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ORIGINAL PAPER

Labor market changes and social inclusiveness across regions: evidence from the rise of the modern office

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Abstract
Could complex changes in the labor market reduce social inequalities across regions? We study the rise of office employment in the early twentieth century that was induced by innovations in office technology and organizational changes affecting the type of required office tasks. The new office jobs required little physical strength. We find that the regional employment share of industries that were strongly connected to the modern office, is positively linked to labor force participation of people with physical impairments. The positive employment effect is more visible for disabled men. In sum, the rise of the modern office that differed across regions started to lower labor market entry barriers and fostered social inclusiveness.

JEL Classification J14 · J23 · O33 · R11

1 Introduction

In the context of inequality, the topic of more balanced growth is high on the policy agenda. In fact, whether interrelated economic, social, and technological changes can have a positive impact on social inclusiveness, decreasing inequality, has not only been of interest today (Kuznets, 1955; Lindert 2000; Hoffman et al. 2002; Piketty 2014; Lindert and Williamson 2016; Naudé and Nagler 2015, 2017). Already in 1893 Émile Durkheim (1984) wondered whether the structural transformation, as initiated during the industrial revolution, would challenge instead of fostering inclusiveness. To our knowledge, this question is still waiting for an answer.

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We understand diversity of the workforce as a measure of social inclusiveness. This can be captured by the accessibility to jobs, for instance, for vulnerable groups across regions. Thus, we address this topic by investigating the relationship between labor market changes and social inclusiveness of regional labor markets for people with disabilities. Unfortunately, today's data are scarce and incomplete due to the sensitive information on disability status. Therefore, we refer to a unique historical regional dataset that informs us about labor market access of disabled people.

In the early twentieth century, the rise of modern office work due to technological progress and organizational changes, which affected the type of required office tasks, revolutionized the job market. Office work became more routinized and accessible due to technological innovations (e.g., typewriter, cash register, mimeograph, Dictaphone, and stenotype) that reformed existing job tasks and lead to more standardized, less costly office work (Rotella 1981). The early twentieth century also saw a rise of modern industrial corporations (Chandler 1977) that needed office workers. Rotella (1981) brings forward two specific explanations for the rise of office employment. First, governments tightened regulatory requirements by demanding record keeping and tax reporting. Second, by implementing organizational changes like vertical integration or internationalization businesses increased their own need for documentation.

The spread of office work increased the demand for jobs that make use of office technologies (e.g., accountants and stenotypists) and jobs related to the office organization like office and cash messengers, lift operators, or janitors. The rising demand for office work also increased labor force participation of population groups that had been underrepresented in non-domestic work in previous periods. So, for women there is a well-documented increase in labor supply due to the rise of the office sector (e.g., Costa 2000; Wyrwich 2019). Another group underrepresented in the labor market were disabled persons. There was an increasing awareness in the twentieth century that people with impairments were able and willing to work (Biesalski 1909) and the rise of office work should have enhanced their employment opportunities as well. The reason behind this conjecture is that factory (blue-collar) work in the early twentieth century required physical strengths that implied a lower employability of people with physical impairments. Contrary to that office work required little physical strength. Therefore people with physical impairments should have found it easier to take up employment in white-collar work relative to blue-collar work.

We focus on the role of regional specialization in modern office jobs for labor force participation of people with disabilities. There is no evidence yet on the labor market integration of people with disabilities taking into account regional differences of this development. However, this is of great interest to gain a broader understanding of the interaction between technological progress and labor market participation for vulnerable groups across regions. Against this backdrop, we hypothesize that the rise of the modern office across regions positively relates to the labor force participation of people with disabilities of both men and women. In the empirical analysis, we exploit spatial variation in the size of office employment during the industrialization in the early twentieth century. We understand our work also as a motivating example, encouraging scholars to analyze the regional consequences of changes in the labor market for social inclusiveness—albeit potential data

limitations. The chosen time period provides a historical setting to investigate how social inclusiveness could be achieved through market mechanisms, in the absence of a close-knit safety net. Put differently, the cultural and institutional environment of the industrialization entailed very difficult conditions for disabled individuals on the job search.

We test our hypothesis with unique regional data from a full census on people with impairments which was conducted in the German Reich in 1925 (*Reichsgebrechlichenzählung*). The census has detailed regional information on demographic characteristics (including employment status and occupation) of all people with disabilities living in Germany and is merged with regional information on the industry and population structure in 1925 (*Berufszählung*). Our results confirm our conjecture. Via new employment opportunities, the labor share of people with impairments increased. At the same time, the overall share of workers with disabilities among all workers was not affected by the rise of the modern office. This suggests that people with disabilities did not benefit to a larger degree than other groups in the labor market back then.

Our paper contributes to the literature on the spatial dimension of disability patterns. Previous research focused mostly on regional differences in the share of people with disabilities. McVicar (2006) documents huge spatial variation in the share of the population eligible for disability benefits when reviewing the empirical literature for the US and UK (see also Charles et al. 2018, for more recent evidence). This literature focuses on local labor market conditions and demographic factors to explain the regional share of disabled people but does not touch upon the economic behavior of this group. There is also work that exploits regional variation in disability insurance policies and how this affects claims (De Jong et al. 2011; Milligan and Shirle 2019) and labor force participation (Gruber 2000; Autor and Duggan 2003; Campolieti 2004; Kostol and Mogstad 2014). Although of general interest, there appears to be no study that investigates regional labor market participation of disabled people as a direct consequence of technological progress in regional industries.

More generally, our research is also related to the literature on the role of technological progress for the (local) economy which is often focused on growth implications of technological relatedness (Frenken et al. 2007; Boschma and Iammarino 2009; Neffke et al. 2011), innovation (Crescenzi and Rodriguez-Pose 2011; Capello and Nijkamp 2019), and technology clusters (Kerr and Robert-Nicoud 2020). We contribute to the literature by shifting our attention to implications of fundamental labor market changes for economic and social inclusion at the regional level. To the best of our knowledge we are first in analyzing how such changes in the labor market contribute to the employment of people with disabilities.

Inspiration was also drawn by a recent turn in economic geography that embraces historically informed research (Petralia et al. 2016; Fritsch and Wyrwich 2018; Mewes 2019; Schoenberger 2020; Allen and Donaldson 2020; Hanlon and Heblich 2020). In the spirit of Diamond and Robinson (2010), we see historical development as a mean to derive general implications that go beyond the historical context. For example, new opportunities to work from home due to digitalization reflect a modern example of how changes in the labor market foster social inclusiveness via the use of flexible work arrangements (e.g., home office) that have become possible due

to ICT innovations that assist people with disabilities (European Parliament 2018). Today, regions specialized in industries where working from home is more widespread may offer people with disabilities better opportunities to participate in the labor market.

Our work is also linked to regional approaches to understand the emergence of historical economic patterns (Becker et al. 2011; Gutberlet 2014; Mokyr 2017, 2018) and contributes to the literature on the socioeconomic impact of the industrial revolution that has been analyzed, for example, with respect to technological change (e.g., Rotella 1981; Atack 1985), the introduction of social insurance systems (e.g., Bauernschuster et al. 2017; Guinnane and Streb 2011, 2015; Fenge and Scheubel 2014), education (e.g., Ó Gráda 2016; Squicciarini and Voigtländer 2015; Goldin and Katz 2000), or the labor participation of women (e.g., Costa 2000; Rotella 1981); so far disregarding, however, the precarious situation of people with impairments. Other papers illustrate how job tasks relate to skills, as becomes evident in the context of computerization where medium-skilled individuals with routine tasks are more prone to lose their jobs than other skill groups (e.g., for computerization see Acemoglu and Autor 2011; Autor et al. 2003). These analyses have focused on changes in job tasks and their effect on standard qualification groups. We also focus on changes in job tasks but then look at the respective effects on workers depending on their health status. Our information on industries and occupational groups allows understanding potential benefits that arise from the interaction between new tasks (here technologies similar to today's computerization) and skill types. Thus, we also contribute to the literature discussing mismatches between job demands and functional limitations (Baldwin and Chung 2014a, b; Kruse et al. 2018).

2 Empirical framework

2.1 Data sources

The core dataset is the census on people with disabilities in the German Reich in 1925 (*Reichsgebrechlichenzählung*, Statistik des Deutschen Reichs 1929) that provides regional information on the demographic characteristics of all people with disabilities. The data were collected by trained census takers. The motivation for the survey was to have a statistical basis for public welfare and care policies.

The data distinguish between different types of impairment out of which we look at blindness, deafness, deaf-muteness, weak and strong physical impairments.[1] Disabilities are not self-reported but recorded by the trained census takers. Strong physical impairments were officially defined so as to include people with a permanent disability of limbs (e.g., deformation and amputation), joints (e.g., stiffness, luxation, and weakness), spine (e.g., deformation), and/or central and peripheral nervous system (e.g., paresis and paralyses), stemming either from congenital or trauma-related

[1] We exclude mental illness because it is unclear to what degree this group could have benefitted from changes in office technologies.

injuries. Less severe impairments were considered as weak impairments. Individuals should have benefitted in different ways depending on the impairment. For instance, compared to individuals with weak physical impairments, blind individuals faced greater obstacles when using a typewriter or cash register. However, individuals with stiff joints or an amputated leg/arm (classified as strong physical impairments) should have had less problems carrying out desk work. There is no information on the type of innovations in use. However, we check whether impairment categories benefitted to varying degrees from an increase in office employment. The information is available on the spatial level of 31 German states and Prussian provinces (for a list of regions, see (Table A1) in the online appendix).

Information on the local share of office employment is based on data from the general employment census that was also conducted in 1925 (*Berufszählung*, see Statistik des Deutschen Reichs 1927). The two data sets are merged by region. This is a full census of the German population, comprising a stratification of employment by industry, occupation, and gender. We focus on manufacturing industries to identify office employees because, in-line with the historical background, it is reasonable to assume that white-collar employment in these industries reflects office jobs (for details, see Wyrwich 2019).[2] In other industry sectors, such as hotels and restaurants, there should have been a higher share of non-office white-collar employment including, for instance, waiters, cooks, trade helpmates, and maids. Therefore, focusing on manufacturing industries should yield a cleaner measure of office employment than using all industries. Nevertheless, we agree that this measure is an approximation of the overall total employment because it could both overestimate (inclusion of non-office jobs within the white-collar numbers for manufacturing) and underestimate (exclusion of office jobs in service industries) the true extent of employment. There is only sparse information on the labor force participation of people with disabilities before the year 1925 to assess changes during the transformation of office work. At least, for the German state of Prussia, there are data from before the transformation of office work that we digitized. The data from 1880 stem from the Prussian Statistical Office (Preussische Statistik 1883).

2.2 Independent and dependent variables

The main independent variable of interest is the regional number of white-collar employees in manufacturing industries over all employees. As argued above, this employment share indicates the regional employment share in office employment (LFPALL_OFFICE from *Berufszählung*).

Our main dependent variable is the general labor force participation of disabled persons (LFP_TOTAL, from *Reichsgebrechlichenzählung*) in German regions. LFP_TOTAL is calculated by dividing the number of disabled employees by the number of all people with disabilities above the age of 14 years by impairment type and gender. It is not possible to consider employment by age groups. The data from

[2] Within the group of dependently employed people it is not possible to distinguish between office and non-office jobs.

the census of disabled persons do not directly distinguish between office and factory employment as would be ideal for this analysis.

Following our main argument, we expect that our measure for the prevalence of office workers LFPALL_OFFICE is positively related to LFP_TOTAL due to the outlined positive direct and indirect effects of the modern office on the labor market inclusion of disabled persons. There should be no or only a modest positive effect of factory employment on the share of disabled employees. In addition, we are interested in the share of disabled employees relative to the general labor force participation EMPS_ALL. The outcome variable of interest in this additional analysis is the share of disabled employees over all employees.

Our analyses explore specific components of the modern office by disentangling two occupational channels of how the modern office could have affected labor force participation of people with disabilities. The outcome variables of interest are the share of people with disabilities in these occupations over all people with disabilities. First, we explore the employment share of people with disabilities in occupations that should have developed in conjunction with the office sector and that hold a supportive function (LFP_SUPPORTOFFICE). These jobs include office messengers, copyboys/girls, lift operators, office assistants, cash messengers, porters, file clerks, janitors and similar occupations. LFP_SUPPORTOFFICE includes mainly unskilled work and reflects a minor share of office-related jobs for people with disabilities. Second, we analyze the share of disabled employees in high-skilled occupations whose activities were primarily carried out in offices (LFP_SKILLOFFICE). This group comprises (a) commercial employees (office and administrative staff) and (b) technical personnel (architects, engineers, technicians, draftsmen and plotters, laboratory assistants, etc.). The information on occupation is available for people with strong and weak impairments. A drawback of the variable LFP_SKILLOFFICE is that commercial employees and technical personnel could be assigned to specific industries but are not disentangled within these specific industries. Therefore, we could underestimate the effect of the office sector for this variable. A priori, it is unclear which group of the two groups benefitted more from the emergence of the modern office. Altogether, our models on occupational channels comprise a subset of office jobs with the advantage that these subsets capture office-related jobs very accurately.

2.3 Control variables

We construct several control variables which are all based on the census on people with disabilities in the German Reich in 1925 (Sect. 3.1) if not stated otherwise. As today, age determines the likelihood of taking up employment but also the likelihood of becoming impaired. We thus control for the age composition of disabled individuals. Our reference group is the share of people with disabilities aged between 20 and 40 years. Additionally, we control for the age of impairment. More precisely, we include the share of people who became disabled when they were older 60 than years. We further add dummy variables for impairment, following the categorization of the data as outlined above.

We control for the overall population share of people with disabilities. The analyses also include a gender dummy, indicating disabled women. It is further important to consider the share of people with disabilities receiving public annuities, namely pensions, accident insurance, and/or disability insurance, because this should be negatively related to incentives to take up employment (Maki 1993; Mullen and Staubli 2016) even though the payments were negligible.[3] For selected groups of people with disabilities, we have information on the number of recipients of a specific welfare program for people with disabilities. The law on welfare for selected groups of people with disabilities, which was introduced in 1920 (*Preußisches Gesetz betreffend die öffentliche Krüppelfürsorge*), encouraged adolescents to take up employment. We consider the share of people receiving support in accordance with this law. Since only people with specific impairments could benefit from this program, we use this variable in a robustness check only.[4] As many men were seriously injured during World War I, there were public policies to promote the reintegration of war veterans into the labor market. For example, in December 1922 there was a law that demanded to give preference to the war-disabled when hiring new employees (*Gesetz über die Beschäftigung Schwerbeschädigter*) (Bajohr 1976). Therefore, we control for regional differences in the share of male veterans with impairments. There were no female veterans.

We introduce regional population density from the general employment census as of 1925 (for details, see Sect. 3.1). Population density captures various differences in regional conditions (e.g., wages, amenities, and public infrastructure). To disentangle the effect of density from white-collar employment, which is typically concentrated in larger cities, only the variation in density that is not related to white-collar employment is considered.[5] We also control for the size of regions with population size per region. Finally, we consider differences in the political climate of the 1920s. To this end, we take into account the vote shares of extreme right-wing parties in the general elections of 1924.

Summary statistics and a correlation matrix can be found in (Table A2) and (Table A3) in the online appendix. The summary statistics show that there is a huge variation with respect to the employment rates of people with disabilities, ranging between 0 and 85%. The share of disabled employees among all employees is very low but reflects the general population share of people with disabilities, which is about 0.0017% on average.

[3] The low level of annuities implied that receivers continued being active in the labor market (for details, see also Guinnane and Streb 2021).

[4] This program was only available in the state of Prussia but not in other German states. Furthermore, information is available for weakly and strongly "fragile" persons because only these two groups were eligible. As only kids and adolescents who were not yet integrated in the labor market were eligible, the variable should nonetheless play no meaningful role.

[5] To this end, the population density is regressed on the regional white-collar employment share.

2.4 Estimation strategy

To investigate our main hypothesis that the modern office increased labor market participation of disabled individuals, we run an OLS estimation with LFP_TOTAL$_{r,d,g}$ (labor force participation of disabled persons) as independent variable. Standard errors are clustered at the state level.[6] The analysis is carried out by regions (r), impairment type (d), and gender (g), which implies that we calculate, for instance, the share of female employees who live in the region Berlin and are deaf. The number of observations is $N = 309$.[7] The control variables shown in vector $Z_{r,d,g}$ were discussed above.

$$\text{LFP\_TOTAL}_{r,d,g} = \beta_1 \text{LFPALL\_OFFICE}_r + Z_{r,d,g} + \varepsilon_{r,d,g} \tag{1}$$

As outlined before, it is likely that men and women were affected differently by the new office technologies. Therefore, we also run models where we interact all independent variables with a gender dummy assuming the value of one for women.

$$\begin{aligned}\text{LFP\_TOTAL}_{r,d,g} = {} & \beta_1 \text{LFPALL\_OFFICE}_r + \beta_2 \text{LFPALL\_OFFICE}_r * \text{WOMEN}_r \\ & + Z_{r,d,g} + Z_{r,d} * \text{WOMEN}_{r,d} + \varepsilon_{r,d,g}\end{aligned} \tag{2}$$

We then replace the dependent variable LFP_TOTAL$_{r,d,g}$ in Eqs. (1) and (2) with the employment share of people with disabilities among all employees (EMPS_ALL$_{r,d,g}$) and the share of selected occupational groups (SUPPORTOFFICE$_{r,d,g}$, SKILLOFFICE$_{r,d,g}$, for definitions, see previous section), keeping the rest of the equation the same. This way we can see whether occupations associated with modern offices experienced higher increases of employment for disabled individuals, which would support our arguments.

3 Results

3.1 The overall employment rate of disabled individuals

An indicator for a potential effect of the rise of the modern office are changes in the employment shares of people with disabilities between the late nineteenth century and the early twentieth century. As mentioned, there is only sparse information on the labor force participation of people with disabilities before the transformation of office work. One exception is data on blinds and deaf-mutes from the year 1880 for the German state of Prussia, which covered two third of Germany's territory back then. Comparing the labor force participation between 1880 and 1925 shows that this rate increased from 6.5 to 15% for women and from 34 to 39.5% for men. For

[6] For the state of Prussia, we cluster at the level of province because Prussia represented two thirds of the size of Germany in 1925.

[7] $N = 310$ is the product of multiplying the number of regions with impairment type and gender (31 * 5 * 2). For one region one of the specific gender-impairment type combinations is not-existent, yielding 309 observations.

deaf-mutes the increase is from 27% in 1880 to 33% in 1925 among women and from 58 to 78.5% for men, respectively. This is already an interesting result that may be explained by the increase in job opportunities in the newly arising office sector.

For 1925, we investigate whether the regional prevalence of office employment is related to the labor force participation of people with disabilities. Following Eq. (1), we use as dependent variable the employment rate of people with disabilities, that is, the number of disabled persons in employment over all disabled individuals above the age of 14 years ($LFP\_TOTAL_{r,d,g}$). As mentioned above, our independent variable of interest is the regional share of white-collar employment in manufacturing industries ($LFPALL\_OFFICE_{r}$).

Table 1 presents the results from OLS estimations with control variables where with each regression we narrow down the definition of the main independent variable. An increase in the regional white-collar employment share in manufacturing by 1 percentage point corresponds with an increase in the employment rate of people with disabilities by 2.4 percentage points.[8]

In additional analyses, we can show that this effect size is substantially larger than that of regional employment shares that include white-collar workers in non-manufacturing industries and blue-collar workers (see Online Appendix, Table A4). For example, the coefficient for the regional white-collar employment share in manufacturing (Column I, Table 1) is more than four times larger than the respective estimate for the overall white-collar employment share. Furthermore, including separate variables for the regional share of white-collar employment and the regional share of blue-collar employment reveals that the white-collar employment plays a much more important role for the employment rate of people with disabilities (see Online Appendix, Table A4 and Table A5). This is particularly pronounced in manufacturing.

The coefficients for the control variables from the results in Table 1 are reported in the online Appendix (see Table A4). The share of recipients of accident or health insurance reduces the employment participation while the share of people with disabilities who are older than 60 years at the disabling event shows the opposite relationship. Women work significantly less frequently than men. Finally, individuals who are blind or have strong physical impairments show significantly lower labor force participation against the baseline group of deaf-mute people. This pattern suggests that type and degree of impairments intuitively affect opportunities to pick up non-domestic employment, meaning individuals with less severe impairments have a higher employment participation.[9]

[8] In a model without any controls this effect size is about 2.9 percent. We also interacted the employment shares in the main model with the disability type dummies to test whether there are heterogeneous effects across people with disabilities. There are no significant interaction effects.

[9] As mentioned in Sect. 3, for selected groups of people with disabilities we have information on the share of recipients of cripple welfare. The share of recipients is negatively related to labor force participation, which is what one would expect, and our main findings prove to be robust (see Table A6, in the online appendix). There are no differences in the effect size when interacting the main variables of interest with the impairment type and the results of the main variables of interest are robust when leaving out all control variables. The latter results can be obtained upon request.

Table 1 The relationship between regional employment structures and labor market inclusion of people with disabilities

Dep Var.	$LFP\_TOTAL_{r,d,g}$		$EMPS\_ALL_{r,d,(g)}$		$LFP\_SUPPORTOFFICE_{r,d,g}$		$LFP\_SKILLOFFICE_{r,d,g}$	
	I	II	III	IV	V	VI	VII	VIII
Employees WC manufacturing$_r$/employees$_r$	2.408***	3.829***	−0.00056		0.288**	0.484**	0.071***	0.125***
($LFPALL\_OFFICE_r$)	(0.492)	(0.707)	(0.00054)		(0.109)	(0.210)	(0.024)	(0.043)
Employees WC manufacturing$_r$/Employees$_r$		−3.130***		−0.00231		−0.484**		−0.122***
($LFPALL\_OFFICE_r$) * Female		(0.663)		(0.00236)		(0.212)		(0.043)
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Controls * Female	N	Y	N	Y	N	Y	N	Y
Observations	309	309	309	309	124	124	309	309
R^2	0.862	0.923	0.974	0.974	0.775	0.903	0.467	0.573

Ordinary least square regressions. Standard errors (in parentheses) are clustered by state and impairment type. White-collar (WC) workers are abbreviated as indicated

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

As outlined in Eq. (2), we then take into account potential gender differences by interacting all independent variables with a female dummy (see column II, Table 1). This is important because of the large increases in female labor force participation around that time. The analysis follows the same steps as in column I, revealing a significant negative interaction term for the measures of female white-collar employment. The interaction term remains negative but smaller in size than the baseline variables. This shows that the effect of the white-collar sector on employment of people with disabilities was positive for men and women but much stronger for men.[10] A one-percentage point increase in the regional white-collar employment share in manufacturing is associated with a 3.8% higher employment rate for men while the respective effect for women is only around 0.7%.

3.2 The employment share of disabled individuals among all employees

Next, we replace the dependent variable in Eq. (1) with the share of disabled employees among all employees ($EMPS\_ALL_{r,d,g}$). This will show whether disabled people benefitted disproportionally from the rise of office employment. The results show that the presence of the white-collar sector did not change the relative share of people with disabilities in the labor market (Table 1 column III). Thus, people with disabilities did not benefit disproportionately to other groups, for example women, from the rise of the modern office.

We analyze whether there are gender-specific effects among people with disabilities in the analysis (Eq. (2) with $EMPS\_ALL_{r,d,g}$, Columns IV). From previous research we know that the rise of the office sector tremendously increased the labor force participation of women (Wyrwich 2019) and thereby the labor supply. Insignificant estimates for our main variables of interest and the gender-specific interaction effect would imply that the rise in labor force participation among women was similar to the effect for people with disabilities. This would not mean that there was no social inclusion effect for people with disabilities. The results provide evidence for this conjecture. They imply that the inclusion effect found in column I and II of Table 1 is not disproportionally stronger when compared to other groups that were pulled into the labor market due to the rise of the office sector.

3.3 The employment rate of people with disabilities by occupational groups

We continue our regression analysis with two occupational groups to understand whether occupations that were related to the emergence of the modern office experienced significant increases in the share of disabled employees.

The first group, $LFP\_SUPPORTOFFICE_{r,d,g}$, captures jobs that are indirectly created and demanded by a rising office sector. Information is available for individuals with major and minor physical impairments. The second occupational group

[10] There are few gender differences among the control variables, which we do not report nor discuss because it is not the focus of our analysis.

$LFP\_SKILLOFFICE_{r,d,g}$ captures skill-intensive white-collar jobs, with available data for all impairment types.

The models in column V–VIII of Table 1 show that the regional share of white-collar employment in manufacturing is positively and significantly related to labor force participation of people with disabilities. The assessment of gender-specific effects confirms again that there was a close-to-zero employment rate effect for disabled women, although the negative interaction effect for $LFP\_SKILLOFFICE_{r,d,g}$ is only weakly significant. The size of the coefficients is smaller because the occupational groups captured by the independent variable represent a smaller share of the labor market. Hence, the results from column V to VIII confirm our theoretical predictions.

3.4 The role of specific manufacturing industries

In this section, we explore whether our results are driven by the rise of office employment in specific manufacturing industries. The census as of 1925 has information on 13 manufacturing industries.[11] To understand in more detail the role of each industry, we run 13 regressions similar to those shown in Table 2. For each, we replace the overall office employment share in manufacturing ($LFPALL\_OFFICE_{r,d,g}$) with the regional employment share of office employment in the respective manufacturing industry.

The findings for employment in occupations that developed in conjunction with the office sector and that hold a supportive function (SKILLOFFICE and SUPPORTOFFICE) across industries are mixed regarding the employment rate of disabled individuals.

Interestingly, for people with disabilities in skilled occupations the analysis shows that there is a positive and significant coefficient estimate for the industries (a) machine, apparatus, and vehicle construction, (b) electrical engineering, precision mechanics, optics, and (c) the chemical industry.[12] These are science-based industries (Fritsch and Wyrwich 2018) that emerged over the course of the second industrial revolution and that were among the industries with a very high employment share of white-collar (office) work within manufacturing (see Table 2). Thus, new manufacturing industries that relied heavily on office work played an important role. However, there is again no effect for disabled women.

[11] We also repeat the models of Table 1 and control for the regional composition of white collar employment within manufacturing. The results on the general share of white collar employment remain significant (see Table A7 in the Online Appendix).

[12] In industry-specific regressions none of the non-manufacturing industries affects the share of people with disabilities in skilled occupations.

4 Conclusions

To find a job, disabled individuals require jobs that match their abilities and disabilities. Also, in times of tight labor markets employers are more likely to rethink old search strategies to find employees. Both conditions were met with the emergence of the modern office which we use as unique historical context for our analysis: a time of massive social and economic upheaval, weak social security benefits and increased demand for labor. Our results show that the modern office—understood as a new working environment shaped by innovative office technologies and changing demand for specific office tasks—raised the employment of individuals with impairments in regions where respective jobs were abundant. The employment increase is larger for male workers with disabilities when compared to their female counterparts. Our results are robust to various specifications and robustness checks. Hence, our results demonstrate that complex labor market changes promote social inclusiveness on a regional level.

Our study has also limitations. There is no information on wages across occupations. Hence, we cannot make any conclusions about the impact of wages on the labor market participation of disabled people. Furthermore, we cannot completely rule out endogeneity although there is no worrisome theoretical concern in this respect. Future research to improve empirical identification thus may be warranted.

Overall, our findings suggest that regional industrialization lowered entry barriers to office jobs, thereby increasing social inclusiveness in absolute terms. In comparison with the overall workforce, people with disabilities benefitted to a similar degree like non-people with disabilities. However, the benefits were not equally distributed across the local population of disabled individuals. Hence, whereas the workforce composition became more inclusive, social inequalities continued to persist as reflected by the lower effect for disabled women. The economic effects of our results are substantial. A 1-percentage point increase in the regional employment share of office jobs raised the employment rate of disabled men by more than 3-percentage points, while the effect for women was only about 1-percentage point. Contrary to men, we do not find benefits for women when investigating specific occupational groups. One potential explanation for the smaller benefits for disabled women is that initially the potential labor supply of disabled men increased, whereas the potential labor supply of disabled women increased to a lower degree because of social norms that were in favor of disabled women being in the domestic sphere. Our historical example shows that complex labor market changes can stimulate labor market participation of disadvantaged groups.

We understand our work also as a motivating example, encouraging scholars to analyze the regional consequences of changes in the labor market for social inclusiveness—albeit potential data limitations. Such assessments will contribute to the understanding and design of local development policies that stimulate inclusive development.

Table 2 The role of office employment in different manufacturing industries for labor force participation of people with disabilities

	LFP_SUPPORT-OFFICE$_{r,d}$ I		LFP_SKILL-OFFICE$_{r,d,g}$ II	
	(Emp WC)$_r$/Emp$_r$	(Emp WC)$_r$/ Emp$_r$ * Female	(Emp WC)$_r$/Emp$_r$	(Emp WC)$_r$/ Emp$_r$ * Female
A: Pit and Quarry Industries: Emp WC industry/Emp industry: 0.06	−1.230	1.427	−0.084	0.120
B: Iron and metallurgy: 0.19	−0.822	0.762	−0.110	0.109
C: Production of iron, steel, and metal goods: 0.03	1.081	−1.178	0.068	−0.063
D: Machine, apparatus, and vehicle construction: 0.18	1.557**	−1.579**	0.486***	−0.480***
E: Electrical engineering, precision mechanics, optics: 0.19	1.076*	−1.033*	0.298**	−0.282*
F: Chemical industry: 0.33	0.484	−0.508	0.542**	−0.543**
G: Textile industry: 0.11	1.265*	−1.255*	−0.221	0.212
H: Paper and duplicating industry: 0.12	6.246***	−6.182**	1.101	−1.035
I: Leather- and linoleum industry: 0.04	−5.499**	5.580**	0.683	−0.702
J: Rubber- and asbestos industry: 0.41	0.346	−0.510	−0.735	0.690
K: Wood fabrication and graving industries: 0.08	0.720	−0.695	0.359	−0.250
L: music instruments and toy industry: 0.15	13.600***	−13.455***	1.447	−1.537
M: Food processing: 0.12	2.845**	−2.805**	0.465	−0.439
N: Clothing trades: 0.03	0.302	−0.258	0.761**	−0.727**
A-N: Controls$_{r,d,g}$	Y		Y	
N	124		309	

Ordinary least square regressions. Standard errors (in parentheses) are clustered at the state/province level. White-collar (WC) workers are abbreviated as indicated ***$p<0.01$; **$p<0.05$; *$p<0.1$. R^2 and standard errors across panels A to N is not reported for brevity

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