Table 6
Log-linear regression of income with three-way interaction between disability, year and gender.

Model 6: Three-way interaction				
		N	8 513 102	
		Adjusted R2	0.580	
		Absorbed occupation dummies (264 categories)		
	b	p	CI (95%)	
Disabled	-0.083	<0.001	-0.100	-0.066
Year	0.026	<0.001	0.026	0.026
Female	-0.072	<0.001	-0.074	-0.071
Disabled X Year	0.002	0.064	-0.000	0.004
Disabled X Female	0.054	<0.001	0.029	0.079
Female X Year	-0.001	<0.001	-0.001	-0.001
Disabled X Year X Female	-0.001	0.525	-0.004	0.002
Education (ref. higher education (MA/PhD))				
Higher education (BA)	-0.180	<0.001	-0.181	-0.179
Secondary school	-0.165	<0.001	-0.166	-0.164
Primary school	-0.207	<0.001	-0.209	-0.206
Unknown education	-0.174	<0.001	-0.183	-0.164
Years of work exp. since 1993	0.042	<0.001	0.042	0.042
Weekly workload (ref 4-19,9 h)				
20-29,9 h	0.365	<0.001	0.364	0.366
30 h or more	0.615	<0.001	0.614	0.616
Migration background	-0.006	<0.001	-0.008	-0.005
Age	0.001	<0.001	0.001	0.001
Married/cohabitant	0.044	<0.001	0.043	0.045
Parenthood	-0.018	<0.001	-0.019	-0.017
Parents' educational level at age 16 (ref. higher education (MA/PhD))				
Higher education (BA)	0.021	<0.001	0.020	0.022
Secondary school	0.048	<0.001	0.047	0.049
Primary school	0.053	<0.001	0.052	0.055
Unknown education	0.075	<0.001	0.070	0.080

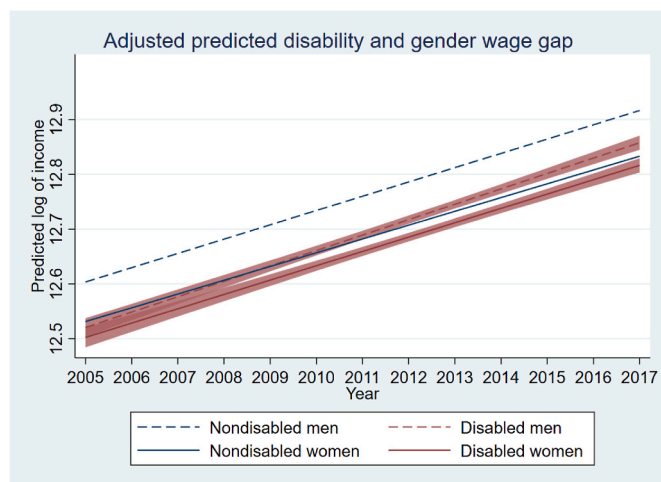


Fig. 2. Predicted log of income for nondisabled and disabled men and women.

exceeded that of disabled women; and Kruse with colleagues (2018) who found that disability related pay gaps were stronger for men. These findings may reflect a disruption of the male gender at the intersection with disability, as some scholars have suggested (Connell, 2005; Mik-Meyer, 2015; Ridgeway and Kricheli-Katz, 2013).

One other reason why men experience a larger disability penalty than women may be that the wage scale is less compressed in high-status well-paying male occupations than in typical low-competence female occupations (Statistics Norway, 2020). Therefore, both disabled and nondisabled men still have higher predicted earnings than women – disabled or not.

The gender differential results from the current study confirm expectations that disabled women experience additive career and income penalties related to disability and their gender, which corresponds to former intersectional studies of disability, gender, and employment

outcomes (Pettinichio and Maroto, 2017; Kim et al., 2019, 2020; Brown and Moloney, 2019). It is evident that even though men may experience stronger disability penalties than women, disabled workers – like nondisabled workers – are subject to the same gender-inequity producing structures of the labour market which – on the macro-level – favour men. These findings, which show that the intersections between disability and gender are both mutually interactional (i.e., disrupting male privilege) and additive at the same time, contribute to a more nuanced understanding of intersectional processes.

The third finding concerns the persistence of the unexplained disability wage gap over time. A residual disability wage gap remained unchanged for both men and women during the study period. These results suggest that global initiatives such as the SDGs or national anti-discrimination legislation have not yet been successful in eliminating inequalities. Evidence from previous research provide reason to believe that anti-discrimination legislation may be ineffective in reducing employment inequalities (Bambra and Pope, 2007; Clayton et al., 2012a) or may even cause a “backlash” (Grue, 2016, 962) if costly mandatory adaptations are perceived as entailing high risk hires for employers (Kruse and Schur, 2003; Schur et al., 2017; Gunderson and Hyatt, Douglas, 1996).

Post-industrialization theories may also explain the status quo: disabled jobseekers are seen as less attractive employers against increasing needs for flexibility, specific skills, and high productivity levels (Whitehead et al., 2009). Another factor contributing to persistent inequalities may be that the use of new technology has both enabling and disabling effects on disabled people (Shakespeare et al., 2022; Schur et al., 2020). Post-pandemic research has for example examined the potential gains for disabled people of covid-induced acceleration in digitalization of working life. These studies on the one hand disseminate concerns that new technology may limit efforts to include disabled people in other ways, and thus lead to increased exclusion of disabled people (Shakespeare et al., 2022), and other hand, show that employment rates of disabled people grew more quickly during the post-covid economic recovery than among non-disabled (Ne’eman and Maestas, 2022). These employment gains were mostly in telework and non-frontline occupations, suggesting that new and more flexible ways of working have benefitted disabled people disproportionately.

Results of the current study should be interpreted within the Norwegian welfare context. Nevertheless, although the exact size of disability penalties found here may be specific to study design and context, the patterns of subordination are almost certainly applicable to other contexts. Two factors influencing external validity can be mentioned: First, the disability definition has no endogenous work-limitation, in contrast to disability measures used in the most common surveys. This implies that wage gaps found here are likely to reflect smaller differences compared to studies using survey data. Second, as previous research has found limited or no impact of social policy and regulation in reducing inequalities, it is unlikely that countries with smaller welfare regimes produce smaller disability-related wage penalties.

6. Conclusions and implications

The findings of this study have implications for future research on disability, gender, and employment, as well as for policymakers. First, the disability-related disadvantages are evident across education and work arenas, shaping educational attainment, career trajectories and financial stability of disabled people. Since structural injustices are additive across arenas employment inequalities of disabled people are likely to exponentiate over their life course. For disabled people, education is both an individual resource and a driver and reinforcer of employment inequalities. Future research which engages with the unequal distribution of educational opportunities among disabled people, can contribute to expanding the understanding of the educational system’s dual role in shaping labour market attainment on the individual

and group level. This has policy implications for initiatives to create more inclusive educational institutions.

Second, current findings reveal that gendered structures of the labour market are likely to cause additive strain on disabled women, but mechanisms of gendered inequalities may also contribute to explain why disabled men experience penalties in their career trajectories. Although scholars have argued that disabled workers are overrepresented in female-dominated low-paid manual or service jobs and underrepresented in better paying male-dominated professional jobs (Wilson-Kovacs et al., 2008), systematic evidence is scarce. More quantitative longitudinal research is needed to determine whether low-skill or part-time jobs offer an entryway into the labour market for disabled people or whether these occupations predominantly serve to hamper opportunities for a stable connection to the labour market, career progression and financial security. These future studies could have important policy implications for work inclusion efforts, employer engagement and career guidance of disabled people.

Third, consequences of new technology on disabled peoples' work participation and wage setting remain unclear. The pandemic-induced shifts in work provide opportunities to study potential gains of technology for disabled workers. Further research should pay special attention to how technology may be inaccessible to various groups of disabled people and seek solutions that improve access.

Declarations of competing interest

None.

Data availability

The authors do not have permission to share data.

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