The Work-to-School Transition: How Certification Combats Income Losses Among Young Displaced Workers*

Patrick Bennett†

September 2022

Abstract

This paper examines how and why returning to education fosters recovery from negative employment shocks among high school dropouts. High school dropout remains a problem, particularly as employment is increasingly skilled over time. Exploiting a policy expanding a Norwegian vocational certification scheme in a triple difference framework, workers displaced post-expansion certify their skills at significantly higher rates relative to those displaced pre-expansion. Increases in certification post-expansion significantly reduce income losses after job loss. Certifying skills fosters recovery among early career displaced workers through the retention of relevant industry-specific human capital, which increases job stability over 20 years later.

*The author wishes to thank Bertil Tungodden, Kjell G. Salvanes, and the audiences of the University of Bristol, the Copenhagen Education Network, the University of Glasgow, the University of Liverpool, the Norwegian University of Science and Technology, the Norwegian School of Economics, the University of Surrey, IWAEE 2021, SOLE 2021, PILLARS Conference 2022, VPET-ECON 2022, and EALE 2022 for their valuable feedback. This work was partially supported by the Research Council of Norway through its Centres of Excellence Scheme, FAIR project No. 262675. The paper was previously circulated under the title "The Work-to-School Transition: Job Displacement and Skill Upgrading Among Young High School Dropouts"

†The University of Liverpool, FAIR-CELE, and IFS. Email: Patrick.Bennett@liverpool.ac.uk

1 Introduction

Employment has become increasingly skilled over time—total hours worked by the non-college educated in the US fell from over 70% in the 1960s to just 40% by 2017 (Autor, 2019)— and high school dropouts increasingly lack relevant skills in the labor market. Such strong declines in demand have long-lasting labor market implications: job loss and other negative labor market shocks cause persistent earnings losses, particularly among the lower educated (Jacobson et al., 1993; Kahn, 2010; Huttunen et al., 2011; Schwandt and von Wachter, 2019). Recent work focuses on isolating the factors which determine the persistence of earnings losses, distinguishing between lost hours worked, declining wages, and worker-firm factors.[1] However, far less is known about how to effectively combat such declines: how can low-educated workers recover from negative employment shocks and what are the underlying mechanisms which foster such recovery?

This paper reveals how returning to formal education to finish high school fosters recovery from adverse employment shocks. I assess how early career workers certify their practical vocational skills following job separations of an involuntary nature—job displacement due to a mass-layoff or closing event—and how returning to education minimizes earnings losses among low educated displaced workers. To isolate the causal role of education in the recovery of labor market outcomes in the aftermath of job loss, I combine a policy expanding access to a second chance certification scheme among women with the methodology of the displaced worker literature. This triple difference approach, comparing displaced workers both before and after the scheme's expansion, informs the mechanisms behind why second chances in the education system eliminate the long-lasting earnings penalties of job displacement (Jacobson et al., 1993).

Isolating the causal role that returning to education to certify practical skills plays in the recovery from negative labor market shocks presents an empirical challenge. Indeed, both the choice to return to education to certify skills and the timing of when in the life cycle to do so are determined by endogenous factors. To overcome the endogeneity of

[1] See, for instance, Schmieder et al. (2018); Raposo et al. (2019); Lachowska et al. (2020)

returning to education in the aftermath of displacement, I compare the certification rates of high-tenured early career workers who are laid off to similar non-displaced high-tenured early career workers. In a triple difference framework, I exploit a sudden expansion of the second chance opportunities available for women in a certification scheme to compare displaced workers' education and labor market outcomes before and after the expansion in the short- and long-run. Such an approach assesses how an exogenous increase in high school completion, as determined by the expanded access to opportunities to transition back into the education system, combats earnings losses in the aftermath of job loss.

The paper makes four key contributions. First, the paper documents that being laid off causes young high school dropouts to certify their skills with a vocational high school degree when second chances are available in the education system. Exploiting an expansion of the Practical Candidate Scheme (PCS) to incorporate fields which employ a large fraction of women such as health care, social work, and retail sales reveals that women displaced after the expansion of the PCS certify at significantly higher rates compared to women displaced pre-expansion. Importantly, there is no evidence that those displaced before and after the expansion have differential trends in certification prior to job loss, suggesting that those displaced pre-expansion are a suitable counterfactual for those displaced post-expansion in the triple difference approach. While there is no additional impact of displacement on the completion of higher education after the PCS' expansion—that is, increases in higher education among women displaced post- and pre-expansion are similar—displacement leads workers to complete higher education at significantly higher rates than their non-displaced counterparts. While recent work concludes that a large fraction of dropouts return to graduate later in life (Albæk et al., 2019; Bennett et al., 2020), this paper emphasizes that job loss causes early career workers—who only recently dropped out of high school—to document their vocational qualifications when the education system enables them to do so.

Second, the paper documents how returning to education mitigates the earnings penalties caused by job loss. Certification significantly reduces the long-run income penalty of job loss: women displaced after the expansion of the PCS—those who certify at signifi-

cantly higher rates—exhibit significantly stronger income recovery compared to women displaced pre-expansion. The rapid recovery of income, despite substantial short-run income penalties, stands in contrast to an extensive literature documenting that job loss during mass-layoff events causes persistent earnings losses (Jacobson et al., 1993; Couch and Placzek, 2010). The probability of working full-time is similar among women displaced pre- and post-expansion, suggesting that certification combats reductions in the wage level. Indeed, Lachowska et al. (2020) show that reductions in wages and hours worked are both important sources behind the displaced worker penalty.

Third, the paper isolates the underlying mechanisms behind why the certification of skills with a vocational diploma effectively combats income losses. Increases in certification are concentrated among those who dropped out of education with no high school. Such workers have to first pass a theoretical exam to account for their lack of any examination in high school while those with some high school can proceed directly to the PCS exam. The concentration of certification among those with no high school suggests that signaling alone cannot explain why certification fosters the recovery of income.

In addition, remaining in the same industry and retaining industry-specific human capital is an important reason behind why certification combats income losses. In the short-run, certification mitigates income losses among those displaced post-expansion through remaining in the same industry. In comparison, women displaced pre-expansion—who exhibit weaker recovery—are significantly more likely to switch industry post-displacement. In the long-run, the labor market impacts of certification persist, and this persistence also reveals the importance of industry-specific human capital. Over 20 years after displacement, those displaced post-expansion are significantly more likely to be employed in the same industry they were displaced from, have a significantly less volatile income, and are significantly less dependent upon unemployment insurance benefits. Increases in certification also translate into significant changes in the occupations and tasks later in life: post-expansion displaced women perform significantly less routine based tasks, whose demand in the labor market has declined over time (Autor et al., 2003), and perform significantly more service based tasks, which are less susceptible to future displacement

events. By retaining relevant experience and skills within a given industry, early career displaced workers benefit from increased job stability.

Finally, the paper reveals important differences in who is on the margin of certifying, shedding light on why early career workers, who only recently dropped out of school, decide to return to finish high school after being laid off. In addition to reducing the opportunity cost of certifying—foregone wage income as in Becker's (1975) schooling decision theory—displacement may lead workers to update their expectations about their labor market prospects as a high school dropout. Differences in who is at the margin of returning to education suggest that dropouts may have previously had wrong expectations about their labor market prospects over the life cycle. Indeed, the impact of displacement on certification is particularly strong among high school dropouts who experienced favorable employment opportunities at young ages such as those who have a parent coworker. Differences in certification across workers of different ability levels and favorable employment opportunities suggest that dropouts leave education too soon (Oreopoulos, 2007) and job loss causes them to reevaluate the importance of a high school degree.

Results are robust to a number of robustness checks and alternative approaches. First, using men, the vast majority of whom work in fields eligible for the PCS both pre- and post-expansion, as a placebo group reveals that certification after the expansion of the PCS remains unchanged compared to their pre-expansion counterparts. The lack of an increase in certification among men displaced post-expansion confirms that the availability of second chance opportunities within the education system matters considerably for the skill upgrading of early career displaced workers. Second, dynamic selection into displacement is not of concern: future displaced and non-displaced workers have similar trends in education prior to displacement and estimated pre-displacement coefficients are not significantly different from zero. Third, selection into displacement on factors such as worker ability, which may be particularly problematic among a sample of early career workers, is also not of concern. Finally, results are robust to alternative choices of counterfactual groups, sample selection, and definitions of displacement.

The paper contributes to a number of strands of literature. First, it informs an exten-

sive literature on the persistent impacts of job displacement, isolating the mechanisms behind why returning to certify skills with a formal education diploma combat earnings declines in the aftermath of job loss.[2] By enabling displaced workers to retain industry-specific human capital, certification resulting from job loss at young ages increases future job stability and reduces the volatility of earnings far later in life, consistent with Delaney and Devereux (2019) who show increases in on-time education decrease earnings volatility. Second, the paper highlights the importance of the "work-to-school" transition after drop out, contributing to the education literature emphasizing the distinction between academic and vocational education in the "school-to-work" transition (Ryan, 2001).[3] Third, the paper reveals that second chance schemes to graduate high school can have persistent labor market benefits later in life, in contrast to the lack of labor market return found for the General Educational Development (GED) in the US (Tyler et al., 2000; Heckman et al., 2011; Jepsen et al., 2016). Compared to the GED program, the vocational certification scheme examined is straightforward, results in the exact same high school diploma formally documenting occupation-specific vocational skills, and is relatively inexpensive. Finally, the paper establishes the labor market benefits of increases in certification among previously low-educated workers, contributing to the literature on licensing and certification within occupations. Though there exists limited causal evidence on the effectiveness of licensing and certification requirements (Anderson et al., 2020), understanding the labor market implications of certification is increasingly important as mandates for certified and licensed workers have drastically increased over time (Kleiner and Krueger, 2013).

2 Norwegian Register Data and Education in Norway

[2]An extensive literature also documents the adverse impacts of job displacement on health and mortality (Sullivan and von Wachter, 2009; Black et al., 2015), family structure and fertility (Charles and Stephens Jr., 2004; Del Bono et al., 2012; Huttunen and Kellokumpu, 2016), child outcomes (Oreopoulos et al., 2008; Rege et al., 2011), and geographic mobility (Huttunen et al., 2018; Gathmann et al., 2018).

[3]For evidence on the impacts of academic & vocational education, see Oosterbeek and Webbink (2007); Malamud and Pop-Eleches (2010); Hall (2012); Hanushek et al. (2017); Bertrand et al. (2021).

2.1 Norwegian Register Data

To analyze the importance of job loss for returning to the education system, this paper makes use of detailed Norwegian Register data provided by Statistics Norway. Interlinked by an anonymized personal identification number, the panel data tracks individuals over time and irrespective of employment status. The population register provides data on demographic characteristics such as age, gender, birth year, and municipality of residence. The data also contains the identity of a child's parents, permitting the construction of the number of children. Data is recorded for the entire population, that is, any individual who is legally residing in Norway.

Earnings are measured as pre-tax income, which includes annual labor income as well as any taxable benefits earned such as parental leave, unemployment, or sickness benefits. To the extent that displaced workers receive public transfers after job loss, the magnitude of the estimated earnings losses post-displacement will be smaller than if earnings were measured as only labor income.[4] Norway has a generous safety net of unemployment benefits, and the sample of workers defined in section 3.1 are all eligible for unemployment benefits. Throughout the paper, earnings are measured in year 2015 Norwegian kroner (NOK).

Data on education comes from the education register and schools are legally required to report any information on student enrollment and graduation to Statistics Norway. The data includes information on the years of education an individual has completed as well as the exact qualification attained including information on field of study. Additionally, any ongoing education is also recorded for each student, including information on field of study. The completion of educational qualifications and ongoing student status are measured at the start of October. Throughout the paper, education is defined as the completion of high school, separately for academic and vocational high school, and the completion of higher education, any tertiary education. Further details of the Norwegian education system are discussed below.

[4]Appendix C provides a comparison of post-displacement income losses between income measured with and without benefits for the cohorts of workers for whom data on labor income is available.

Crucially, the data provides a linkage between workers and their employers, where both plant and firm identifiers are observed. Such data is available from 1986–2015 and enables the construction of the number of employees in the plant/firm as well as tenure with the same employer. Throughout the paper, the focus is on plants, and the terms employer and plant are used interchangeably. Additional information such as employment status—employed, unemployed, or outside the labor force—, full- or part-time status, and the industry of employment is also recorded.

Finally, data on cognitive ability is extracted from compulsory military testing data performed at the age of 18. Military testing was compulsory for all men of the birth cohorts considered throughout the paper. Cognitive ability is measured as an IQ test, an aggregate score of tests in arithmetic, word similarities, and figures.[5] IQ is measured on a 9 point scale, with an average value of 5 and a standard deviation of 2.

2.2 Education in Norway

For all birth cohorts considered in this paper, compulsory schooling is 9 years of education.[6] This is comprised of 6 years of primary schooling and 3 years of lower secondary education. As such, all individuals are able to join the labor force from 16–17 after the completion of compulsory schooling.

After the completion of compulsory schooling, a student decides whether to enroll in high school, which is non-compulsory. High school education lasts for 3–4 years and is structured into vocational programs as well as academic programs. Vocational high school emphasizes a theoretical and practical component in the classroom and is, primarily, geared towards professional employment in a particular vocation rather than post-secondary education. Typical vocational high school programs last 3–4 years, beginning with the theoretical classroom component and finishing with practical training. Practical training may be done either at the school itself or as an apprenticeship. To complete the vocational high school program, students must pass exams in both the theoretical and

[5]The first two exams are similar to the Wechsler Adult Intelligence Scale (WAIS) test while the figures test is similar to a Raven Progressive Matrix test.

[6]See Black et al. (2005, 2008) for further details of the change in compulsory schooling.

practical components.

The completion of academic high school typically takes 3 years and enables students to continue into university education. Prior to a reform in 1994 examined in Bertrand et al. (2021), the system was very divided between academic and vocational education with little progression to university education from the vocational track. All birth cohorts considered in this paper are enrolled in education under the divided pre-reform system, as the reform defined eligibility according to birth year.

Tertiary education is comprised of university colleges (høgskole), which specialize in shorter programs in subjects such as nursing and teaching, and universities. The direct cost of higher education is close to zero in Norway, as there is no tuition and most students will qualify for student loans and direct subsidies from the government. In addition, technical colleges (teknisk fagskole) offer non-tertiary, post-secondary education in vocational subjects. Such programs are short, spanning a minimum of 6 months to 2 years. The completion of a post-secondary education at a technical college conveys the status of a vocational technician, and is tailored as further education among those who already have a considerable background in a particular vocation. Admission to technical colleges requires a vocational high school degree and at least two years of experience in the vocation, though students at technical colleges may be admitted on the basis of other factors such as extensive work experience (Farstad, 1999). Throughout the paper, higher education is defined as the completion of tertiary education, following the International Standard Classification of Education (ISCED) definition.

2.3 The Practical Candidate Scheme

The PCS enables those who previously dropped out of high school to certify their on-the-job knowledge with a formal vocational high school education diploma. Unlike the GED program in the United States, students are awarded the exact same degree as if they had completed vocational high school. The content of the examination in the PCS is equivalent to the final year examination as students in vocational education, and practical candidates do not need to have completed any other subjects such as Norwegian, English,

math, science, or history to be issued the vocational education diploma.

Eligibility to register under the PCS mirrors the vocational high school system and includes both a theoretical component and a practical component. If a candidate had previously completed the theoretical portion of vocational high school while enrolled in formal education in the past, this qualifies the student under the first eligibility criteria. Any candidate who lacks the theoretical qualifications under the PCS is required to first pass an examination in vocational theory, and counties offer free preparation courses for the theoretical examination under the PCS.[7] However, applicants to the PCS are not classified as formal students enrolled in an educational institution unless they return to formally enroll in high school.

To fulfill the second eligibility criteria, an applicant must describe, in detail, the nature of their professional employment which provides them with a sufficient level of knowledge in the practical components of their vocation. Typically, the candidate must detail their tasks and responsibilities as well as how long they have been working in an industry corresponding to their vocation. The candidate must submit an application with their detailed on-the-job competencies to the county, who is responsible for assessing the eligibility of the candidate. If the county deems the candidate's description to be inadequate, they may seek further documentation and clarification from the individual. Practical candidates must apply to the PCS in the county they reside in.

Should the county deem a PCS applicant to satisfy both eligibility criteria, the individual is responsible for registering with the county to take an examination demonstrating their on-the-job competence. Throughout the process, the individual is responsible for taking the initiative in qualifying under the PCS and the individual must pay a fee to sit the examination set by the national government annually.[8] The length of the examination under the PCS is subject dependent, but lasts roughly one day where the candidate demonstrates, to an evaluation committee, their competence in the skills of that specific trade. Importantly, an individual may apply for the PCS irrespective of employment

[7] Counties have a large amount of responsibility for their educational programs. There were 19 counties during the time period considered in this paper.

[8] In 2019, the fee for the PCS examination was 951NOK.

status provided they fulfill both eligibility criteria. As such, both workers in employment and workers out of employment may be examined under the PCS. If an individual fails to pass the PCS, the candidate must wait a minimum of another 6 months should they wish to try again. Pass rates are also subject dependent, but tend to be high, roughly 80–90% at the time (Kirke-, utdannings- og forskningsdepartementet, 1999).

2.3.1 The Expansion of the PCS

Prior to 1997, many vocational fields which traditionally employ a high fraction of women were not eligible for certification under the PCS, as the scheme historically covered vocational subjects traditionally dominated by men. The expansion of newly recognized vocations such as health care, social work, and retail allowed workers in these jobs to certify their skills under the PCS (Michelsen et al., 2014; Tangen, 2000; Farstad, 1999). Farstad (1999) points to the lack of possibility of formal certification in these vocations as an explanation for a lack of females completing vocational high school, which had historically been dominated by men in Norway. Consistent with this, following the inclusion of these additional fields, there was a dramatic increase in certification under the PCS at the end of the 1990s (Michelsen et al., 2014).[9]

Section 4 examines how the expansion of the PCS impacted certification among displaced workers, comparing not only those displaced before and after the expansion but also contrasting women, who are disproportionately impacted by the expansion, to men, who are largely unimpacted. Since men are largely unimpacted by the expansion of the PCS, they offer an opportunity to understand how the balance between academic and vocational education evolves over time irrespective of the expansion. For instance, comparing the outcomes of women and men post-expansion informs whether there is a general shift away from academic to vocational education over time.

A concern for the triple difference strategy described above is that there is potentially an increasing trend in certification and licensing already taking place prior to the

[9]A point emphasized in the GED literature is that it induces students to drop out of high school (Heckman et al., 2012). The expansion of the PCS does not seem to have had any such effects: as women are impacted more by the expansion, their dropout would increase relative to men following the expansion if this had any impacts. If anything, female dropout relative to male dropout decrease over the period.

expansion of the PCS. If this were the case, then the incentives to certify skills under the PCS with a formal degree would be increasing over the sample period irrespective of the expansion. Reassuringly, Figure A.1 reveals that the trends in the educational attainment of two fields where licensing is prominent—health care and social work—which were also included under the expansion of the PCS are no different from trends in any other industries. If anything, certification in health care and social work appears to be on a slightly flatter trend prior to the expansion of the PCS, suggesting that the increasing importance of licensing over the sample period is not of concern.

3 Defining Involuntary Job Loss

3.1 Isolating a High-Tenured Sample

By combining a definition of job loss which is plausibly involuntary with a sample of high-tenured workers for whom job loss is unanticipated, the job displacement literature estimates the impacts of job loss among displaced workers. This paper follows a similar approach to isolate a smaple of high-tenured young workers. Sample restrictions are defined relative to the year $b = 1990, \ldots, 1999$, where a worker is employed in b but might transition into non-employment one year after in $b + 1$. Early career workers are defined as those aged 23–27 in year b. Such a sample of workers corresponds to those who entered the labor market after dropping out of school by age 19 at the latest and are not far removed from when they dropped out.

Several sample restrictions ensure that the sample of early career workers are high-tenured workers who dropped out of high school. First, young workers must have at least one year of tenure in their employing plant in b.[10] Second, they must be attached to the labor force in all years from $b - 3$ to b, defined as having minimum level of income in a given year (one grunnbeløpet).[11] Third, they must have dropped out of education from

[10] See Appendix Table L in Bennett and Ouazad (2019) for an overview of tenure restrictions in the displacement literature.

[11] A grunnbeløpet is an amount of income which corresponds to a basic amount in the National Insurance scheme. The amount of income which constitutes one basic amount (1G) changes from year to year with inflation. At the start of the sample period in 1990, 1G corresponded to 34,100kr (in 1990 NOK) and in 1999, 1G corresponded to 46,950kr (in 1999 NOK).

the ages of 16–18 having not completed high school. Age of dropout is defined as the age a student was when they were first not enrolled in education in the current as well as the subsequent year. Non-enrollment in two subsequent years eliminates students who take a gap in their studies and return to education the following year.

Fourth, young workers must be employed in a plant with at least 10 employees in b.[12] Such a restriction eliminates the possibility of very small changes in employment classifying as a mass-layoff event, as defined in section 3.2. Finally, workers must not be enrolled in education prior to the sample period in $b-4$. Note that future displaced and non-displaced workers are subject to the exact same sample criteria, and that all workers are followed unconditionally after year b.

Table B.1 describes the final estimation sample in year b separately by gender. The sample pools all years $b = 1990, \ldots, 1999$, resulting in a sample of 67,814 men and 48,540 women. While workers span the ages 23–27, they are, on average, aged 25 in year b. The sample of high school dropouts is of a lower average cognitive ability, as only 39% of men have an IQ score at or above the median.

High-tenured workers have, on average, 4 years of tenure. As such, some of the high-tenured workers are potentially still employed in their first job after entering the labor market and dropping out of high school. While all almost men are employed full-time, only 74% of women are working full-time in year b. High-tenured men earn considerably more than women, though high school dropouts of both genders are high earners for their age who earn above median income among all workers 18–54.[13] There exist considerable differences in the industry men and women work in: 43% of high-tenured men are employed in manufacturing, while 32% of women are employed in the public, education, health, and social work industries and 28% employed in retail and service jobs.

The vast majority of the sample dropped out of education having completed only compulsory education, and as such will have to first pass a theoretical exam as described in

[12]See Appendix Table J in Bennett and Ouazad (2019) for an overview of employer size in the displacement literature.

[13]In 1994, median income among all workers aged 18–54 was 308,067kr for men and 201,826kr for women

Section 2.3 to be eligible for the PCS, though roughly 20% dropped out having completed some high school. As the sample definition does not restrict the education of high-tenured workers from $b-3$ to b, a considerable portion of men (11%) have already completed vocational high school by year b. Women return to complete high school in the same period to a lesser degree, and only 3% of women have completed vocational high school by b, reflecting the reduced opportunities available to women pre-expansion. Less than 1% of both men and women have completed academic high school by b.

3.2 Defining Mass-Layoff Events and Job Displacement

The paper combines idiosyncratic mass-layoff events at the plant level with employee job transitions (either job-to-job or employment to non-employment) to define displaced workers. At the worker level, a job transition is defined as an employee who transitions to a new plant or to non-employment between b and $b+1$. At the plant level, a mass-layoff event is defined as a plant in year b which satisfies one of two criteria: (i) closed between b and $b+1$ or (ii) plant reduced employment by 30% or more between b and $b+1$. Plant closures address potential administrative closings or mergers, and exclude false closings where over 80% of workers employed in the same plant in year b are employed together in the same plant in $b+1$.

Combining these two definitions, a displaced worker is one who loses their job and is employed in a plant in year b which has a mass-layoff event or closes in the next year. Such a definition is similar to existing measures of displacement used throughout the displacement literature as well as those used in the context of Norway (Huttunen et al., 2018). Flaaen et al. (2019) validate the methodology of the displacement literature: combining survey and administrative data reveals that conventional definitions of job displacement produce similar displacement rates and estimates to alternative methodological approaches. However, as there may be particular concerns with displacement defined among a sample of young workers (Von Wachter and Bender, 2006), section 4.3 examines in detail the potential issue of selection into displacement.

Throughout, displaced workers are compared to similar high-tenured workers who are

non-displaced; that is, those who did not experience a job transition during a mass-layoff event. As such, non-displaced workers may continue to be employed in the same plant, transition between jobs, leave their job for voluntary reasons, or even be displaced in a future year (but not between b and $b+1$). Indeed, Krolikowski (2018) emphasizes the importance of defining a non-displaced group which is both similar prior to displacement and followed unconditionally for the post-displacement period for the estimated impacts of job displacement on earnings.

4 The Impact of Job Displacement on Certification and Higher Education

4.1 Empirical Specification

To understand the causal role that job loss has on certification, and how the availability of opportunities in the education system impact certification after job loss, the paper combines job displacement with an expansion of the PCS in the late 1990s. Such an expansion permits the comparison of the education of displaced workers pre-expansion to displaced workers post-expansion (both relative to their respective non-displaced counterparts). Prior to 1997, many vocational fields which traditionally employ a large fraction of women were not eligible for certification under the PCS. After the expansion of the PCS, fields such as health care, social work, and retail sales were incorporated (Michelsen et al., 2014; Tangen, 2000).

Pooling all base years $b = 1990, \ldots, 1999$, equation (1) estimates the impact of job displacement on education, differentially for those displaced post- and pre-expansion:

$$\begin{aligned} Y_{it} = \; & \alpha + \sum_{k=-3}^{+10} \gamma_k \cdot (D_i \times \tau_t)^k + \sum_{k=-3}^{+10} \delta_k \cdot (D_i \times \tau_t)^k \times expansion_b \\ & + \theta \cdot D_i + \eta \cdot expansion_b + \zeta \cdot D_i \times expansion_b + \phi \cdot expansion \times \tau_{b,t} \\ & + municipality^{t=0} \times \tau_{m(i),t} + \pi_b + \varepsilon_{it}, \end{aligned} \tag{1}$$

where the cross-sectional dimension i corresponds to a worker in a specific base year b as workers may appear in multiple base years provided they meet the sample criteria described in 3.1. As such, all variables are base year specific and the outcome of a worker in time t depends on what base year they are in. Time is measured relative to displacement by $t = y - b$, the calendar year y relative to b. Workers are followed from -3 to $+10$, where displacement, as defined above, occurs at some point between $+0$ and $+1$. Y_{it} corresponds to two education outcomes, measured as the completion of vocational high school or the completion of higher education.

Cohorts displaced after the expansion of the PCS are defined as:

$$expansion_b = \begin{cases} 1, \text{ if } b = 1996, ..., 1999 \\ 0, \text{ if } b < 1996. \end{cases}$$

As the 1996 cohort is displaced between 1996 and 1997, they are the first cohort to be displaced into the post-expansion years. While those displaced prior are also eventually treated by the expansion of the scheme, they are not eligible to certify under the PCS in the expanded vocational fields immediately following displacement.

$(D_i \times \tau_t)^k$ is equal to one k years after a worker is displaced. The triple difference coefficients of interest, δ_k, correspond to the difference in the impact of displacement on education after the expansion of the PCS. As such, they estimate the difference in outcomes between those displaced after the expansion and those displaced before the expansion, both relative to their respective non-displaced counterparts. For $k = +1, \ldots, +10$, δ_k corresponds to the post-displacement difference in the impact of displacement after the expansion of the PCS.

The impact of displacement pre-/post-expansion estimated in equation (1) corresponds to a triple difference regression. Compared to the standard double difference regression in the displacement literature, the triple difference framework requires that the displaced/non-displaced difference in education between pre-/post-expansion cohorts would be stable in the absence of the expansion of the PCS. If this assumption holds, then those displaced pre-expansion represent a valid counterfactual for those displaced

post-expansion.

While such an assumption is inherently untestable, the coefficients $\delta_{-3}, \ldots, \delta_{+0}$ provide a direct test of the similarity of trends in education between future displaced and non-displaced workers before and after the expansion of the PCS *prior* to the displacement event. Indeed, Table B.1 reveals that a considerable fraction of the high-tenured high school dropout sample has already certified prior to displacement. The placebo coefficients test if future displaced and non-displaced workers post-expansion certified in the time leading up to displacement at similar rates as the same workers pre-expansion. In addition, Section 4.2.1 uses men as a placebo group, as men are employed in jobs eligible for the PCS both before and after its expansion and are largely unimpacted by the expansion.

As described above, equation (1) is estimated separately by gender. The inclusion of municipality-time fixed effects ($municipality^{t=0} \times \tau_{m(i),t}$) control for municipality-specific confounders which may vary over time such as school quality. Municipality is measured prior to displacement in the base year and, as such, are (on their own) time-invariant. The inclusion of base year fixed effects (π_b) compares displaced and non-displaced workers within the same base year. By pooling all base years, the relevant panel dimension i is base year-person, and standard errors are clustered at the person level. Both γ_{-1} and δ_{-1} are set to zero by convention, and the estimated γ_k and δ_k coefficients are interpreted relative to the omitted difference in time -1.

4.2 The Impact of Displacement on Education After the PCS' Expansion

As a starting point, Figure 1 plots the unconditional certification rates across four different groups of women: (i) pre-expansion non-displaced workers, (ii) pre-expansion displaced workers, (iii) post-expansion non-displaced workers, and (iv) post-expansion displaced workers. Prior to displacement, all four groups have similar trends in certification. Over time, all groups see increases in certification. However, comparing post- to pre-expansion cohorts reveals that this increase in certification is far greater after the expansion of the PCS. This is true among both displaced as well as non-displaced workers.

The triple difference exploits the difference in certification rates between displaced and non-displaced workers post-expansion, compared to the same difference pre-expansion. Indeed, there is a considerable difference between the certification rates of displaced and non-displaced workers post-expansion, where those displaced certify at even higher rates relative to those non-displaced. At the same time, those displaced pre-expansion eventually go on to certify at marginally lower rates. These considerable differences suggest that the expansion of the PCS had a substantial impact on certification and that displacement post-expansion has an additional impact on certification over and above this.

Figure 1: Average Pre- and Post-displacement Certification Rates Before and After the PCS' Expansion, Female Workers

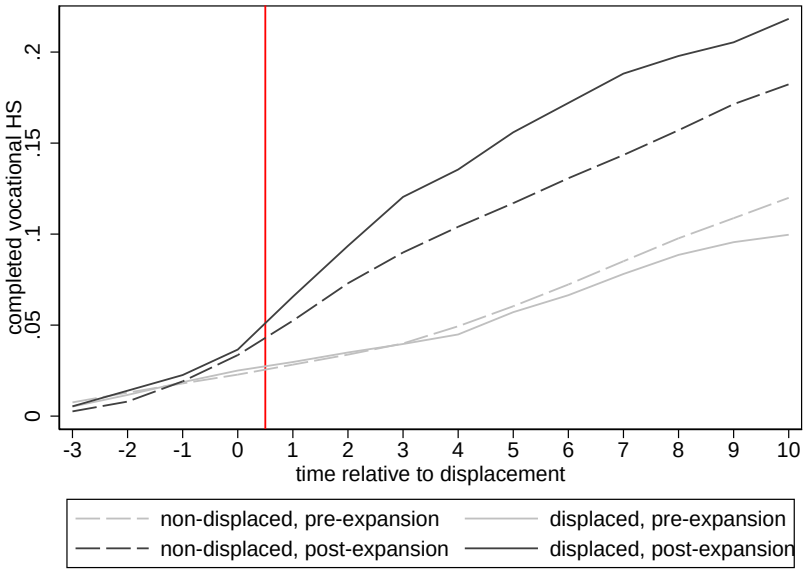


Figure plots the unconditional average completion of vocational high school across four groups relative to the displacement event: non-displaced workers before the PCS expansion, displaced workers before the PCS expansion, non-displaced workers after the expansion, and displaced workers after the expansion. Expansion cohorts are those in base years 1996 onward. Sample of high-tenured workers defined as in Section 3.1.

Figure 2 plots the estimated difference in certification rates between post- and pre-expansion displaced women relative to their respective non-displaced counterparts, δ_k from equation (1). The estimated interaction coefficients confirm the descriptive patterns above: the impact of displacement on certification is greater for women displaced post-expansion relative to women displaced pre-expansion. From three years after dis-

Figure 2: The Estimated Difference in the Impact of Displacement on Certification Post-Expansion Relative to Pre-Expansion Cohorts, Female Workers

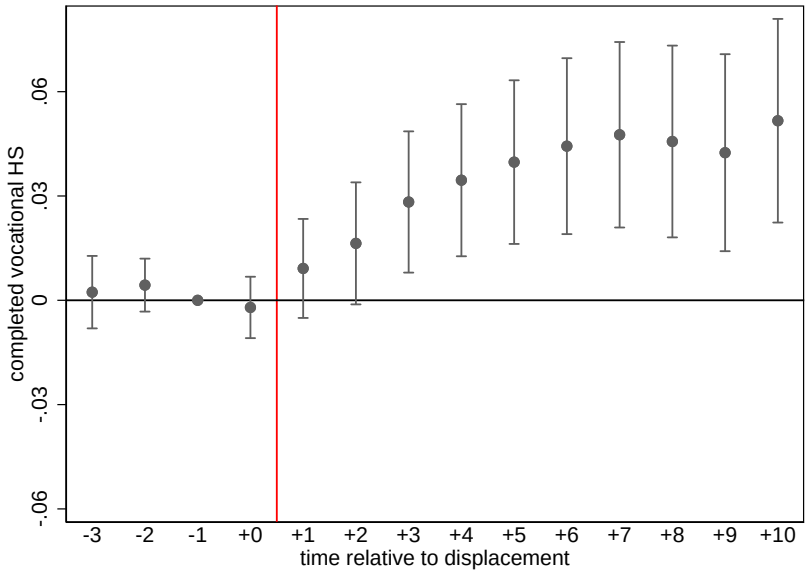


Figure plots the interaction between $Expansion_b$ and $D_{it}^{k \text{ years after displacement}}$ from equation 1 for women, with the outcome variable equal to 1 if an individual has completed vocational high school. Post-expansion cohorts are those from 1996 onward. Coefficients interpreted as the difference between displaced workers post-expansion and displaced workers pre-expansion (both relative to their respective non-displaced counterparts). Average completion of vocational high school among non-displaced workers in +10 (both pre- and post- expansion cohorts): 13.3%. δ_{-1} set to zero by convention. Full results reported in Appendix D. Displacement event occurs between +0 and +1. 95% confidence interval reported. Sample of high-tenured workers defined as in Section 3.1.

placement, those displaced post-expansion certify at significantly higher rates relative to the fixed difference in certification in time -1. Such differences are large in magnitude, and correspond to a 3–5 percentage point increase in certification. Relative to the average probability of certification among all non-displaced workers in $+10$ of 0.133, the post-expansion increase in certification among displaced women corresponds to a 38% increase in certification. Crucially, those displaced post- and pre-expansion have similar trends in certification prior to displacement, and these differences in certification are stable pre-displacement, small in magnitude, and not statistically significant. The lack of differential trends pre-displacement suggests that those displaced pre-expansion represent a suitable counterfactual for those displaced post-expansion.

Increases in certification among women after displacement and after the expansion of the PCS indicate that the opportunities available for graduating high school matter considerably. Indeed, the negative shock of displacement leads displaced workers to reevaluate the importance of a high school degree. However, displaced women only certify their skills when they have the opportunity to do so, as the estimated γ_k coefficients from equation (1) reported in Table D.1 are generally small in magnitude and not significantly different from zero.

The increase in certification among displaced women post-expansion may also translate into increases in higher education. Indeed, the completion of vocational high school leads to additional opportunities in the education system, as described in Section 2.2, to further invest and refine specialist skills. In contrast to Figure 2, there is no differential impact of displacement on the completion of higher education between post- and pre-expansion cohorts (Figure 3). Thus, while the availability of opportunities matters for those at the margin of certifying, increases in certification do not translate into gains in higher education among displaced women at the margin post-expansion.

4.2.1 Validating the Importance of the PCS' Expansion: Using Men as a Placebo Group

To further test whether the expansion of the PCS is responsible for the increase in certification among women displaced post-expansion in Figure 2, Appendix D estimates the

Figure 3: The Estimated Difference in the Impact of Displacement on the Completion of Higher Education Post-Expansion Relative to Pre-Expansion Cohorts, Female Workers

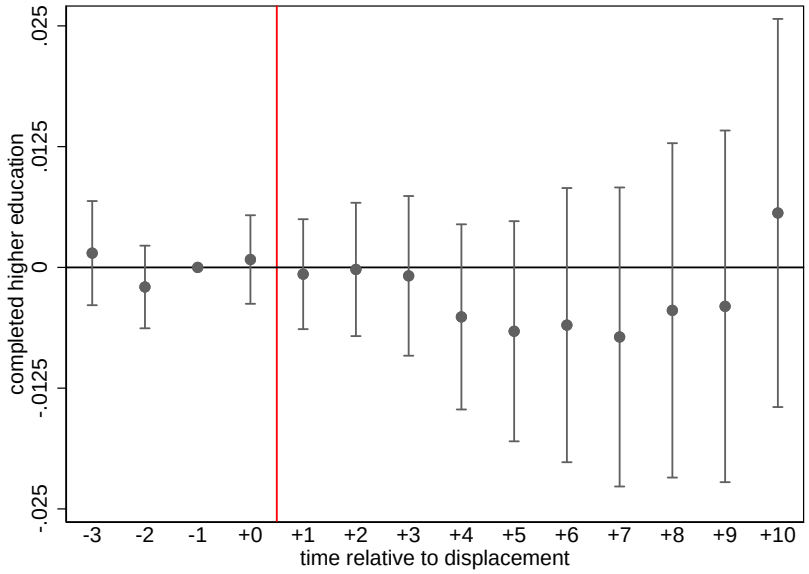


Figure plots the interaction between $Expansion_b$ and $D_{it}^{k \text{ years after displacement}}$ from equation 1 for women, with the outcome variable equal to 1 if an individual has completed higher education. Post-expansion cohorts are those from 1996 onward. Coefficients interpreted as the difference between displaced workers post-expansion and displaced workers pre-expansion (both relative to their respective non-displaced counterparts). Average completion of higher education among non-displaced workers in +10 (both pre- and post-expansion cohorts): 4.4%. δ_{-1} set to zero by convention. Full results reported in Appendix D. Displacement event occurs between +0 and +1. 95% confidence interval reported. Sample of high-tenured workers defined as in Section 3.1.

same regressions for men. As displaced men are eligible for the PCS throughout the sample period, both prior to and after the PCS' expansion, certification among men displaced post-expansion should be largely unimpacted by the inclusion of new fields. While men and women are employed in different jobs, Appendix D.1 reveals that they follow very similar trends in employment rates over time. Thus, there may be level differences in the employment rates of men and women, but the similar employment trends suggests that they are similarly impacted by downturns and booms.

Using men as a placebo group, Table D.4 reveals that there is no increase in certification among men displaced post-expansion compared to those displaced pre-expansion and, if anything, they are slightly less likely to certify in the short-run. The lack of an increase in certification among men suggests that the expansion of second chance opportunities for women, rather than a general shift away from academic towards vocational education, causes the increase in post-expansion certification among women.[14]

While there is no additional impact of displacement on certification after the expansion of the PCS among men (the δ_k coefficients from equation 1), displacement does lead to significant increases in certification among all men in the short-run (the γ_k coefficients from equation 1). Such increases in certification correspond to a 1.5–3 percentage point increase in the probability of completing vocational high school among all men, and point to the fact that men are eligible for the PCS both pre- and post-expansion. Similar patterns are seen for the impact of displacement on the completion of higher education for men in Table D.5: while there is no additional impact of displacement on higher education post-expansion, displacement leads to significant increases in higher education.

[14]If anything, there is a slight tendency towards academic education over time, as post-expansion displaced men have slightly higher completion of academic high school relative to pre-expansion displaced men (such differences are insignificant). At the same time, the academic high school of women displaced pre- and post-expansion are virtually identical, and increases in vocational high school post-expansion do not come at the expense of academic high school.

4.3 Establishing the Validity of the Displaced Worker Methodology

4.3.1 Assessing the Potential for Selection into Job Displacement

The validity of the displacement methodology hinges on the fact that non-displaced workers represent a valid counterfactual for displaced workers. An important remaining question is whether *all* future displaced workers, combining pre- and post-expansion displacement cohorts, have similar trends in education as non-displaced workers prior to displacement. In particular, it might be that returning to education leads to voluntary job transitions among workers. While the triple difference relies on the similarity in trends of displaced/non-displaced workers between pre- and post-expansion cohorts, it remains informative to understand how education evolves before job loss among all displaced workers.

Estimating the impact of displacement among all workers, both those displaced pre- and post-expansion, reveals that displacement leads to significant increases in education among women (Figures E.1a and E.2a) and men (Figures E.1b and E.2b). Prior to displacement, the estimated coefficients when $k \leq 0$ are small in magnitude and not significantly different from zero. The lack of significant differences prior to displacement reveals that while future displaced and non-displaced workers do certify prior to displacement, they do so at similar rates over time. Such similar trends in education prior to displacement suggest little scope for selection into who is displaced. Figure E.3 shows that there is no impact on enrollment in high school education. Indeed, displaced workers complete vocational high school without returning to the classroom, pointing to the importance of certification rather than returning to the classroom. In addition, there is no impact of displacement on the completion of academic high school (Figure E.4), suggesting young displaced workers certify rather than return to full-time high school education.

Appendix E.3 further confirms that selection into who is laid off is not of concern for the results. While there might be selection into which workers plants lay off and which workers plants retain, this is not the case. Figure E.5a compares the cognitive ability of displaced workers by whether they are displaced in a mass-layoff or plant closing

event. If, for instance, plants lay off their least capable workers while retaining their more productive workers, then there would be large differences in cognitive ability in Figure E.5a as while there may be choice in who to retain during a mass-layoff event, this is not the case during a plant closing as all workers are laid off. Reassuringly, those displaced during a mass-layoff event have similar levels of IQ compared to those displaced during a plant closing, and such differences are not statistically significant.

In addition, Appendix E.4 reveals that there is not selection of young workers into different plants, an issue emphasized in Von Wachter and Bender (2006). If, for instance, lower ability workers self-select into plants (or industries) with higher levels of turnover, and plants with higher turnover are more prone to mass-layoff events, then displaced workers will be negatively selected on ability relative to non-displaced workers. Appendix E.4 confirms that, if anything, displaced workers have slightly *higher* levels of cognitive ability relative to their non-displaced counterparts (Figure E.6a) and results are robust to accounting for these small differences in the levels of cognitive ability between displaced and non-displaced workers (Figure E.7).

4.3.2 Robustness to Choice of Counterfactual, Sample Selection, and Definition of Displacement

Four key challenges to the triple difference methodology can be addressed at this stage, and results are presented in Appendix F. First, results are robust to altering the counterfactual group of non-displaced workers. While non-displaced workers are, by definition, not displaced between b and $b+1$, they may be displaced in future years from $b+1$ and onward. Indeed, young workers are particularly prone to displacement relative to older workers (Farber, 2015). The sample of high-tenured young workers is no exception: 46% of the non-displaced sample is employed in a plant which, in a future year $b+1, \ldots, b+10$ experiences a mass-layoff or closing event. Though non-displaced workers are not necessarily displaced during such an event, that is, they do not necessarily transition to non-employment or another employer, such a counterfactual represents a group of workers whose plants will eventually downsize and are, arguably, more similar to displaced workers. Results in Appendix F.1.1 reveal similar estimates of the impact of

displacement when excluding non-displaced workers whose employing plant is expanding.

In addition, Appendix F.1.2 assesses the importance of the presence of future displaced workers in the non-displaced counterfactual group. In particular, the pre-expansion non-displaced sample may contain workers who are displaced in the future, and are potentially treated by the expansion later in life. Appendix F.1.2 reveals that future displaced workers in the pre-expansion period do not drive the increase in education observed in Figure 2, and excluding those who become unemployed at any point from +1–+10 from the non-displaced group produces similar results.

Second, results in Appendix F.2 are robust to increasing the number of workers in year b to 50 workers as is standard among the displacement literature in the United States (Jacobson et al., 1993; Lachowska et al., 2020). While restricting the sample to 10+ employees limits the scope for small changes in employment being classified as a layoff event, this is even more true among a sample of 50+ employee plants. As the average plant in Norway is smaller compared to the US, imposing the restriction of 50+ employees reduces the total sample by over 40%. Despite this, certification remains significantly higher among women displaced after the expansion of the PCS.

Third, results in Appendix F.3 include early leavers, defined as those who experience a job transition from b to $b+1$ whose plant will go on to experience a mass-layoff/closing event from $b+1$ to $b+2$, into the definition of displaced workers. Early leavers may differ from displaced workers (Schwerdt, 2011), and their inclusion into the displacement group may fundamentally alter the composition of displaced workers: if, for instance, early leavers are more able workers and there is a positive correlation between ability and certification, then the baseline results would understate the true findings. In contrast, if plants begin to lay off the least productive workers in the year prior to an eventual mass-layoff event, then the pool of non-early leaver displaced workers who experience the eventual mass-layoff event would be positively selected on ability. Reassuringly, results are robust to reclassifying the definition of displacement to include early leavers, suggesting little scope for selection into displacement.

4.3.3 Comparing the Certification of Younger and Older Workers

Fourth, Appendix F.4 compares the post-expansion certification rates of young workers, those aged 23–27 as in the baseline results, to a sample which includes even older workers, those aged 23–30. Interestingly, including these older workers reduces the magnitude of the estimated triple difference coefficients. While the younger sample sees increases in certification post-expansion of 3–5 percentage points, the slightly older sample of workers sees increases of around 2–3 percentage points. This decrease in the impact of displacement on education post-expansion reveals that age is a key factor in the ability to return to education in the aftermath of displacement. Indeed, the work-to-school transition is a more important avenue among those who recently dropped out and older workers are less likely to certify vocational skills.

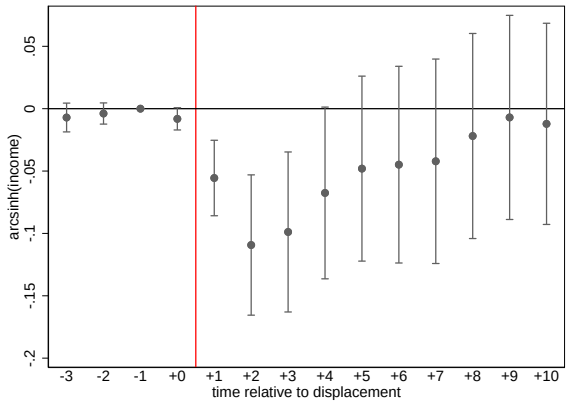
5 The Causal Impacts of Certification on Labor Market Outcomes

As a starting point, Figure 4 presents the impact of job displacement on income (Figure 4a) and full-time employment (Figure 4b) among all female workers, both those displaced before and after the expansion of the PCS, estimating a double difference regression corresponding to the average impact of displacement among pre- and post-expansion cohorts. Rather than using the log of income, which by construction excludes those with zero income post-displacement, income is transformed using the inverse hyperbolic sine (Ravallion, 2017; Bellemare and Wichman, 2020). Such a transformation has a similar interpretation as a log transformation, but is defined at zero. The probability of having zero income post-displacement increases considerably (Figure G.6) and it is important to include those who have zero income as a direct result of displacement.

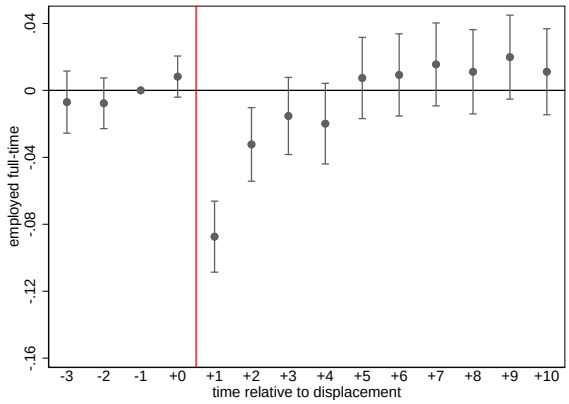
While all workers are employed prior to displacement in +0, they may differ in their working hours. Figure 4b reveals that future displaced workers have similar working hours to non-displaced workers, as differences in the probability of working full-time are not statistically significant pre-displacement. However, future displaced workers begin to

Figure 4: The Estimated Impact of Displacement on Labor Market Outcomes, Female Workers

(a) Income



(b) Full-time Employment



Outcome variable inverse hyperbolic sine (arcsinh) of income in panel (a), equal to 1 if an individual is employed full-time (30+ hours/week) in panel (c). Displacement event occurs between +0 and +1. 95% confidence interval reported. Average full-time employment among sample in base year (both displaced and non-displaced): 74.5%. Sample of high-tenured workers defined as in Section 3.1. γ_{-1} set to zero by convention. Estimating equation: $Y_{it} = \alpha + \sum_{k=-3}^{+10} \gamma_k \cdot (D_i \times time_t)^k + \theta \cdot D_i + municipality^{t=0} \times time_{m(i),t} + \pi_b + \varepsilon_{it}$.

experience a small slowdown in income just prior to displacement in +0. As is frequently observed in the job displacement literature (see e.g. Jacobson et al., 1993), this "Ashenfelter dip" (Ashenfelter, 1978) suggests that the income of future displaced workers begins to decline just prior to displacement. While statistically significant at the 10% level, the decline in earnings is small in magnitude.

Consistent with other papers in the job displacement literature, displacement is a pronounced adverse shock leading to significantly lower income in the short-run. Income declines for displaced women by around 6–11% following job loss. However, income losses are much shorter lasting than previously found. Indeed, the income of young displaced workers quickly recovers such that 10 years after displacement, there are no significant differences in income between displaced and non-displaced workers. Similar patterns are observed for full-time employment, which substantially declines immediately after displacement but then rapidly recovers.

5.1 Does Certification Causally Impact Income?

Such rapid recovery of income and employment after job loss stands in contrast to not only the job displacement literature, but also the literature on the scarring effects of unemployment at young ages (Gregg and Tominey, 2005). Combined with the significant impacts on certification among post-expansion displaced workers, the recovery of income suggests that certification among displaced workers fosters recovery after job loss. However, young workers may simply be more resilient than older workers post-displacement: Kletzer and Fairlie (2003) and Von Wachter and Bender (2006) suggest that the earnings losses of young displaced workers are lower relative to older displaced workers.

Figure 5 directly tests the causal role of certification in the recovery of post-displacement income, combining the displaced worker methodology with the expansion of the PCS. Estimating the triple difference regression of equation (1), the Figure asks whether the income recovery of women displaced after the expansion of the PCS—who certify at significantly higher rates compared to their non-displaced counterparts—is greater relative to women displaced pre-expansion. If certification causally impacts labor market outcomes, then the recovery of income post-displacement should be greater among women displaced post-expansion.

Figure 5 confirms that certification fosters income recovery post-displacement: while the short-run income losses of women displaced post-expansion are similar to those displaced pre-displacement, income in the long-run is significantly higher among post-expansion women, starting from 7 years after displacement. By ten years after displacement, women displaced after the expansion of the PCS have income 20% higher despite similar income losses immediately following displacement.

The stronger income recovery among women displaced post-expansion may be due to an increase in wages relative to those displaced pre-expansion, an increase in hours worked, or some combination of the two forces. Lachowska et al. (2020) emphasize that both reductions in wages and hours worked are responsible for long-run earnings declines, with declines in hours worked explaining slightly more than lost earnings. Figure H.1 tests the competing explanations of wages and hours worked in the stronger income

Figure 5: The Estimated Difference in the Impact of Displacement on Income Post-Expansion Relative to Pre-Expansion Cohorts, Female Workers

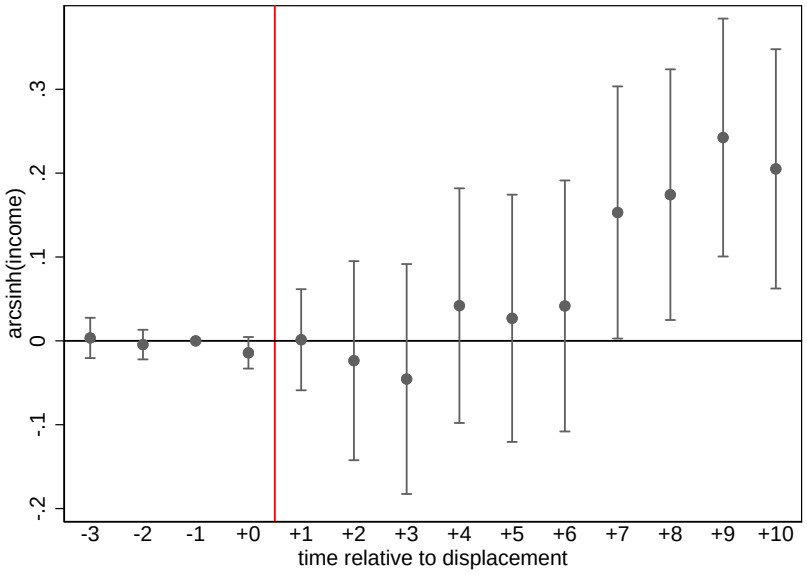


Figure plots the interaction between $Expansion_b$ and $D_{it}^{k \text{ years after displacement}}$ from equation 1 for women, with the outcome variable the inverse hyperbolic sine (arcsinh) of income. Post-expansion cohorts are those from 1996 onward. Coefficients interpreted as the difference between displaced workers post-expansion and displaced workers pre-expansion (both relative to their respective non-displaced counterparts). δ_{-1} set to zero by convention. Full results reported in Appendix D. Displacement event occurs between +0 and +1. 95% confidence interval reported. Sample of high-tenured workers defined as in Section 3.1.

recovery post-expansion, showing that the probability of being employed full-time is not significantly different among women displaced post- and pre-expansion. As hours worked are similar, this suggests that certification combats declining wage levels among women displaced post-expansion.[15]

The significant differences in post-displacement income trajectories after the expansion of the PCS confirm that certification plays an important causal role in recovery from adverse shocks. The importance of certification for the recovery of income losses is further established by examining the difference in income between men displaced post- and pre-expansion in Table D.6. Using men as a placebo group, the income losses of men displaced post-expansion are not significantly different from those of men displaced pre-expansion in the long-run. As men are eligible for certification under the PCS over the entire period, the lack of significant differences in long-run income recovery supports the fact that certification is behind the strong recovery of income of women displaced post-expansion.

6 The Mechanisms Behind why Second Chance Education Fosters Recovery

Early career displaced workers experience short-run income losses which recover rapidly after job loss and certification plays an important role in such recovery. A remaining question is why returning to education to finish high school via this second chance certification scheme is so effective in mitigating earnings losses post-displacement.

To address this question, the results below take two approaches. Firstly, the paper provides evidence on the relative importance of human capital accumulation versus signaling in certifying skills post-displacement. Important differences by whether or not a worker dropped out of education with some high school suggest that signaling alone cannot explain the recovery of income post-displacement (Section 6.1).

Secondly, the paper examines the long-run effects of certification on labor market outcomes far later in life. Doing so not only establishes the persistent effects of education over

[15]More detailed data on hours worked is unavailable throughout the period.

time but, crucially, informs the underlying mechanisms behind why certification combats lost earnings over a long time horizon. Indeed, the impact of early career certification in the aftermath of job loss does persist into adulthood.

Results suggest that the retention of industry-specific human capital is an important mechanism behind why second chance education improves labor market prospects after job loss.[16] While all displaced workers, both pre- and post-expansion, lose any firm-specific human capital, certification enables workers to remain qualified within specific vocation. Such a finding is consistent with prior work highlighting the importance of industry-specific human capital in earnings losses among displaced workers (Neal, 1995; Huttunen et al., 2011).

The retention of extensive experience within an industry is fundamentally important in combating earnings losses, a finding supported by a number of facts. First, while women displaced pre-expansion are significantly more likely to change industry 10 years after job loss, those displaced post-expansion, who certify at significantly higher rates, are equally likely to remain in the same industry as a result of displacement (Section 6.2). Such differences are consistent with remaining in the same industry as being an important mechanism behind the stronger recovery among women displaced post-expansion. Second, women displaced post-expansion have significantly less volatile income and are significantly less likely to receive unemployment insurance benefits later in life over 20 years after early career displacement (Section 6.2.1). Thus, for the same level of earnings, those who certify their skills with a formal qualification are employed in significantly more stable jobs. In addition, women displaced post-expansion are significantly more likely to be employed in the same industry that they were employed in prior to displacement. By formally documenting experience and skills within their specific vocation, certification enables workers to retain extensive industry-specific human capital after displacement.

Third, those who certify post-expansion are considerably more likely to be employed in service occupations and much less likely to have no occupation relative to women displaced pre-expansion (Section 6.3.1). Importantly, service occupations are those which

[16]Data on occupations is not available for workers in the pre-displacement period, and as such, the paper cannot exclude the importance of similar shifts in occupations.

are incorporated into the PCS after its expansion, further supporting the importance of the retention of industry-specific human capital through certification. Finally, certification enables displaced workers to perform tasks which are in demand later in life: those displaced post-expansion perform less routine tasks and more service based tasks (Section 6.3.2). The retention of industry-specific human capital impacts on-the-job tasks, enabling certified women to shift away from routine tasks which faces a declining labor market premium over time (Autor et al., 2003; Goos et al., 2014).

6.1 Distinguishing Between Signaling and Human Capital Accumulation

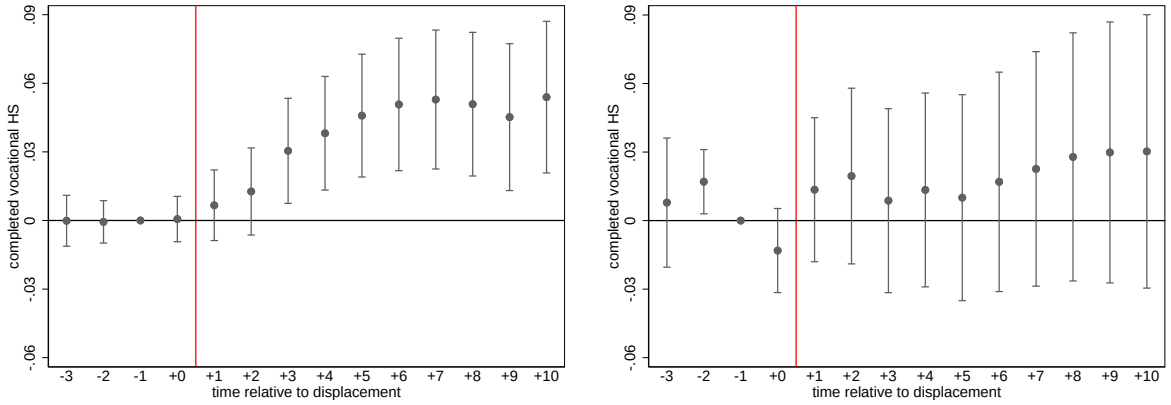
Does certification enable recovery from negative labor market shocks through human capital acquisition, generating new knowledge and skills through the certification process, or through signaling (Weiss, 1995; Jaeger and Page, 1996), simply having a diploma to document a worker's qualifications? Figure 6 provides suggestive evidence that signaling alone cannot explain the observed effects. As described in Section 2.3, any candidate for the PCS who has previously completed some exams in the vocational high school system can proceed directly to examination under the PCS while those who dropped out without any high school education will have to first pass a theoretical examination in their vocation. Distinguishing between those who dropped out with no and some high school sheds light on the relative importance of signaling and human capital accumulation.

Figure 6 reveals that displaced workers who dropped out with no high school (panels a and c) drive the observed increases in certification and income post-expansion. In contrast, those who dropped out with some high school see no significant differences in education or income post-expansion (panels b and d). While the effects are not significantly different from each other across the two subsamples, dropouts with no high school have to first complete a theoretical exam for which counties offer preparation courses for. While data on these preparation courses is unobserved, the stark differences suggest that signaling alone cannot explain why certification promotes the recovery of labor market outcomes after displacement.

Figure 6: The Estimated Difference in the Impact of Displacement on Education/Income Post-Expansion Among Dropouts with Different Levels of High School, Female Workers

(a) Dropout with No H.S.

(b) Dropout with Some H.S.



(c) Dropout with No H.S.

(d) Dropout with Some H.S.

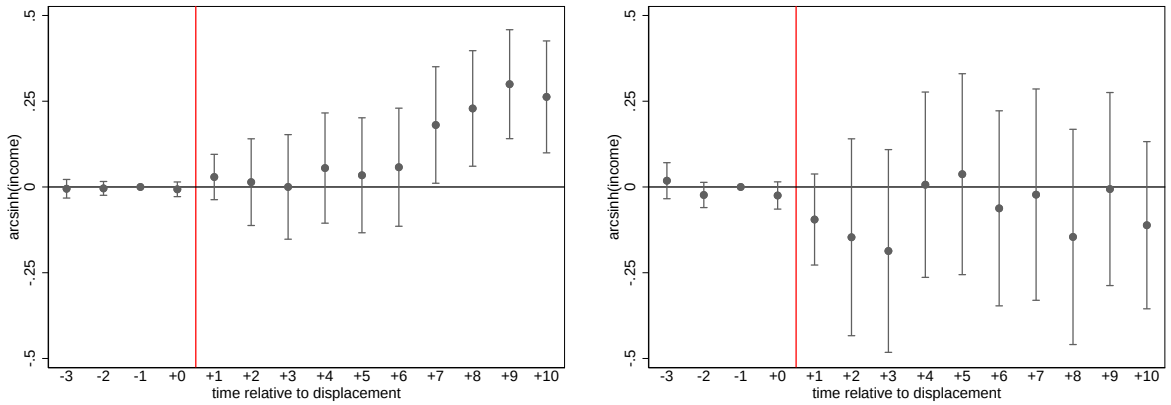


Figure plots the interaction between $Expansion_b$ and $D_{it}^{k \text{ years after displacement}}$ from equation 1 for women, with the outcome variable equal to 1 if an individual has completed vocational high school (panels a and b) and the inverse hyperbolic sine (arcsinh) of income (panels c and d). Post-expansion cohorts are those from 1996 onward. Coefficients interpreted as the difference between displaced workers post-expansion and displaced workers pre-expansion (both relative to their respective non-displaced counterparts). δ_{-1} set to zero by convention. Displacement event occurs between +0 and +1. 95% confidence interval reported. Sample of high-tenured workers defined as in Section 3.1. Sample of panels (a) and (c) is those who dropped out with no high school, and have to first pass a theoretical exam to be eligible for the PCS, while sample of panels (b) and (d) dropped out with some high school, and can progress directly to the PCS exam.

6.2 The Importance of Remaining in the Same Industry After Certification

Figure 7 tests whether remaining in the same industry is an important reason behind the stronger recovery of women displaced post-expansion, plotting the fraction of industry switching 10 years after job loss among displaced women pre- and post-expansion relative to their non-displaced counterparts. Important differences in the probability of switching industries after job loss suggests that remaining in the same industry is an important reason behind the stronger recovery of women displaced post-expansion. While many women do change industries relative to their industry in year b, displacement causes women to switch industry pre-expansion: those displaced are 4ppt more likely to switch industry compared to their non-displaced counterparts. However, after the expansion of the PCS, a different picture emerges: switching rates of those displaced post-expansion are not significantly different from their non-displaced counterparts and, if anything, those displaced are slightly less likely to switch industries. Remaining employed within the same industry 10 years after job loss, and the retention of industry-specific human capital, enables the stronger income recovery of displaced women post-expansion.

6.2.1 Long-run Differences in Income and Income Stability

While remaining in the same industry after certification plays an important role in the recovery of income in the aftermath of job loss, a remaining question is whether certification has any labor market impacts over a longer time horizon. Table 1 tests how persistent the impacts of certification on labor market outcomes are over the life cycle. Labor market outcomes are measured over 20 years after early career displacement, from 2014–2018. These cross-sectional long run regressions mirror the specification of equation 1, interacting a displacement indicator with a post-expansion indicator for displaced women (panel A) and displaced men (panel B). As women are those treated by the PCS' expansion, men offer a placebo group whose labor market outcomes should be largely unchanged as their education is unaffected by the schemes' expansion.

Table 1 reveals that for the same level of income, young women displaced post-expansion have a significantly more stable income relative to those displaced pre-expansion.

Figure 7: The Fraction of Industry Switching Pre-/Post-Expansion 10 Years After Displacement, Female Workers

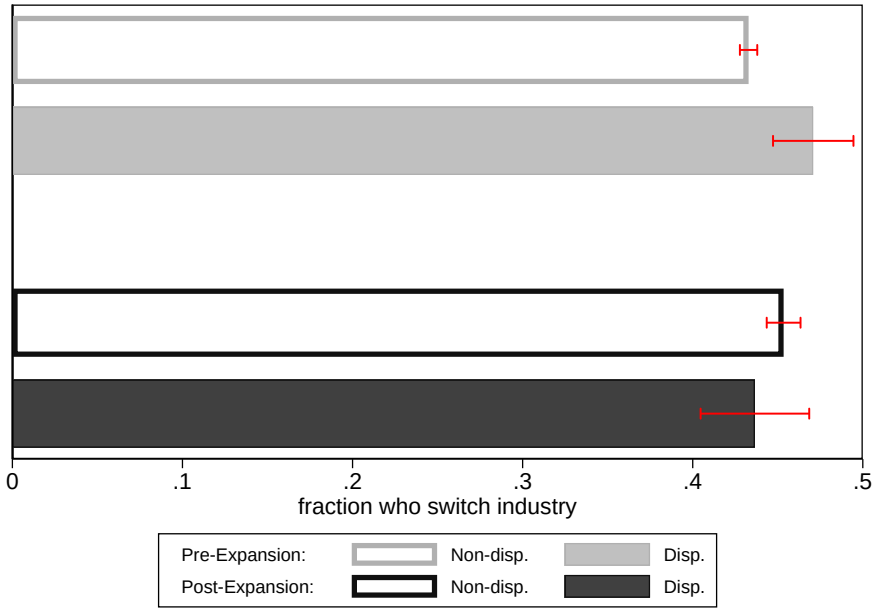


Figure plots the fraction of workers who switch industry from +0 to +10. Industry broadly defined as in Table B.1 as: manufacturing; wholesale & retail trades, restaurants, and hotels; public, education, health, and social work; and all other industries. Post-expansion cohorts are those from 1996 onward. 95% confidence interval reported. Sample of high-tenured workers defined as in Section 3.1.

Certification at young ages does not impact the level of income later in life from 2014–2018, measured by the percentile in the income distribution, as while the interaction between post-expansion and displaced is positive, it is statistically insignificant and small in magnitude (columns 1–3, panel A). However, certification significantly reduces the volatility of income later in life (column 4, panel A). Such changes are large in magnitude, the income of women displaced post-expansion is 10% less volatile relative to the average among non-displaced workers, and are consistent with prior work emphasizing that education both increases the level of earnings and reduces the volatility of earnings (Delaney and Devereux, 2019).

While certification leads to less volatile income over 20 years after displacement, women displaced post-expansion are also significantly less likely to receive unemployment insurance benefits (column 5, panel A). Significant decreases in the receipt of unemployment benefits suggest that certification increases income stability via increased job stability later in life as a result of certification. Indeed, Stevens (1997) emphasizes

the importance of multiple job losses among displaced workers, and workers displaced early in their career may face future displacement events later in their career. This increased job stability is also reflected in the industry of employment later in life, where certification increases the probability of working in the same broad industry that workers are displaced from early in their career by over 40% (column 6, panel A).

Taken together with the results of Figure 7, these significant impacts later in life reveal the underlying mechanisms through which certification combats earnings losses: certification enables displaced workers to remain employed in the same industry and retain their industry-specific human capital. Prior work in the job displacement literature points to the importance of industry-specific human capital in post-displacement earnings profiles (Neal, 1995; Huttunen et al., 2011). While all displaced workers, both those displaced pre- and post-expansion, lose any employer-specific human capital after being laid off, they continue to retain their extensive expertise and work experience within their industry. By certifying their skills, women displaced post-expansion are able to continue to be employed in the same industry over time, and are compensated for their extensive industry-specific human capital in the form of more stable employment. Switching industries is costly for pre-expansion displaced women who do not certify, as they have a significantly more volatile income and are significantly more likely to receive unemployment insurance later in life.

In contrast to women, men, see no significant differences after the expansion of the PCS, confirming that differences in certification among women are the cause behind the increased stability of income. Job stability is an important factor which increases among women who certify, and retention of industry-specific human capital is an important reason behind why certification of vocational knowledge and skills combats earnings losses post-displacement.

Table 1: The Long Run Impacts of Certification on Labor Market Outcomes Among Early Career Workers Displaced Pre- and Post-Expansion

	Income				Benefits	Industry
	(1)	(2)	(3)	(4)	(5)	(6)
	Percentile in Income Distribution	Income in Top 50%	Income in Top 25%	S.D. Income (1000s)	Ever receive U.I.	Employed in Same Pre-Disp. Industry
			Panel A - Female			
Disp.	-0.152	0.003	0.003	4.009***	0.006	-0.047***
	(0.570)	(0.013)	(0.009)	(1.400)	(0.007)	(0.009)
Disp. × Expansion	0.318	0.009	0.007	-5.235***	-0.033***	0.105***
	(0.915)	(0.021)	(0.015)	(2.028)	(0.012)	(0.019)
Individuals	48188	48188	48188	48127	48188	48188
Avg. Non-Disp.	48.358	0.447	0.141	52.380	0.088	0.255
			Panel B - Male			
Disp.	1.547***	0.036***	0.025***	4.814**	-0.001	-0.050***
	(0.448)	(0.011)	(0.009)	(1.883)	(0.007)	(0.007)
Disp. × Expansion	-0.616	-0.002	-0.004	3.681	-0.002	-0.021
	(0.787)	(0.020)	(0.017)	(4.772)	(0.013)	(0.015)
Individuals	66934	66934	66934	66806	66934	66934
Avg. Non-Disp.	55.366	0.578	0.203	71.616	0.102	0.205

Standard errors clustered at the individual level. ***, **, and * correspond to significance at the 1%, 5%, and 10% levels respectively. Table reports results from cross-sectional regression of one of six outcome variable (percentile in earnings distribution, 2 variables indicating if an individual is in the top 50% or top 25% of the income distribution, the standard deviation of income, a variable indicating if an individual ever received unemployment insurance, and a variable indicating if an individual is employed in the same industry they were displaced from) on displacement dummy interacted with $expansion_b$. Industry broadly defined as in Table B.1 as: manufacturing; wholesale & retail trades, restaurants, and hotels; public, education, health, and social work; and all other industries. National income distribution calculated using data on income from 2014–2018, separately by gender and for each birth cohort. Estimating equation: $Y_i = constant + \beta_1 \cdot D_i + \beta_2 \cdot D_i \times Expansion_b + \pi_b + \varepsilon_i$, where $D_i = 1$ if a worker was displaced from 23–27.

6.3 Occupational Choices and Task Composition of Work

6.3.1 Occupational Shifts among Post-Expansion Displaced Women

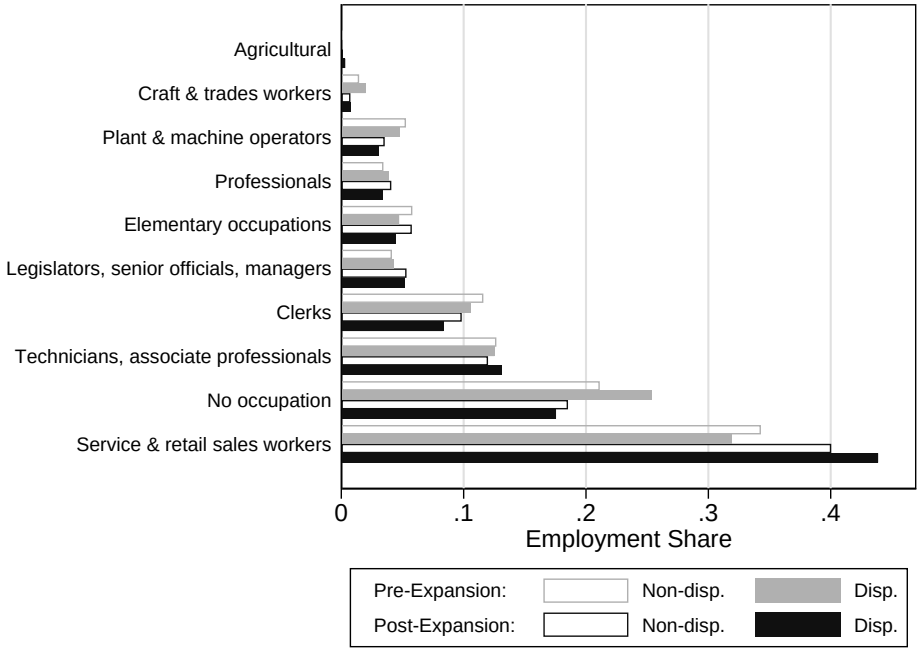
In the long run, women displaced post-expansion retain industry-specific human capital through certification and avoid switching to another sector. To further understand the benefits to remaining in the same type of work, the paper makes use of detailed occupation data available far later in life to understand how the composition of work changes. If workers who certify shift away from tasks whose importance has declined over time, such as routine tasks, and shift to non-routine tasks whose importance has increased over time, then certification enables workers to perform jobs which are in demand in the labor market. Previous work reveals that education is an important factor in occupational choices and the tasks performed within an occupation: higher skilled college educated workers have an advantage in performing non-routine tasks compared to non-college educated workers who traditionally specialize in more routine tasks (Autor et al., 2003).

As a starting point, Figure 8 compares the occupational choices among displaced women pre-expansion and displaced women post-expansion, both relative to their non-displaced counterparts. As in the previous section, occupations are measured much later in life, when early career displaced workers are between ages 41–45. Two clear differences between pre- and post-expansion displaced women emerge. First, those displaced post-expansion are substantially more likely to be employed in service and sales occupations. While women displaced post-expansion are nearly 4 ppt more likely to be employed in such occupations, those displaced pre-expansion are 2 ppt less likely to be employed in such occupations (panel B). The most common occupations among services are nursing assistants and care workers, the exact vocations which were included into the PCS after its expansion.

Second, those displaced post-expansion are 1 ppt *less* likely to have no occupation later in life, while those displaced pre-expansion are over 4 ppt *more* likely to have no occupation later in life. Thus, while there are shifts in the types of occupations performed among post-expansion displaced women, certification also impacts the extensive margin, the probability of being employed in any occupation. Such dramatic differences reinforce

Figure 8: Long-run Differences in Occupational Choices Between Early Career Displaced and Non-Displaced Workers, Pre- and Post-Expansion

(a) Occupational Shares, Levels



(b) Occupational Shares, Difference between Displaced and Non-Displaced

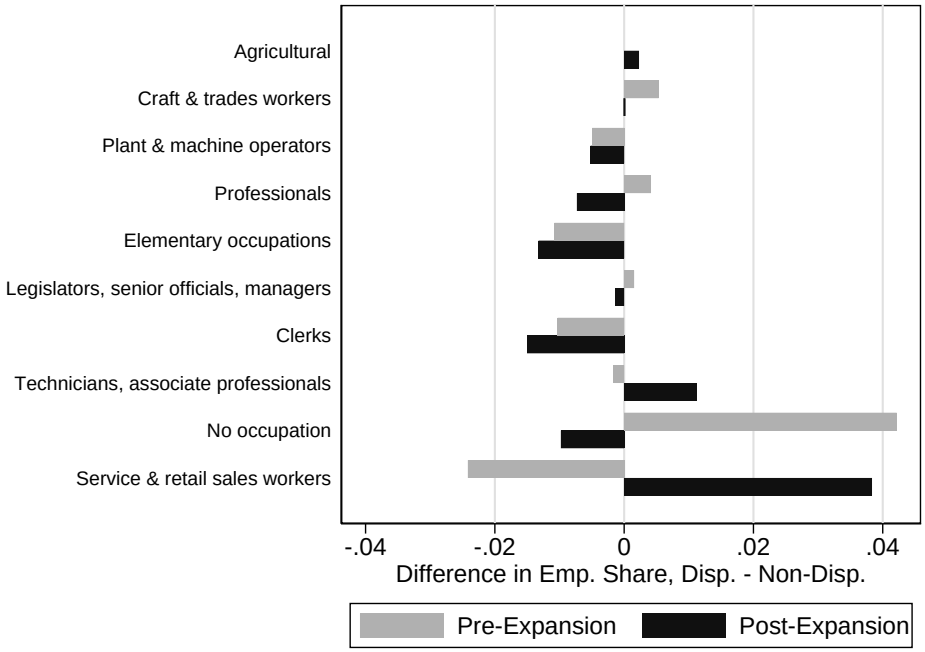


Figure plots the occupational shares of displaced and non-displaced women pre- and post-expansion (panel a) and the difference between displaced and non-displaced women pre- and post-expansion (panel b). Occupations are measured annually from 2008 (for 1990 cohort) until 2017 (for 1999 cohort), when sample of early career workers are aged 41–45. Occupations are classified according to the Norwegian standard classification of occupations as discussed in Appendix J. Sample of high-tenured workers defined as in Section 3.1.

the finding of the importance of job stability as a result of certification, as those women displaced prior to the expansion of the PCS struggle to find employment later in life as they remain significantly less educated after being laid off. In addition, such changes in the extensive margin are not observed among men whose access to certification remains unchanged post-expansion (see Section I).

6.3.2 Does Certification Impact On-the-job Tasks?

Table J.1 in Appendix J.4 reveals that the observed differences in occupational choices translate into meaningful shifts in the nature of work performed among young displaced workers, matching occupations to measures of math, routine, social, and service tasks using O*NET data as in Deming (2017).[17] In line with an extensive literature documents the role of computerization in the decline of clerical work and routine tasks as a whole (Autor et al., 2003; Goos et al., 2014) and the rise of work specializing in services (Autor and Dorn, 2013), women displaced post-expansion perform significantly higher levels of service tasks and significantly lower levels of routine tasks later in life.

7 Who is on the Margin of Returning to High School?

While displaced workers reevaluate the importance of completing high school after job displacement, it is less clear what underlying factors change between dropout and eventual certification. Appendix K presents a standard school decision for those deciding whether to restart education as in Becker (1975). In addition to directly impacting the opportunity cost of returning to education, displaced workers may update their expectations about the labor market prospects as a high school dropout as a direct result of job loss. Indeed, previous literature points to the importance of expectations about the benefits of education in major education decisions and that students may have wrong expectations (Jensen, 2010; Wiswall and Zafar, 2014). At the same time, displacement might directly impact how much an individual discounts the future. In addition, prefer-

[17] Appendix J details the linkage of occupations in the Norwegian register data to tasks in the U.S. O*NET data. Importantly, Appendix J.5 reveals that the observed differences in tasks are not driven by the matching process between occupations in the Norwegian classification system to occupations in the US classification system, as focusing on direct one to one matches reveals similar results.

ences may change with age such that, later in the life cycle, the same individual may be more mature or patient than their younger self (Lavecchia et al., 2016).

Further understanding precisely *who* decides to certify is crucial to shed light on the potential importance of such factors. Previous work emphasizes the importance of cognitive ability (Heckman and Vytlacil, 2001)—where more cognitively able students go further in education—and economic conditions during adolescence (Cascio and Narayan, 2019; Carrillo, 2020)—where students complete less education during positive economic shocks—for education decisions. Section L.1 reveals that while more cognitively able men return to education at significantly higher rates after job loss, those with an average IQ are also able to take advantage of second chance education. Thus, while those with higher levels of cognitive ability do return to the education system at significantly higher rates, the possibility to certify is an important second chance option which also benefits the typical worker with the sample average, lower level of IQ. Section L.2 suggests that students who experienced favorable employment opportunities while in school—those who have a parental co-worker and those living in areas during periods of lower unemployment levels—are particularly likely to certify. Such differences suggest that those who dropout to take advantage of such employment opportunities may drop out too soon (Oreopoulos, 2007).

8 Conclusion

How can high school dropouts recover from negative employment shocks and remain competitive in the labor market? This paper reveals that returning to education fosters recovery from negative shocks among high school dropouts. Comparing early career workers who are displaced both before and after an expansion of a second chance certification scheme reveals that attaining a vocational high school diploma in the aftermath of job loss significantly reduces the earnings penalties of job loss.

By leading young workers to certify their practical skills, job displacement has long-lasting consequences for young high school dropouts. In contrast to the displacement literature, which identifies persistent earnings losses following job loss, early career dis-

placement may actually be beneficial to workers through increases in education. Crucially, the availability of opportunities to formally certify skills matters: an unanticipated expansion of the certification scheme to include additional fields causes women displaced after the expansion to certify at significantly higher rates. This increase in certification among women displaced post-expansion leads to strong income recovery relative to women displaced pre-expansion, whose recovery is significantly weaker.

Making use of data on labor market outcomes far later in life sheds light on the mechanisms behind why certification fosters recovery from negative labor market shocks: by returning to the education system to attain a high school diploma, displaced workers are able to remain employed in the same industry and retain their extensive industry-specific human capital after job loss. Indeed, certification significantly increases the probability of remaining in the same industry which workers were displaced from in both the short- and long-run. Displaced workers benefit from their retention of industry-specific human capital in terms of increased job stability over 20 years later in life: those displaced post-expansion are significantly less reliant on unemployment insurance benefits, have a significantly less volatile income later in life, increase their specialization in service occupations, and shift away from routine tasks whose importance has declined over time. Given the declining demand for routine tasks established in the literature (Autor et al., 2003), such changes reduce the probability that workers displaced at young ages are afflicted by additional mass-layoff events.

This paper reveals that the work-to-school transition in vocational education is an important option for young workers who joined the labor market after dropping out of high school and that expanding second chance opportunities enables displaced workers to return to the education system. The paper's findings provide novel insights into the debate within the education literature on the importance of the relative merits of academic education—with its more general focus and transferable skills—compared vocational education—with its more narrow focus on specific occupational skills at the expense of broader skills—in the school-to-work transition (Ryan, 2001). Though vocational education can play an important role in developing relevant labor market skills,

it is traditionally marginalized in policy debates in favor of academic education (OECD, 2010).

Results are relevant to policymakers wishing to improve the prospects of high school dropouts, as they reveal that flexibility in the provision of second chance opportunities for formally documenting relevant skills within the education system fosters recovery from negative shocks. Among the 20–30% of a cohort who drop out of high school, a route for skill upgrading through certification of practical vocational skills offers gains in the labor market. In addition, the impacts of skill upgrading at young ages persist well into adulthood, consistent with the literature on active labor market programs which emphasizes the importance of human capital accumulation in the labor market benefits of ALMPs (Card et al., 2017). Indeed, skill upgrading in vocational education at young ages is an important opportunity for subsequent labor market outcomes among the low educated. As certification and licensing mandates have drastically increase over time (Kleiner and Krueger, 2013), the provision of second chances in the education system enables workers to not only bounce back from negative shocks but remain competitive in the labor market into adulthood.

References

Albæk, K., R. Asplund, E. Barth, L. Lindahl, M. Strøm, and P. Vanhala (2019). Better late than never? how late completion affects the early careers of dropouts. IZA Discussion Papers 12560, Institute of Labor Economics (IZA).

Anderson, D. M., R. Brown, K. K. Charles, and D. I. Rees (2020). Occupational licensing and maternal health: Evidence from early midwifery laws. *Journal of Political Economy 128*(11), 4337–4383.

Ashenfelter, O. (1978). Estimating the effect of training programs on earnings. *The Review of Economics and Statistics 60*(1), 47–57.

Autor, D. H. (2019, May). Work of the past, work of the future. *AEA Papers and Proceedings 109*, 1–32.

Autor, D. H. and D. Dorn (2013, August). The growth of low-skill service jobs and the polarization of the us labor market. *American Economic Review 103*(5), 1553–97.

Autor, D. H., F. Levy, and R. J. Murnane (2003, 11). The Skill Content of Recent Technological Change: An Empirical Exploration*. *The Quarterly Journal of Economics 118*(4), 1279–1333.

Becker, G. S. (1975). *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education, Second Edition*. NBER.

Bellemare, M. F. and C. J. Wichman (2020). Elasticities and the inverse hyperbolic sine transformation. *Oxford Bulletin of Economics and Statistics 82*(1), 50–61.

Bennett, P., R. Blundell, and K. G. Salvanes (2020, August). A Second Chance? Labor Market Returns to Adult Education Using School Reforms. IZA Discussion Papers 13592, Institute of Labor Economics (IZA).

Bennett, P. and A. Ouazad (2019, 10). Job Displacement, Unemployment, and Crime: Evidence from Danish Microdata and Reforms. *Journal of the European Economic Association 18*(5), 2182–2220.

Bertrand, M., M. Mogstad, and J. Mountjoy (2021). Improving educational pathways to social mobility: Evidence from norway's reform 94. *Journal of Labor Economics 39*(4), 965–1010.

Black, S. E., P. J. Devereux, and K. G. Salvanes (2005, March). Why the apple doesn't fall far: Understanding intergenerational transmission of human capital. *American Economic Review 95*(1), 437–449.

Black, S. E., P. J. Devereux, and K. G. Salvanes (2008). Staying in the classroom and out of the maternity ward? the effect of compulsory schooling laws on teenage births*. *The Economic Journal 118*(530), 1025–1054.

Black, S. E., P. J. Devereux, and K. G. Salvanes (2015). Losing heart? the effect of job displacement on health. *ILR Review 68*(4), 833–861.

Card, D., J. Kluve, and A. Weber (2017, 10). What Works? A Meta Analysis of Recent Active Labor Market Program Evaluations. *Journal of the European Economic Association 16*(3), 894–931.

Carrillo, B. (2020). Present bias and underinvestment in education? long-run effects of childhood exposure to booms in colombia. *Journal of Labor Economics 38*(4), 1127–1265.

Cascio, E. U. and A. Narayan (2019, February). Who needs a fracking education? the educational response to low-skill biased technological change. Working Paper 21359, National Bureau of Economic Research.

Charles, K. K. and M. Stephens Jr. (2004). Job displacement, disability, and divorce. *Journal of Labor Economics 22*(2), 489–522.

Couch, K. A. and D. W. Placzek (2010). Earnings losses of displaced workers revisited. *American Economic Review 100*(1), 572–89.

Del Bono, E., A. Weber, and R. Winter-Ebmer (2012). Clash of career and family: Fertility decisions after job displacement. *Journal of the European Economic Association 10*(4), 659–683.

Delaney, J. M. and P. J. Devereux (2019). More education, less volatility? the effect of education on earnings volatility over the life cycle. *Journal of Labor Economics 37*(1), 101–137.

Deming, D. J. (2017, 06). The Growing Importance of Social Skills in the Labor Market. *The Quarterly Journal of Economics 132*(4), 1593–1640.

Farber, H. S. (2015, May). Job loss in the great recession and its aftermath: U.s. evidence from the displaced workers survey. Working Paper 21216, National Bureau of Economic Research.

Farstad, H. (1999). *Vocational Education and Training in Norway*. EDC collection. European Centre for the Development of Vocational Training.

Flaaen, A., M. D. Shapiro, and I. Sorkin (2019, April). Reconsidering the consequences of worker displacements: Firm versus worker perspective. *American Economic Journal: Macroeconomics 11*(2), 193–227.

Gathmann, C., I. Helm, and U. Schönberg (2018). Spillover effects of mass layoffs. *Journal of the European Economic Association*, jvy045.

Goos, M., A. Manning, and A. Salomons (2014, August). Explaining job polarization: Routine-biased technological change and offshoring. *American Economic Review 104*(8), 2509–26.

Gregg, P. and E. Tominey (2005). The wage scar from male youth unemployment. *Labour Economics 12*(4), 487 – 509. European Association of Labour Economists 16th Annual Conference, Universidade Nova de Lisboa, Lisbon, 9th – 11th Sepetember, 2004.

Hall, C. (2012). The effects of reducing tracking in upper secondary school: Evidence from a large-scale pilot scheme. *Journal of Human Resources 47*(1), 237–269.

Hanushek, E. A., G. Schwerdt, L. Woessmann, and L. Zhang (2017). General education, vocational education, and labor-market outcomes over the lifecycle. *Journal of Human Resources 52*(1), 48–87.

Heckman, J. and E. Vytlacil (2001). Identifying the role of cognitive ability in explaining the level of and change in the return to schooling. *The Review of Economics and Statistics 83*(1), 1–12.

Heckman, J. J., J. E. Humphries, P. A. LaFontaine, and P. L. Rodríguez (2012). Taking the Easy Way Out: How the GED Testing Program Induces Students to Drop Out. *Journal of Labor Economics 30*(3), 495–520.

Heckman, J. J., J. E. Humphries, and N. S. Mader (2011). Chapter 9 - the ged. Volume 3 of *Handbook of the Economics of Education*, pp. 423 – 483. Elsevier.

Huttunen, K. and J. Kellokumpu (2016). The effect of job displacement on couples' fertility decisions. *Journal of Labor Economics 34*(2), 403–442.

Huttunen, K., J. Møen, and K. G. Salvanes (2011). How destructive is creative destruction? effects of job loss on job mobility, withdrawal and income. *Journal of the European Economic Association*.

Huttunen, K., J. Møen, and K. G. Salvanes (2018). Job loss and regional mobility. *Journal of Labor Economics 36*(2), 479–509.

Jacobson, L. S., R. J. LaLonde, and D. G. Sullivan (1993, September). Earnings losses of displaced workers. *The American Economic Review 83*(4), 685–709.

Jaeger, D. and M. Page (1996). Degrees matter: New evidence on sheepskin effects in the returns to education. *The Review of Economics and Statistics 78*(4), 733–40.

Jensen, R. (2010, 05). The (perceived) returns to education and the demand for schooling. *The Quarterly Journal of Economics 125*(2), 515–548.

Jepsen, C., P. Mueser, and K. Troske (2016). Labor market returns to the ged using regression discontinuity analysis. *Journal of Political Economy 124*(3), 621–649.

Kahn, L. B. (2010). The long-term labor market consequences of graduating from college in a bad economy. *Labour Economics 17*(2), 303 – 316.

Kirke-, utdannings- og forskningsdepartementet (1999). Med tradisjon mot framtida en analyse av resultatene fra fag- og svenneprøver i 1998.

Kleiner, M. M. and A. B. Krueger (2013). Analyzing the extent and influence of occupational licensing on the labor market. *Journal of Labor Economics 31*(2), S173–S202.

Kletzer, L. G. and R. W. Fairlie (2003). The long-term costs of job displacement for young adult workers. *ILR Review 56*(4), 682–698.

Krolikowski, P. (2018). Choosing a control group for displaced workers. *ILR Review 71*(5), 1232–1254.

Lachowska, M., A. Mas, and S. A. Woodbury (2020). Sources of displaced workers' long-term earnings losses. *American Economic Review 110*(10), 3231–66.

Lavecchia, A., H. Liu, and P. Oreopoulos (2016). Chapter 1 - behavioral economics of education: Progress and possibilities. Volume 5 of *Handbook of the Economics of Education*, pp. 1 – 74. Elsevier.

Malamud, O. and C. Pop-Eleches (2010). General education versus vocational training: Evidence from an economy in transition. *The Review of Economics and Statistics 92*(1), 43–60.

Michelsen, S., O. J. Olsen, and H. Høst (2014). Origins and development of vet 1850-2008 — an investigation into the norwegian case. Technical report, Nord-VET - The future of Vocational Education in the Nordic countries.

Neal, D. (1995). Industry-specific human capital: Evidence from displaced workers. *Journal of Labor Economics 13*(4), 653–677.

OECD (2010). *Learning for Jobs*. OECD Reviews of Vocational Education and Training.

Oosterbeek, H. and D. Webbink (2007). Wage effects of an extra year of basic vocational education. *Economics of Education Review 26*(4), 408 – 419.

Oreopoulos, P. (2007). Do dropouts drop out too soon? wealth, health and happiness from compulsory schooling. *Journal of Public Economics 91*(11), 2213 – 2229.

Oreopoulos, P., M. Page, and A. H. Stevens (2008). The intergenerational effects of worker displacement. *Journal of Labor Economics 26*(3), 455–000.

Raposo, P., P. Portugal, and A. Carneiro (2019). The sources of the wage losses of displaced workers: the role of the reallocation of workers into firms, matches, and job titles. *Journal of Human Resources*.

Ravallion, M. (2017). A concave log-like transformation allowing non-positive values. *Economics Letters 161*, 130 – 132.

Rege, M., K. Telle, and M. Votruba (2011). Parental job loss and children's school performance. *The Review of Economic Studies 78*(4), 1462–1489.

Ryan, P. (2001). The school-to-work transition: A cross-national perspective. *Journal of Economic Literature 39*(1), 34–92.

Schmieder, J. F., T. von Wachter, and J. Heining (2018). The costs of job displacement over the business cycle and its sources: Evidence from germany. Technical report.

Schwandt, H. and T. von Wachter (2019). Unlucky cohorts: Estimating the long-term effects of entering the labor market in a recession in large cross-sectional data sets. *Journal of Labor Economics 37*(S1), S161–S198.

Schwerdt, G. (2011, January). Labor turnover before plant closure: 'Leaving the sinking ship'; vs. 'Captain throwing ballast overboard'. *Labour Economics 18*(1), 93–101.

Stevens, A. H. (1997, January). Persistent effects of job displacement: The importance of multiple job losses. *Journal of Labor Economics 15*(1), 165–88.

Sullivan, D. and T. von Wachter (2009). Job displacement and mortality: An analysis using administrative data. *The Quarterly Journal of Economics 124*(3), 1265–1306.

Tangen, F. (2000). Oecd thematic reviewon adult learning norway background report. Technical report, Norwegian Ministry of Education, Research and Church Affairs.

Tyler, J. H., R. J. Murnane, and J. B. Willett (2000, 05). Estimating the Labor Market Signaling Value of the GED*. *The Quarterly Journal of Economics 115*(2), 431–468.

Von Wachter, T. and S. Bender (2006). In the right place at the wrong time: The role of firms and luck in young workers' careers. *American Economic Review 96*(5), 1679–1705.

Weiss, A. (1995, December). Human capital vs. signalling explanations of wages. *Journal of Economic Perspectives 9*(4), 133–154.

Wiswall, M. and B. Zafar (2014, 12). Determinants of college major choice: Identification using an information experiment. *The Review of Economic Studies 82*(2), 791–824.