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# Gender gaps from labor market shocks☆

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ABSTRACT

Job loss leads to persistent adverse labor market outcomes, but assessments of gender differences in labor market recovery are lacking. We utilize plant closures in Denmark to estimate gender gaps in labor market outcomes and document that women face an increased risk of unemployment and lose a larger share of their earnings in the two years following job displacement. The majority of the gender gap in unemployment remains after accounting for observable differences in human capital across men and women. In a standard decomposition framework, we document that child care imposes an important barrier to women's labor market recovery regardless of individual characteristics.

## 1. Introduction

Throughout the twentieth century, earnings and labor market participation rates of men and women converged alongside economic development in many middle- and high-income countries (Goldin, 1995). A large share of women moved from unpaid production in the home or in family businesses to being wage-earners in the labor market. With the inflow into paid employment, women have also become directly exposed to labor market shocks, such as job loss. While a large literature has established that job loss leads to persistently lower earnings and higher unemployment rates in the long run (e.g. Huttunen et al. (2011); Ichino et al. (2017); Jacobson et al. (1993); Lachowska et al. (2020)), an understanding of gender differences in labor market recovery following job loss remains unexplored.

This paper investigates what are the effects of *women's* and *men's* job loss on future labor market outcomes. The literature provides several potential explanations for why there may exist gender gaps after job loss. One important factor is the constraint that child care may impose on women's labor market recovery. Much evidence shows that the arrival of children drives a wedge between men's and women's labor market trajectories (Harkness and Waldfogel (2003); Angelov et al. (2016); Kleven et al. (2019b); Lundborg et al. (2017)). Women are likely to change jobs into more family-friendly workplaces around the arrival of their first child (Hotz et al. (2017); Nielsen et al. (2004)), and gender differences in willingness to commute and search-behavior increase with parenthood (Bütikofer et al. (2020); Le Barbanchon et al. (2021)). These factors may affect labor market outcomes following job loss. Another important source of overall gender gaps is differences in human capital, broadly defined to include education, occupation, and other types of sorting in the labor market (Card et al. (2015); Gallen et al. (2019); Goldin (2014); Goldin and Katz (2016); Petersen and Morgan (1995)). Such differences might affect disparities in labor market recovery. In this paper, we will try to disentangle the roles these two channels play for recovery following job loss.

To do so, we rely on full population employer-employee matched data from Denmark. The main advantage of our setting is the high quality of the Danish administrative data. In addition to relevant worker and firm-level information, we have linkable background information on each individual, such as their labor market experience, education, and family characteristics. Beyond estimating gender gaps following displacement, we are able to decompose the gender gaps into child-related inequality and inequality related to labor market experience.

To identify the effect of job loss on labor market outcomes, we use variation in job displacement from plant closures. As this is initiated by a firm-level shock, it makes the job loss and the timing plausibly exogenous to the individual. Our treatment group consists of men and women, who are employed at the closing plant within manufacturing at least one year before the first year of closure and have experienced one plant closure between 1995 and 2006. We defined the control group as workers matched on sociodemographic characteristics employed in a plant that

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is not closing. Our identifying assumption of the displacement effect is that the labor market outcomes of the individuals in the displacement and control groups would have evolved similarly over time in the absence of the displacement. We verify this parallel trends assumption by examining the leads to the event. We compute the gender gaps following displacement as the differences in labor market trajectories of men and women following the plant closure, which can be understood as the unconditional gender gap in displacement. To account for gender differences in confounding factors, we perform matching of men to women providing us with a new sample containing men similar to the women on observable characteristics. This allows us to compute the conditional gender gap. While the unconditional gap is the policy relevant estimate, the conditional gap is important for understanding the source of persistent gender gaps.

We find substantial gender gaps in the risk of unemployment following job loss. For both men and women, job loss leads to a reduction in earnings and an increase in unemployment for at least six years. Women on average experience a 14.2 percentage point increase in the probability of unemployment over the first two years, while for men this is lower at 9.8 percentage points. This amounts to a relative gender gap of 45% in the risk of unemployment. Over time, the gender gap in unemployment risk decreases and closes four years after job displacement. Women also experience a larger relative loss in earnings. In the first year, the unconditional relative gender gap in the change in earnings is 44% (8.6 percentage points), as men lose on average 19.6 % of their earnings while women lose 28.2 % of their earnings. In the fourth year following displacement, the gender gap disappears. We don't find a gender gap in participation rates.

Heterogeneity analysis shows that workers with little formal training face the most adverse labor market trajectories after job loss with a large relative gender gap. Meanwhile, there is little or no gender gap among workers with vocational training or higher education. While women are worse off across all age groups, older women face the greatest absolute risk of unemployment and the biggest drop in earnings. However, the relative gender gaps are greatest among workers between ages 35 to 50. We also show that the relative gender gap increases by 2.5x from 33% in households without children to 80% in households with children. To disentangle why women are consistently worse off, we turn to the relative importance of human capital and the role of child care. The conditional gender gaps, controlling for differences in human capital, are smaller but never fully closed. Subsequently, we perform a Kitagawa (1955)-Oaxaca (1973)-Blinder (1973) decomposition. We show that gender differences in human capital explain 1/3 of the gap in unemployment and 2/3 of the gap in earnings. Child care is an important contributor to the residual gap. If men and women were equally affected by the presence of small children, the gender gap in earnings would have been halved and the gender gap in employment would have been reduced by 1/3. Finally, we show that initial sorting across occupations and sectors does not affect the gender gap in unemployment following displacement.

The main contribution of this paper is to address a shortcoming in the existing literature on adverse outcomes following job loss: the almost complete absence of women. In this literature, it is common to purely focus on male workers (e.g. Oreopoulos et al. (2008); Sullivan and Von Wachter (2009); Browning and Heinesen (2012); Davis and Von Wachter (2011); Halla et al. (2020); Huttunen et al. (2011); Seim (2019)).[1] Even among the studies that include women in their sample, they seldomly address gender differences (e.g. Eliason and Storrie (2006); Jung and Kuhn (2018); Lachowska et al. (2020); Rege et al. (2009)). This tradition implies that conditions and constraints that are particularly important for women have not been identified and investigated. The paper closest to ours is the work by Illing et al. (2021) who use German data to compare men and women and find that women's earnings losses are about 35% greater than men's upon displacement. This is partly driven by women being more likely to take up part-time work and mini-jobs, but also by lower earnings in full-time jobs.[2] We contribute with an explicit analysis of gender gaps in labor market outcomes following displacement and explore the circumstances under which gender gaps are mitigated or exacerbated. We decompose the gender gaps and show that men are better able than women to recover as a result of higher levels of human capital and by not being constrained by child care.

Existing evidence shows that trade-pressure has led to an increase in labor market polarization (Autor et al. (2015); Hummels et al. (2014)) alongside a rise in service-based employment and has reduced gender gaps in labor market opportunities and outcomes (Ngai and Petrongolo (2017); Petrongolo and Ronchi (2020)). However, there is little evidence of how this transition affects gender gaps among workers in declining sectors.[3] In our sample, women constitute 30% of the exposed workers. We focus on closing plants in manufacturing and document that, within goods production, women are worse off.

Our paper also contributes to the literature on gender gaps and parenthood. It is well-established that women's labor market trajectories drop dramatically at the onset of parenthood (Angelov et al. (2016); Berniell et al. (2021); Daniel et al. (2013); Delecourt and Fitzpatrick (2021); Ejrnæs and Kunze (2013); Harkness and Waldfogel (2003); Kleven et al. (2019b); Lundborg et al. (2017)). This is partly attributed to reduced labor supply and employment in more flexible settings (Hotz et al. (2017); Kleven et al. (2019b); Nielsen et al. (2004)). When the responsibility of child care falls disproportionately on women, it likely imposes a barrier to labor market recovery.[4] We document that having children increases the gender gap following job loss, regardless of mothers' characteristics. This provides insights into the mechanisms of the child penalty. Even after going back to work post birth, mothers' ability to adjust to labor market shocks is constrained by child care responsibilities.

The remainder of the paper is organized as follows. Section 2 describes the institutional background, data, and the definition of plant closures. Section 3 presents the research design. Section 4 contains the results along with robustness checks, and Section 5 discusses the mechanisms behind it. Section 6 concludes the paper.

## 2. Background and data

In this section, we outline the main features of the Danish labor market and present a summary of Denmark's progress on gender equality. We describe the data and present the definition of plant closures and the displaced workers.

### 2.1. The Danish labor market

Danish firms can adjust employment with relative ease as a result of lax employment protection legislation. Wages are high, but indirect wage costs are among the lowest in the world (Eriksson and Westergaard-Nielsen, 2009). This labor market model has led to job turnover rates that are similar to the UK and US rather than the rest

[1] See Table Appendix A for a comprehensive overview of the sex composition in this literature among papers that include estimates of labor market outcomes.

[2] Other examples of an explicit focus on women include the work by Bono et al. (2012) showing that women's job loss leads to reduced fertility. Several papers have investigated women's responses to their husband's job loss (Halla et al. (2020); Hardoy and Schøne (2014); Skoufias and Parker (2006)).

[3] Exceptions to this include Aksoy et al. (2021), Ge and Zhou (2020) and Keller and Utar (2018). While men often are the mode worker, women have worked in goods production since the onset of the industrial revolution (Wikander et al., 1995).

[4] Mörk et al. (2020) and Ruiz-Valenzuela (2021) provide overviews of the literature on job loss and inter-generational spillovers. This literature stands out in the job loss literature more broadly by often including a comparison between maternal and paternal job loss.

of continental Europe (Botero et al. (2004); Hobijn and Sahin (2009)). Most employment spells are short (Andersen, 2021), and occupational mobility is high (Groes et al., 2015). Relatively generous unemployment insurance ensures that workers bear low costs of changing jobs. The majority of workers pay for voluntary unemployment insurance.

The combination of a flexible labor market and fairly generous unemployment insurance is often referred to as the "flexicurity model". An additional component of the model is the active labor market policies. These policies provide search assistance and retraining programs as well as monitor the recipients. Unemployed individuals receive income support and public assistance in getting back to work. During the unemployment spell, individuals are required to actively search for and accept appropriate job offers.[5]

A large reform in 1993/1994 decreased the maximum time on unemployment insurance from eight to four years, and heavily increased monitoring and sanctions. The goal of the reform, which took place prior to the period we cover, was both to reduce the unemployment rate and moral hazard problems (see Kreiner and Svarer (2022) for an in-depth description and review of evidence). Search unemployment and registered unemployment are aligned in the period we cover, with an average unemployment rate of 6% (Andersen and Svarer, 2007).[6] The level of UI is constant for 4 years set at 90% of former earnings with a cap on the higher bound. After four years, individuals can receive means-tested social assistance.

Our analysis covers 1995 to 2006, which is a period of a substantial increase in globalization and integration of national economies, influencing the Danish economy in general and the Danish manufacturing industry more specifically. While the 'flexicurity model' has mitigated some of the shocks (Andersen (2021); Humlum and Munch (2019)), offshoring of routine tasks in manufacturing has led to increased wage polarization (Gu et al. (2020); Hummels et al. (2014)). A substantial part of Danish slaughterhouses was closed in the 00s, and livestock has instead been transported to central Europe. China's entry into the WTO largely eradicated what was left of Danish textile production (Utar, 2018).

### 2.2. Gender equality in Denmark

Denmark has, alongside other Nordic countries, long been praised for social policies that enable high female labor force participation. Compared to international standards, there is a relatively small gender gap in labor force participation, and more than 80% of Danish mothers with children below the age of 10 work outside the home, and 2/3 work full time (Leira, 2010). Women's paid work increased dramatically from the 1960s onwards alongside expansions of the public sector that institutionalized work that previously took place in the family (Datta Gupta et al., 2008). The gender gap in participation decreased until the early '90s and has remained fairly stable since. Couples in Denmark face individual taxation, which creates a strong incentive for secondary earners, often women, to participate in the labor market (Selin, 2014). Other public policies include parental leave schemes and daycare with nearly universal coverage (Leira, 2010). The majority of the remaining gender gap is driven by the child penalty (Kleven et al., 2019b). Upon parenthood, men's labor market trajectory is unaffected, while women reduce hours and opt for jobs with more flexibility (Kleven et al. (2019b); Nielsen et al. (2004)).

### 2.3. Data sources and descriptive statistics

The starting point of our analysis is the Danish employer-employee matched register data covering the universe of Danish workplaces and all the corresponding workers. This register contains key labor market information such as wages, tenure, labor market status, and occupation. Information on unemployment insurance and social assistance allows us to construct a reliable measure for non-participation, i.e. exits from the labor market. We define non-participation as the fraction of the year where an individual is neither working nor complying with the active labor market policies (outlined in Section 2.1). Mandatory pension payments are used to infer hours worked, and we use this information to create a measure of labor market experience. We link this data with background information on sex, education, age, place of residence, marital status, and the number of children below the age of 18 in the household.[7]

We consider the period from 1995 to 2006 for two reasons. First, while the employer-employee matched data goes back to 1981, Danish women's labor market participation did not plateau until the early 1990s. Second, we purposely end our analysis before the financial crisis. The shocks induced by the crisis affected many dimensions of the Danish economy (Bonin (2020); Jensen and Johannesen (2017); Renkin and Züllig (2021)). More importantly, men's labor force participation decreased more during the crisis than women's labor force participation. In sum, we consider a period where labor force participation of Danish men and women moved in tandem.

For each private-sector workplace with at least five workers, we classify a workplace as closing if the number of workers in the workplace is reduced by 90% or more between year $t-3$ and $t$. Hence, our definition of an event is stricter than that of a mass layoff; it describes full plant closures and largely follows Bingley and Westergaard-Nielsen (2003) and Browning and Heinesen (2012).[8] With this definition of a plant closure as a shock to displacement, we plausibly estimate a shock that is more orthogonal to displaced workers' characteristics than a mass layoff, where a large, yet selected share of workers within a plant lose their job. We prefer to use the broader sample than one-year closures for two reasons. First, it doubles our sample size, which is particularly important as it allows us to gain power for heterogeneity analysis. Second, in many cases plant closures last for longer than one year as it administratively takes a longer period to completely close down the operations, so by allowing for a longer time period of closures we are capturing a more accurate definition of plants that close.[9] Ninety-five percent of the plants close fully and retain zero workers. The remaining 5% retain on average 2.4 workers (median: 1). This number likely signifies either administrative workers finalizing the closure or simply a registration issue, likely occurring in firms with multiple plants. Forty-nine percent of plants belong to firms that have multiple plants. On average, the workers are displaced from plants with 185 workers (median: 53). Displaced workers are categorized as treated the year they separate from the closing plant. In the robustness section, we modify our definitions by only including plants closing over one year and by increasing the cut-off for the size of plants we consider.

Our treatment group consists of men and women who are employed at the plant (that has five workers or more) within the manufacturing

[5] Individuals claiming either unemployment insurance or social assistance have regular meetings with a caseworker. The first meeting takes place within 1 month of unemployment and the frequency increases within the spell. The caseworker evaluates the effort and decides if there is a need for e.g. a short job search course, educational requalification, or internships at private or public workplaces. Failures to e.g. show up for appointments or accept a suitable job are met with sanctions (Svarer, 2011).

[6] From 1981–2006, the average difference between the unemployment rate of the young population groups (25–29) and the population over 30 was 3%-point, well below the EU average of 5%-point (Hernanz and Jimeno, 2017).

[7] The number of children is based on residency, implying that children not living with their parent are not included and potential stepchildren in the household are included.

[8] Bingley and Westergaard-Nielsen (2003) investigate the role of firm-specific human capital in labor market trajectory following job loss. Browning and Heinesen (2012) document increased risk of mortality and hospitalization among displaced men. Both papers use Danish data.

[9] To ensure that we do not misclassify a workplace as closing due to a merger, administrative changes in legal structure, etc., we follow the displaced workers and calculate the share of workers that remain co-workers the following year. If this share is above 50 percent, we do not consider the plant to be closing.

industry at least one year before the first year of closure (note that they could be displaced in either the first, second, or third year of the closure) and have experienced one plant closure between 1995 and 2006. We exclude workers who are students, self-employed, top managers, and those on (part-time) early retirement in the event year, but we do not condition on future labor market outcomes. We focus exclusively on plant closures in the manufacturing sector. Seventy percent of all exposed workers in the sample period are in plants that are in the manufacturing sector.[10] We only allow for workers to be treated once between 1995 and 2006. While it is fairly rare for workers to be treated more than once, when we exclude these workers this leads to about a 7.5% reduction in the $person \times year$ number of observations. Displaced workers are categorized as treated the year they separate from the closing plant.[11]

We follow the most recent literature (de Chaisemartin and D'Haultfœuille, 2020) and define the control group as only including workers who never experience a plant closure with the same set of restrictions as the displaced workers. Our identification strategy relies on choosing an appropriate control group of workers. We apply coarsened exact matching to match one-to-one without replacement to find the most suitable control group.[12] We perform the matching separately for men and women and match on pre-displacement (t-1) quintiles of earnings, marital status, age, educational groups, quintiles of tenure at the firm, unemployment status, labor market experience, and industry (27 code classification).[13] We do so for values of these covariates in the year before workers are treated (and a randomly assigned year for the control group that follows the same distribution of years as plant closures).

In Appendix B, we report balancing tests of both these and other variables not used in the matching and find that they, on average, balance. Our final sample consists of 1,492,791 observations, corresponding to 133,768 unique individuals, of which, due to 1:1 matching, half of them are treated. We have 47,668 treated men and 19,230 treated women, corresponding to a female share of 30%.[14] In Fig. 1, we report the evolution in the risk of unemployment for control and treated workers, for women and men when compared to workers of their own gender. Prior to displacement, the two groups have extremely similar labor market trajectories. Moving on, we report the difference between the control and treatment groups.

*Computing the conditional gap*

Beyond comparing treated workers to similar-on-observables control workers (what we will refer to as the unconditional gender gap), we are also interested in understanding the size of the gender gap when relevant observable characteristics are held constant except gender between men and women (what we will refer to as the conditional gender gap). Intuitively, we would like to compare the labor market trajectory of a treated man and a treated woman with the same age, same education, same likelihood of unemployment, same labor market experience, same tenure at the firm, and within the same industry to the labor market trajectory of a control man and a control woman with exactly the same age, same education, same likelihood of unemployment, same labor market experience, same tenure at the firm, and within the same industry. To do so empirically, before we match treated workers to control workers described above, we match men to women workers using Eq. (1):

$$Female_i = \alpha + education_i + age_i + industry_i + tenure_i + income_i + unemployment_i + experience_i + u_i \quad (1)$$

where the matching covariates are measured in the year before displacement for the treated group and the year before the randomly assigned year for the control group. The outcome variable is $Female_i$ - we choose to use women as the baseline because the sample of women is smaller (30% of the sample). $Education_i$ measures the education category of individual $i$ in the year before displacement, $Age_i$ is the age of individual $i$ in the year before displacement, $industry_i$ are the 27 subcategories describing the industry of individual $i$ in the year before displacement, $tenure_i$ are the quintiles of tenure at the firm of individual $i$ in the year before displacement, $income_i$ are the quintiles of income at the firm of individual $i$ in the year before displacement, $unemployment_i$ is the number of weeks unemployed of individual $i$ in the year before displacement, $experience_i$ is the measure of labor market experience, obtained from mandatory pension contributions of individual $i$ in the year before displacement.

This provides us with a new 're-matched' sample containing men similar to the women in our sample. The result of this exercise is reported in Fig. 1 panel (c). For the four years prior to the event, women and the re-matched men are following similar employment trajectories. In the years -5 and -6, men are facing slightly lower unemployment probability than women with similar characteristics. Following the event, re-matched men who were displaced are facing a risk of unemployment that is lower than women's and higher than the men's in our baseline sample.

In Table 1, we report covariates separately for men and women for our estimating sample after having performed the matching. The year prior to displacement, exposed men earned 3700 DKK (~ € 500 per year) more compared to the control group (adjusted to 2019-levels). While this difference is statistically significant at a 1% significance level, this is hardly an economically meaningful amount. Comparing the men and the women, the most striking differences are on educational levels and earnings. The women are much more likely to have little formal training, i.e. high school or less (50% vs. 34%). The year prior to displacement, the women earned 100,000 DKK (~ € 13,500) less than the men. This corresponds to a gender gap of 26%, while the gender gap in the full private sector labor market is just slightly smaller. The partners of the women earn a larger share of the household income than the partners of the men (49% vs 32%), implying that household income is higher for the men compared to the women. The largest sector for both sexes is 'Iron & Metal', followed by 'Food, Drinks & Tobacco'. For parental status and marital status, men and women are similar. The workers in our sample are representative of the population of Danish private-sector workers.

## 3. Empirical strategy

This paper assesses gender differences in labor market recovery following job displacement. With the aim of estimating the effect of job loss

[10] Every other sector has a share of exposed workers almost tenfold less, such as 'Retail & Service' (9% of workers), 'Finance & Insurance' (6% of workers) and 'Construction' (5% of workers). Men are over-represented in construction, while women are over-represented in the service sector.

[11] Our sample is not balanced as we allow for workers to enter employment (as opposed to being e.g. student workers, self-employed or part-time retired) later than the first year of our analysis (1995). Attrition is limited to migration out of Denmark and mortality. 80.5% of individuals are observed for all 12 years, an additional 6.2% are observed for 11 years and just 1.1% are observed for fewer than 6 years. Workers who are not observed throughout the period are on average 5.1 years younger than workers observed all 12 years.

[12] The intention of this part of our research design was to create a subsample of workers within our large control group most similar on observable labor market characteristics to our treated workers. We aimed to choose the most important individual characteristics that might influence job loss and future labor market trajectory while keeping in mind that an increasing number of covariates included increases the difficulty of finding common support in one-to-one coarsened exact matching. Our choice of matching covariates is similar to the most recent papers using plant closures in Denmark, such as Bertheau et al. (2021) and Foerster et al. (2022).

[13] Our matching procedure and the ensuing results do not change if we add occupation to our matching covariates. These results are available on request.

[14] Our sample is larger than the sample used by Browning and Heinesen (2012). They exclude female workers and impose restrictions to ensure stable full-time employment for up to 3 years prior to the event, and only include single-plant establishments. Restricting on stable full-time employment has bigger implications for the number of displaced women we can consider (reducing our sample to 9.122 displaced women). They cover 1985–2001 and as reported in Appendix G, events are more common in the 00s than in the 90s.

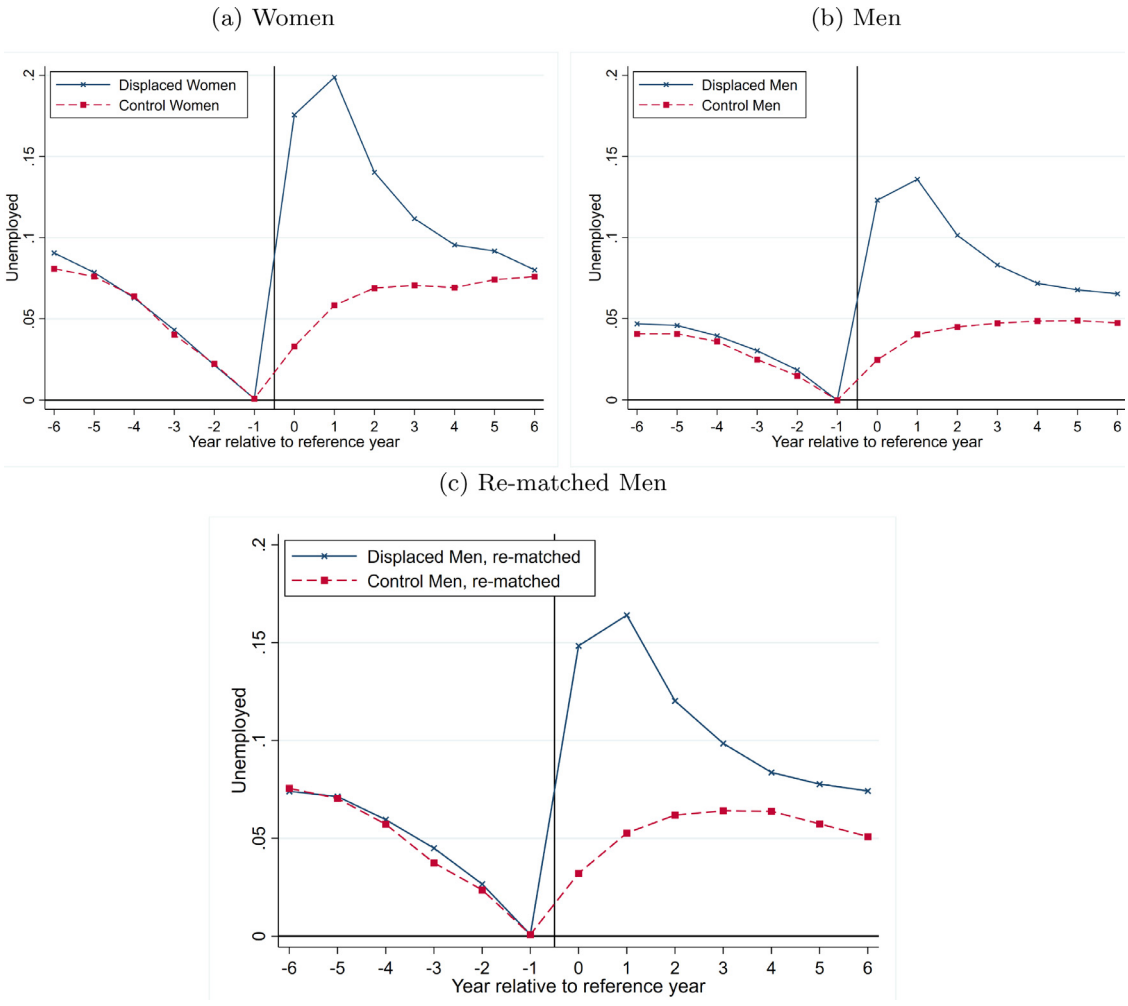



**Fig. 1.** Risk of Unemployment, Treatment and Control *Notes:* Evolution of the risk of unemployment (claiming benefits for 3 months or more) for the exposed and control workers. Panel (a) compares the probability to be unemployed (i.e. claiming benefits for 3 months or more) of women who are displaced (blue, X) to the control women (red, circles) based on estimation Equation 1. Panel (b) shows the equivalent picture for men. The control group is a matched control group that resembles the displaced individual at the reference date. Panel (c) reports the results for a sample of men that are similar to the sample of women, based on observable characteristics. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

on future labor market outcomes, concerns related to endogeneity arise. The likelihood of a worker being displaced is likely to be correlated to individual unobservable characteristics. To overcome these issues of endogeneity, we exploit plant closures in the manufacturing sector, making the timing of the job loss plausibly exogenous to the individual as it is initiated by a firm-level shock.

Our research design uses an event study specification, following seminal work in this literature such as Jacobson et al. (1993), Sullivan and Von Wachter (2009), and more recently, Bertheau et al. (2021). This approach allows us to estimate the dynamic effects of job loss on displaced workers using the following baseline model separately for men and women:

$$Y_{i,j,t} = \alpha + \sum_{k=-6,t\neq-1}^{6} \beta_k PlantClosure_{i,j,t+k} + \sum_{k=-6,t\neq-1}^{6} \lambda_k Time_{i,j,t+k} + \theta_t + \theta_t \times \delta_j + u_{i,j,t} \quad (2)$$

where $Y_{i,j,t}$ is the dependent variable, $PlantClosure_{i,j,t+k}$ is a dummy variable equal to one in the year $t+k$ since the job displacement for individual $i$ employed in plant $p$ in the year of displacement, $Time_{i,j,t+k}$ identifies $t+k$ years since the event to capture cohort effects, $\theta_t$ captures year fixed effects, and $\theta_t \times \delta_j$ estimates municipality specific year fixed effects.[15] The dependent variables include unemployment (whether the individual $i$ is unemployed for at least 12 weeks in year $t$), labor earnings (the total labor income of individual $i$ in year $t$), changes in earnings (computed as the ratio of labor earnings of individual $i$ at time $t$ divided by the average earnings of individual $i$ in three years prior to year before plant closure ($t^* - 4$, $t^* - 3$ and $t^* - 2$), and labor market participation (the fraction of the year the individual $i$ is employed or actively searching in year $t$).[16]

This estimation strategy is a generalization of the Difference-in-Differences method and relies on the assumption that earnings and the risk of unemployment would have evolved similarly in the

[15] Identifying the effect of plant closure on the exposed workers relies on the assumption that the plant closure does not affect the control group. If plant closures are large enough to affect the local labor market the control group will also be affected. Appendix C shows the dispersion of exposed workers across Denmark. Workers live in all municipalities except for small islands. Within commuting zones, the closures appear to be fairly spread out in the country. In the preferred specification, we include an interaction term between year and municipalities to capture local labor market effects. This makes little difference relative to the inclusion of municipality and year-fixed effects separately.

[16] We separately estimate Eq. (2) for the sample of men and the sample of women allowing the full set of fixed effects to vary differently for the men and the women.

**Table 1**
Characteristics of the estimating sample, by gender.

| | Men | | Women | |
|---|---|---|---|---|
| | Control | Treatment | Control | Treatment |
| Age | 40.947 | 40.909 | 39.967 | 39.904 |
| | (11.018) | (11.108) | (10.553) | (10.719) |
| Age, relative to partner | 2.150 | 2.161 | -2.699 | -2.622 |
| | (4.065) | (4.163) | (4.488) | (4.387) |
| Children in the HH, dummy | 0.494 | 0.483 | 0.555 | 0.547 |
| | (0.500) | (0.500) | (0.497) | (0.498) |
| Number of Children | 0.883 | 0.858 | 0.951 | 0.944 |
| | (1.050) | (1.042) | (1.007) | (1.029) |
| Married | 0.551 | 0.550 | 0.584 | 0.583 |
| | (0.497) | (0.498) | (0.493) | (0.493) |
| Cohabit | 0.169 | 0.162 | 0.171 | 0.157 |
| | (0.375) | (0.368) | (0.376) | (0.364) |
| Vocational degree | 0.499 | 0.499 | 0.341 | 0.342 |
| | (0.500) | (0.500) | (0.474) | (0.474) |
| High school diploma or less | 0.351 | 0.353 | 0.541 | 0.535 |
| | (0.477) | (0.478) | (0.498) | (0.499) |
| A university degree | 0.150 | 0.149 | 0.118 | 0.123 |
| | (0.357) | (0.356) | (0.323) | (0.328) |
| Middle-management | 0.109 | 0.107 | 0.042 | 0.044 |
| | (0.311) | (0.309) | (0.200) | (0.206) |
| | Industry | | | |
| Iron & Metal | 0.479 | 0.472 | 0.354 | 0.348 |
| | (0.500) | (0.499) | (0.478) | (0.476) |
| Wood, Paper & Graphics | 0.137 | 0.137 | 0.158 | 0.159 |
| | (0.344) | (0.344) | (0.365) | (0.365) |
| Food, Drinks & Tobacco | 0.188 | 0.186 | 0.242 | 0.246 |
| | (0.391) | (0.389) | (0.429) | (0.431) |
| | Earnings | | | |
| Earnings | 394,476 | 390,835 | 290,950 | 289,274 |
| | (183,787) | (171,477) | (113,515) | (114,219) |
| Male income share | 0.675 | 0.680 | 0.513 | 0.516 |
| | (0.195) | (0.192) | (0.224) | (0.228) |
| Observations | 47,678 | 47,678 | 19,234 | 19,234 |

*Notes:* The table contains means and standard deviation (in parentheses) of key variables in the year prior to the event. Family information is obtained from full population registers, education refers to the highest completed degree. Earnings, sector, and management dummies are obtained from the employer-employee matched data. Earnings are adjusted for inflation and reported in 2019-levels. Male income share is reported conditional on being married or cohabiting.

treated and control group in the absence of the plant closure, i.e. the assumption of parallel trends. Our parameters of interest are $\beta_k$ for $k = -6, -5, \dots, 0, 1, \dots, 6$, capturing the dynamic effects in 6 years before and after the plant closure of the workers exposed to the plant closure compared to similar workers. We interpret the significance of the $\beta_k$ for $k = 0, 1, \dots, 6$ coefficients as evidence of the causal relationship between job displacement and future labor market outcomes. Additionally, the absence of meaningful effects in the pre-period can rule out anticipation effects.

To confirm the validity of our findings, we conduct the following robustness checks. First, we check that our estimates are not sensitive to the cutoff in the plant size definition. Second, we report results for workers displaced from plants that close within one calendar year and for all displaced workers except early leavers. Third, we check the robustness of our findings in light of the new advances in the two-way fixed effects (TWFE) literature.

We estimate Eq. (2) on two samples described in the data section. First, use the sample of all displaced men and women matched to similar workers of their own gender. This provides us with the unconditional gender gap. Next, we use the sample of the displaced men that are similar to women on observables characteristics as described in Section 'Computing the conditional gap'. Once we estimate Eq. (2) on this matched men sample, the estimates are obtained by comparing the treated to the control men within this sample. This provides a gender gap where differences in observable characteristics are taken into account (conditional gender gap). Moving on we report absolute gender gaps as the percentage point difference in the estimates for women minus the estimates for men, and the relative gender gaps as the % difference calculated as the $\frac{\beta_{women}}{\beta_{men}} - 1$.

## 4. Gender gaps following job displacement

To measure the effect of women's and men's job loss on future labor market outcomes, we start by presenting results estimating Eq. (2) for labor market outcomes for men and women respectively for up to 6 years following displacement. We investigate how sensitive our results are to definitions of the displaced group. We also show that our results are robust to recent advances regarding TWFE applications with differential timing in treatment.

We then turn to the role of workers' characteristics to explore the circumstances under which gender gaps might be mitigated or exacerbated. Motivated by the existing literature, we investigate heterogeneity by age and educational attainment. We also report heterogeneity by the presence of children in the household. Finally, we perform a Kitagawa (1955)-Oaxaca (1973)-Blinder (1973) decomposition to quantify the role of different observable characteristics of displaced men and women.

### 4.1. Main results

Fig. 2 reports yearly labor market outcomes following displacement for men and women. Displaced men and women face an increased risk of entering long-term unemployment and experience substantial drops in earnings for up to six years. In the year of displacement and the following year, there is a substantial gender gap in the risk of entering unemployment (for three months or more) as shown in panel a) of Fig. 2. Women face an increased risk of 14.2percentage points, while men experience an increase in risk by around 9.8 percentage points. The absolute gender gap is 4.4 percentage points, and the relative gender gap equals to 45%. Following the initial two years, the gender gap is greatly reduced and finally disappears.

Women experience a larger initial percentage drop in earnings as shown in panel b) of Fig. 2. The outcome variable reported is the relative change in earnings. In the first year, the unconditional gender gap in the change in earnings is 8.6 percentage points (or a relative gender gap of 44%), as men lose on average 19.6 % of their earnings while women lose 28.2 % of their earnings, relative to predisplacement earnings. In the fourth year following displacement, the gender gap disappears. Men lose a larger absolute amount of income. In the year of displacement and the following year, men lose 65,500 DKK (€ 8,800) while women lose 57,200 DKK (€ 7,700) as shown in panel c) of Fig. 2. This gap remains statistically significant throughout the period. The baseline gender gap in the year prior to the event is 100.000 DKK (€ 13.400), corresponding to 26%. The job displacement leads to an average additional loss of €1,100 for women as compared to men (the gender gap in earnings loss) which increases the gender gap in earnings by around 8% from its baseline prior to displacement.

Looking at non-participation rates (defined as the residual of time spent in employment and time spent being registered as unemployed), we don't find a gender gap following displacement. Both men and women face a 9 percentage point increase in the likelihood of being registered as non-participating.

Subsequently using the matched sample of men with characteristics that are similar to the sample of women, we estimate the conditional increase in the risk of unemployment following job loss for men and women to compare the conditional and unconditional gender gap. The majority of the gender gap in unemployment remains. Among the men matched on observables to women, the risk of unemployment stands at 12 percentage points. This leads to a decrease in the magnitude of the gender gap, from the relative unconditional 45% gender gap to the relative conditional 18% gender gap in the risk of unemployment. Men similar to women experience 21–28% drop in relative earnings in the

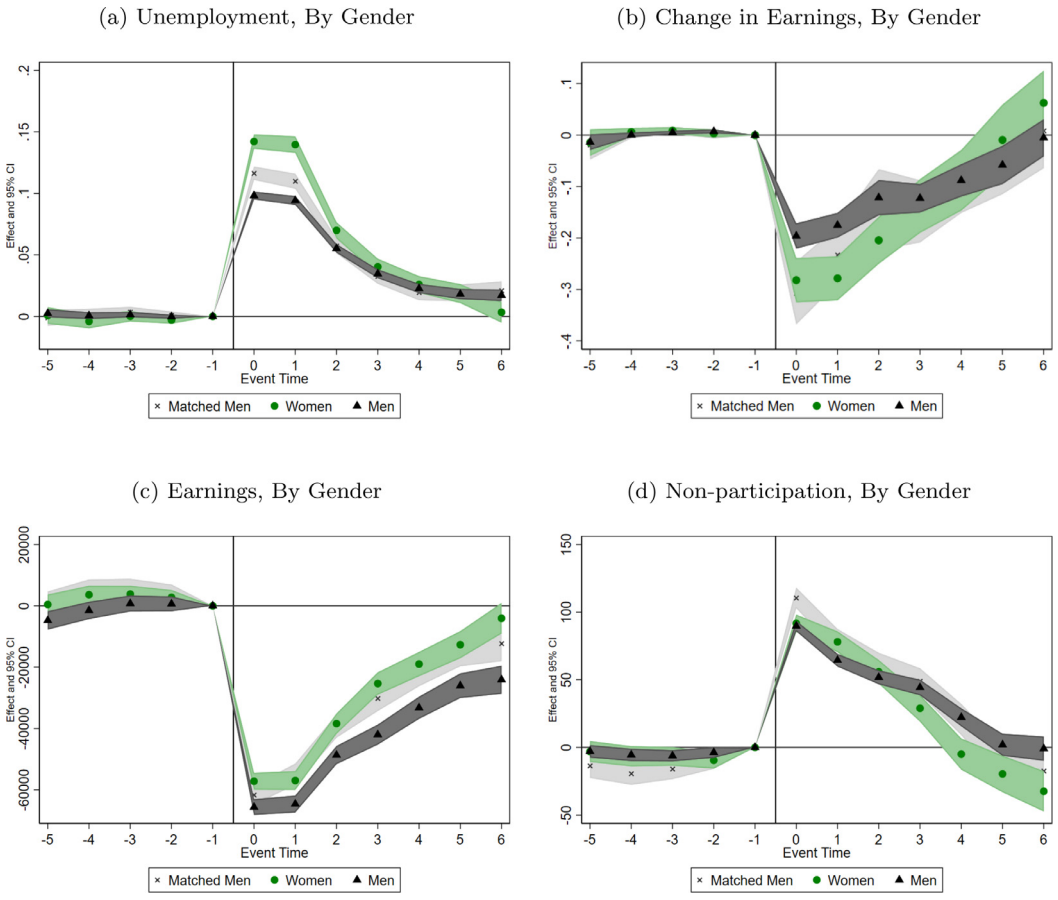



**Fig. 2.** Labor Market Adjustment Following Displacement *Notes:* Job displacement between -1 and 0. Black triangles denote displaced men [N=47,678], while green circles denote displaced women [N=19,234], relative to an equal size control group of workers of their own gender who are not displaced. The grey crosses show the estimation on the matched sample of men (treated and control) that on average have similar observable characteristics as the sample of women (treated and control). The outcome in panel (a) is an indicator taking the value 1 if the individual is claiming benefits for at least 3 months in a calendar year. Panel (b) shows the earnings compared to the average earnings in the years t=-2, t=-3 and t=-4. Panel (c) report absolute earnings and panel (d) reports a measure of the fraction of the year for non-participation, defined as neither working nor being registered as unemployed. Each panel shows the difference between the displaced workers and a matched control group, obtained from estimating Eq. (2). The corresponding regressions are reported in Appendix L. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

first and second year, which brings them closer to the earnings losses of women.

Across outcomes, the $\beta_k$ for k < −1, i.e. before the displacement, allow us to investigate pre-trends and anticipation effects. For unemployment and earnings, none of the pre-periods are significantly different from zero, implying that our treated and control workers had similar earnings and risk of unemployment in the five years before displacement. In general, we interpret this as the absence of dynamic selectivity into closing plants supporting the validity of our research design. Our results are similar in magnitude to what Bingley and Westergaard-Nielsen (2003) and Bertheau et al. (2021) report for Denmark.

Conditioning on having non-zero working hours in a given year returns smaller estimates in Appendix D, but the gender gaps remain largely unchanged. Together with the absence of a gender gap in participation rates, this tells us that displaced women are not leaving the labor market to a larger extent than displaced men. The men who have positive work hours still face an increased risk of unemployment of 8.2 percentage points in the year following displacement and women face a risk of 13.8 percentage points. The following year, the risk of unemployment decreases to 6.7 and 9.8 percentage points for men and women, respectively. We also report results for any employment, the extensive margin. In the first three years following displacement, there are meaningful gaps, e.g. with women on average 10 percentage points less likely to be in any employment as opposed to 7 percentage points for men. After four years, these gender gaps close. Conditional on being employed, we don't find a gender gap in the displacement effect on hours worked - both sexes on average decrease their hours in the year of displacement by 20%, which decreases to a 5–10% reduction in hours worked in the following three years. These estimates are largely in line with the estimates reported by Bertheau et al. (2021).

**Robustness:** Intuitively, workers in smaller plants have more influence over the performance of the plant than workers in bigger plants. Approximately 12% of the displaced workers were employed in plants with 5–10 workers, while more than 60% of the workers are displaced from plants with 50+ workers. Dropping workers displaced from plants with less than 10 workers hardly changes the point estimates. This is reported in Appendix E. Only including plants with 50 or more workers reduces the sample by 35% and estimates become less precise. The point estimates of the gender gaps in both unemployment and earnings shrink. This is driven by the men in the plants facing a larger risk of unemployment, while the estimated risk for the women remains unchanged.

Our definition of plant closure requires 90% of workers to be displaced during the period of the plant closure, and we require workers to have at least one year of tenure before the plant closes. We consider the event the year when the worker is no longer employed in the closing plant. Allowing for a longer time period of closure also introduces potential heterogeneity among workers who leave in the first versus the last year of the plant closure. To alleviate this concern, we conduct additional analysis on the timing of displacement. First, we check that the patterns are similar across men and women. In our sample, 31.0% of

displaced women and 33.8% of displaced men are initially employed in plants that close within one year. For each plant closure happening over multiple years, we can label the main event year as being the year most workers separate. 37.9% (36.3) of our sample displaced women (men) leave in the main event year. 20.1% of displaced men and 19.3% of displaced women leave before the main event year and can be referred to as 'early leavers'. Second, we run the same specification as in Eq. (2) on two different samples: i) on the workers who are displaced from a plant that closes within one year and ii) all workers who are displaced except the early leavers. This is reported in Appendix F. We find that across both of these samples, the estimates are very similar to the results presented in Fig. 2 and we do not observe any pretrends, which suggests that different timing of displacement is not driven by anticipation effects. Importantly, these restrictions don't affect the size of the unemployment risk or the gender gaps.[17]

Recent developments in the methodological literature have pointed out that in settings like this - with differential timing of treatment - the baseline specification might be biased towards zero. We consider plant closures over a 10-year period, and in Appendix G we show that the occurrence of plant closures is relatively evenly distributed across the years in our sample. We implement the estimator proposed by Sun and Abraham (2021). The obtained estimates and our baseline estimates are virtually identical. This is a result of the control group mirroring the cohort shares of the treatment group across years as well as the dynamic specification controlling for cohort fixed effects. Finally, we implement the decomposition proposed in Goodman-Bacon (2021) to show that our estimation does not contain negative weights and the average treatment effect reflects the comparison between the never-treated and timing of events in the treated group.

### 4.2. Heterogeneous effects

The literature on job loss has pointed to several at-risk groups of workers - importantly, those with little formal training and older workers (Ichino et al., 2017).[18] In Fig. 3, we report the risk of unemployment by age and educational attainment.

Women and men older than 50 face a higher risk of unemployment compared to younger women and men. Women older than 50 face a 20–22 percentage point increase in the risk of unemployment in the first two years, with a gender gap of 4 percentage points (or a relative gender gap of 25%). Women younger than 35, on the other hand, face a 10 percentage point increase in the risk of unemployment in the first two years, with an gender gap of 4 percentage points (or a relative gender gap of 40 %). Finally, women aged 35-50, face a 14 percentage point risk in unemployment in the first two years, with a gender gap of 6 percentage points (or a relative gender gap of 75 %). While older workers are worse off in absolute terms, we find the largest relative gender gap among middle aged workers which coincides with years of parenthood and child care. Related, Kunze and Troske (2012) document gender gaps in search-duration among displaced German workers and link this to fertility and child care. When we compare similar men and women using the matched sample, gender gaps among all three groups are reduced.

Workers with a high school diploma or less education face the largest risk of unemployment and a large gender gap exists. These men face an increased risk of unemployment of 12.1 percentage points and the women face a 17.8 percentage point risk of unemployment, relative to the control group. This is a 5.7 percentage point gender gap, or a 47% relative gender gap. When comparing similar men and women, the gender gap remains largely unaffected.[19] Workers with vocational training face an increased unemployment risk of 10 percentage points. Those with at least some college face a risk of unemployment of 7 percentage points. There is no meaningful gender gap in these two groups.

These results mirror the existing literature on job displacement and labor market shocks more broadly, while our contribution highlights the gender differences across these. Less educated workers face adverse labor market outcomes while more educated workers are more likely to adapt (Gu et al. (2020); Hummels et al. (2014); Utar (2018)). Specifically in the job closure literature, Ichino et al. (2017) document that older workers in Austria have lower re-employment probability after displacement and that women are worse off. Using Norwegian data, Salvanes et al. (2021) show that the probability of employment decreases with age.

When comparing displaced workers to non-displaced workers of their own gender, our results on earnings mirror those Illing et al. (2021) report for German workers. However, when comparing similar men and women, German women experience an even larger gender gap in both absolute and relative earnings while we show that gender gaps decrease when comparing similar men and women.[20]

To directly explore the role of child care, we estimate Eq. (2) separately for households with and without children and report this in Fig. 4.[21] In the presence of children, job displacement increases the risk of unemployment by 6.7-7.2 percentage points for men and 12–13.2 percentage points for women in the first two years of displacement. This leads to a relative gender gap in the risk of unemployment of 80% in the presence of children. In households without children, job displacement increases the risk of unemployment by 12 percentage points for men and 16 percentage points for women in the first two years of displacement, which is a relative gender gap of 33%. In sum, the relative gender gap increases by 2.5x from 33% in households without children to 80% in households with children. Comparing similar men to similar women in the matched sample leads to a conditional relative gender gap of 43% between individuals with children and 20% between individuals without children. The large absolute difference between men and women with children and the relative size of the gender gap in the risk of unemployment after job displacement motivates us to conclude that the presence of children is an important determinant.

## 5. Explaining the gender gap

There could be three potential mechanisms behind the gender gap in unemployment after job displacement, namely gender differences in human capital, the role of child care, and pre-displacement sorting across firms and occupations. While the heterogeneity analysis suggested that the relative gender gap increases by 2.5x from 33% in households without children to 80% in households with children, it is possible that other observables are different across these two subsamples. To hold constant these other factors when conducting heterogeneity analysis, we turn to the Kitagawa (1955)-Oaxaca (1973)-Blinder (1973) decomposition (hereafter KOB) as the standard choice in decomposing the roles of observables and include standard human capital variables and dummies for the presence of children across age groups. Finally, to rule out sorting, we test whether gender differences in pre-displacement sectors, occupations, firms, plants, or years explain the gender gap in the unemployment that follows job loss.

[17] We have also performed this check specifically for workers without formal education for whom plant-specific human capital arguably plays a bigger role. The point estimate is reduced slightly, indicating that 'early leavers' are not leaving due to better outside options. These results are available upon request.

[18] The specific cutoffs of these variables were chosen depending on their frequency distribution, but the results are robust to coding age as a binary variable of below and above 40 years old.

[19] The results are similar for lost earnings, with the oldest and the least educated workers being worse off. This is reported in Appendix H.

[20] However, their data limitation results in a sample that is very selected, and not all children are observed. Denmark and Germany also differ along dimensions that may contribute to these differences. For example, Danish couples face individual taxation, while German couples are taxed jointly.

[21] We report summary statistics for these groups in Appendix M.

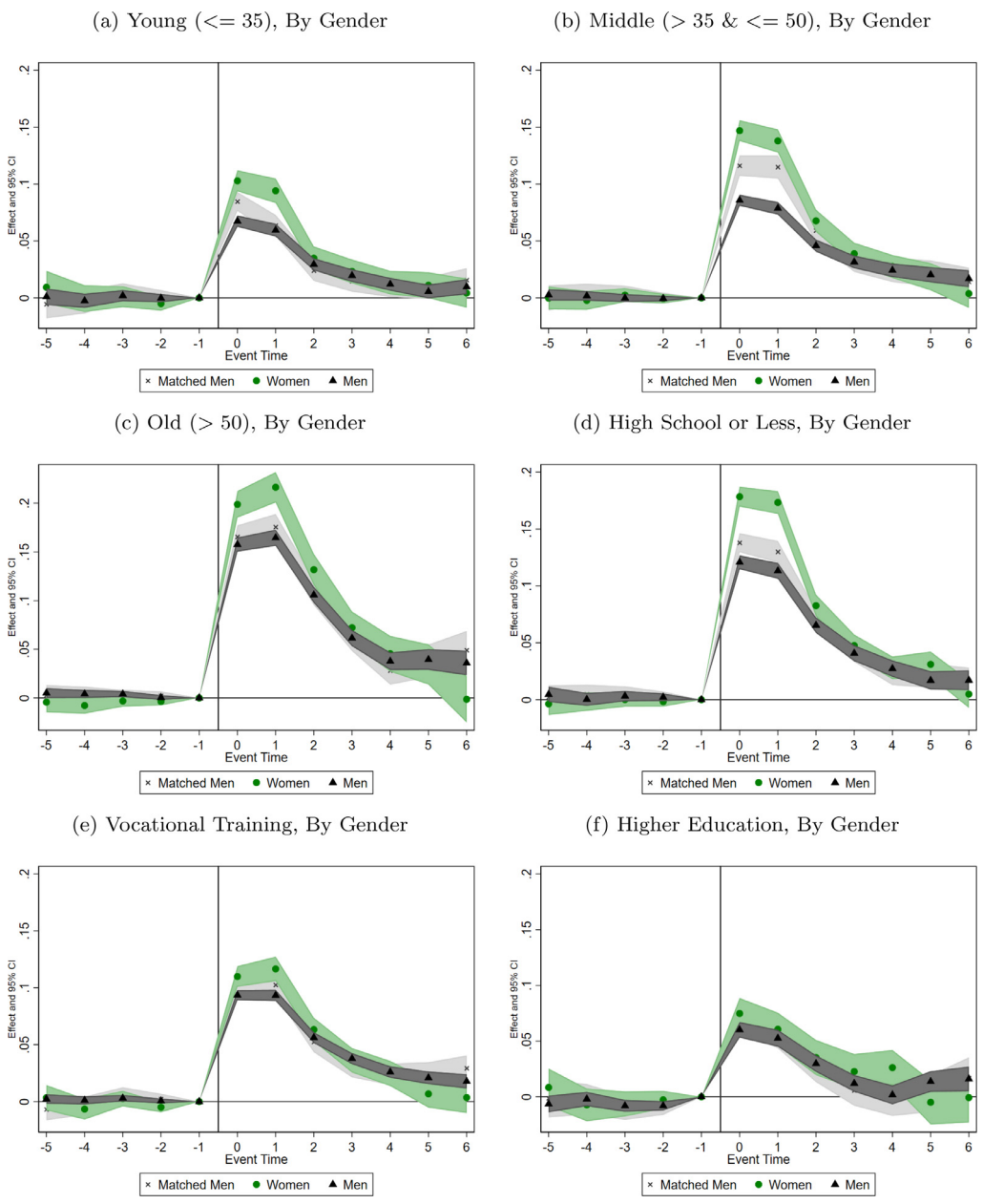



**Fig. 3.** Heterogeneity of Risk of Unemployment, by age and education *Notes:* See Fig. 2. Each figure reports the risk of unemployment for women (green circles), men (black triangles), and rematched men (grey crosses). Panel (a) reports workers below 36 (women=14,474; men=34,324), (b) reports workers between 36 and 50 (women=15,392; men=35,800), and (c) reports workers above 50 (women=8,602; men=25,232). Panel (d) reports results for workers with high school or less education (women=20,688; men=33,522), panel (e) reports workers with vocational training (women=13,144; men=47,586), and panel (f) reports results for those with some higher education (women=4,636; men=14,248). Regressions are reported in Appendix L. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

**Human Capital**: The goal of the decomposition exercise is to estimate the gap between men and women with the same observable characteristics. The outcome variables are the risk of unemployment and earnings in the year after displacement.[22] The independent variables included in the decomposition, measured in the year before displacement, are earnings, tenure at the firm, labor market experience, labor market experience squared, education categories, and dummies for the presence of children. This analysis is conducted on the displaced workers. The part of the gap that can be explained by different observable characteristics is often referred to as the 'explained effect', while different returns to the same characteristics are referred to as the 'unexplained effect'. In addition, a constant term would capture differences not included in the analysis. The sum of these two latter components is often referred to as discrimination.

However, decomposition exercises seldom include children and focus on gender differences in e.g. labor market experience and education. Departing from this literature, we include the dummies for the presence of a preschool child, a child between 6–12, and a teenager as independent variables. As per Table 1, slightly more women than men are parents. However, being a parent likely has very different implications for men and women. If women and men with the same characteristics (i.e. parents) are facing different obstacles, due to unequal child care responsibilities, it is not the different characteristics but the different 'returns' to children that explain the gender gap.

The characteristics of men and women vary along several dimensions with important implications for the gender gaps. This is reported

[22] We also report the risk of unemployment in the second and fourth year.

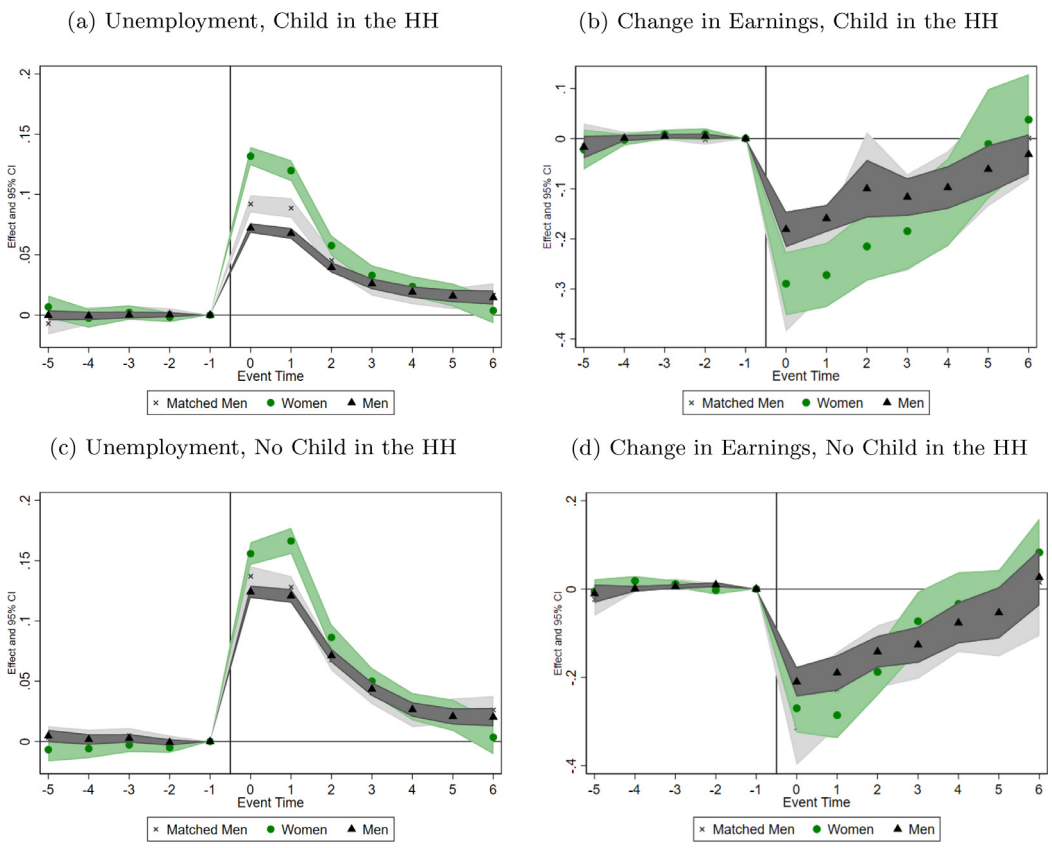



**Fig. 4.** Children *Notes:* See Fig. 2. Panel (a) and (b) reports the evolution in the risk of unemployment and lost earnings for workers with children below 18 years in the household (women=21,197; men=46,604). Panels (c) and (d) the equivalent estimate for those without children (women=17,271; men=48,752). Corresponding regressions are reported in Appendix L.

in Table 2. The most important covariate for the explained part of the gender gap in the risk of unemployment is pre-displacement earnings, followed by educational categories. The gender gap in unemployment in the year following displacement is 6.2 percentage points, and different characteristics can account for 2 percentage points. However, 44% of the gap in unemployment (1.8 percentage points) can be attributed to returns to having children below 12. The presence of preschool children matters most, while teenagers do not contribute to the unexplained gap in unemployment. In the second year following displacement, the gap in unemployment is 3.8 percentage points, and 1.3 percentage points can be explained by different characteristics. Again, almost half (48%) of the residual gap is due to children having different effects on men and women. Four years after displacement, only the presence of preschool children at the point of layoff matters, as, intuitively, all children are now older. Compared to men, women are thus facing large negative returns to having small children. In addition, women and men have different returns to experience in the labor market, and women are facing larger returns to formal education.

This picture is mirrored for changes in earnings. For the changes in income, the gender gap is 4.5percentage points, and different characteristics explain 2.9 percentage points of the gap. Pre-displacement earnings and experience in the labor market matter the most. However, children more than account for the residual gap in lost earnings, and again the coefficient reduces in size with the age of the child. It is also worthwhile noticing that women are facing higher returns on pre-displacement earnings and formal education. Moreover, the constant term is large, meaning that characteristics that we do not include and/or discrimination are important for the gender gap in earnings.[23]

This analysis shows that observable characteristics explain 1/3 of the gap in unemployment, and gender differences in child care responsibilities account for another 1/3 of the gap. The 65% gender gap in earnings is explained by differences in observables and the different impact of children more than account for the rest of the gap. If the presence of children had the same effect on men and women, the gap in unemployment would have been reduced by 1/3 and the gap in earnings would have been halved.

That uneven distribution of child care is a major driver of gender gaps is corroborated by the literature on gender gaps in search patterns and demand for job amenities. These gender gaps translate into meaningful gender gaps in both wages and employment opportunities: the gender differences in willingness to commute and reservation wages documented by Le Barbanchon et al., 2021 are three times as large for parents than non-parents. Bütikofer et al. (2020) and Borghorst et al. (2021) document that the gender gap in commuting increases with parenthood. Fluchtmann et al. (2020) show that men and women have different demands for amenities such as family friendliness and commuting time, implying that women apply for more low-wage jobs. Caldwell and Danieli (2022) show that a gender difference in willingness to commute is an important component in explaining why women may have fewer employment opportunities than men, in line with the evidence on women being more exposed to monopsonistic employers (e.g. Barth and Dale-Olsen (2009); Hirsch et al. (2010))

**Pre-displacement Sorting**: We investigate the role initial sorting across sectors, subsectors, and plants plays in gender gaps in unemployment. To account for this, we estimate the gender gap by comparing men and women displaced from the same plants and sectors by adding pre-displacement fixed effects to the baseline regression. First, we add fixed effects at the sectorial level (with seven different manufacturing sectors, where women are over-represented in 'Food, Drinks & Tobacco'

[23] With rich covariates, Larsen et al. (2020) investigate the gender wage gap in Denmark and manage to dramatically reduce both the unexplained part by including measures for the gender-segregated labor market.

**Table 2**
Kitagawa (1955)-Oaxaca (1973)-(Blinder, 1973)-Decomposition.

| | 1st year following displacement | | | | | | 2nd year following displacement | | | 4th year following displacement | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) Unemployment | (2) | (3) | (4) Changes in earnings | (5) | (6) | (7) Unemployment | (8) | (9) | (10) Unemployment | (11) | (12) |
| | | Explained | Unexplained | | Explained | Unexplained | | Explained | Unexplained | | Explained | Unexplained |
| | | Covariates | Returns | | Covariates | Returns | | Covariates | Returns | | Covariates | Returns |
| Men | 0.134*** | | | 0.877*** | | | 0.0987*** | | | 0.0695*** | | |
| | (0.00164) | | | (0.00168) | | | (0.00151) | | | (0.00151) | | |
| Women | 0.196*** | | | 0.832*** | | | 0.137*** | | | 0.0929*** | | |
| | (0.00301) | | | (0.00300) | | | (0.00276) | | | (0.00274) | | |
| Difference | -0.0621*** | | | 0.0453*** | | | -0.0383*** | | | -0.0234*** | | |
| | (0.00342) | | | (0.00343) | | | (0.00315) | | | (0.00312) | | |
| Explained | -0.0199*** | | | 0.0295*** | | | -0.0129*** | | | -0.00902*** | | |
| | (0.00132) | | | (0.00180) | | | (0.00118) | | | (0.00119) | | |
| Unexplained | -0.0422*** | | | 0.0158*** | | | -0.0254*** | | | -0.0144*** | | |
| | (0.00365) | | | (0.00375) | | | (0.00339) | | | (0.00340) | | |
| Earnings | | -0.0137*** | 0.00754 | | 0.0340*** | -0.134** | | -0.00851*** | -0.00362 | | -0.00567*** | 0.00750 |
| | | (0.00116) | (0.00985) | | (0.00171) | (0.0619) | | (0.00105) | (0.00837) | | (0.00111) | (0.00908) |
| Tenure | | -0.000196 | 0.00295 | | 0.000651*** | 0.00698 | | -0.000236** | -0.0164** | | 1.46e-05 | -0.00807 |
| | | (0.000182) | (0.00873) | | (0.000189) | (0.0188) | | (0.000108) | (0.00766) | | (2.23e-05) | (0.00757) |
| Experience | | -0.00149 | -0.0847*** | | 0.0234*** | -0.0346 | | -0.00619*** | -0.0389 | | -0.00519*** | 0.0306 |
| | | (0.00183) | (0.0299) | | (0.00190) | (0.0644) | | (0.00172) | (0.0256) | | (0.00181) | (0.0267) |
| Experience sq. | | 0.000384 | 0.0487*** | | -0.0284*** | -0.00883 | | 0.00572*** | 0.0272* | | 0.00466** | -0.0253 |
| | | (0.00185) | (0.0180) | | (0.00192) | (0.0367) | | (0.00175) | (0.0155) | | (0.00181) | (0.0164) |
| University | | -0.00197*** | 0.00464** | | 0.000540*** | -0.0135** | | -0.00153*** | 0.000358 | | -0.00112*** | -0.000321 |
| | | (0.000272) | (0.00182) | | (0.000138) | (0.00556) | | (0.000218) | (0.00144) | | (0.000204) | (0.00149) |
| Vocational | | -0.00590*** | 0.00640** | | 0.00389*** | -0.00739 | | -0.00408*** | 0.000269 | | -0.00248*** | -0.00115 |
| | | (0.000505) | (0.00294) | | (0.000435) | (0.00625) | | (0.000463) | (0.00248) | | (0.000458) | (0.00255) |
| Preschool child | | -0.000382* | -0.0101*** | | 0.000457** | 0.0152*** | | -0.000395** | -0.00845*** | | -0.000339** | -0.00528*** |
| | | (0.000226) | (0.00173) | | (0.000232) | (0.00524) | | (0.000193) | (0.00147) | | (0.000140) | (0.00153) |
| Child (6–12 years) | | 0.00214*** | -0.00808*** | | -0.00295*** | 0.00791** | | 0.00151*** | -0.00377*** | | 0.000668*** | -0.000920 |
| | | (0.000244) | (0.00152) | | (0.000305) | (0.00355) | | (0.000206) | (0.00131) | | (0.000145) | (0.00136) |
| Teenager | | 0.00121*** | -0.00102 | | -0.00204*** | -4.54e-05 | | 0.000797*** | 0.000178 | | 0.000432*** | 0.00129 |
| | | (0.000174) | (0.00169) | | (0.000259) | (0.00336) | | (0.000140) | (0.00145) | | (0.000124) | (0.00159) |
| Constant | | | -0.00853 | | | 0.184*** | | | 0.0177 | | | -0.0127 |
| | | | (0.0142) | | | (0.0713) | | | (0.0119) | | | (0.0123) |
| | 61,137 | 61,137 | 61,137 | 53,805 | 53,805 | 53,805 | 54,665 | 54,665 | 54,665 | 39,775 | 39,775 | 39,775 |

*Notes:* The table report results for a Kitagawa (1955)-Oaxaca (1973)-Blinder (1973)-decomposition, decomposing the gap in unemployment and lost earnings for displaced men and women in the years following job loss. Labor market covariates are pre-displacement earnings, tenure at the (lost) job, experience in the labor market (obtained from mandatory pension scheme contribution), dummies for university degree, and a dummy for a vocational degree. Dummies for the youngest child in the family being a pre-school child, a child between 6 and 12, or a teenager are included. The age of the child is also measured in the year prior to displacement.

while men are over-represented in 'Iron & Metal'). We then add fixed effects at the most detailed sector level (using 6-digit NACE codes).[24] Finally, we add predisplacement plant fixed effects. This is reported in Appendix I. These specifications have little implication for the gender gap. Finally, we report the distributions of year fixed effects, and fixed effects for the pre-displacement sector, sub-sector, firms and plants, for displaced men and women, respectively. This is reported in Appendix J. The distributions of the obtained fixed effects across men and women are very similar. Combined, these exercises lead us to conclude that the gender gap in unemployment cannot be a result of initial differences in sorting, or because men and women are displaced in different years.

### 5.1. Generalizability of our results

In this section, we consider how our results can be translated across different contexts, such as other countries with different labor markets and across different industries. Several features of the setting suggest that the gender gaps following displacement are likely to be larger in other countries, while gender gaps following lay-offs in other sectors likely depend on the gender gaps in human capital.

The first consideration is to understand how Danish workers respond to job losses relative to their international counterparts with the aim of understanding how the flexicurity of the Danish labor market (as described in Section 2.1) might play a role. For this exercise, we pause the consideration of different reactions across genders. Bertheau et al. (2021) have improved the methodology to allow for international comparisons by building a harmonized dataset that combines matched employer-employee data from almost three decades and seven countries (Austria, Denmark, France, Italy, Portugal, Spain, and Sweden) and use the same definition of job losses. Danish workers, similarly to the Swedish and French, experience a considerably lower likelihood of unemployment after job loss. In the first year, on average 8% of Danish workers are unemployed, yet this number is around 30% in Spain, Portugal, and Italy. Five years after displacement, around 20% of displaced workers from Spain, Portugal, and Italy are unable to find employment, while this fraction is only around 5% in Sweden and Denmark and around 10% in France and Austria. These large differences are partly driven by workers in Southern Europe fully leaving the labor market. In Denmark, few workers - regardless of gender - leave the labor market following job loss as shown in Fig. 2, panel (d). Moving on to gender difference, Bertheau et al. (2021) report gender gaps in earnings, in an ancillary analysis in the Appendix. They document that gender gaps are larger in countries with bigger average effects of displacement. In a recent paper, Illing et al. (2021) estimate gender gaps following a mass layoff in Germany. However, data limitation results in a sample that is very selected, and not all children are observed. In their sample, women's earnings losses are 35% higher than men's, and they report large gender gaps in the presence of children below preschool age. That gender gaps following displacement are larger in Germany than in Denmark mirrors the larger size of both the gender wage gap and the child penalty (Eurostat (2022); Kleven et al. (2019a)). While the Danish gender pay gap at 13.9% is slightly above the EU average of 13% (Eurostat (2022)), child penalties are smaller than in most other middle- and high-income countries. The combination of a flexible labor market and less severe impact from children on labor market outcomes suggests that gaps following displacement are likely to be larger in other contexts.

Besides the flexible labor market, other features of Denmark are arguably unique in international comparison. Parental leave is generously compensated, and child care is heavily subsidized. However, as there is little evidence between the provision of private child care services and maternal employment (Kleven et al. (2020), Baker et al. (2008), Havnes and Mogstad (2011)), we do not believe generous universal child care in Denmark would lead to a lack of generalizability of our findings. Similarly, extending maternity leave provides little, if any, effect on maternal employment and gender gaps (Dahl et al. (2016); Olivetti and Petrongolo (2017))

Our findings reiterate that women's labor market gains are fragile and that unequal distribution of child care responsibility is an important driver of this. It is worth noting that Danish mothers on average face a child penalty of around 20% of their earnings in the long run (Kleven et al., 2019b). Yet, if they experience an exogenous labor market shock they will suffer close to an 80% larger increase in unemployment risk than their male parent counterparts. We can juxtapose our findings on the gender gap in unemployment risk with existing evidence on the determinants of the gender gap in earnings reported by Kleven et al. (2019b). By performing a decomposition analysis, they document that in the period of our analysis (1995 to 2006), 60% of the gender gap can be explained by child-related gender inequality and the remaining 40% with a combination of education-related and residual gender inequality. Our estimates are comparable showing that the differential effect of children explains on average half of the gap in earnings.

While our analysis has focused on manufacturing, it is possible to discuss how our findings would translate to other industries. First, we find that the gender gap in unemployment disappears if the workers have formal education, such as a vocational diploma or higher education. Hence, in industries where more workers have formal education and where the gender gap in educational attainment is smaller, our findings would predict a lower gender gap in unemployment risk. Finally, we have estimated Eq. (2) only for the Food, Drinks, & Tobacco sector of manufacturing, a sub-sector where women are over-represented. We show these results in the Appendix K. We find that also in the sub-sector that is female-dominated, women suffer larger consequences of job displacement than men, as we find the same absolute and relative gender gaps in unemployment risk.

## 6. Conclusion

While women's and men's labor market outcomes have converged, substantial gender gaps remain. In this paper, we use administrative data from Denmark and an identification strategy using plant closures to show that displaced women following job loss are worse off than displaced men. While both men and women face adverse labor market outcomes for up to 6 years relative to non-displaced workers with similar characteristics, gender gaps exist in the first four years following job loss. In the first year, women on average experience a 14.2 percentage point increase in the probability of unemployment over the first two years, while for men this is lower at 9.8 percentage points. This amounts to a relative gender gap of 45 % in the risk of unemployment. Over time, the gender gap in unemployment risk decreases and closes four years after. We show that the gender gap increases by 2.5x from 33% in households without children to 80% in households with children. To disentangle why women are consistently worse off, we turn to the relative importance of human capital and the role of child care. The majority of the gender gap in unemployment remains after accounting for observable differences in human capital across men and women. In a standard decomposition analysis, we show that standard human capital explanations far from account for the gender gaps in unemployment and earnings. If men and women were equally affected by children, the gender gap in earnings would have been halved and the gender gap in unemployment would have been reduced by 1/3. We conclude that children impose a barrier to women's labor market recovery, regardless of individual-level characteristics.

Two implications follow. First, while the literature on the long-term negative effects following job displacement is large, women are often excluded from the analysis and a systematic investigations of the magnitude and the mechanisms behind gender gaps are lacking. This striking gap in the literature implies that policy recommendations are not based

[24] As employer-specific fixed effects are conditioned on unemployment it is not meaningful to add fixed effects from the new job.

on the most relevant estimates. For example, while the most exposed workers during the Covid-19 pandemic were women (Alon et al., 2021), there is a lack of existing evidence on what would mitigate their recovery. Our estimates show that estimates based solely on male workers are substantially biased towards zero. Moreover, conditions and constraints that are particularly important for women have been overlooked. We point to gender differences in human capital among displaced workers. Second, we show that child care responsibility imposes an important barrier to women's labor market recovery, shedding light on a mechanism behind the persistent child penalties. We document this in Denmark, where child penalties are small. In other settings, this channel might be even more important.

## Data availability

The authors do not have permission to share data.

## Appendix A. Literature on Job Loss and Earnings, Samples

| Author(s), year | Setting | Sex | Comments on gender gap |
|---|---|---|---|
| North America | | | |
| Jacobson et al. (1993) | Pennsylvania | F, M | Women better of initially, but recover slower |
| Sullivan and Von Wachter (2009)* | Pennsylvania | M | NA |
| Couch and Placzek (2010) | Connecticut | F, M | Larger % drop for women |
| Davis and Von Wachter (2011) | US | M | NA |
| Krolikowski (2018) | US | F, M | Not reported |
| Jung and Kuhn (2018) | US | F, M | Not reported |
| Lachowska et al. (2020) | Washington | F, M | Sex only available for subset of data |
| Oreopoulos et al. (2008)* | Canada | M | NA |
| Europe | | | |
| Bingley and Westergaard-Nielsen (2003) | Denmark | F, M | Not reported |
| Bennett and Ouazad (2019)** | Denmark | M | Women as robustness |
| Foerster et al. (2022) | Denmark | M | NA |
| Eliason and Storrie (2006) | Sweden | F, M | Not reported |
| Seim (2019) | Sweden | M | NA |
| Rege et al. (2009) | Norway | F, M | Not reported |
| Hardoy and Schøne (2014) | Norway | M | NA |
| Huttunen et al. (2011) | Norway | M | NA |
| Gathmann et al. (2020)*** | Finland | F, M | Women worse off |
| Hijzen et al. (2010) | UK | F, M | Smaller % drop for women |
| Schmieder et al. (2020) | West-Germany | M | Women as robustness |
| Illing et al. (2021) | Germany | F, M | Women worse off |
| Ichino et al. (2017) | Austria | F, M | Women worse off, no dynamics |
| Halla et al. (2020) | Austria | M | NA |
| Raposo et al. (2021) | Portugal | F, M | Not reported |
| Leombruni et al. (2013) | Italy | F, M | Women worse off |
| Other | | | |
| Appleton et al. (2001) | China | F, M | Women worse off, no dynamics |
| Bognanno and Delgado (2005) | Japan | F, M | No difference, no dynamics |
| Khanna et al. (2021)** | Columbia | F, M | Women worse off |
| Bhalotra et al. (2021)** | Brazil | F, M | No difference |
| Rucci et al. (2020) | Chile/Brazil | F, M | Not reported |

*Notes:* *spillover to children is in the main outcome, **crime is the main outcome, ***health is in the main outcome. The table reports selected papers studying the labor market consequences of job loss in high-income countries along with details on the gender composition of the sample as well as comments on the gender gap, if relevant. This list is not meant to be an exhaustive list of the literature but includes both studies with a focus on labor market outcomes as well as papers that focus on children, crime, and health as long as labor market outcomes are also reported.

## Appendix B. Balancing after Matching

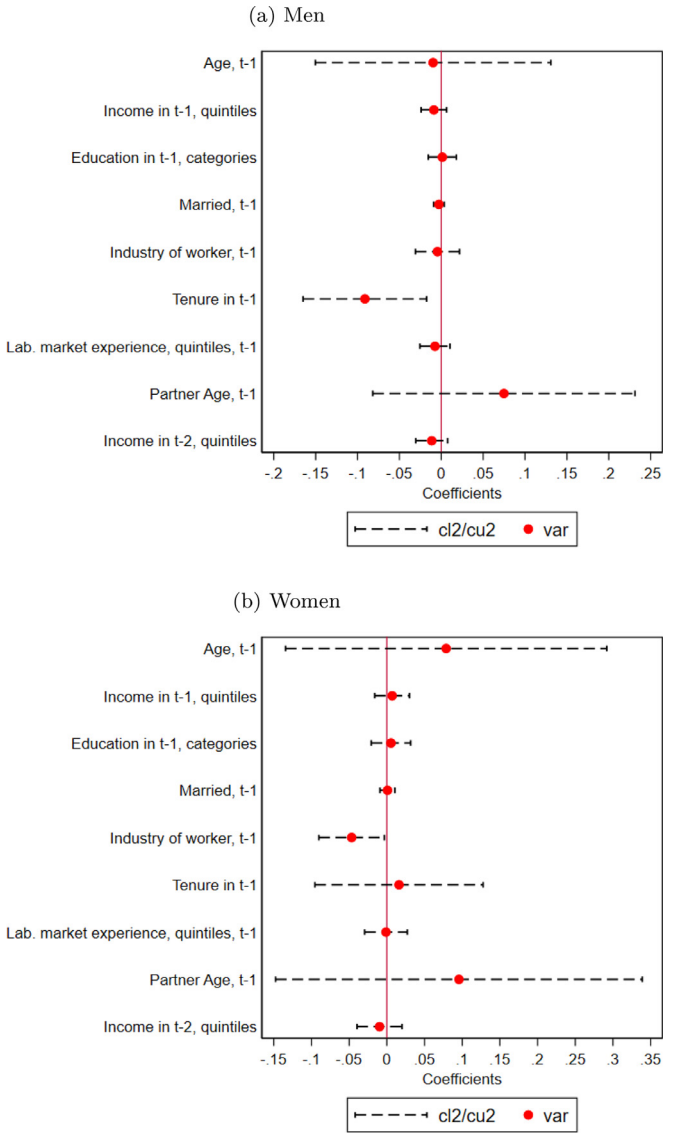



**Fig. B1.** Note: We perform the matching separately for men and women and match on pre-displacement earnings, marital status, age, educational groups, tenure at the firm, unemployment history, and labor market experience. Continuous variables are discretized in deciles before matching. We do not match on partner's age or on income in year t-2.

## Appendix C. Geographical Location of Exposed Worker

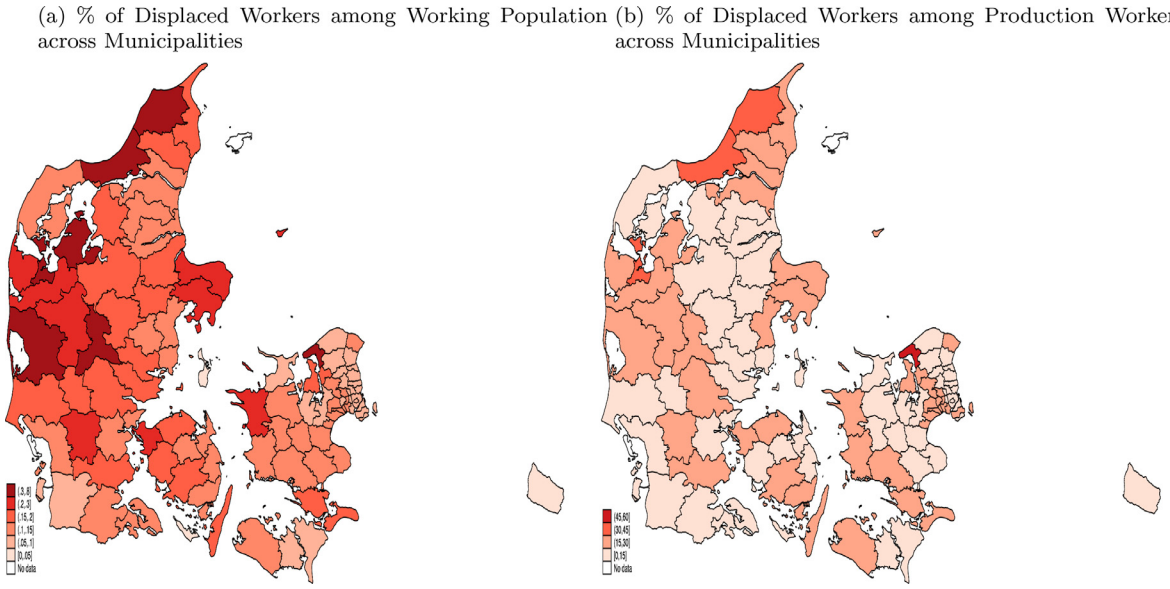



**Fig. C1.** Note: Data is missing for the small islands of Rømø and Læsø, where less than 5 displaced workers live.

## Appendix D. Alternative Outcomes

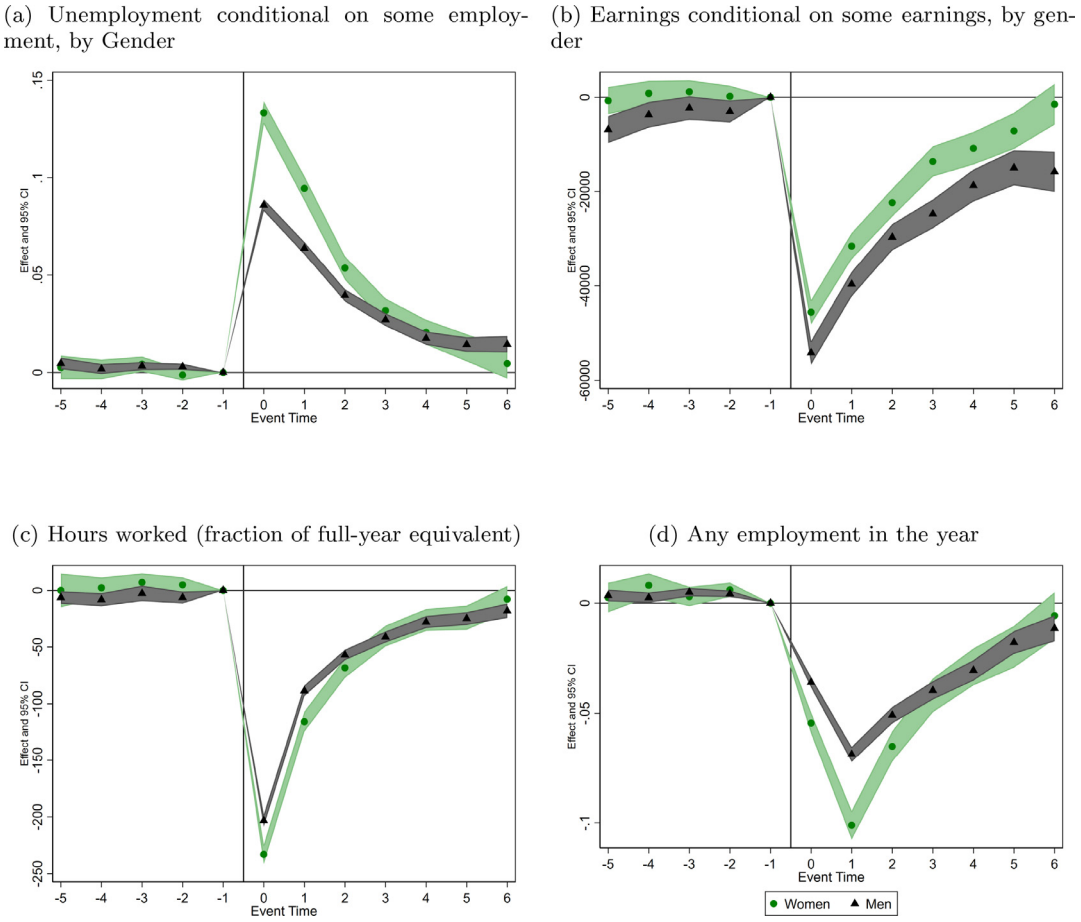



**Fig. D1.** Note: Job displacement between -1 and 0. Grey triangles denote displaced men, while green circles denote women, relative to a control group of workers of their own gender who are not displaced. Each panel shows the difference between the displaced workers and a matched control group with corresponding confidence intervals, obtained from estimating Eq. 2. In panels (a), (b), and (c) we condition on non-zero work hours. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

## Appendix E. Sensitivity to Plant Closure Definition

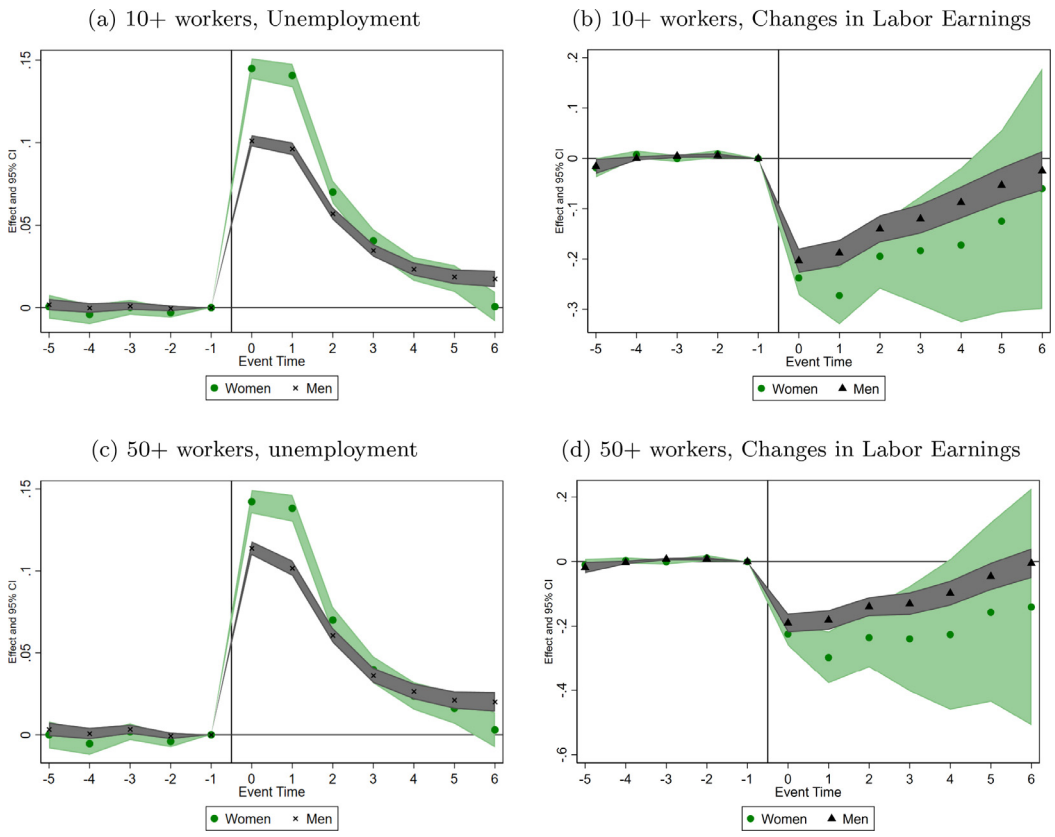



**Fig. E1.** *Notes:* See Figure 2. Panels (a) and (b) show displacement effects on workers in plants with at least 10 workers prior to the beginning of the closure. Panels (c) and (d) show the effect on workers in plants with at least 50 workers.

## Appendix F. Sensitiving to the Timing of Displacement of Workers

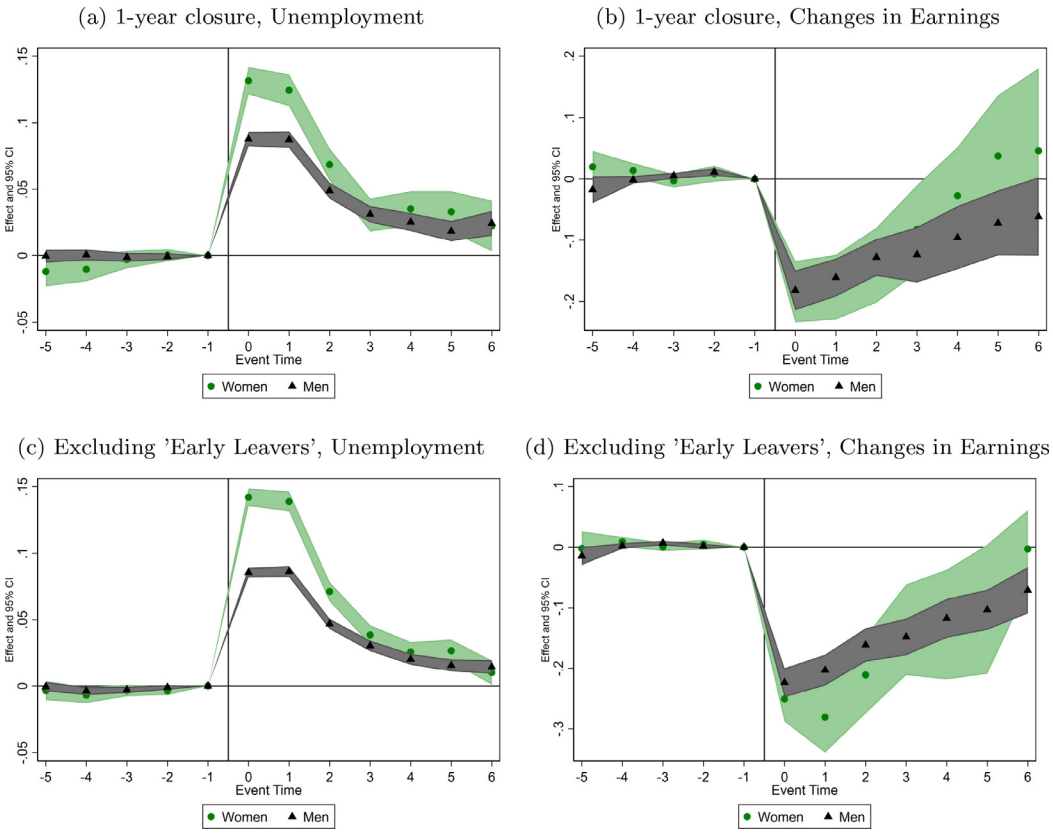
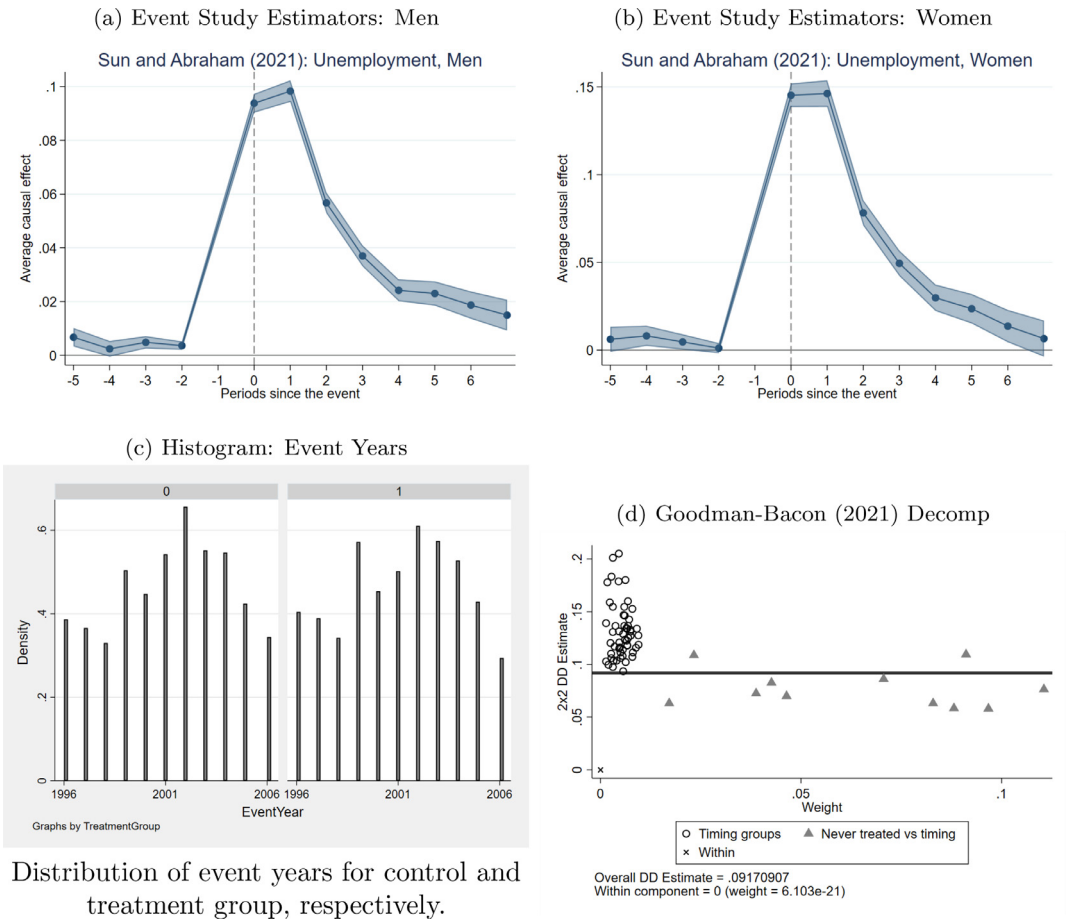



**Fig. F1.** *Notes:* See Figure 2. Panel (a) and (b) report the displacement effects on unemployment and changes in earnings after restricting the sample to only considering plants that close down within 1 year. This corresponds to 31.0% of the displaced women and 33.8% of the displaced men. Panels (c) and (d) report the results when excluding 'early-leavers', i.e. restricting our sample to the sum of i) workers leaving from plants that close within 1 year, and ii) workers leaving from plants that close down over multiple years, but leave in the most common separation year or later. This sample is 20% smaller than our original estimation sample (19.3% for women and 20% for men).

## Appendix G. Robustness Estimators




Distribution of event years for control and treatment group, respectively.

**Fig. G1.** *Notes:* Top panel report estimates obtained using the estimator proposed by Sun and Abraham (2021), specifying the control group to be the never-treated worker, for men and women, respectively. The bottom panel shows the distribution of event years and the decomposition proposed in Goodman-Bacon (2021) showing our estimation does not contain negative weights and the average treatment effect reflects the comparison between the never-treated and timing of events in the treated group..

## Appendix H. Heterogeneity, Change in Earnings

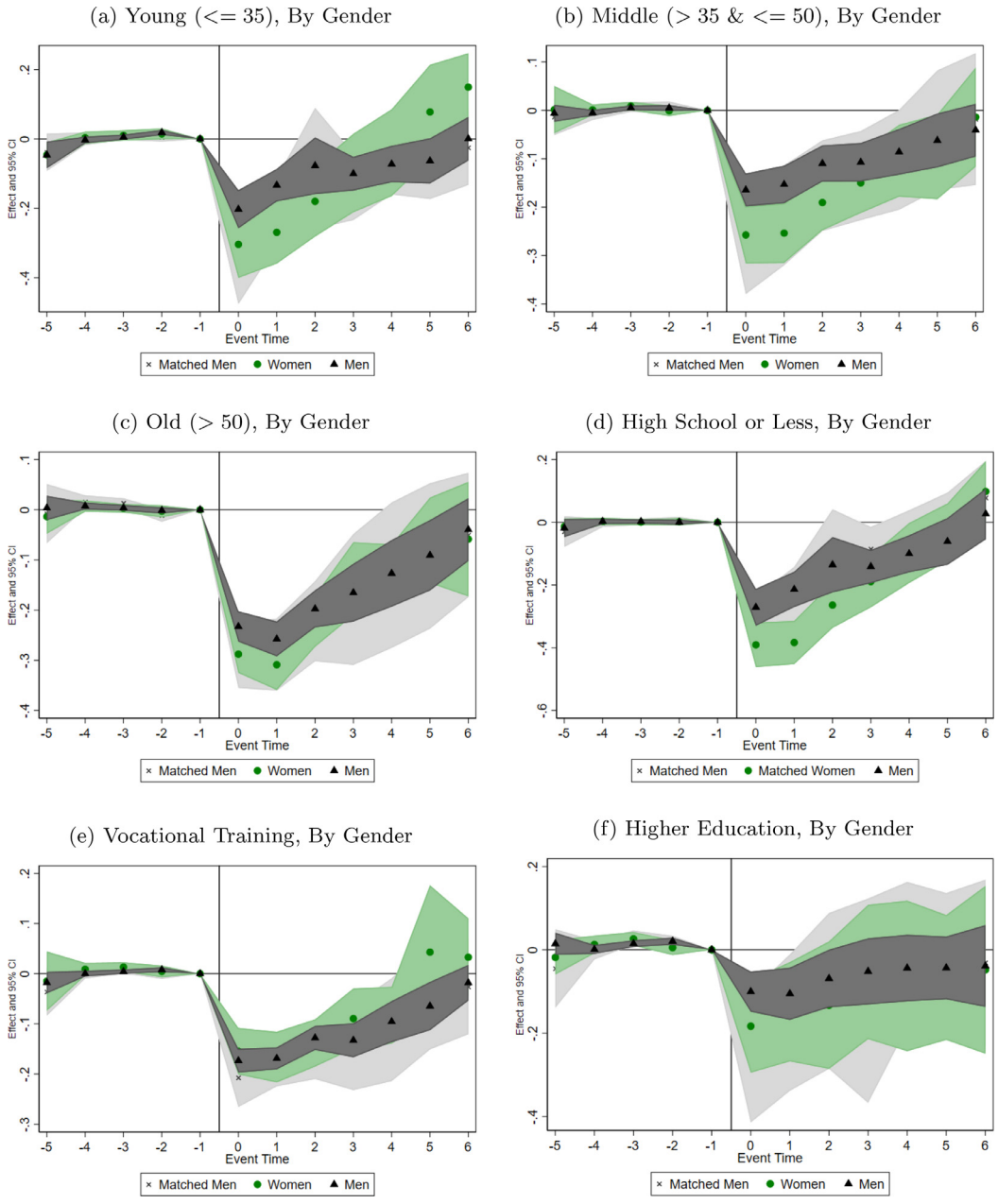
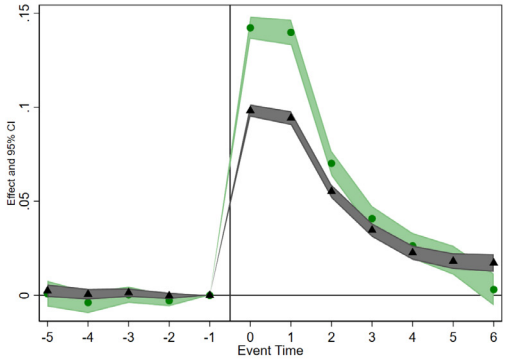


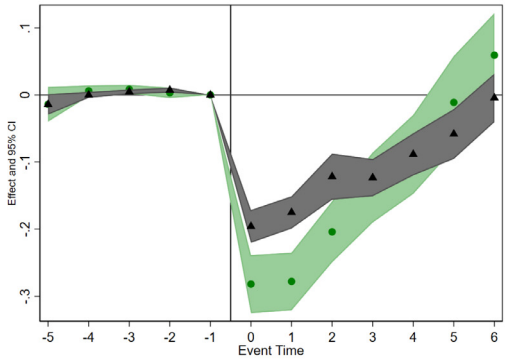

**Fig. H1.** *Notes:* See Figure 2.

## Appendix I. Sorting: Sectors and Plants

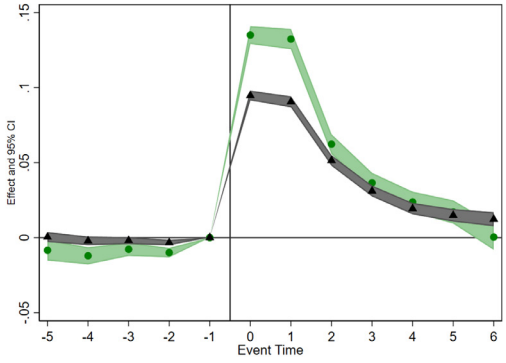
(a) Displacement Effect on Unemployment, Including Industry Fixed Effects



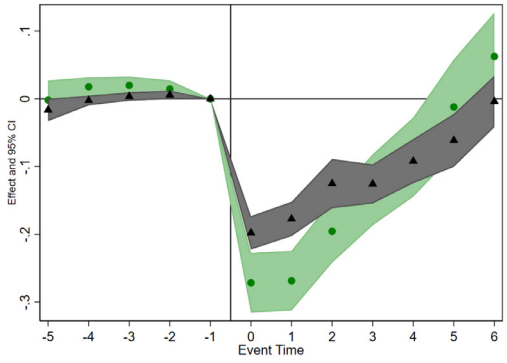

(b) Displacement Effect on Earnings, Including Industry Fixed Effects



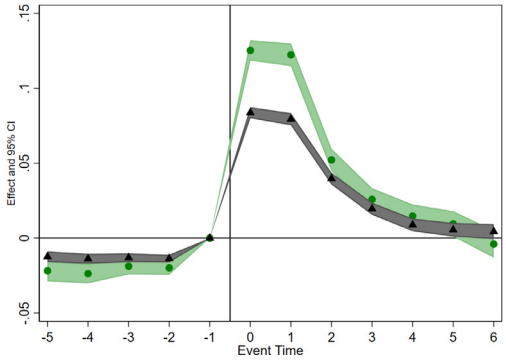

(c) Displacement Effect on Unemployment, Including Sub-sector Fixed Effects




(d) Displacement Effect on Earnings, Including Sub-sector Fixed Effects




(e) Displacement Effect on Unemployment, Including Plant Fixed Effects




(f) Displacement Effect on Earnings, Including Plant Fixed Effects

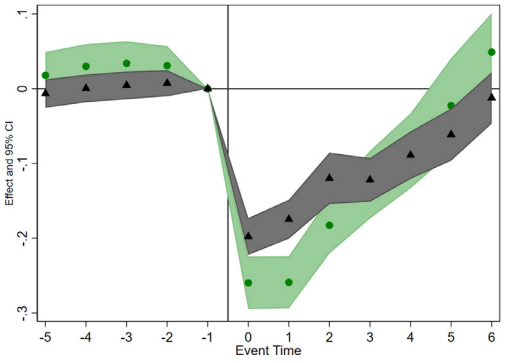



**Fig. I1.** *Notes:* See Figure 2.

## Appendix J. Fixed Effects, Men and Women

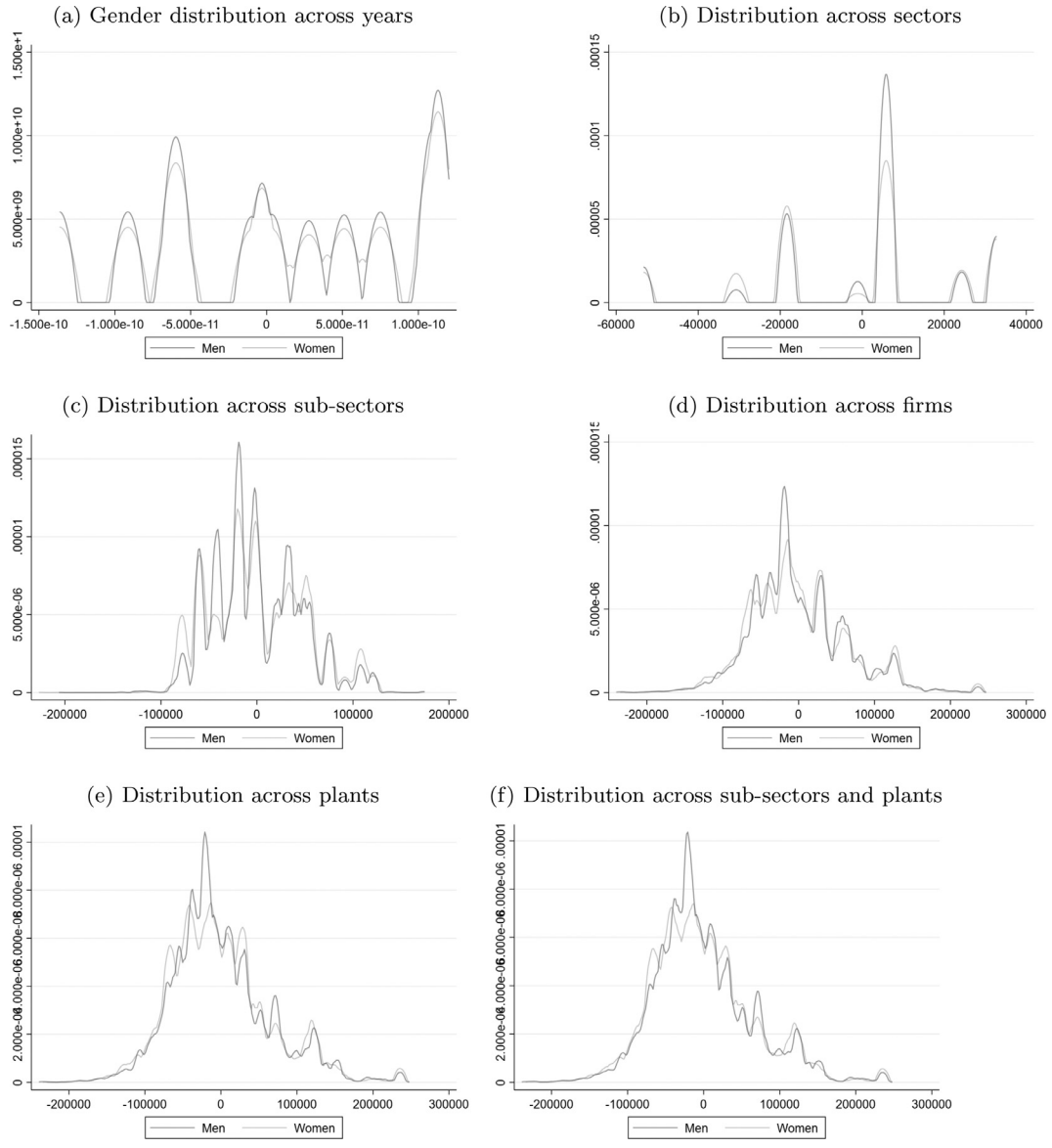



**Fig. J1.** *Notes:* Fixed effects obtained from estimating Equation 2 on the sample on displaced workers, i.e. without control workers.

## Appendix K. Labor Market Adjustment Following Displacement (Food, Drinks and Tobacco Sector)

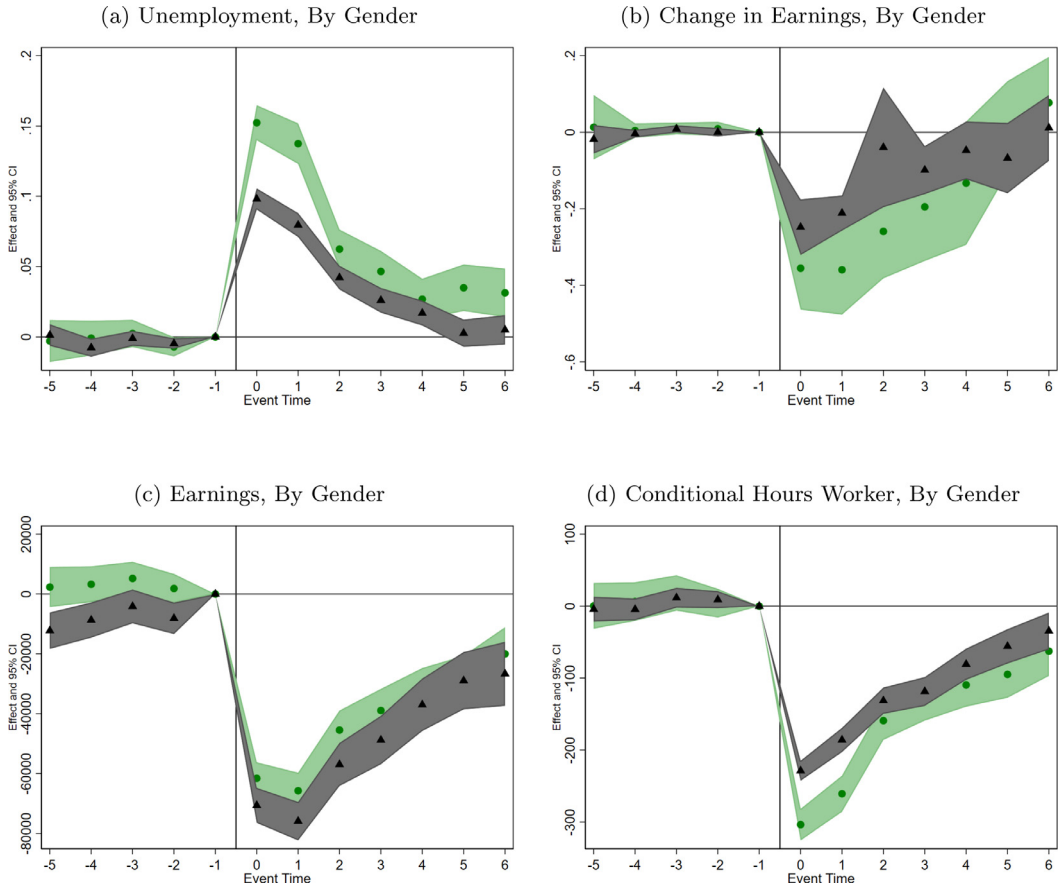



**Fig. K1.** *Notes:* Job displacement between -1 and 0. Black triangles denote displaced men, while green circles denote displaced women, relative to an equal size control group of workers of their own gender who are not displaced. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

## Appendix L. Regression Tables

**Table L.4**
Labor market outcomes, by gender.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unemployment | | | Changes in Earnings | | | Earnings | | | Non-participation | | |
| | Men | Women | Men matched | Men | Women | Men matched | Men | Women | Men matched | Men | Women | Men matched |
| t-5 | 0.00250 | 0.000772 | 0.00402 | -0.0136* | -0.0145 | -0.0331* | -4,772*** | 421.8 | -1,174 | -2.944 | -3.051 | -13.15*** |
| | (0.00169) | (0.00347) | (0.00354) | (0.00780) | (0.0131) | (0.0191) | (1,533) | (1,670) | (1,901) | (2.377) | (3.970) | (4.990) |
| t-4 | 0.000659 | -0.00402 | 0.00424 | 0.000532 | 0.00605 | -0.00460 | -1,511 | 3,608** | 2500 | -5.525** | -6.551* | -12.05*** |
| | (0.00143) | (0.00286) | (0.00288) | (0.00225) | (0.00406) | (0.00462) | (1,442) | (1,505) | (1,657) | (2.338) | (3.826) | (4.414) |
| t-3 | 0.00147 | 0.000121 | 0.00193 | 0.00499*** | 0.00863*** | 0.00510 | 755.9 | 3,819*** | 5,677*** | -6.195*** | -6.670* | -11.82*** |
| | (0.00115) | (0.00218) | (0.00229) | (0.00174) | (0.00331) | (0.00351) | (1,333) | (1,389) | (1,513) | (2.110) | (3.530) | (4.126) |
| t-2 | -0.000198 | -0.00303** | 0.000295 | 0.00720*** | 0.00340 | 0.00690* | 634.1 | 2,753** | 6,166*** | -3.731* | -9.515*** | -10.60*** |
| | (0.000854) | (0.00150) | (0.00162) | (0.00196) | (0.00395) | (0.00388) | (1,233) | (1,237) | (1,324) | (2.049) | (3.120) | (3.867) |
| t | 0.0982*** | 0.142*** | 0.120*** | -0.196*** | -0.282*** | -0.284*** | -65,654*** | -57,210*** | -59,117*** | 89.71*** | 91.68*** | 114.2*** |
| | (0.00165) | (0.00300) | (0.00287) | (0.0125) | (0.0219) | (0.0293) | (1,316) | (1,402) | (1,466) | (1.976) | (3.306) | (4.049) |
| t+1 | 0.0942*** | 0.140*** | 0.113*** | -0.175*** | -0.278*** | -0.213*** | -64,636*** | -56,975*** | -52,683*** | 64.41*** | 78.04*** | 84.84*** |
| | (0.00187) | (0.00346) | (0.00322) | (0.0123) | (0.0219) | (0.0280) | (1,414) | (1,571) | (1,697) | (2.406) | (3.947) | (4.465) |
| t+2 | 0.0553*** | 0.0700*** | 0.0613*** | -0.122*** | -0.204*** | -0.121*** | -48,678*** | -38,415*** | -37,111*** | 51.78*** | 55.86*** | 61.69*** |
| | (0.00181) | (0.00337) | (0.00315) | (0.0175) | (0.0233) | (0.0405) | (1,518) | (1,702) | (1,812) | (2.636) | (4.467) | (4.963) |
| t+3 | 0.0347*** | 0.0404*** | 0.0382*** | -0.123*** | -0.138*** | -0.126*** | -42,008*** | -25,345*** | -26,594*** | 44.30*** | 28.94*** | 47.88*** |
| | (0.00184) | (0.00339) | (0.00316) | (0.0141) | (0.0266) | (0.0321) | (1,671) | (1,863) | (1,968) | (2.940) | (5.060) | (5.040) |
| t+4 | 0.0227*** | 0.0259*** | 0.0250*** | -0.0880*** | -0.0878*** | -0.0770** | -33,239*** | -19,011*** | -18,339*** | 22.26*** | -4.949 | 15.00** |
| | (0.00193) | (0.00350) | (0.00323) | (0.0160) | (0.0301) | (0.0332) | (1,850) | (2,027) | (2,147) | (3.406) | (5.904) | (5.971) |
| t+5 | 0.0182*** | 0.0186*** | 0.0204*** | -0.0580*** | -0.00937 | -0.0457 | -26,056*** | -12,689*** | -8,221*** | 1.964 | -19.58*** | -24.93*** |
| | (0.00213) | (0.00394) | (0.00343) | (0.0190) | (0.0351) | (0.0389) | (2,052) | (2,263) | (2,432) | (4.171) | (6.930) | (7.288) |
| t+6 | 0.0172*** | 0.00338 | 0.0195*** | -0.00516 | 0.0627** | 0.0326 | -24,109*** | -4,067 | -4,619* | -0.904 | -32.46*** | -27.17*** |
| | (0.00239) | (0.00433) | (0.00375) | (0.0184) | (0.0319) | (0.0399) | (2,337) | (2,555) | (2,736) | (4.590) | (7.638) | (7.789) |
| Person X Year | 1,064,186 | 429,137 | 430,702 | 952,565 | 384,814 | 368,473 | 1,064,186 | 429,137 | 430,702 | 964,095 | 389,465 | 389,079 |
| Person | 95,356 | 38,468 | 38,468 | | | | 95,356 | 38,468 | 38,468 | | | |
| R-squared | 0.026 | 0.037 | 0.031 | 0.004 | 0.009 | 0.003 | 0.014 | 0.027 | 0.014 | 0.023 | 0.020 | 0.019 |

Standard errors clustered at the individual level in parentheses *** p<0.01, ** p<0.05, * p<0.1.

**Table L.5**
Unemployment, by age, by gender.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | Young | | | Middle | | | Old | | |
| Var | Men | Women | Matched Men | Men | Women | Matched Men | Men | Women | Matched Men |
| t-5 | 0.000961 | 0.00928 | -0.00555 | 0.00257 | -0.000176 | -6.13e-06 | 0.00499* | -0.00436 | 0.00287 |
| | (0.00370) | (0.00735) | (0.00631) | (0.00254) | (0.00513) | (0.00561) | (0.00258) | (0.00534) | (0.00527) |
| t-4 | -0.00256 | -0.000680 | -0.00338 | 0.00174 | -0.00220 | 0.00329 | 0.00409** | -0.00783* | 0.00344 |
| | (0.00315) | (0.00599) | (0.00525) | (0.00212) | (0.00421) | (0.00461) | (0.00209) | (0.00425) | (0.00411) |
| t-3 | 0.00195 | 0.00105 | 0.00456 | -0.000216 | 0.00242 | 0.00357 | 0.00396** | -0.00312 | 0.00212 |
| | (0.00247) | (0.00468) | (0.00415) | (0.00175) | (0.00307) | (0.00363) | (0.00164) | (0.00298) | (0.00311) |
| t-2 | -0.000279 | -0.00504 | 0.000554 | -0.000533 | -0.000644 | -0.000262 | 0.000370 | -0.00371* | 0.00222 |
| | (0.00183) | (0.00314) | (0.00317) | (0.00122) | (0.00213) | (0.00242) | (0.00122) | (0.00198) | (0.00227) |
| t-1 | | | | | | | | | |
| t | 0.0674*** | 0.103*** | 0.0847*** | 0.0858*** | 0.147*** | 0.116*** | 0.158*** | 0.199*** | 0.166*** |
| | (0.00256) | (0.00471) | (0.00423) | (0.00250) | (0.00462) | (0.00455) | (0.00371) | (0.00695) | (0.00597) |
| t+1 | 0.0595*** | 0.0941*** | 0.0636*** | 0.0787*** | 0.138*** | 0.115*** | 0.165*** | 0.216*** | 0.176*** |
| | (0.00287) | (0.00549) | (0.00473) | (0.00282) | (0.00521) | (0.00517) | (0.00425) | (0.00797) | (0.00677) |
| t+2 | 0.0294*** | 0.0349*** | 0.0240*** | 0.0459*** | 0.0677*** | 0.0592*** | 0.106*** | 0.132*** | 0.109*** |
| | (0.00273) | (0.00524) | (0.00460) | (0.00273) | (0.00498) | (0.00505) | (0.00423) | (0.00821) | (0.00676) |
| t+3 | 0.0196*** | 0.0232*** | 0.0146*** | 0.0315*** | 0.0388*** | 0.0332*** | 0.0614*** | 0.0722*** | 0.0616*** |
| | (0.00281) | (0.00534) | (0.00465) | (0.00285) | (0.00494) | (0.00526) | (0.00424) | (0.00845) | (0.00685) |
| t+4 | 0.0120*** | 0.0134** | 0.0102** | 0.0243*** | 0.0275*** | 0.0244*** | 0.0377*** | 0.0454*** | 0.0281*** |
| | (0.00287) | (0.00528) | (0.00482) | (0.00302) | (0.00515) | (0.00536) | (0.00463) | (0.00935) | (0.00737) |
| t+5 | 0.00559* | 0.0111* | 0.00880* | 0.0204*** | 0.0186*** | 0.0214*** | 0.0395*** | 0.0344*** | 0.0380*** |
| | (0.00307) | (0.00580) | (0.00490) | (0.00338) | (0.00609) | (0.00585) | (0.00543) | (0.0105) | (0.00856) |
| t+6 | 0.00981*** | 0.00422 | 0.0156*** | 0.0168*** | 0.00379 | 0.0141** | 0.0359*** | -0.00145 | 0.0491*** |
| | (0.00340) | (0.00652) | (0.00529) | (0.00380) | (0.00640) | (0.00632) | (0.00640) | (0.0121) | (0.0100) |
| Person X Year | 359,810 | 149,709 | 164,346 | 420,367 | 180,622 | 157,904 | 284,009 | 98,806 | 116,276 |
| Person | 34,324 | 14,474 | 14,474 | 35,800 | 15,392 | 15,392 | 25,232 | 8602 | 8602 |
| R-squared | 0.017 | 0.030 | 0.022 | 0.021 | 0.036 | 0.027 | 0.062 | 0.076 | 0.057 |

Standard errors clustered at the individual level in parentheses *** p<0.01, ** p<0.05, * p<0.1.

**Table L.6**
Unemployment, by educational attainment, by gender.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | High School or Less | | | Vocational | | | Higher Education | | |
| Var | Men | Women | Matched Men | Men | Women | Matched Men | Men | Women | Matched Men |
| t-5 | 0.00466 | -0.00362 | 0.00234 | 0.00227 | 0.00339 | -0.00689 | -0.00641* | 0.00842 | -0.00130 |
| | (0.00340) | (0.00503) | (0.00520) | (0.00208) | (0.00566) | (0.00483) | (0.00381) | (0.00863) | (0.00868) |
| t-4 | 0.000311 | -0.00168 | 0.00489 | 0.00110 | -0.00661 | -0.00364 | -0.00194 | -0.00718 | -0.00230 |
| | (0.00287) | (0.00412) | (0.00423) | (0.00178) | (0.00462) | (0.00408) | (0.00325) | (0.00746) | (0.00700) |
| t-3 | 0.00317 | 9.59e-05 | 0.00520 | 0.00299** | 0.00260 | 0.00603* | -0.00809*** | -0.00636 | -0.00988* |
| | (0.00229) | (0.00317) | (0.00331) | (0.00145) | (0.00347) | (0.00329) | (0.00271) | (0.00569) | (0.00546) |
| t-2 | 0.00220 | -0.00169 | 0.00236 | 0.000551 | -0.00492** | 0.00227 | -0.00802*** | -0.00271 | -0.00757* |
| | (0.00168) | (0.00221) | (0.00246) | (0.00107) | (0.00227) | (0.00231) | (0.00213) | (0.00410) | (0.00438) |
| t-1 | | | | | | | | | |
| t | 0.121*** | 0.178*** | 0.138*** | 0.0936*** | 0.110*** | 0.104*** | 0.0601*** | 0.0748*** | 0.0708*** |
| | (0.00309) | (0.00444) | (0.00425) | (0.00223) | (0.00462) | (0.00427) | (0.00356) | (0.00708) | (0.00625) |
| t+1 | 0.113*** | 0.173*** | 0.130*** | 0.0933*** | 0.117*** | 0.103*** | 0.0526*** | 0.0606*** | 0.0572*** |
| | (0.00355) | (0.00508) | (0.00484) | (0.00251) | (0.00549) | (0.00480) | (0.00385) | (0.00761) | (0.00695) |
| t+2 | 0.0654*** | 0.0827*** | 0.0699*** | 0.0562*** | 0.0632*** | 0.0525*** | 0.0298*** | 0.0352*** | 0.0268*** |
| | (0.00347) | (0.00493) | (0.00478) | (0.00241) | (0.00532) | (0.00464) | (0.00378) | (0.00805) | (0.00692) |
| t+3 | 0.0409*** | 0.0476*** | 0.0428*** | 0.0378*** | 0.0362*** | 0.0304*** | 0.0121*** | 0.0227*** | 0.00574 |
| | (0.00355) | (0.00491) | (0.00492) | (0.00245) | (0.00547) | (0.00466) | (0.00384) | (0.00799) | (0.00698) |
| t+4 | 0.0274*** | 0.0280*** | 0.0228*** | 0.0260*** | 0.0247*** | 0.0240*** | 0.00182 | 0.0263*** | -0.00171 |
| | (0.00367) | (0.00507) | (0.00505) | (0.00256) | (0.00562) | (0.00479) | (0.00432) | (0.00801) | (0.00783) |
| t+5 | 0.0170*** | 0.0311*** | 0.0209*** | 0.0209*** | 0.00676 | 0.0243*** | 0.0138*** | -0.00489 | 0.00293 |
| | (0.00409) | (0.00570) | (0.00534) | (0.00282) | (0.00616) | (0.00528) | (0.00471) | (0.0101) | (0.00842) |
| t+6 | 0.0171*** | 0.00491 | 0.0169*** | 0.0178*** | 0.00354 | 0.0293*** | 0.0161*** | -0.000641 | 0.0168* |
| | (0.00443) | (0.00617) | (0.00581) | (0.00321) | (0.00695) | (0.00571) | (0.00567) | (0.0114) | (0.00950) |
| Person X Year | 369,723 | 229,119 | 215,074 | 537,779 | 149,251 | 167,178 | 156,684 | 50,767 | 56,274 |
| Person | 33,522 | 20,688 | 20,688 | 47,586 | 13,144 | 13,144 | 14,248 | 4636 | 4,636 |
| R-squared | 0.032 | 0.047 | 0.036 | 0.027 | 0.030 | 0.026 | 0.014 | 0.019 | 0.016 |

Standard errors clustered at the individual level in parentheses *** p<0.01, ** p<0.05, * p<0.1.

**Table L.7**
Unemployment by presence of children, by gender.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Children | | | No Children | | |
| Var | Men | Women | Matched Men | Men | Women | Matched Men |
| t-5 | -0.000211 | 0.00673 | -0.00696 | 0.00457* | -0.00673 | 0.00331 |
| | (0.00212) | (0.00478) | (0.00460) | (0.00263) | (0.00497) | (0.00479) |
| t-4 | -0.000664 | -0.00262 | -0.000783 | 0.00168 | -0.00593 | 0.00198 |
| | (0.00179) | (0.00397) | (0.00371) | (0.00224) | (0.00402) | (0.00399) |
| t-3 | 0.000125 | 0.00213 | 0.00173 | 0.00269 | -0.00284 | 0.00492 |
| | (0.00145) | (0.00305) | (0.00293) | (0.00180) | (0.00302) | (0.00315) |
| t-2 | 0.000287 | -0.00175 | 0.00145 | -0.000754 | -0.00508** | 0.000287 |
| | (0.00107) | (0.00205) | (0.00212) | (0.00134) | (0.00217) | (0.00234) |
| t-1 | | | | | | |
| t | 0.0722*** | 0.132*** | 0.0923*** | 0.124*** | 0.156*** | 0.137*** |
| | (0.00203) | (0.00382) | (0.00366) | (0.00259) | (0.00480) | (0.00409) |
| t+1 | 0.0677*** | 0.120*** | 0.0888*** | 0.121*** | 0.166*** | 0.128*** |
| | (0.00229) | (0.00439) | (0.00414) | (0.00294) | (0.00553) | (0.00463) |
| t+2 | 0.0395*** | 0.0576*** | 0.0454*** | 0.0712*** | 0.0863*** | 0.0678*** |
| | (0.00221) | (0.00423) | (0.00400) | (0.00287) | (0.00547) | (0.00460) |
| t+3 | 0.0259*** | 0.0330*** | 0.0241*** | 0.0434*** | 0.0500*** | 0.0401*** |
| | (0.00227) | (0.00422) | (0.00406) | (0.00292) | (0.00557) | (0.00470) |
| t+4 | 0.0190*** | 0.0237*** | 0.0172*** | 0.0265*** | 0.0288*** | 0.0216*** |
| | (0.00240) | (0.00435) | (0.00419) | (0.00306) | (0.00578) | (0.00492) |
| t+5 | 0.0159*** | 0.0166*** | 0.0137*** | 0.0207*** | 0.0217*** | 0.0251*** |
| | (0.00263) | (0.00486) | (0.00446) | (0.00343) | (0.00657) | (0.00532) |
| t+6 | 0.0145*** | 0.00372 | 0.0165*** | 0.0202*** | 0.00358 | 0.0262*** |
| | (0.00297) | (0.00538) | (0.00493) | (0.00385) | (0.00721) | (0.00581) |
| Person X Year | 549,415 | 249,714 | 210,140 | 514,771 | 179,423 | 228,386 |
| Person | 46,604 | 21,197 | 21,197 | 48,752 | 17,271 | 17,271 |
| R-squared | 0.018 | 0.033 | 0.022 | 0.035 | 0.047 | 0.036 |

Standard errors clustered at the individual level in parentheses *** p<0.01, ** p<0.05, * p<0.1.

## Appendix M. Summary Statistics, Parents

| | Women | | Men | |
|---|---|---|---|---|
| | No Children | Children | No Children | Children |
| Age | 42.370 | 37.951 | 42.069 | 39.734 |
| | (12.800) | (7.941) | (12.598) | (9.035) |
| Age, relative to partner | -2.688 | -2.642 | 1.812 | 2.374 |
| | (4.576) | (4.342) | (4.220) | (4.030) |
| Number of Children | 0.000 | 1.719 | 0.000 | 1.781 |
| | (0.000) | (0.745) | (0.000) | (0.785) |
| Married | 0.458 | 0.686 | 0.357 | 0.752 |
| | (0.498) | (0.464) | (0.479) | (0.432) |
| Cohabit | 0.193 | 0.140 | 0.161 | 0.170 |
| | (0.395) | (0.347) | (0.368) | (0.376) |
| Vocational | 0.325 | 0.356 | 0.501 | 0.497 |
| | (0.468) | (0.479) | (0.500) | (0.500) |
| High School or Less | 0.555 | 0.524 | 0.363 | 0.339 |
| | (0.497) | (0.499) | (0.481) | (0.473) |
| A university Degree | 0.121 | 0.120 | 0.136 | 0.164 |
| | (0.326) | (0.325) | (0.343) | (0.370) |
| Management | 0.044 | 0.042 | 0.097 | 0.119 |
| | (0.205) | (0.201) | (0.295) | (0.324) |
| | Industry | | | |
| Iron & Metal | 0.330 | 0.368 | 0.467 | 0.484 |
| | (0.470) | (0.482) | (0.499) | (0.500) |
| Wood, Paper & Graphics | 0.174 | 0.145 | 0.142 | 0.132 |
| | (0.379) | (0.352) | (0.349) | (0.338) |
| Food, Drinks & Tobacco | 0.248 | 0.241 | 0.190 | 0.183 |
| | (0.432) | (0.428) | (0.392) | (0.387) |
| | Earnings | | | |
| Earnings | 294,668 | 286,400 | 380,450 | 405,423 |
| | (111726) | (115455) | (169836) | (184803) |
| Male income share | 0.552 | 0.489 | 0.694 | 0.667 |
| | (0.243) | (0.209) | (0.205) | (0.185) |
| Observations | 17,271 | 21,197 | 48,752 | 46,604 |

*Notes:* The table contains means and standard deviation (in parentheses) of key variables in the year prior to the event. Family information are obtained from full population registers, education refers to the highest completed degree. Earnings, sector, and management dummies are obtained from the employer-employee matched data. Earnings are adjusted for inflation and reported in 2019-levels. Male income share is reported conditional on being married or cohabiting.

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