Short-Time Work Incidence and Consequences: Individual- and Firm-Level Evidence from Austria

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1 Introduction

During the COVID-19 pandemic, income replacement programs have engulfed enormous amounts of taxpayers' money, reaching more than 10 percent of pre-crisis GDP in many countries. Several European governments have expanded short-time work programs to an unprecedented extent. These programs subsidize firms' hoarding of idle labor after a negative labor demand shock.

Advocates often argue that short-time work programs prevent the dissolution of valuable employment relationships by retaining workers with high firm-specific human capital and by avoiding costly employment adjustments for firms. Absent short-term work, frictions (e.g., liquidity constraints or wage rigidity) would lead firms to inefficiently lay off such workers with a high present value. In contrast, opponents worry that short-time work programs subsidize many nonviable employment relationships, thus slowing doing a healthy and necessary labor reallocation process, and are costly, as firms that would have hoarded labor even absent the subsidy will take it up.

A related, but more specific question is: why do we need short-time work programs in the first place? What does a short-time work program add to a system where firms can already *temporarily* lay off their workers during the negative shock, to later on recall them, while the government replaces workers' labor income loss via an unemployment insurance payment?

These questions are not well understood. In particular, the existing literature has mainly focused on how the take-up of short-time work subsidies affects employment and survival of firms in the short run. In the paper, we go beyond the existing literature by studying both the incidence and the long-term effects of short-time work programs on firms and workers.

Specifically, we focus on the experience of Austria in the aftermath of the Great Recession. During that period, the Austrian government used short-time work programs on large scale: in 2009, the take-up of short-time work in the entire economy was 2 percent of the workforce - while only a negligible fraction of workers were on short-time work before that recession. In contrast, the incidence of temporary layoffs was 3.5 percent in 2009, up from 3 percent before the crisis. Even more striking are the numbers in the manufacturing sector, which was hit particularly hard during the 2008/2009 crisis: In 2009 as many as 1 in 10 workers took up short-time work, while 8 percent were on temporary layoff. In other words, short-time work was a major program to cushion workers and firms from the

shocks to firms during the Great Recession.

Using matched firm-worker data from the Austrian social security registers (ASSD), this paper addresses two main questions. First, we take a detailed look the take-up of short-time work programs by workers and firms. We do not only document which firms sent which worker on short-time work but we also compare the characteristics of firms (and their workers) who relied on temporary layoffs to absorb the shock. These programs are, in a benchmark model, equivalent, and we use a simple model to clarify which factors should lead to a divergence in take-up between the two programs, chiefly, formal or informal firing and (re-)hiring costs (see, e.g., Oi, 1962; Hamermesh and Pfann, 1996).

The paper - which we are in the process of writing up and plan to make available online ahead of the conference - is organized as follows. Section 2 recaps some of the related literature. In Section 3, we start out with a simple theoretical framework that organizes our empirical analysis. In Section 4, we study the correlates of short time work. In particular, we document the characteristics of workers (and their employers) on short-time work to the those on temporary layoff, and evaluate these characteristics in light of the theoretical framework. Section 4 uses the event-study methodology to explore the short- and long-term consequences of short-time work take-up (relative to temporary layoffs) for workers and firms.

The extended abstract contains the current set of key findings, the model sketch, and a literature review.

2 Related Literature

Here we briefly review recent papers exploring the effects of short-time work.

Giupponi and Landais (2020) use Italian employer-employee data for the years 2000-15 matched with firm-level balance sheet data and STW on an individual and firm level. They leverage exogenous variation across firm size and tax and industry codes. The key takeaway is that the program works in retaining employment whilst decreasing hours per employee. Kopp and Siegenthaler (2019) combine establishment panel data in Switzerland (2009-15) with data on STW applications. First, they compare establishments before and after a successful STW application. Second, they argue that STW rejections, after matching on covariates, are exogenous since there are no clear guidelines on when to deny applications. Results indicate lower dismissal rates and higher survival rates among establishments that successfully applied to STW.

A series of recent papers studies the experience of Germany, where STW programs were used extensively during the Great Recession. Tilly and Niedermayer (2017) use data on short-time work in Nuremberg (60k short-time workers, corresponding to 390k months) between 2008-10. [1] They merge this data set with social security data (IEB) and establishment-level data. Drawing on a calibrated a model, the authors find that that short-time work reduced job loss during the recession, but welfare gains are modest. Preceding their model the authors also document a positive relation between tenure and short-time work take-up. Boeri and Bruecker (2011) use the IAB Establishment Panel in Germany, where managers were asked whether they use STW, and provide establishment-level correlates of

[1] Scholz (2017), the first to use this data set, studies which workers get selected into short time work. She finds that there is no difference with respect to measures of human capital, such as tenure and education.

take-up. Kruppe and Scholz (2019) also use the IAB establishment data and through dynamic matching find no effects of short-time work on employment. Balleer et al. (2016) also use the IAB Establishment Panel. Cooper, Meyer, and Schott (2017) use the AFiD-Panel "Industriebetriebe", a survey which spans 1995-2010 for manufacturing plants with more than twenty employees, and find a decrease in unemployment during recessions, but also a decrease in allocative efficiency.

Cahuc, Kramarz, and Nevoux (2018) make use of administrative data for French establishments during 2007-11. The authors instrument take-up with geographical proximity of previous users of short time work before the recession. The authors show that short-time work preserved employment and helped firms survive.

US evidence on short-time work programs is scarce. The main reason is that, while those programs exist in some states, STW take-up is very low. Among the new studies is Tracey and Polachek (2018), who use US firm-level administrative data for the years 1991-1993 for a sample of 3,415 firms. The author finds that firms with STW, using semiparametric estimation, reduces layoff but only for cyclically sensitive firms.

3 Simple Framework

We present a simple framework that organizes our empirical analysis later on. This stripped-down 2-period model studies the employment adjustment of a firm that faces a shock in period 1 but knows for sure that the employment relationship will have a positive value in the future. As an essential ingredient, the model describes the decision of a firm (that needs to adjust its employment in period 1) whether to temporarily lay off a workers or send her on short-time work.

3.1 Baseline Model

A worker is attached to a firm engaging in linear production. The worker supplies labor inelastically, earning an exogenously fixed wage w each period they are employed. The productivity of the match varies exogenously over time, yielding p_t units of an output good in period t when the worker is employed. Let l_t be an indicator that takes value 1 when the firm employs a worker in period t, u_t indicate when the firm decides to leave the worker unemployed, and s_t be an indicator for period t STW. These three indicators describe all possible employment states for the worker.

The firm is responsible for paying a per-period cost e_u when $u_t = 1$ and a per-period cost e_s when $s_t = 1$. These costs can be thought of as capturing the UI/STW experience-rating faced by the firm. The firm's profit maximization problem is given by

$$\max_{\{l_t,u_t,s_t\}_{t=1,2}} \sum_{t=1}^{2} \beta^{t-1}[(p_t - w)l_t - e_u u_t - e_s s_t]$$
$$\text{s.t.} \quad l_t, u_t, s_t \in \{0,1\}$$
$$\text{and} \quad l_t + u_t + s_t = 1.$$

We consider a scenario in which productivity in the first period is lower than in the second, $p_1 \leq p_2$. We

assume $w \leq p_2$, so that the match is profitable in the second period. This ensures the worker is always employed in the second period: $l_2 = 1$. What happens in the first period depends on the first-period productivity p_1, the wage w, and the costs to the firm of contraction (e_u and e_s).

- **Employment.** If $p_1 - w \geq -\min\{e_u, e_s\}$, the firm employs the worker in the first period: $l_1 = 1$.
- If $p_1 - w < -\min\{e_u, e_s\}$, the firm does not employ the worker. In this case:
  - **STW.** If $e_u < e_s$ the firm lays off the worker temporarily: $u_1 = 1$.
  - **Temporary layoff.** If $e_s < e_u$ the firm places the worker on STW: $s_1 = 1$.
  - If $e_s = e_u$, the firm is indifferent between temporary layoff and STW.

In this baseline case, firms choose the cheapest route to escaping employment. Firms that face lower e_s relative to e_u are more likely to take up STW. Note that in the special case $e_s = e_u = 0$, neither u_1 nor s_1 enter the firm's objective function and the firm is clearly indifferent between TL and STW.

3.2 Hiring and Firing Costs

Now suppose there is a cost of hiring a new worker $C_h > 0$ and a (potentially different) cost of firing the worker $C_f > 0$. For simplicity, we first consider the case where $e_s = e_r = 0$. C_f may capture severance payments while C_h may capture the cost of posting a vacancy or job training. The firm's problem is

$$\begin{aligned} &\max_{\{l_t, u_t, s_t\}_{t=1,2}} \left(\sum_{t=1}^{2} \beta^{t-1}[(p_t - w)l_t - C_f u_t]\right) - \beta C_h(u_1 - u_2) \\ &\text{s.t.} \quad l_t, u_t, s_t \in \{0, 1\} \\ &\text{and} \quad l_t + u_t + s_t = 1. \end{aligned}$$

It is now costless for the firm to place the worker on STW in the first period. Because we assume match profit in the second period is positive and restoring a STW worker to full employment is free, the firm always does so in the second period. On the other hand, temporary layoff with recall now entails hiring and/or firing penalties, leading to a net cost of $C_f + \beta C_h$. To avoid the re-hiring cost, the firm can choose not to recall the worker, but then it forgoes match profit in the second period. The net cost in this latter case is $C_f + \beta(p_2 - w)$.

Since the cost of both temporary and permanent layoffs are positive, STW is the preferred instrument. The firm either keeps the worker employed in both periods, or it contracts in the first period by placing the worker on STW. Layoffs are never considered. In particular,

- **Employment.** If $p_1 - w > 0$, the firm employs the worker in both periods.
- **STW.** If $p_1 - w < 0$, the firm places the worker on STW in the first period and restores them to full employment in the second period.

When the firm must fund some of the cost of STW and of UI, the solution depends on whether UI is cheaper than STW by a margin large enough to offset hiring/firing costs. The firm's general problem is

$$\max_{\{l_t,u_t,s_t\}_{t=1,2}} (\sum_{t=1}^{2} \beta^{t-1}[(p_t - w(p_t))l_t - (e_u + C_f)u_t - e_s s_t]) - \beta C_h(u_1 - u_2)$$
$$\text{s.t.} \quad l_t, u_t, s_t \in \{0,1\}$$
$$\text{and} \quad l_t + u_t + s_t = 1$$

As in the previous section, the cost to the firm of placing the worker on STW in the first period is e_s. As before, the firm always restores a STW worker to full-time employment in the second period. Temporary layoff with recall in the second period entails both a firing and a hiring cost, leading to a net cost of $e_u + C_f + \beta C_h$. To avoid the re-hiring cost, the firm can instead forgo match profit in the second period by not recalling the worker. The net cost in this case is $e_u + C_f + \beta(p_2 - w)$. The firm's decision depends on how period 1 match profit $p_1 - w$ and the costs of these contraction possibilities compare to each other:

1. **Employment.** If $p_1 - w > -\min\{e_s, e_u + C_f + \beta C_h, e_u + C_f + \beta(p_2 - w)\}$, the firm employs the worker in both periods: $l_1 = l_2 = 1$.

Otherwise, the firm chooses the cheapest contraction option. If STW is the cheapest option, the path is straightforward:

2. **STW.** If 1. does not hold and $e_s < \min\{e_u + C_f + \beta C_h, e_u + C_f + \beta(p_2 - w)\}$, the firm places the worker on STW in the first period and restores them to full employment in the second period.

If it is instead cheaper to layoff the worker, the firm may or may not recall them in the second period, depending on whether the re-hiring cost exceeds period 2 match profit:

3. **Temporary layoff.** If neither 1. nor 2. holds and $\beta C_h < \beta(p_2 - w)$, the worker is laid off then recalled in the second period.

4. **Permanent layoff.** If neither 1. nor 2. holds and $\beta C_h > \beta(p_2 - w)$, the worker is laid off and not recalled.

Intuitively, firing costs make layoffs less attractive, pushing firms either towards STW or full employment labor hoarding. (Re-)hiring costs make temporary layoffs less attractive, though the appeal of permanent layoffs is unaffected.

Unlike in the $e_s = e_u = 0$ case, there is a potential equivalence between STW and temporary layoffs when firms bear some of the costs of UI and STW. In particular, the firm is indifferent between the two instruments when $e_s = e_u + C_f + \beta C_h$. The firm is indifferent between STW and *permanent* layoff when $e_s = e_u + C_f + \beta(p_2 - w)$, but firm's choice has consequences for both employment and production in this case.

3.3 STW Re-hiring Regulations

Hiring and firing costs are one reason firms may prefer STW over layoffs. A drawback of STW may be regulations that require firms to re-instate full time employment for workers placed on STW. To study this, we return to the baseline model without hiring and firing costs from the first section. The difference is that we now assume p_2 is drawn stochastically from a distribution $G(p)$. The firm observes the realized productivity only at the start of the second period. The problem is similar to before:

$$\begin{aligned}
&\max_{\{l_1,u_1,s_1\}} (p_1 - w)l_1 - e_u u_1 - e_s s_1 + \beta \mathrm{E}[\max_{\{l_2,u_2,s_2\}} (p_2 - w)l_2 - e_u u_2 - e_s s_2] \\
&\text{s.t.} \quad l_t, u_t, s_t \in \{0, 1\} \\
&\text{and} \quad l_t + u_t + s_t = 1 \\
&\text{and} \quad s_1(1 - l_2) = 0
\end{aligned}$$

The third constraint captures the requirement that if the firm places the worker on STW in the first period, it must employ the worker full time in the second period. As before, if the match is sufficiently profitable in the first period, the solution is straightforward:

1. **Employment.** If $p_1 - w > -\min\{e_u, e_s - \beta \Pr(p_2 - w < 0)\mathrm{E}[p_2 - w | p_2 - w < 0]\}$, the firm employs the worker in the first period. It employs the worker in the second period iff the realized productivity leads to positive match profit: $p_2 - w > 0$.

The term $-\beta \Pr(p_2 - w < 0)\mathrm{E}[p_2 - w | p_2 - w < 0]$ is the expected cost to the firm of the STW regulation that binds it to re-employ workers placed on STW. If on the other hand match profit is high enough to justify employment, the firm chooses the contraction option that is cheapest in expectation:

2. **STW with guaranteed recall.** If 1. does not hold and $e_u < e_s - \beta \Pr(p_2 - w < 0)\mathrm{E}[p_2 - w | p_2 - w < 0]$, the firm places the worker on STW in the first period and restores them to full employment in the second period.

3. **Temporary layoff.** If 1. does not hold and $e_u > e_s - \beta \Pr(p_2 - w < 0)\mathrm{E}[p_2 - w | p_2 - w < 0]$, the firm lays the worker off in the first period and recalls them iff the realized productivity leads to positive match profit: $p_2 - w > 0$.

To build intuition for the regulation penalty, let $G(p) = \text{Uniform}(\underline{p}, \overline{p})$ and $w \in [\underline{p}, \overline{p}]$. Then,

$$-\beta \Pr(p_2 - w < 0)\mathrm{E}[p_2 - w | p_2 - w < 0] = -\frac{\beta}{2} \frac{(w - \underline{p})^2}{\overline{p} - \underline{p}}$$

The higher the exogenous wage level, the more costly it is for the firm to choose STW in the first period because it will be forced to pay the wage in the second period. Conversely, when either $\underline{p}$ or $\overline{p}$ increases so that the productivity distribution becomes more favorable, the regulation is less likely to bind and STW becomes more attractive. When $e_u = e_s$, temporary layoffs are a superior instrument and the firm never considers STW.

4 Data, Variable Definitions, and Analysis Sample

This paper uses data on short-time work (STW) compensation and unemployment insurance (UI) benefits from the public employment service Austria (AMS). The data contains day-specific labor market spells including information on income from February 1997 until June 2020 and can be linked to various worker and firm characteristics from the Austrian social security data (ASSD), which is available since 1972.

Using this data, we can identify workers and firms who take up STW and track them in the following years. Since take-up of the STW program was sizeable only during 2008 and 2009, most of our analysis looks the correlates of STW take-up during the financial crisis 2008q1–2010q4. For the same reason, we will concentrate on the consequences of STW take-up in the years following the 2008/09 crisis.

While much of the recent literature has focused on the impact of STW on firms, we exploit our matched firm-worker to also study the take-up by firms and workers. In particular, we will not only study which firms take up STW and how take-up affects employment and firm survival in the short- and the long-run. We will also look at the characteristics of workers who take-up STW and how take-up affects their short- and long-run career, similarly for their employers.

We collapse the daily spell data set into an annual panel, among workers employed on January 1st of a given calendar year. We then track their incidence of short-term work, layoffs (permanent or temporary), or neither (i.e., employment). A worker is in short-time work (STW) when she experienced at least once short-time work in a given year. A worker is defined to be laid off if she separated from her original employer and subsequently took up unemployment in a given year (but was not classified as being on short time work in that year). We further split the laid-off workers into two groups. A worker is temporary laid off, if she was reemployed by her original employer within a year. All other layoffs are defined as permanent. Furthermore, we are in the process of obtaining data on workers' ex ante recall expectations to classify layoffs as temporary vs. permanent (instead of the ex post measure we currently use). To avoid competing events among STW, temporary layoff and permanent layoff, we prioritize STW over layoffs (permanent layoff and temporary layoff), and permanent layoff over temporary layoff. In 2009, there were 2,691,726 employees and 239,721 employers in our sample, across industries. Among manufacturing sector, the numbers are 526,385 and 21,712, respectively for employees and employers.

In Figure 1 we plot the fraction of workers on STW, temporary layoff and permanent layoff, as a share of total employment. Panel (a) refers to all industries, while Panel (b) refers to only the manufacturing sector. Panel (a) shows that, in a typical year between 6 and 8 percent are laid off permanently, while about 3 percent were laid off temporarily. During the peak of the Great Recession in 2009, both permanently and temporary layoffs go up, the former by 1 and the latter by 0.5 percentage points. This compares to an incidence of 2 percent of the work force in 20009 (while in "normal" times, STW take-up is negligible).

The spike in STW take-up is even more dramatic spike in the manufacturing sector. In 2009, 1 in 10 workers took up STW at some point, up from basically zero in the pre-crisis year 2007. In contrast, spikes also occur for temporary and permanent layoffs in 2009, although their magnitude is relatively low. We conclude that STW has been an important program to cushion firms and workers from the shock associated with the financial crisis of 2008/09.

Hence, in what follows, we focus on workers and firms in the manufacturing sector. This sector was hit particularly hard during the Great Recession and STW take-up was disproportionately large. Therefore, understanding take-up and consequences of STW is of particular interest in this sector.

5 Correlates of Short-Time Work

In this section, we describe which workers get short-time work and which workers are laid off using the various covariates. We restrict our sample to the manufacturing sector and the years 2008-2010, where most of the short-time work take-up took place.

5.1 Univariate Analysis

First, we present results for a univariate analysis of STW take-up for the following observable characteristics:

- Figure 2 plots take-up by industry
- Figure 3 plots take-up by 5-year age group
- Figure 4 plots take-up by 2-year tenure group
- Figure 5 plots take-up by income group
- Figure 6 plots take-up by firm size group

5.2 Multivariate Analysis

Second, we present results for a multivariate analysis. First, in Figure 7 for our full sample and then restricting to separators (either short time work or laid off) in Figure 8.

6 Consequences of Short-Time Work

This section documents consequences of short-time work, separately on the worker and firm levels.

6.1 Worker-Level Event Study

Figure 9 shows monthly income conditional on employment in the sample of manufacturing workers with high-labor force attachment in 2007/08 separately for workers with a separation into (i) STW, (ii) permanent unemployment, (iii) temporary unemployment in 2008/2009, relative to matched workers that stay employed in the same year.[2] Interestingly, relative to matched stayers, income conditional on employment 9 years after STW take up is about 15% lower for workers with a permanent layoff, while income losses for workers receiving STW are much lower. Importantly, we do not interpret these

[2]Workers are matched based on discrete categories of income, tenure, age, gender, and firm size within the manufacturing industry in the baseline year and we restrict the sample to the 94.5% of workers with an exact match. High-labor force attachment is defined as being employed in each month during the base year.

findings as the causal effect of STW but rather as descriptive markers suggesting that workers who receive STW (or, similarly, a temporary layoff) might be high-value workers.

6.2 Firm-Level Event Study

Figure 10 shows the number of employed workers by firm relative to baseline employment in the sample of manufacturing firms with at least 50 employed workers in the baseline quarter with earliest STW take-up between 2008q1 and 2010q4. Panel (a) shows results conditional on firm survival, while Panel (b) shows results including firm exits. The figure reveals that in line with the retention obligation the number of workers in a firm converges back to its initial level at the time of STW take-up. However, including firm exits shows that employment 6 years after STW take up is about 15% lower than in the baseline quarter. Additionally, Figure 11 confirms that – in line with the law – STW is used as a last resort and that there is an increasing number of separations in the year before firms take up STW. At the same time the number of hires relative to baseline employment decreases shortly before STW take up but increases again about 1.5 years after, consistent with the maximum take up duration of about 18 months until December 2010. Interestingly, Figure 12 reveals that this increase is mainly driven by new hires, while recalled hires stay consistently below their baseline level. Finally, Figure 13 shows the number of separations into different labor market states and confirms that the increase in separations before firms take up STW is driven by separations into unemployment, while job-to-job transitions remain relatively constant.

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Figures

Figure 1 **Take-up by Year**

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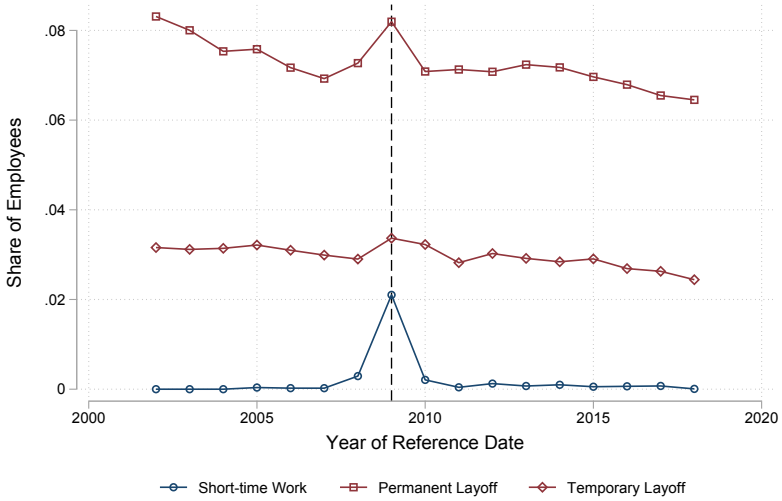
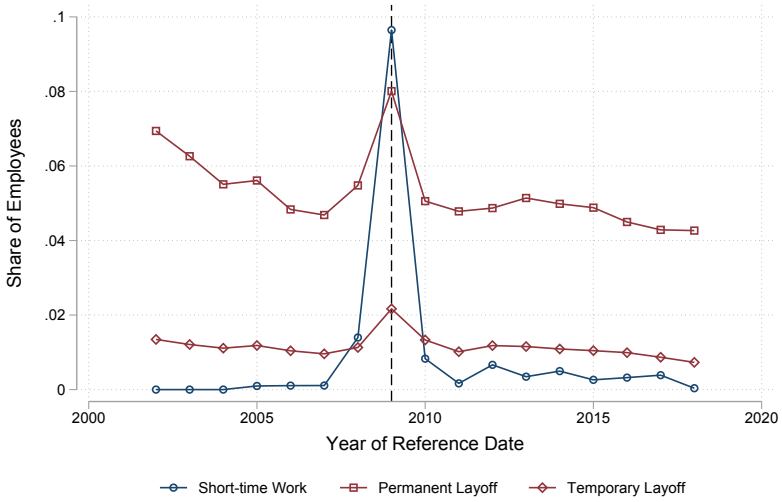
(a) **All Industries**

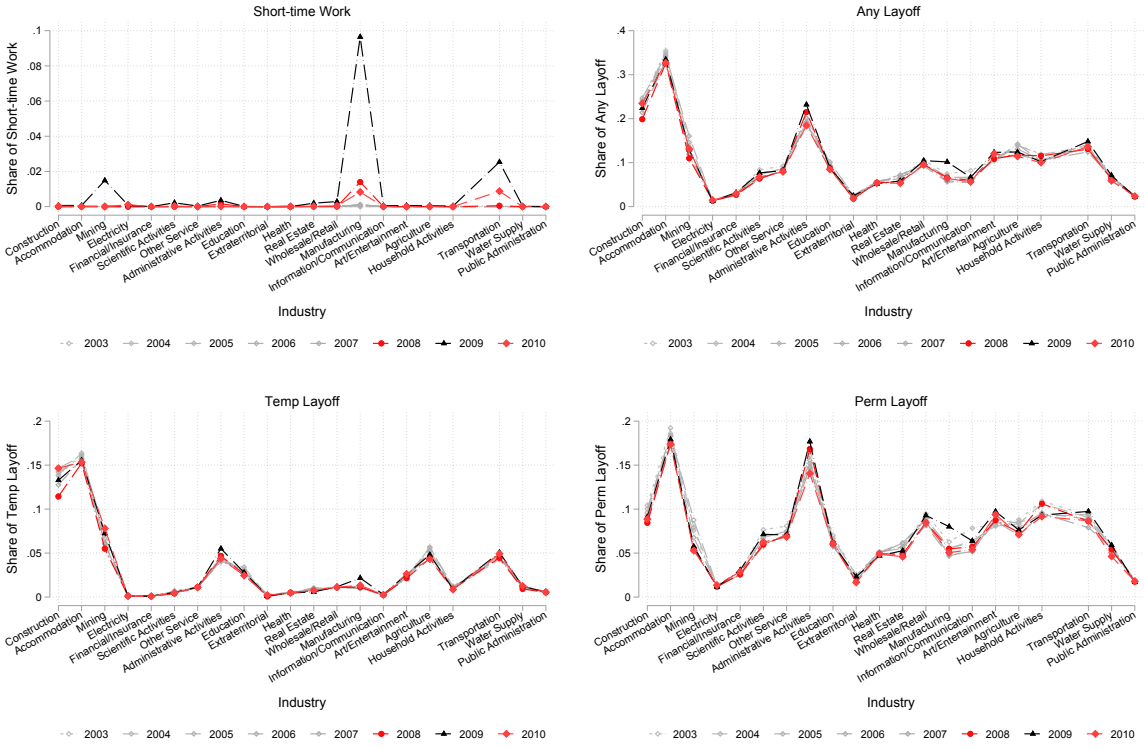


(b) **Manufacturing**



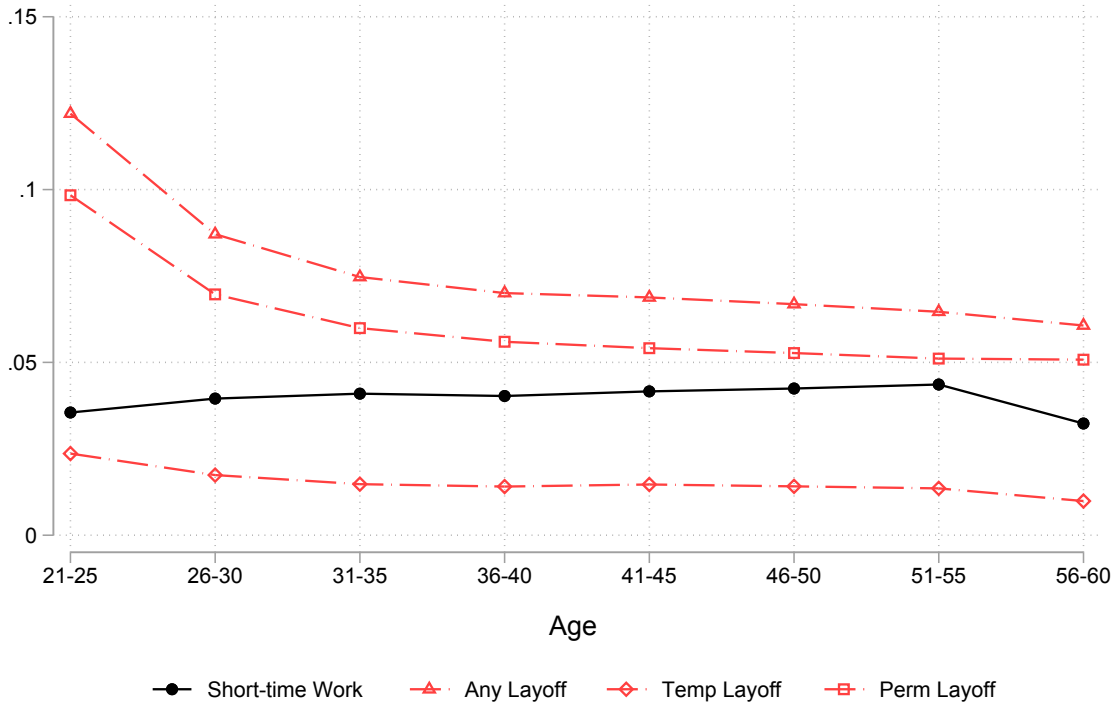
Notes: This figure shows the share of employees with (i) short-time work, (ii) permanent layoff, (iii) temporary layoff by year, for all industries and manufacturing only.

Figure 2 **Take-up by Industry**



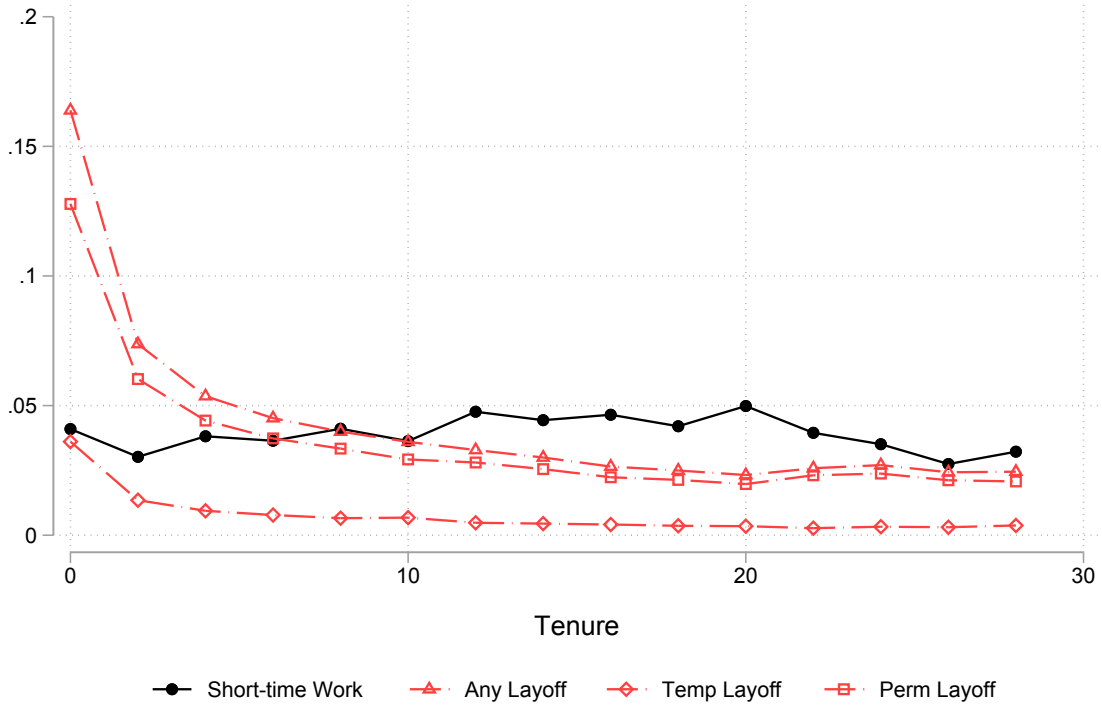
Notes: This figure shows the share of employees with (i) short-time work, (ii) any layoff (i.e. temporary and permanent layoff), (iii) temporary layoff, and (iv) permanent layoff by industry separately for years 2003–2010.

Figure 3 **Take-up by Age Group**



Notes: This figure shows the share of employees with (i) short-time work, (ii) any layoff (i.e. temporary and permanent layoff), (iii) temporary layoff, and (iv) permanent layoff by 5-year age groups in the sample of workers aged 21–60 who were employed on January 1 in a given year 2008–2010. Layoffs are defined as separations into unemployment. Layoffs are classified as temporary if the laid off employee returns to her original employer within 12 months; otherwise a layoff is classified as permanent.

Figure 4 **Take-up by Tenure**

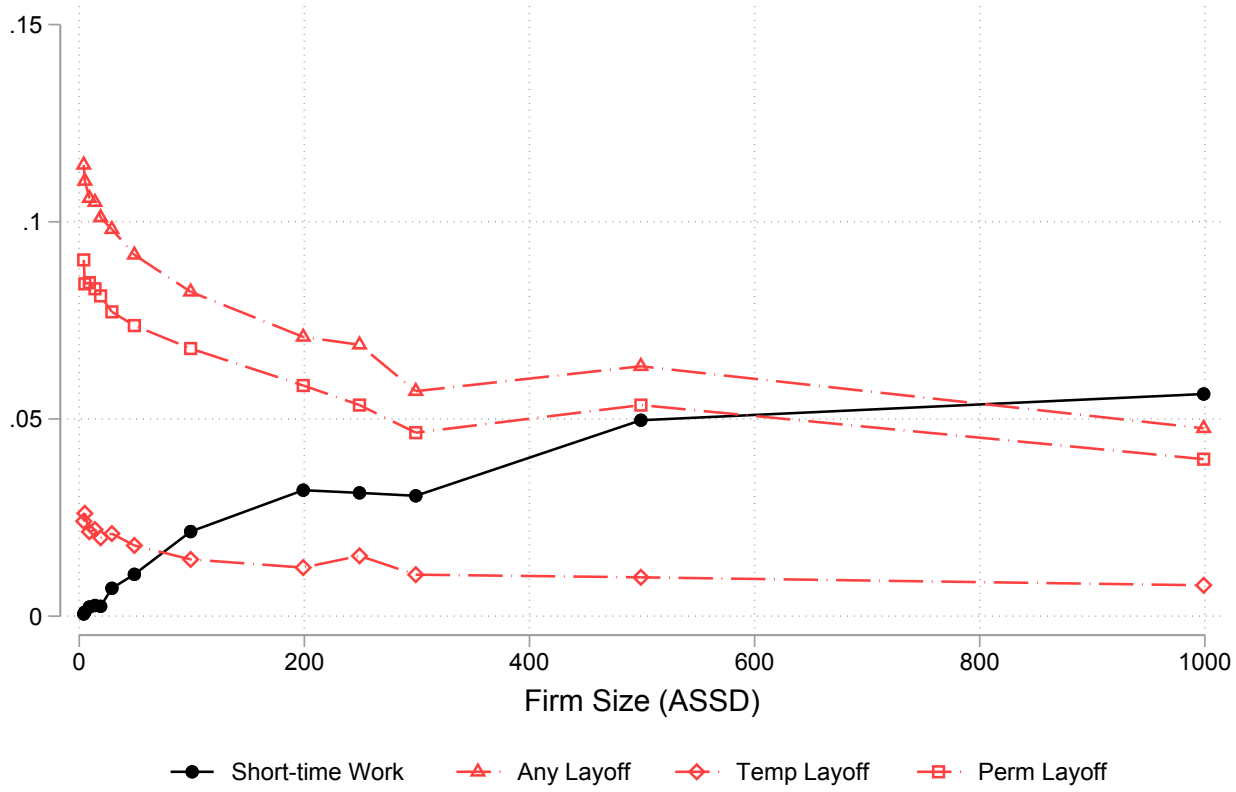


Notes: This figure shows the share of employees with (i) short-time work, (ii) any layoff (i.e. temporary and permanent layoff), (iii) temporary layoff, and (iv) permanent layoff by 2-year tenure groups in the sample of workers aged 21–60 who were employed on January 1 in a given year 2008–2010. Layoffs are defined as separations into unemployment. Layoffs are classified as temporary if the laid off employee returns to her original employer within 12 months; otherwise a layoff is classified as permanent.

Figure 5 **Take-up by Income**

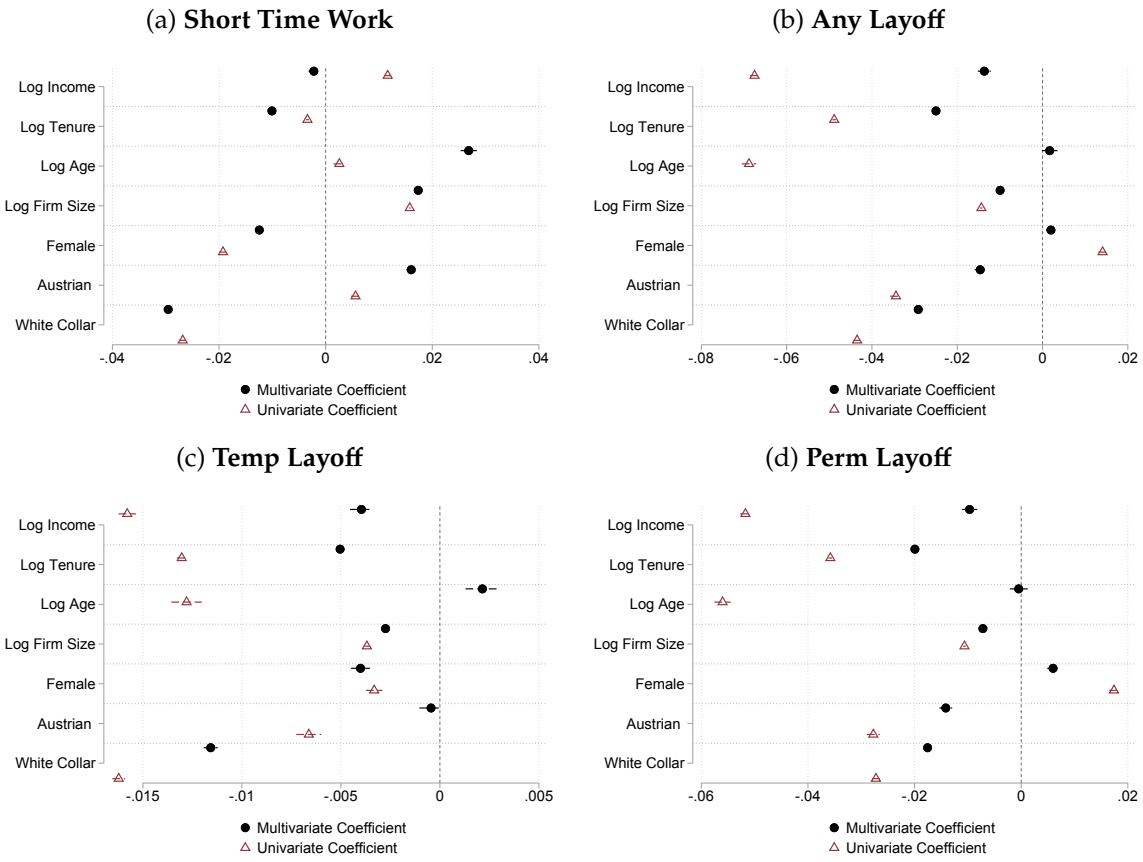
Notes: This figure shows the share of employees with (i) short-time work, (ii) any layoff (i.e. temporary and permanent layoff), (iii) temporary layoff, and (iv) permanent layoff by 30 evenly spaced income groups in the sample of workers aged 21–60 who were employed on January 1 in a given year 2008–2010. Layoffs are defined as separations into unemployment. Layoffs are classified as temporary if the laid off employee returns to her original employer within 12 months; otherwise a layoff is classified as permanent.

Figure 6 **Take-up by Firm Size**



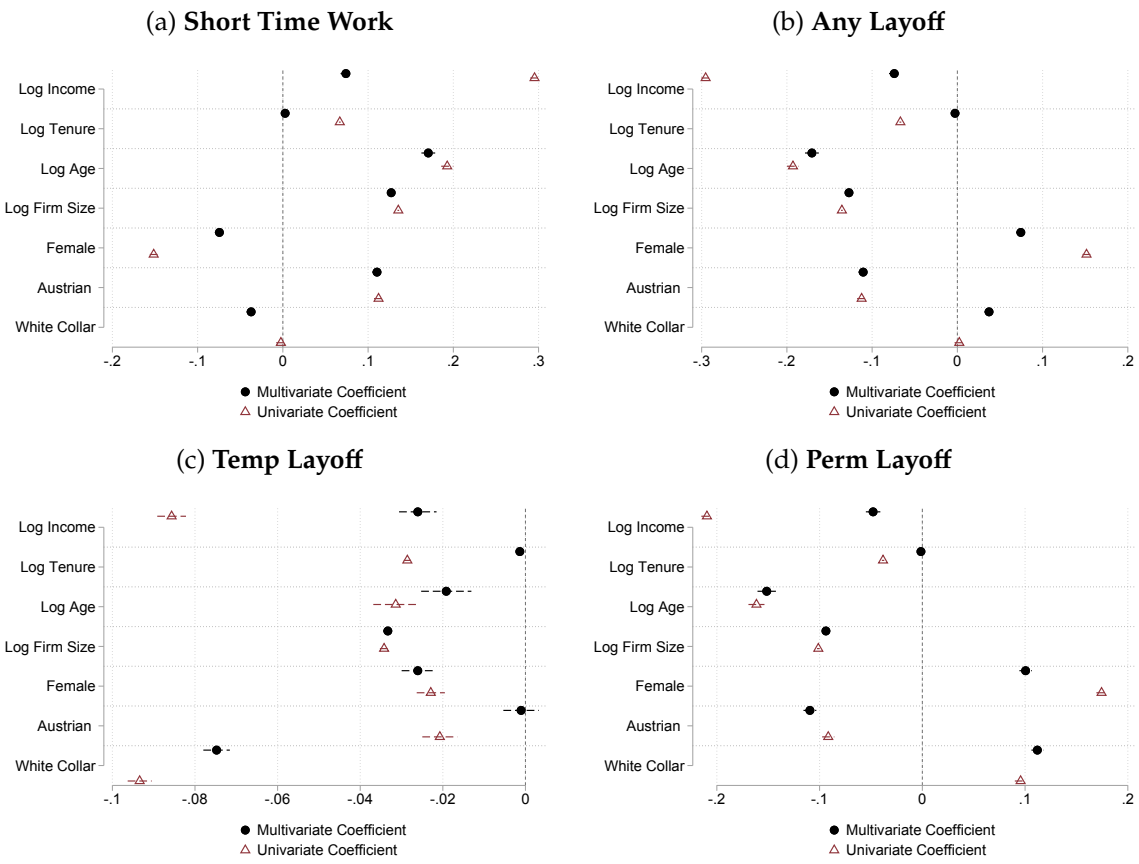
Notes: This figure shows the share of employees with (i) short-time work, (ii) any layoff (i.e. temporary and permanent layoff), (iii) temporary layoff, and (iv) permanent layoff by 20 quantiles of firm size groups in the sample of workers aged 21–60 who were employed on January 1 in a given year 2008–2010. Layoffs are defined as separations into unemployment. Layoffs are classified as temporary if the laid off employee returns to her original employer within 12 months; otherwise a layoff is classified as permanent.

Figure 7 **Multivariate Analysis, All Employed Workers**



Notes: We estimate a multivariate regression, and a univariate regression for each outcome (indicator for short time work, any layoff, temp layoff, perm layoff) on the sample of workers employed at the beginning of the year. We plot coefficients with corresponding 95% confidence. The sample contains the period 2008-2010. Layoffs are defined as separations into unemployment. Layoffs are classified as temporary if the laid off employee returns to her original employer within 12 months; otherwise a layoff is classified as permanent.

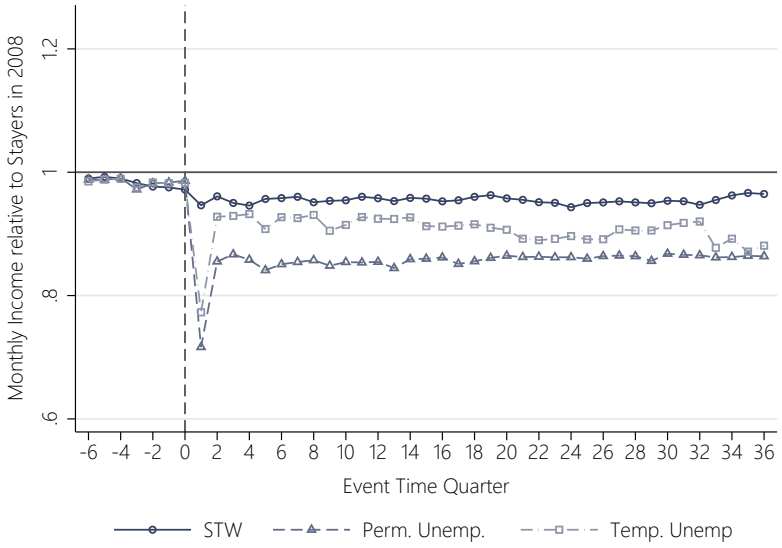
Figure 8 **Multivariate Analysis, Separators Only**



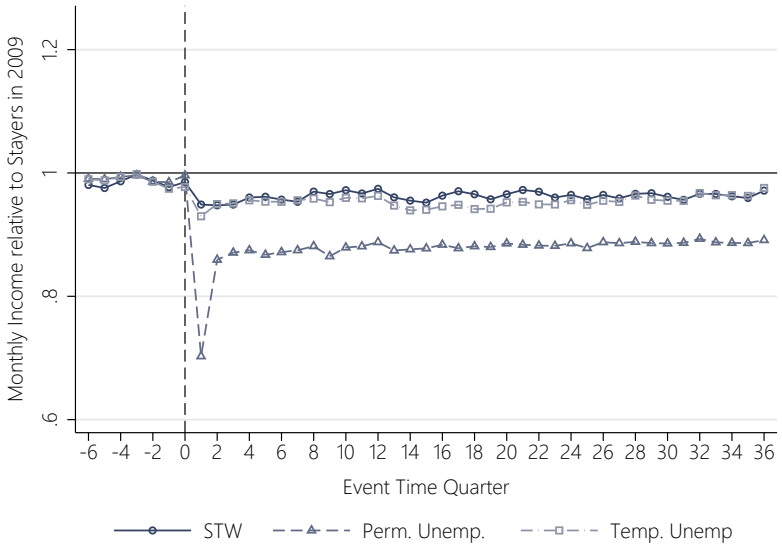
Notes: We estimate a multivariate regression, and a univariate regression for each outcome (indicator for short time work, any layoff, temp layoff, perm layoff) on the sample of workers employed at the beginning of the year. We plot coefficients with corresponding 95% confidence. The sample contains the period 2008-2010, furthermore we restrict the sample to workers that were either laid off or subject to short time work. Layoffs are defined as separations into unemployment. Layoffs are classified as temporary if the laid off employee returns to her original employer within 12 months; otherwise a layoff is classified as permanent.

Figure 9 **Monthly Income relative to Stayers by Event Time Quarter**

(a) **Separations in 2008**



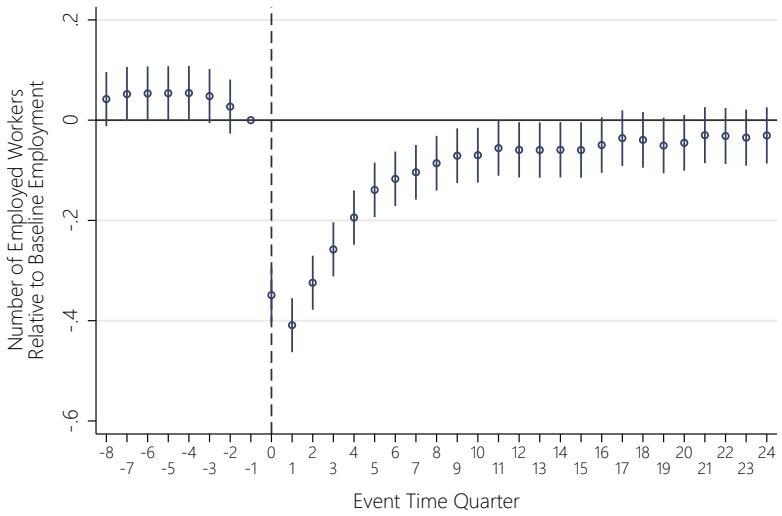
(b) **Separations in 2009**



Notes: This figure shows monthly income conditional on employment in the sample of matched workers with high-labor force attachment in 2007/2008 for workers with a separation into (i) STW, (ii) permanent unemployment, (iii) temporary unemployment in 2008/2009, relative to workers that stay employed in 2008/2009. Event time 0 is the first quarter with a separation in year 2008/2009. Layoffs are defined as separations into unemployment. Layoffs are classified as temporary if the laid off employee returns to her original employer within 12 months; otherwise a layoff is classified as permanent.

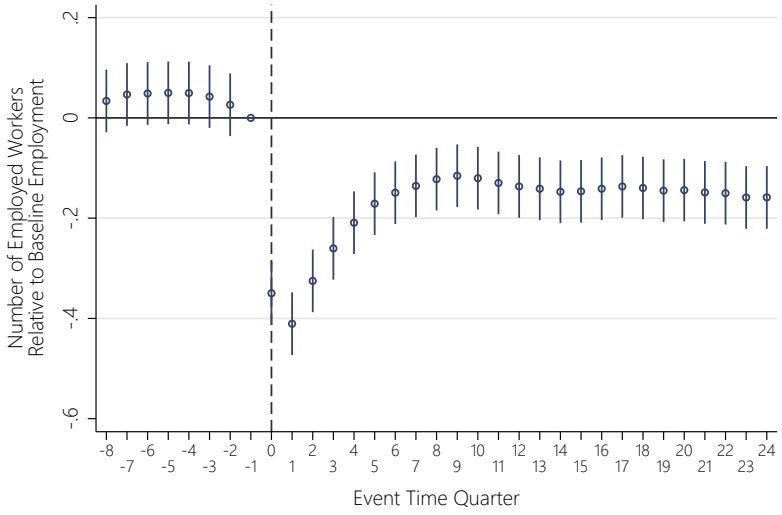
Figure 10 **Firm Employment relative to Baseline Quarter by Event Time**

(a) **Conditional on Firm Survival**



Note: 8292 Observations for 266 Firms in mfo Industries with at least 50 employed workers, conditional on STW Take-Up = 1 and survival = 1.

(b) **Including Firm Exits**

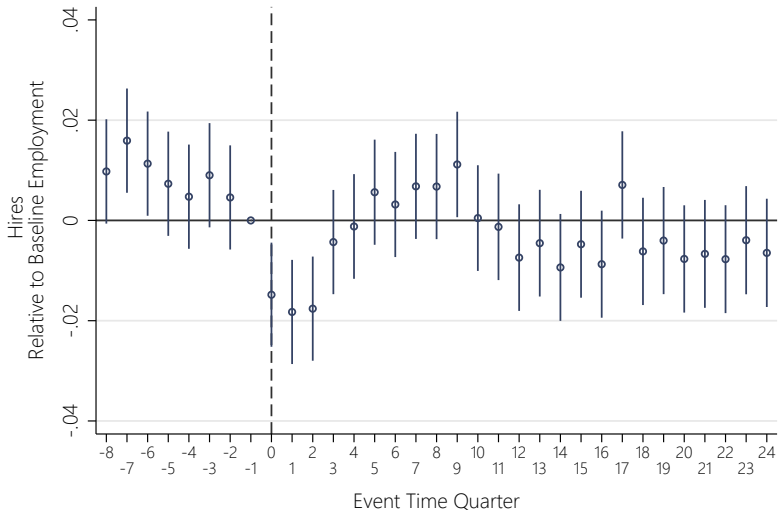


Note: 8778 Observations for 266 Firms in mfo Industries with at least 50 employed workers, conditional on STW Take-Up = 1 and survival = 0.

Notes: This figure shows the number of employed workers by firm relative to baseline employment in the sample of manufacturing firms with at least 50 employed workers in the baseline quarter with earliest STW take-up between 2008q1 and 2010q4. Event time 0 is the earliest quarter where the firm takes up STW.

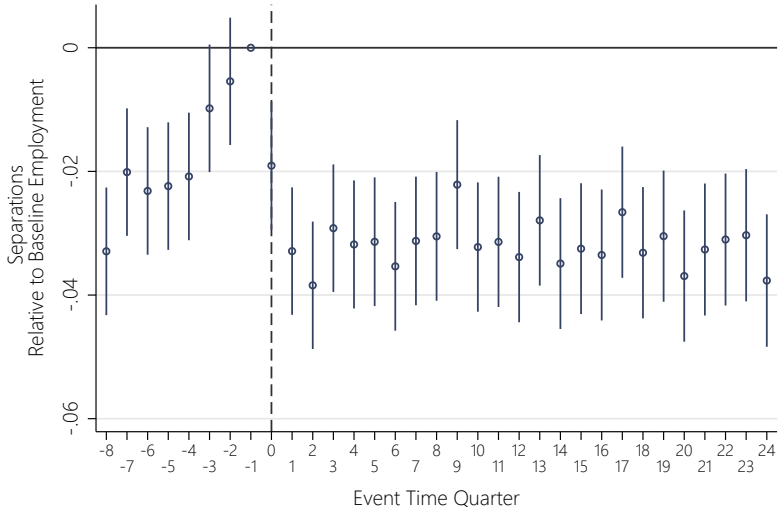
Figure 11 **Firm Hires and Separations relative to Baseline Quarter by Event Time**

(a) **Hires**



Note: 8292 Observations for 266 Firms in mfo Industries with at least 50 employed workers, conditional on STW Take-Up = 1 and survival = 1.

(b) **Separations**

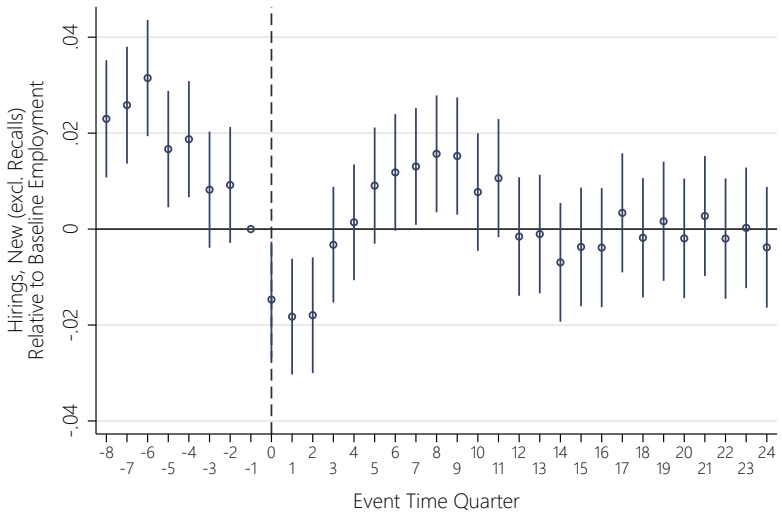


Note: 8292 Observations for 266 Firms in mfo Industries with at least 50 employed workers, conditional on STW Take-Up = 1 and survival = 1.

Notes: This figure shows the number of hires and separations by firm relative to baseline employment in the sample of manufacturing firms with at least 50 employed workers in the baseline quarter with earliest STW take-up between 2008q1 and 2010q4. Event time 0 is the earliest quarter where the firm takes up STW.

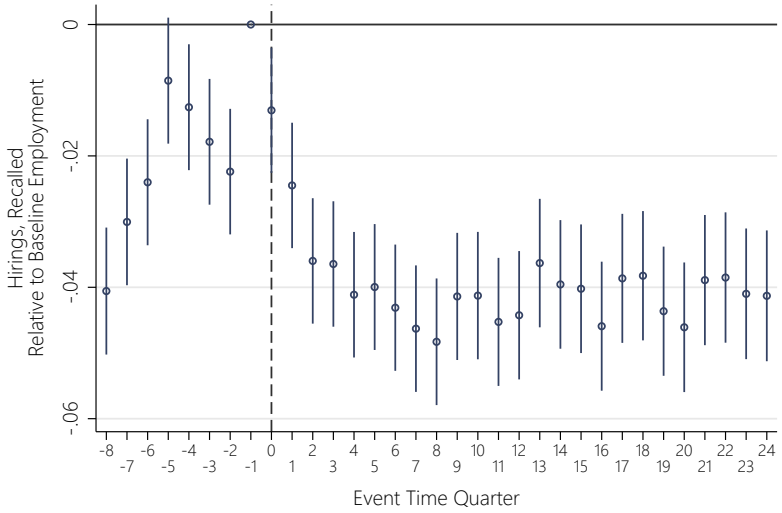
Figure 12 **New and Recalled Firm Hires relative to Baseline Quarter by Event Time**

(a) **New Hires**



Note: 8327 Observations for 269 Firms in mfo Industries with at least 50 employed workers, conditional on STW Take-Up = 1 and survival = 1.

(b) **Recalled Hires**

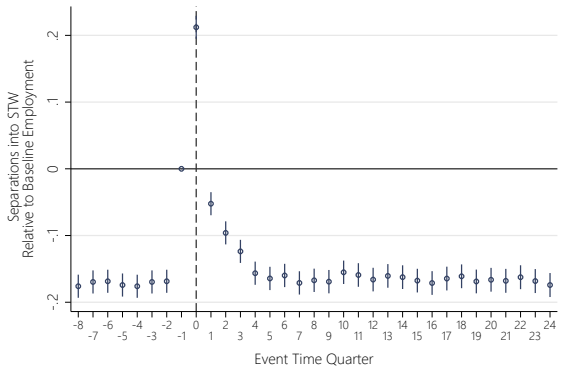


Note: 8327 Observations for 269 Firms in mfo Industries with at least 50 employed workers, conditional on STW Take-Up = 1 and survival = 1.

Notes: This figure shows the number of new and recalled hires by firm relative to baseline employment in the sample of manufacturing firms with at least 50 employed workers in the baseline quarter with earliest STW take-up between 2008q1 and 2010q4. Event time 0 is the earliest quarter where the firm takes up STW.

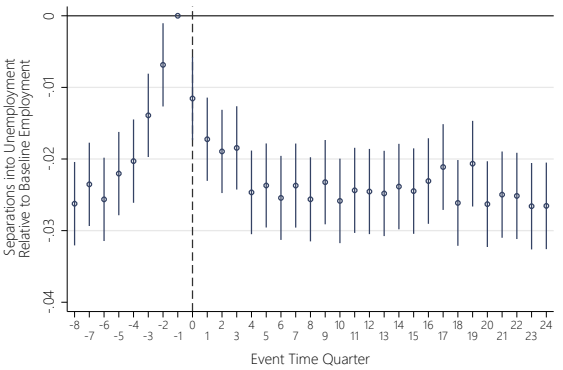
Figure 13 **Firm Separations by Labor Market State relative to Baseline Quarter by Event Time**

(a) **Short-Time Work**



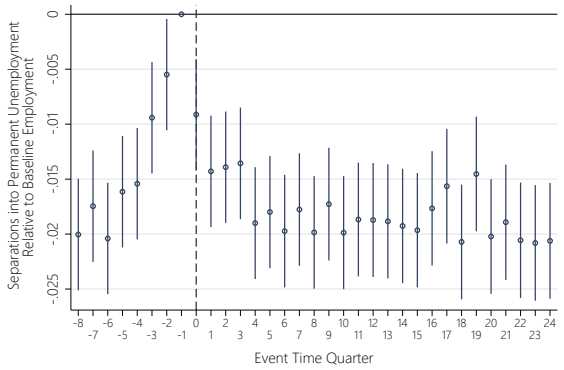
Note: 8292 Observations for 266 Firms in mfo Industries with at least 50 employed workers, conditional on STW Take-Up = 1 and survival = 1.

(b) **Unemployment**



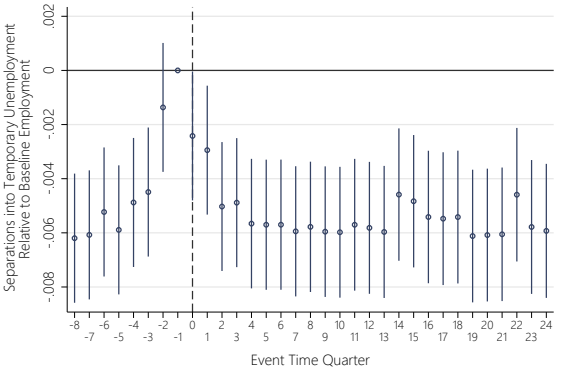
Note: 8292 Observations for 266 Firms in mfo Industries with at least 50 employed workers, conditional on STW Take-Up = 1 and survival = 1.

(c) **Permanent Unemployment**



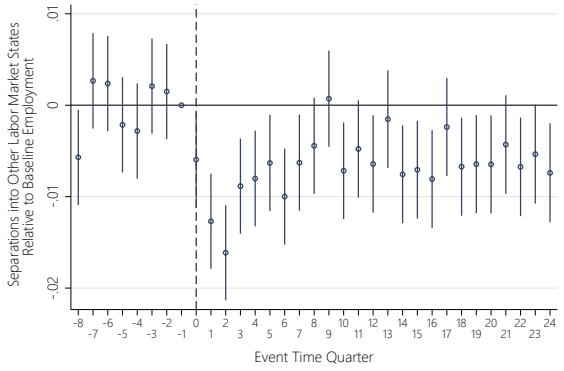
Note: 8292 Observations for 266 Firms in mfo Industries with at least 50 employed workers, conditional on STW Take-Up = 1 and survival = 1.

(d) **Temporary Unemployment**



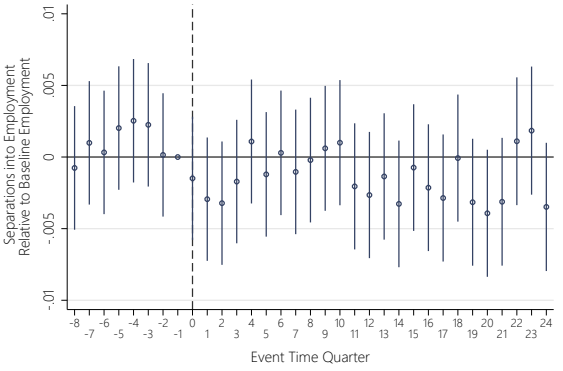
Note: 8292 Observations for 266 Firms in mfo Industries with at least 50 employed workers, conditional on STW Take-Up = 1 and survival = 1.

(e) **Other Labor Market State**



Note: 8292 Observations for 266 Firms in mfo Industries with at least 50 employed workers, conditional on STW Take-Up = 1 and survival = 1.

(f) **Employment**



Note: 8292 Observations for 266 Firms in mfo Industries with at least 50 employed workers, conditional on STW Take-Up = 1 and survival = 1.

Notes: This figure shows the number of separations into different labor market states relative to baseline employment in the sample of manufacturing firms with at least 50 employed workers in the baseline quarter with earliest STW take-up between 2008q1 and 2010q4. Event time 0 is the earliest quarter where the firm takes up STW.