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Firm Consolidation and Labor Market Outcomes

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Abstract

Using rich administrative data from the Netherlands, we study the consequences of firm consolidation for workers. For workers at acquired firms, takeovers are associated with a 8.5% drop in employment at the consolidated firm and a 2.6% drop in total labor income. These effects are persistent even four years later. We show that the primary mechanism for this job loss is labor restructuring at consolidating firms. Specifically, workers with higher-than-expected pay relative to their human capital and workers with skills that are likely already present at acquirers are less likely to be retained.

Keywords: Takeovers, labor market outcomes, labor restructuring.

JEL classification: G34, J2, J3, M51.

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1 Introduction

Firm takeovers where one firm absorbs another firm are common phenomena in markets worldwide. Such consolidations can not only impact product competition, prices, and consumer welfare but can also be consequential for workers (Autor, Katz, Patterson and Reenen, 2020; Azar, Marinescu and Steinbaum, 2022; Benmelech, Bergman and Kim, 2022; Rinz, 2022). Understanding the short- and long-term impacts of consolidations on worker outcomes is important for effective regulation of consolidations and the design of labor market, social insurance, and safety net policies.

This paper studies how takeovers affect the labor market outcomes of workers at consolidating firms by using administrative data on takeovers in the Netherlands from 2011 to 2015. Leveraging rich individual-level information on workers at firms involved in takeovers, we find evidence of heightened job loss post-takeover for workers at acquired firms, leading to long-term negative impacts on workers' labor market outcomes, such as earnings and total income. These negative effects are pervasive across many types of takeovers. Characterizing the types of workers affected, we find that "over-placed" workers who have higher-than-expected-pay prior to the takeover and "duplicative" workers with skills that are likely already present at the acquirer are harmed the most. These results are consistent with *labor restructuring*, where consolidating firms restructure their workforce in order to increase efficiency post-takeover.

We first document the short- and long-term impacts of takeovers on incumbent workers at the firms targeted by takeovers ("target firms"). Our analysis matches target firms to control firms that have not participated in any consolidation activity during our study period and then characterizes differential worker outcomes using an event study framework. We find that takeovers can have a large and long-lasting impact on workers at target firms. While workers who are present at treated and control target firms four years prior to the takeover have similar earnings and employment trajectories prior to the takeover, our event study estimates indicate that these workers fare quite differently post-takeover. There is substantial job loss among the workers of target firms: in the four years after a takeover, workers at a target firm are 8.5% less likely to be retained at the consolidated firm compared to workers in the control firm. This lower retention rate translates into income loss: workers at target firms have €1,069.51 (2.6%) lower labor income and €789.27 (1.9%) lower total income, which includes earnings at any firm and income from various government benefits (e.g.,

unemployment insurance benefits, social safety net payments). These effects are long-lasting and are present even in the fourth year after the takeover. We show that these effects are not driven by lower wages. Instead, we estimate a 1% reduction in the likelihood that workers are employed anywhere and no impact on overall hours worked, suggesting that workers who are not retained are not able to find employment quickly.

We next turn to heterogeneity analyses to better understand which workers are affected by takeovers the most. We find that a dominant mechanism driving job loss in this setting is labor restructuring, changes in the consolidated firm's production process. We highlight two types of workers affected by restructuring activities: "over-placed" workers who are compensated at higher rates than what would be expected based on their human capital and "duplicative" workers who are likely to be made redundant by the consolidation.

We present two pieces of evidence consistent with the importance of labor restructuring. First, we show that labor restructuring leads to more job loss among "over-placed" workers. As in Lagaras (2020) and Schmieder, von Wachter and Heining (2022), we characterize over-placed workers as workers who have secured employment at a firm with a higher wage premium than is expected for workers' skills that are valued equally across employers, estimated using a standard Abowd, Kramarz and Margolis (1999) decomposition. We find that over-placed workers are 3.3 times more likely to be separated from the consolidated firm post-takeover compared to workers who are not over-placed, consistent with firms targeting restructuring activities at more generously compensated workers.

Second, we use worker-level skill data to create a measure of human capital relatedness (HCR) between acquirer and target firms participating in a takeover (Lee, Mauer and Xu, 2018). We find that high HCR takeovers, that is, takeovers where the target and acquirer workers have a more similar skill distribution, generate larger employment reductions at the consolidated firm in terms of both retention and hours worked. We then exploit our rich individual-level data to study the outcomes of specific workers who have similar skills to the workers at acquirers and thus are most likely to serve similar roles. We find that for a worker of a specific skill level, being acquired by a firm with a larger share of workers with that same skill level increases the likelihood of separation. For a given worker, being acquired by a firm where over two-thirds of the workforce has a similar skill set leads to a 18.9% reduction in retention compared to 9.4% for workers being acquired by

firms where fewer than a third of workers have the same skills.

We finally investigate two alternative mechanisms that could explain our results: increasing labor market concentration and increasing product market concentration as consequences of takeovers. First, we find that virtually none of the takeovers in our sample have a meaningful impact on labor market concentration (see also Arnold, 2021). Therefore, we conclude that takeover-induced changes in labor market concentration cannot drive our job loss results. Second, we also find that takeovers that are more likely to increase product market concentration (e.g., horizontal takeovers between firms in the same narrowly defined industry) do not induce larger job loss.

Our work contributes to the recent literature on the consequences of mergers and acquisitions for workers (Furlan, 2015; Geurts and Van Biesebroeck, 2019; Arnold, 2021; Todd and Heining, 2020; Prager and Schmitt, 2021). We make several contributions to this literature. First, we are able to study administratively identified takeovers, rather than relying on worker flows between firms as some prior work did, potentially missing the mergers of smaller firms. Second, we have comprehensive administrative data on a variety of worker outcomes, including employment outcomes, earnings, and benefit uptake. These data allow us to comprehensively characterize the consequences of takeovers. Third, using detailed data on skills, we are able to examine a potentially important mechanism behind takeover-induced job loss. In this latter aspect, the most similar papers to ours are Lagaras (2017) which uses micro-data from Brazil to characterize how workers at target firms are affected differently based on their occupational relatedness with the acquirer and Lagaras (2020) which studies long-term earnings of workers separated from target firms. In another related paper Lee, Mauer and Xu (2018) use aggregate data in the United States to study how post-consolidation job loss is increasing in the human capital relatedness of consolidating firms. Similar to Lagaras (2017) and Lee, Mauer and Xu (2018), we find that job loss is higher among target workers at firms that have higher human capital relatedness (and therefore are more likely to have efficiency gains) and further find that this job loss is higher for the specific types of workers whose skills are replicated in the acquirer. We further are able to complement this work by demonstrating through our comprehensive income measures (including non-labor income) that even in the generous social safety net environment of the Netherlands, affected individuals tend to be underemployed and have lower total income, even four years after their firm is acquired.

We also contribute to the literature on the longer-term impacts of job loss (e.g., Couch and

Placzek, 2010; Farber, 2017; Goldschmidt and Schmieder, 2017; Schmieder, von Wachter and Heining, 2022). This literature typically compares workers who lost their jobs to workers who did not lose their jobs and uses mass layoff events for identification. Our work uses another source of exogenous variation in job loss, namely firm takeovers. Firm takeovers substantially increase the probability of job loss and job loss has longer-term negative consequences for workers.

Our findings have important implications for assessing welfare effects of firm consolidations. First, they suggest that takeovers can have negative, long-lasting impacts on target workers' labor market outcomes. Second, we show evidence that labor restructuring is an important determinant of job loss: workers who are over-placed or workers in acquisitions where the acquirer is more likely to have workers already serving a given role experience higher rates of separation. These findings suggest that even consolidations that are typically viewed favorably from a consumer welfare perspective, those that increase efficiency without likely increasing product market concentration, can still have large, long-term welfare impacts for target workers through labor restructuring.

The remainder of this paper proceeds as follows. In Section 2, we describe the data and our empirical approach. In Section 3, we show that takeovers have long-lasting, negative impacts on incumbent worker outcomes. In Section 4, we demonstrate that labor restructuring is the primary mechanism driving these results through series of heterogeneity analyses. Finally, in Section 5, we conclude.

2 Data and Methods

2.1 Data Sources

We study the impact of takeovers on labor demand and the labor market outcomes of workers of acquirer and acquired firms using several administrative datasets from Statistics Netherlands (CBS). We begin with an administrative dataset which identifies various "firm events", such as when firms are established, closed down, or taken over. A takeover is defined as an event where one business takes over one or more other businesses in the sense that the production factors of the acquirer continue in the same manner. The business which is taken over will cease to exist in its previous form. In this dataset, we can observe the date of the takeover and the different firms involved. A unique advantage of this dataset is that, in contrast to previous papers which relied on worker flows

to identify takeovers (e.g., Todd and Heining, 2020), we are able to identify all takeover events. Having data on takeovers means that we can accurately capture these events even for small firms. Appendix A provides details on specific administrative datasets that were used to construct our sample.

We combine information on takeovers with a matched employer-employee dataset for all Dutch firms and workers covering the 2006–2019 period. This dataset contains each employment spell at the monthly level, including information on earnings, hours, and contract types. To assess the labor market outcomes of workers, we also link to an administrative dataset covering income from various government benefits, including unemployment insurance benefit and social safety net payments.

The final employee-level dataset used is an education database, which contains education information for a subsample of workers. While coverage of this dataset is increasing over time (from 47% in 2006 to 71% in 2019), its sample is skewed towards younger, more educated workers. We use an inverse Mincer equation to impute education levels for workers for whom education information is missing. For the full procedure, we refer to Appendix B.

2.2 Sample Construction and Matching Procedure

We focus on takeovers that happen between 2011 and 2015. We make a number of sample restrictions. First, we restrict to takeovers that involve firms that are active in the four years prior to the takeover and that do not experience any firm event (e.g., takeover, merger, etc.) in those intervening years. Second, because we are interested in employee outcomes, we require that both consolidating firms have at least three employees in the year prior to the takeover. This restriction ensures that we eliminate firms with only self-employed individuals and owners. Third, we restrict to takeovers in which both consolidating firms only have one business unit prior to the takeover.[1] Finally, because our empirical strategy uses matching, we require that the variables used in the matching process are non-missing.

For our main analysis, we focus primarily on effects for *incumbent workers* who were present at the target firm four years prior to the takeover. While this restriction prevents us from looking at results for workers with shorter tenures, it also allows us to avoid conditioning our sample on a potentially endogenous outcome, retention prior to the takeover. Thus, we are able to test for

[1] Appendix A provides more details on our definition of a firm vis-à-vis Dutch categorization and firm hierarchies.

potential pre-trends and anticipation effects in retention and other individual-level outcomes.

The Netherlands has various employment arrangements that imply different contract lengths and legal protections. We restrict our sample to permanent and fixed-term contracts, arrangements that are comparable to US employment relationships.[2] Appendix A provides more details on these restrictions.

Our analysis uses an event-study framework to study the effect of takeovers on workers' labor market outcomes. We match target firms to control firms using coarsened exact matching based on firm characteristics four years prior to the takeover. We create coarse cells based on year of takeover, 3-digit industry code, province, firm-level employment (seven categories), number of establishments (three categories), firm age (five categories), average worker tenure (three categories), and average earnings of workers from that specific firm (four categories).[3] We then use propensity score matching within these cells. To construct propensity scores, we estimate a linear probability model of participating in a takeover using polynomials of employment, number of establishments, and municipality fixed effects.[4] We estimate this propensity score separately for each year. A firm that is targeted by a takeover is assigned to a control firm with the closest propensity score within the cell.

2.3 Summary Statistics

Table 1 shows summary statistics of takeover events for our sample of matched target firms. In our sample, 30.8% of events are horizontal takeovers defined as takeovers between firms in the same 3-digit industry. We characterize 8.1% of our events as a vertical takeover: a takeover between a service-industry firm and a manufacturing firm. This classification is not exhaustive and over half of the events in our sample meet neither takeover definition. Incorporating firm location, 67% of takeovers take place between firms in the same province and 20.3% take place between firms that are both in the same 3-digit industry and the same province. Further, 11.3% of events are in

[2] In the Netherlands, companies can offer employees permanent ("open-ended") or fixed-term ("temporary") contracts. Employment protection legislation including protection against dismissal in the Netherlands is very strong for the former but not for the latter (OECD, 2019). The incidence of temporary contracts in the Netherlands is high at around 20% of employment, compared to around 12% for the OECD on average and 4% for the US in 2017 (OECD, 2021).

[3] We note that we do not match on total labor income from all employers or total income (sum of total labor income and income from various government benefits).

[4] Municipalities (355 in 2019) are the third tier of public administration in the Netherlands after the central government and the provinces (12 in total).

tradeable and 40.4% of events are in non-tradeable industries.[5] To assess how takeovers affect labor market concentration, we create a projected takeover-induced labor market concentration change measure using historical worker flows (see Arnold, 2021).[6] We find that only two of our takeovers have a non-negligible impact on labor market concentration.

< *Insert Table 1 about here* >

A few important conclusions can be drawn from Table 1. First, takeovers in this period are heterogeneous. However, only a small subset are large enough such that we would expect large changes in labor market concentration.[7] Finally, the tradeability of products of the consolidating firms as well as the product and geographic overlap between them vary. This suggests that to some extent product market concentration might change as a result of some of these takeovers.

Table 2 summarizes characteristics of the firms involved in takeovers and compares them to the matched set of control firms as of four years prior to the takeover. Column (1) reports statistics on acquirer firms and columns (2)–(3) report statistics on target firms (and their matched controls). Comparing acquirer and targets firms, the most striking difference is in the average size of the two types of firms. Acquirers are much larger: they have three times as many employees on average (85.37 versus 24.42) and 40% more establishments on average (2.13 versus 1.47). By construction, given our matching procedure, treatment and control firms are very similar on observable characteristics including size, industry, and region.

< *Insert Table 2 about here* >

Finally, Table 3 summarizes characteristics of the workers of acquirer and acquired firms (four years prior to the takeovers) and matched controls. Again, column (1) reports statistics on acquirer

[5] Tradeability of a given product is identified using the industry code of the firm. A tradeable product is one that is sufficiently portable to be sold long distances or across borders. For example, massages are non-tradeable while computers are tradeable. We use the definitions put forward by OECD (2018).

[6] We follow an analogous procedure to Arnold (2021) to create a measure of expected labor market concentration for a given takeover. The primary difference in our approach is the difference in geography used. While Arnold (2021) uses United States commuting zones, we use labor market regions. The size of this geographic definition is between municipalities and provinces and is analogous to the commuting zone definition constructed by Statistics Netherlands. There were 36 different labor market regions in the Netherlands during our time of study.

[7] In Arnold (2021), only consolidations that had a projected change in labor market concentration over 0.21 induced general equilibrium wage effects (in the United States context, 5% of the mergers between firms where each firm employed over 50 people). Only two of our matched sample produces changes in the Herfindahl-Hirschman Index (HHI) over that threshold, suggesting there are unlikely to be general equilibrium effects.

firms and columns (2)-(3) report statistics on target firms (and their matched controls). Comparing the acquirer and target firms, workers at acquirer firms tend to have longer tenure, be slightly higher skilled, have higher labor income, and are less likely to be fixed-term contract workers. Given their presence in the matching algorithm, treatment and control target workers are similar in terms of their average tenure and earnings. Reassuringly, even worker characteristics that are omitted from the matching algorithm, including gender, age, country of birth, and contract type are fairly well balanced. However, treated targets have slightly fewer skilled workers.[8]

< *Insert Table 3 about here* >

2.4 Event Study Estimation

We are primarily interested in the impact of the takeover on incumbent target workers. For workers to enter our estimation sample, they must be employed at the target firm four years prior to the takeover. Importantly, we do not require these workers to remain employed for the interim four years prior to the takeover. This allows us to test for pre-trends in retention and compensation of these workers for the years leading up to the takeover. An advantage of focusing on incumbent workers is that it prevents endogenous selection of workers into our sample (e.g., anticipation effects).

We use a standard event-study framework to estimate how worker outcomes change around the takeover event.

$$Y_{it} = \sum_{k \neq -2} \beta_k \cdot \mathbb{I}(k = t) \cdot \text{Takeover}_i + \psi_i + \nu_t + \sum_l \gamma_l \cdot \mathbb{I}(l = t) + \varepsilon_{it}, \tag{1}$$

where i indexes workers, t indexes event time, and Y_{it} is an outcome at the level of an individual worker. Takeover_i is an indicator for being an incumbent worker employed at a firm involved in a takeover four years prior to the event, the β_k are event-time indicators, the ψ_i are worker fixed effects, the ν_t are event-time fixed effects, the γ_l are calendar-year fixed effects. We cluster standard errors at the event level. Because of the staggered timing of these events, we use the weighting approach proposed by Sun and Abraham (2021).

[8] We use actual skill levels as reported in the Education Database as well as imputed skill values using an inverse Mincer equation (see Appendix B). Low-skilled refers to workers who have up to and including a low (junior) secondary education. Medium-skilled refers to workers with upper-secondary or post-secondary education excluding tertiary education. Workers designated as high-skilled have tertiary education.

Our estimates of the event-time coefficients β_k represent the causal effect of being in a target firm under standard difference-in-differences assumptions. In particular, we require that conditional on covariates, the outcomes of the matched comparison group of firms (and their workers for worker-level outcomes) represent a valid counterfactual for the target firms.

To verify the plausibility of our difference-in-differences assumptions, we look at how similar firms and their workers involved in takeovers are to the matched firms and their workers. Examining the cross-sectional characteristics of the firms and workers (Tables 2 and 3, respectively), we find that four years prior to the takeover, the target firms and their matched control firms and workers appear quite similar. Such cross-sectional comparisons, however, do not guarantee that the outcomes of workers at target and its matched control firm trend similarly. One particular concern is that even if Table 3 suggests that workers do not differentially select into target firms four years prior to the takeover, they may still be differentially retained or compensated in the interim. We validate the comparability of incumbent workers at target and matched control firms by comparing pre-trends in outcome variables in Section 3.

A final potential concern, given the general equilibrium findings of Arnold (2021), is that there could be spillovers from firms involved in takeovers onto control firms in which case the Stable Unit Treatment Value Assumption would be violated. However, as discussed in Section 2.3, this is unlikely to be a large concern in this context since very few of our events generate a meaningfully large change in labor market concentration. Similarly, we will show that our results are not driven by takeovers that are likely to lead to large changes in product market power, suggesting that our results are not affected by spillovers in product market concentration or price-cost markups (see Section 4.1).

2.5 Estimation of Firm Wage Premia

We are interested in the effect of takeovers on the quality of firms where workers find employment. We estimate a standard Abowd, Kramarz and Margolis (1999) (AKM) model using the universe of Dutch firms for the time period 2006 to 2019. We proxy firm quality by the estimated firm fixed effect, which is commonly referred to as the *firm wage premium*.

We estimate the following regression:

$$y_{it} = \alpha_i + \psi_{j(i,t)} + \beta\theta_{it} + \varepsilon_{it} \tag{2}$$

where i indexes individuals, j indexes firms, t indexes time, y_{it} is logged normalized earnings for worker i at firm j in year t (normalized earnings are total payments from firm j per year divided by the number of full time days worked at firm j), the α_i are worker fixed effects, the $\psi_{j(i,t)}$ are firm fixed effects, the θ_{it} include a set of year indicators and a flexible polynomial of worker i's age, and ε_{it} is an idiosyncratic log wage component, capturing purely transitory earnings fluctuations. In this estimation, worker effects α_i and firm effects $\psi_{j(i,t)}$ are separately identified by workers who change employers.[9]

In the AKM framework, α_i reflects the worker's time-invariant human capital, such as education and ability, that is rewarded equally across different employers, while $\psi_{j(i,t)}$ gives the percentage wage premium enjoyed by every worker employed at firm j. Such a premium could represent rent-sharing (Card, Cardoso and Kline, 2016), strategic wage posting behavior (Burdett and Mortensen, 1998; Moscarini and Postel-Vinay, 2013), other components of the wage structure such as an efficiency wage premium, compensating differentials (Sorkin, 2018), or variation in general payment practices (e.g., the presence of unions, corporate culture, or negotiating power). Appendix Figure C1 shows the distribution of firm and worker fixed effects.

For the estimation of the AKM model, we use a number of sample restrictions. A possible concern is that consolidations can impact firms' wage structure, and hence the estimated firm fixed effects. To avoid such endogeneity, we drop observations during and after the year of the first consolidation we observe in the time period for any firms that eventually consolidate. For workers with multiple jobs within a given year, we keep the job with the highest associated earnings.

[9]The crucial assumption for this interpretation of the AKM decomposition to hold is that the idiosyncratic log earnings component ε_{it} is unrelated to the sequence of worker i's employers $j(i,t)$. For a discussion and test of the validity of this conditional exogenous mobility assumption, see Abowd, Kramarz and Margolis (1999) and Card, Heining and Kline (2013). Schneck (2021) presents an application using similar Dutch micro data as ours.

3 The Effect of Takeovers on Incumbent Worker Outcomes

We examine worker retention, various measures of earnings and income, and benefit uptake for workers who were present at target firms four years prior to the takeover.[10] We find that workers of target firms experience reductions in employment at the consolidated firm compared to workers at control firms. This reduction translates into lower total labor market income, driven by changes in employment, wages and hours.

Figure 1 shows results for our main employment outcomes, including retention (i.e., employment at the consolidated firm), hours at the consolidated firm, employment at any firm, and hours at any firm. For each outcome, the left panel shows unadjusted results, while the right panel shows regression estimates based on equation (1). These figures allow us to investigate the plausibility of our difference-in-differences assumptions by looking at the estimates prior to the takeover. Both of these figures suggest that incumbent workers who were present four years prior to the takeover and their matched controls followed similar trends in terms of retention, hours worked, and employment.

Panels (a) and (b) of Figure 1 show results for two measures of employment at the consolidated firm: panel (a) shows a binary measure of retention at the consolidated firm, where retention is defined as being employed by either the target or its acquirer in a given year and panel (b) shows total hours worked at either the target or its acquirer. We find that in the four years following the takeover, workers are 6 percentage points (8.5%) less likely to be retained and work 77.61 (7.3%) fewer hours at the consolidated firm compared to control firm workers.

< Insert Figure 1 about here >

Although workers at target firms are less likely to remain employed at their original firms, it may be the case that these workers find employment at other firms. Panels (c) and (d) show employment results when we examine employment at any firm. Panel (c) suggests that while the likelihood that workers separate from their original firms increases substantially, there is only a small reduction in their overall employment probability. We find that workers are 1 percentage point (1%) less likely to be employed anywhere in the four years after the takeover, significant at the 10% level. We observe a small, statistically insignificant short-term reduction in total hours worked, which recovers three

[10] Appendix E presents the corresponding estimates for incumbent workers employed at the acquirer firms. We find that these workers do not experience large changes in retention or earnings.

years after the takeover.

We next turn to income measures, such as compensation at workers' original firms, any other labor income, and total income, which includes earnings at any firm and income from other government benefits (e.g., unemployment insurance benefit and other social safety net payments). Panel (a) of Figure 2 shows that labor income is on average €1,069.51 (2.6%) lower among incumbent workers at firms targeted by takeovers in the years after the takeover. Turning to our measure of total income, target workers experience a decline of €789.37 (1.9%). Thus, the comparatively generous social insurance and safety net programs of the Netherlands only partially compensate for the large decrease in labor market income. These effects are not only large in magnitude, they are also persistent: even four years after the event, target workers on average have 2.8% lower labor market income (from any firm) and 2.3% lower total income.

< *Insert Figure 2 about here* >

We also investigate to what extent the effects on labor income are the result of reductions in employment and changes in compensation conditional on being employed. Figure 3 restricts the sample to target workers who remain employed, either at the consolidated firm or at any other firm. We find that even for these workers, there is a substantial 1,242.06 (2.8%) drop in labor income in the four years after the takeover. Panel (c) of Figure 3 shows little evidence that this change in labor income is driven by wage effects.[11] Instead, these results suggest that the long-term impacts on target workers are largely driven by reductions in the quantity work, both on the extensive margin (i.e., retention) as well as on the intensive margin (i.e., hours worked).

< *Insert Figure 3 about here* >

To further test whether workers experienced changes in returns to employment, we create a measure of their *current* firm's average wage premium for each worker-year using the firm wage premium estimates of our AKM model (see Section 2.5).[12] Consistent with the null estimates observed on wages, Figure 4 provides no evidence that incumbent workers shifted to higher or

[11] Wages are defined here as total labor income divided by total hours worked.

[12] For workers working at multiple firms, we aggregated across all jobs within a given year, weighting by the hours worked at each firm. Workers with no employment were dropped from the regression.

lower paying firms post-takeover.[13] Taken together, these findings suggest that takeover-induced reductions in income are not driven by changes in wages.

< *Insert Figure 4 about here* >

In Appendix E, we also examine labor market outcomes for the workers of acquirer firms. Here, we follow a similar matching procedure as described in Section 2 for target firms, now keeping takeovers where both the acquirer and the target can be matched to a respective control firm. Appendix Table E2 shows that we are able to match acquirer firms and workers quite well. We then replicate the results on labor market outcomes for the workers of acquirer firms in Appendix Figure E2. This figure suggests that unlike for the workers of target firms, the takeover has little impact on the employment, wages, or overall income of the workers of acquirer firms.

4 Mechanisms

Thus far, we have shown that, on average, takeovers result in a large, long-lasting decline in target workers' income. We find no evidence that workers' wages are affected. Instead, we find that they work less, due to both reduced retention and reduced hours. Through series of heterogeneity analyses, we now aim to understand what mechanism can explain our results.

Takeovers affect workers with varying skills and demographics (see Section 2.3). In this section, we first show that job loss for incumbent workers appears to be a pervasive phenomenon across various types of workers. We then show that some worker-firm combinations generate larger job losses. These findings are consistent with a particular mechanism, labor restructuring, which is in line with the neoclassical efficiency-seeking motive of takeovers (Gort, 1969; Jensen, 1993; Mitchell and Mulherin, 1996; Andrade, Mitchell and Stafford, 2001).

4.1 Pervasiveness of Takeover-Induced Job Loss

To understand the mechanism behind our job loss results, we perform our event-study analysis on various subsets of workers. Figure 5 shows the difference-in-differences estimates from separate regressions for our two measures of employment at the consolidated firm: retention and total hours

[13] We note that for firms participating in takeovers, firm fixed effects are estimated prior to the takeover to avoid causal changes to firm payment behavior after the takeover.

worked. Panel (a) of Figure 5 shows that the estimates on retention are similar across worker characteristics, such as gender, education, age groups, and earnings groups. Panel (b) of Figure 5 shows that the effects on hours are larger for highly-educated, medium- and highly-paid workers, as well as permanent as opposed to fixed-term workers.

4.2 Labor Restructuring

We examine labor restructuring as a potential mechanism behind our finding of takeover-induced job loss. Takeovers are an opportunity for firms to not only combine their labor forces but to also break existing labor contracts and take advantage of economies of scale. We highlight two particular types of workers that are likely affected by labor restructuring: "over-placed" workers who are highly paid, conditional on their human capital and "duplicative" workers who have similar skills and therefore likely similar roles as workers in the acquirer. We show that both over-placed and duplicative workers are less likely to be retained at the consolidated firm.

< *Insert Figure 5 about here* >

4.2.1 Over-placed Workers

As Panel (b) of Figure 5 shows, hours reductions appear to be increasing in the wage rate. A potential channel through which labor restructuring might materialize is disrupting implicit contractual relationships with employees who earn substantial firm-specific rents. To investigate this channel, we leverage estimates of firm and worker effects (Abowd, Kramarz and Margolis, 1999; Card, Heining and Kline, 2013) using a similar method to Lagaras (2020) and Schmieder, von Wachter and Heining (2022).

We identify over-placed workers, workers at a target firm with a higher employer wage premium than is expected for workers' skills that are valued equally across employers. We estimate the median firm wage premium within each quintile of the worker fixed effects distribution. We then characterize over-placed workers as those at firms with a higher-than-median firm wage premium. These over-placed workers are receiving more generous pay from the target firm than the average worker with the same level of human capital receives. Thus, for a consolidated firm, these workers are likely more expensive than the human capital that they provide to the firm.

Figure 6 shows retention and hours results for over-placed and not over-placed workers. A starkly larger retention effect is found for over-placed workers: over-placed workers experience 13.05% and 11.9% reductions in retention and hours, respectively, at the consolidated firm compared to statistically insignificant 3.9% and 2.8% reductions for not over-placed workers. Further, when we examine other outcomes in Appendix Figure E4, we see that these workers experience much larger overall reductions in work at any firm (including both the extensive margin of employment and the intensive margin of hours worked) as well as larger reductions in labor income and total income. Together, these results suggest that over-placed workers experience sustained losses after losing their high firm-specific rents post-takeover. These findings are consistent with consolidating firms restructuring their workforce in order to increase efficiency post-takeover.

< Insert Figure 6 about here >

4.2.2 Duplicative Workers

In addition to letting over-placed workers go, consolidating firms can also restructure their labor force through eliminating workers who have similar skills at the two consolidating firms (duplicative workers). We investigate this type of labor restructuring using two different heterogeneity analyses relying on individual worker skill data.[14] Our first approach examines heterogeneity *across workers* within events. Our second approach examines heterogeneity *across events* with different levels of skill overlap.

Using our rich individual-level data, we can identify which specific *workers* are most likely to be affected by restructuring. For this exercise, we use individual-level data to test whether job losses are higher specifically for those workers who are acquired by firms with a higher share of similarly skilled workers. For instance, for a medium-skilled worker at a target firm, does one's likelihood of job loss differ if an acquirer's pre-takeover workforce has 20% or 90% of individuals with the same skill level? Figure 7 shows the estimated percentage change for workers being acquired by firms with different ranges of skill overlap, that is, different shares of workers with the same skill level in the period prior to the takeover. We see that the retention effect for a given worker is increasing in the degree to which the acquirer's workforce resembles the worker's skill level. The average worker

[14] We rely on skill data as opposed to occupation data since we cannot observe occupation in our administrative data.

being acquired by a firm with a low degree of worker similarity will experience a 9.4% and 7.6% reduction in retention and hours, respectively, at the consolidated firm, while a worker at a highly similar firm will face a 19.0% and 18.0% reduction in retention and hours, respectively.

This pattern suggests that takeovers in this context produce opportunities for efficiency-increasing restructuring as evidenced by the high human capital relatedness of the firms that tend to consolidate. Further, among different types of workers, job loss appears to be greatest when the potential for economies of scale is the highest.

< *Insert Figure 7 about here* >

To examine heterogeneity across events, we also investigate how employment effects differ across consolidations with different levels of human capital relatedness (HCR). HCR characterizes the degree of overlap in skills and duties of the workforce of consolidating firms (Lee, Mauer and Xu, 2018). Higher HCR implies greater potential economies of scale and therefore potential job loss for incumbent workers. We use individual-level skill data to generate a measure of human capital relatedness following an analogous approach to the occupation-based measure used in Lee, Mauer and Xu (2018).

To construct our HCR index, we flag all workers who are present at firm j four years prior to the takeover and earlier (that is, we do not incorporate observations from $t-3$ onward). We restrict to firms where we have at least ten observations of employee skills in this period. We then create firm j's human capital profile vector H_j, which indicates the number of firm j's workers that fall into each of three given skill categories divided by the total number of workers at that firm j: $H_j = (H_{\text{low},j}, H_{\text{medium},j}, H_{\text{high},j})$. For a given takeover with acquirer A and target T, we then construct a time-invariant HCR index defined as

$$HCR = \frac{H_A H_T'}{\sqrt{H_A H_A'}\sqrt{H_T H_T'}}.$$

The HCR index is increasing in the overlap of skill categories of the two firms; it is equal to zero if the firms employ workers of completely different skill levels and is equal to one if the distribution of workers across skill levels is identical in the two firms. As seen in Figure 8, the distribution of the HCR index is skewed with 83%, 66%, and 28% of events having an index over 0.8, 0.9 and 0.95,

respectively.

< *Insert Figure 8 about here* >

Do takeovers between firms with higher HCR generate higher rates of job loss? Figure 9 shows the percentage change estimates of retention for events with above and below median HCR. We show results for both overall retention as well as hours worked at the consolidated firm, post-takeover. We see that the highest HCR events have a modestly higher impact on retention than lower HCR events: takeovers between firms with less than 50% HCR induce a statistically insignificant 7.2% and 5.9% reduction in retention and hours worked, respectively, compared to a 9.0% and 8.0% reduction for workers at takeovers that have a higher degree of HCR.

< *Insert Figure 9 about here* >

4.3 Alternative Mechanisms

Our heterogeneity results thus far are consistent with firms taking part in labor restructuring post-consolidation to reduce labor inputs from over-placed workers and duplicative workers. The literature has proposed alternative mechanisms that may lead to takeover-induced job loss, such as increased product or labor market concentration (see e.g., Geurts and Van Biesebroeck, 2019; Arnold, 2021). We now rule out that these mechanisms are driving our results.

We first investigate whether takeovers that are likely to produce larger changes in concentration in the product market are associated with larger reductions in retention and hours for incumbent workers. Figure 10 shows the difference-in-differences estimates from separate regressions for our two measures of employment at the consolidated firm. We investigate whether retention impacts differ for takeovers that are horizontal (i.e., between firms in the same 3-digit industry) or vertical (i.e., between a service and manufacturing firm). Because horizontal takeovers can potentially involve monopoly-induced reductions in production, one may expect that such consolidations would be associated with larger job loss. However, we find that horizontal takeovers induce a 5.7% reduction in retention, a slightly *smaller* effect compared to the overall average effect. In contrast, vertical takeovers are actually associated with a large 45% reduction in retention. Next, we use industry codes to differentiate takeovers of firms producing tradeable and non-tradeable items. Again, while

non-tradeable consolidations would be expected to generate greater market power and therefore reduced production and employment, we find that retention effects are *lower* among non-tradeable firms. Takeovers are associated with respective 9.3% and 8.9% drops in retention for non-tradeable and tradeable firms. Thus, reductions in employment and hours for incumbent workers do not appear to be driven by changes in product market concentration.

The other alternative mechanism for takeover-induced job loss that has been explored in previous work is labor market concentration. As discussed in Section 2.3, very few of our events (2 out of 1,013) have a non-negligible impact on firm monopsony power. Thus, increasing labor market concentration cannot be driving our results.

< Insert Figure 10 about here >

5 Conclusion

Firm consolidations represent an increasingly important phenomenon in many countries. While the impact of consolidations on product markets has received much policy attention, they also potentially impact the workers of consolidating firms. In this paper, we show that firm takeovers have large, long-term consequences for workers at targeted firms. These workers experience heightened job loss, reductions in employment and income. Even in the Netherlands, where the social safety net is particularly generous, increased social insurance and welfare program payments are insufficient to compensate for this income loss.

Job loss is pervasive across many types of takeovers and is likely the product of labor restructuring. We identify two types of workers that are especially impacted: over-placed workers who are at higher-paying firms than would be expected based on their own characteristics and duplicative workers who have similar skills to workers at the acquiring firm. At the same time, we find little evidence for other potential explanations that have been raised as concerns about consolidations: takeover-induced job loss is not larger in takeovers that are likely to create larger changes in product market concentration and few takeovers induce large changes in labor market monopsony power. These findings suggest that while takeovers may allow firms to take advantage of economies of scale and become more efficient, they are costly for workers at these firms.

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Table 1: Takeover Characteristics

Event Type	Share (%)
Horizontal	30.8
Same 2-digit industry	36.1
Same province	67.0
Same province and 3-digit industry	20.3
Same province and 2-digit industry	23.8
Vertical	8.1
Between tradeable firms	11.3
Between non-tradeable firms	40.4
High Labor Market HHI Change (> 0.21)	0.0
Number of Takeovers	1,013

Note: This table shows the characteristics of the takeovers in our sample. All industry definitions rely on Standard Industry Classifications. A horizontal takeover is defined as a takeover between firms in the same 3-digit industry. A vertical takeover is defined as a takeover between a service-industry firm and a manufacturing firm. There are 12 provinces in the Netherlands. High HHI changes in the labor market correspond to takeovers that generate a change in HHI greater than or equal to the change of labor market concentration of 0.21 (see Arnold, 2021).

Table 2: Firm Characteristics

	Acquirer	Target	Target (Control)	Treat vs. Control Difference	Normalized Difference
	(1)	(2)	(3)	(4)	(5)
Employment	85.37	24.42	28.10	-3.68	-0.02
	(337.00)	(89.99)	(131.80)	(2.27)	
Establishments	2.13	1.47	1.25	0.23	0.09
	(6.22)	(2.06)	(1.35)	(0.08)	
Firm Age (yrs)	20.54	16.96	17.81	-0.89	-0.05
	(14.21)	(12.85)	(13.26)	(0.42)	
Service	0.67	0.73	0.73	-0.00	-0.00
	(0.47)	(0.44)	(0.01)	(0.00)	
Manufacturing	0.12	0.09	0.08	0.01	0.03
	(0.33)	(0.29)	(0.27)	(0.00)	
Construction	0.08	0.06	0.06	0.00	0.00
	(0.26)	(0.24)	(0.25)	(0.00)	
Healthcare	0.06	0.05	0.05	0.00	0.00
	(0.23)	(0.22)	(0.22)	(0.00)	
South-Holland	0.24	0.22	0.21	0.01	0.02
	(0.43)	(0.41)	(0.41)	(0.01)	
North-Holland	0.16	0.19	0.18	0.00	0.01
	(0.37)	(0.39)	(0.38)	(0.01)	
Groningen	0.13	0.13	0.12	0.00	0.02
	(0.34)	(0.33)	(0.33)	(0.01)	
Gelderland	0.10	0.11	0.09	0.01	0.05
	(0.30)	(0.31)	(0.29)	(0.01)	
Number of Firms	1,013	1,013	1,013		

Note: This table shows the characteristics of the firms in our sample four years prior to the takeover. The first column corresponds to average characteristics of acquirer firms, the second column corresponds to average characteristics of target firms, and the third column corresponds to firms selected as controls for the target firm. The fourth column shows the mean difference of characteristics between treated and control target firms. Standard deviations are in parentheses. The fifth column shows the normalized difference of characteristics between treated and control target firms (see Imbens and Wooldridge, 2009). The table only reports the dominant industries (service, manufacturing, construction) and provinces (South-Holland, North-Holland, Groningen, Gelderland) in our sample.

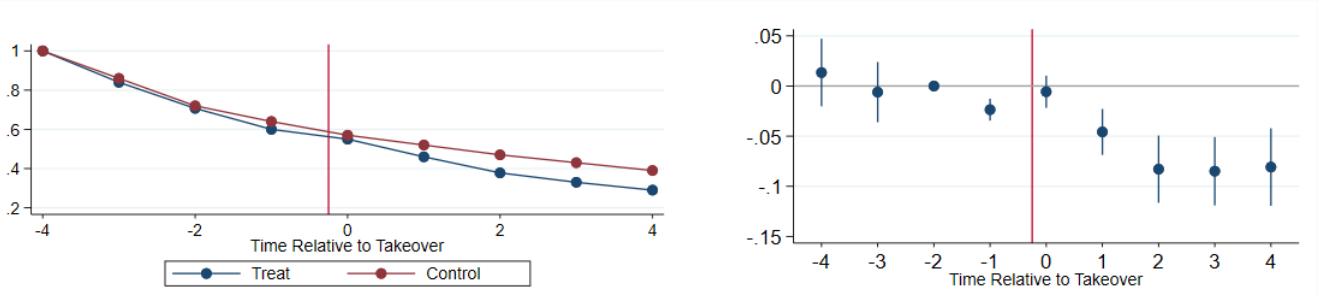
Table 3: Worker Characteristics

	Acquirer	Target	Target (Control)	Treat vs. Control Difference	Normalized Difference
	(1)	(2)	(3)	(4)	(5)
Female	0.54	0.46	0.41	0.00	0.07
	(0.50)	(0.50)	(0.49)	(0.01)	
Age (years)	40.91	39.66	39.65	0.51	0.00
	(11.79)	(11.77)	(11.56)	(1.14)	
Born in the Netherlands	0.90	0.86	0.81	0.02	0.10
	(0.30)	(0.35)	(0.39)	(0.00)	
Tenure (0 years)	0.15	0.24	0.23	0.00	0.02
	(0.35)	(0.42)	(0.42)	(0.00)	
Tenure (1-2 years)	0.40	0.52	0.49	0.03	0.04
	(0.49)	(0.50)	(0.50)	(0.00)	
Tenure (3+ years)	0.46	0.25	0.28	-0.03	-0.05
	(0.50)	(0.43)	(0.45)	(0.00)	
Low Skill	0.22	0.27	0.22	0.00	0.08
	(0.42)	(0.44)	(0.41)	(0.00)	
Medium Skill	0.37	0.37	0.40	-0.02	0.04
	(0.48)	(0.48)	(0.49)	(0.01)	
High Skill	0.41	0.36	0.38	-0.01	-0.03
	(0.49)	(0.48)	(0.49)	(0.01)	
Labor Income	44,637	41,200	43,232	-1,171	-0.04
	(34,132)	(33,710)	(33,727)	(363)	
Permanent Contract	0.79	0.75	0.73	0.01	0.03
	(0.41)	(0.43)	(0.44)	(0.01)	
Fixed Contract	0.21	0.25	0.27	-0.01	-0.03
	(0.41)	(0.43)	(0.44)	(0.01)	
Number of Incumbent workers	111,398	18,251	18,164		

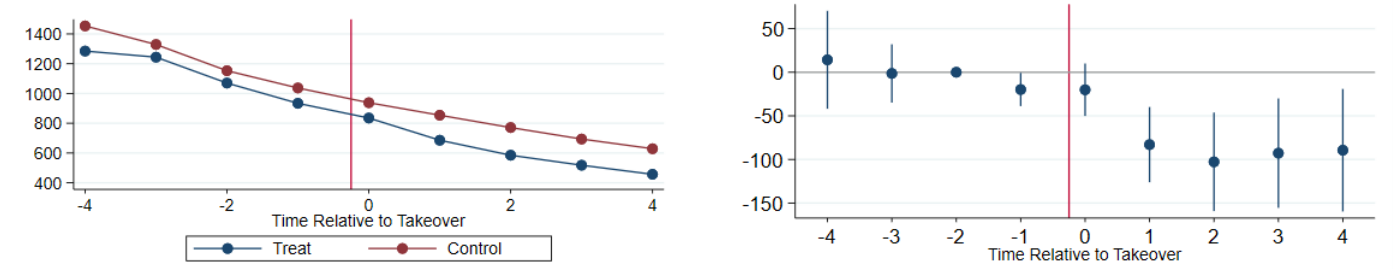
Note: This table shows the characteristics of incumbent workers in our sample who were employed at various firms four years prior to the takeover. The first column corresponds to average characteristics of workers at acquirer firms, the second column corresponds to average characteristics of workers at target firms, and the third column corresponds to workers at firms selected as controls for the target firm. The fourth column shows the mean difference between worker characteristics at the treated and control target firms. Standard deviations are in parentheses. The fifth column shows the normalized difference between worker characteristics at the treated and control target firms (see Imbens and Wooldridge, 2009).

Figure 1: Outcomes of Target Workers: Employment

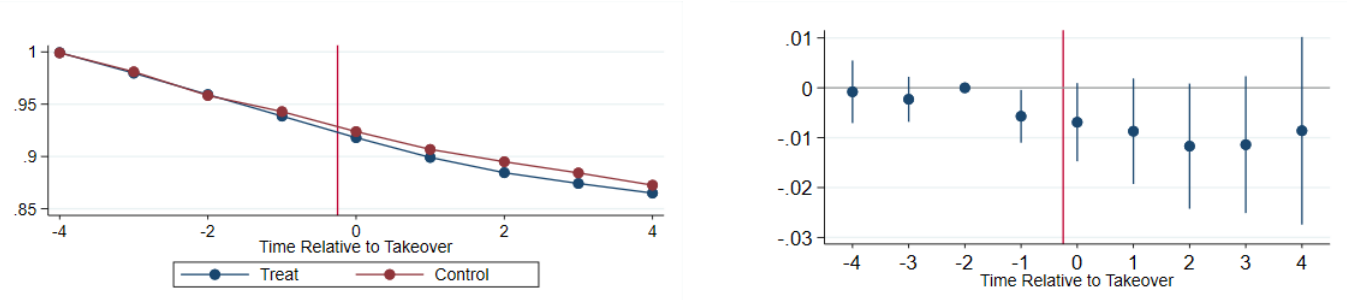
(a) Retention at Consolidated Firm



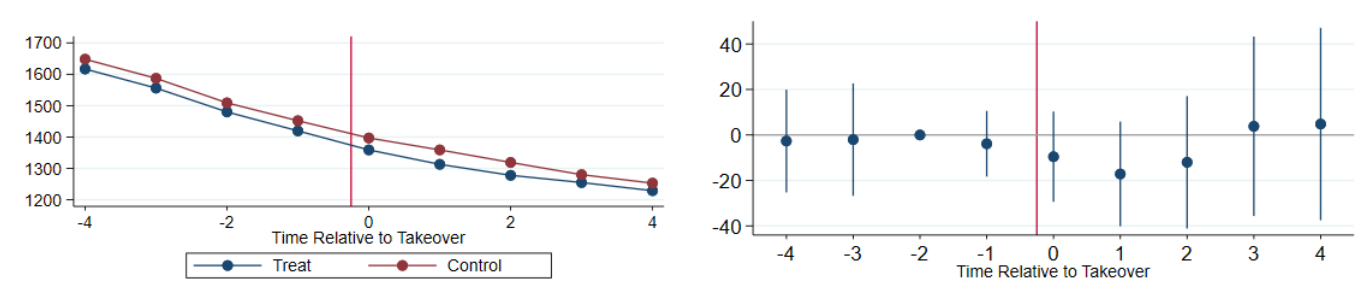
(b) Hours at Consolidated Firm



(c) Employed at Any Firm



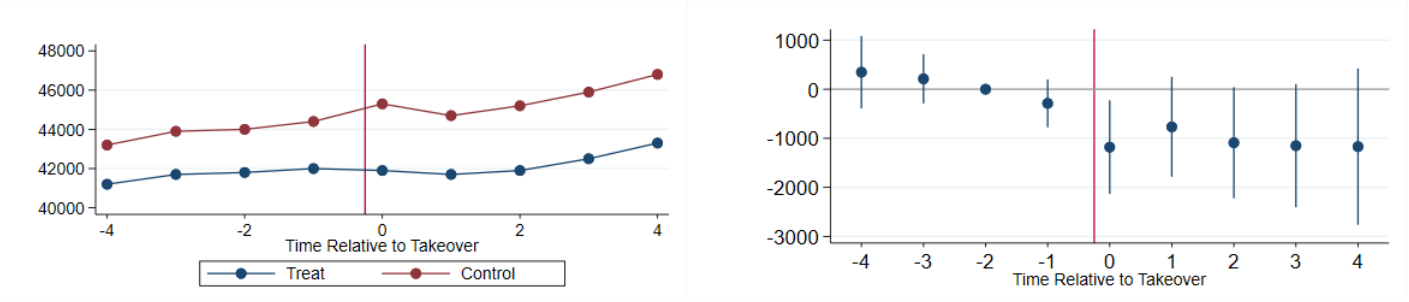
(d) Total Hours at Any Firm



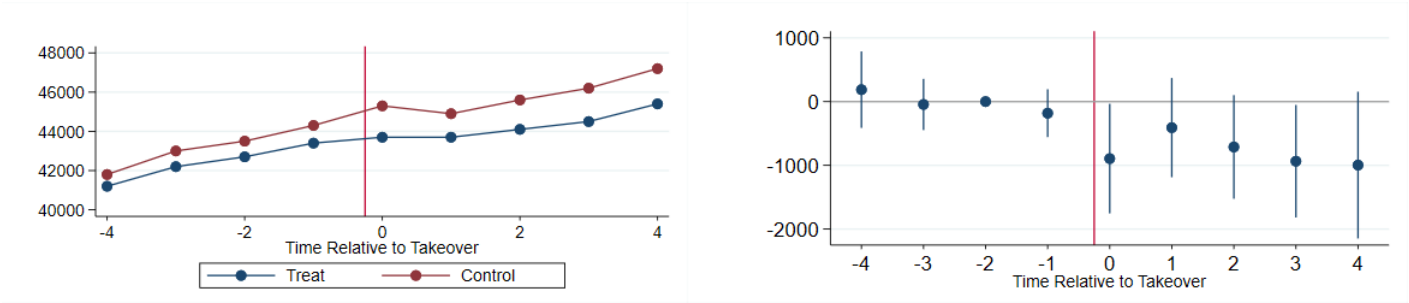
Note: This figure shows the timeseries for target firms and control firms as well as the event-study coefficients for target firms using $t-2$ as the omitted time-period. Event-study coefficients were estimated using the Sun and Abraham estimator (Sun, 2021; Sun and Abraham, 2021).

Figure 2: Outcomes of Target Workers: Income

(a) Labor Market Income



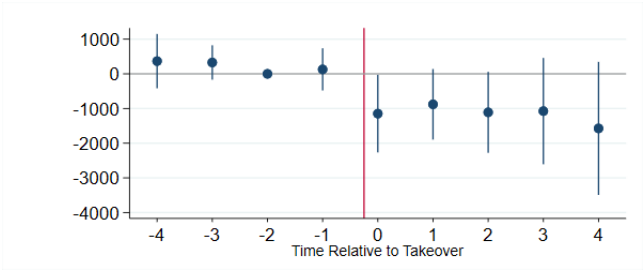
(b) Total Income (Including Labor Market Income and Social Safety Net Payments)



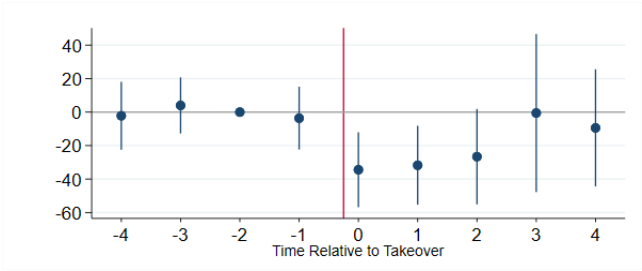
Note: This figure shows the timeseries for target firms and control firms as well as the event-study coefficients for target firms using $t-2$ as the omitted time-period. Event-study coefficients were estimated using the Sun and Abraham estimator (Sun, 2021; Sun and Abraham, 2021).

Figure 3: Outcomes of Target Workers: Income, Wages, and Hours Worked, Conditional on Retention

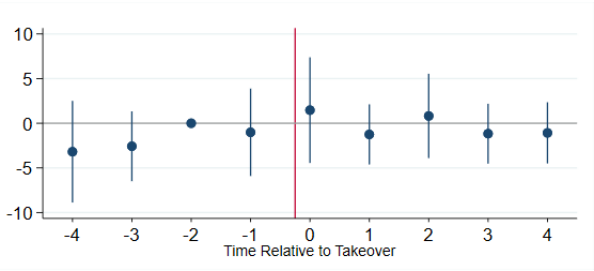
(a) Labor Market Income



(b) Total Hours at Any Firm

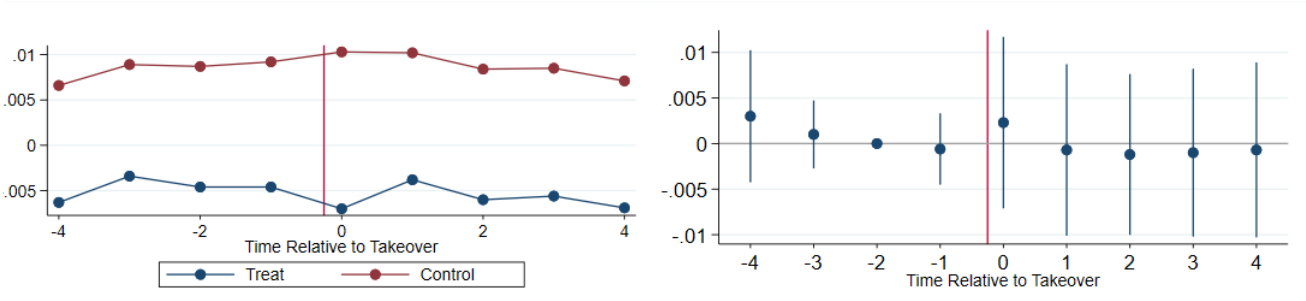


(c) Hourly Wage



Note: This figure shows the event-study coefficients for target firms using $t-2$ as the omitted time-period. Event-study coefficients were estimated using the Sun and Abraham estimator (Sun, 2021; Sun and Abraham, 2021). This sample is restricted to incumbent workers from the target firm that are employed at any firm.

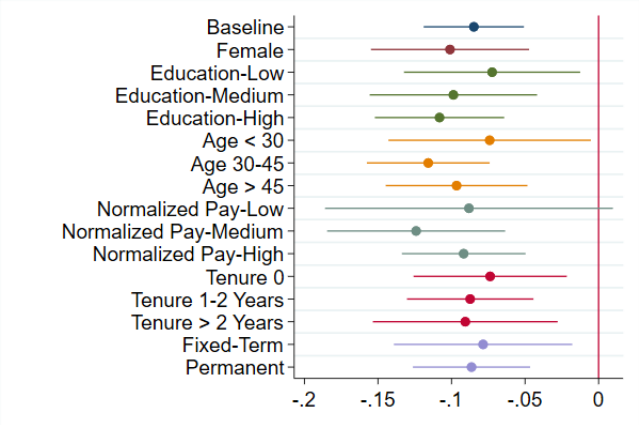
Figure 4: Outcomes of Target Workers: Wage Premium of Employing Firm



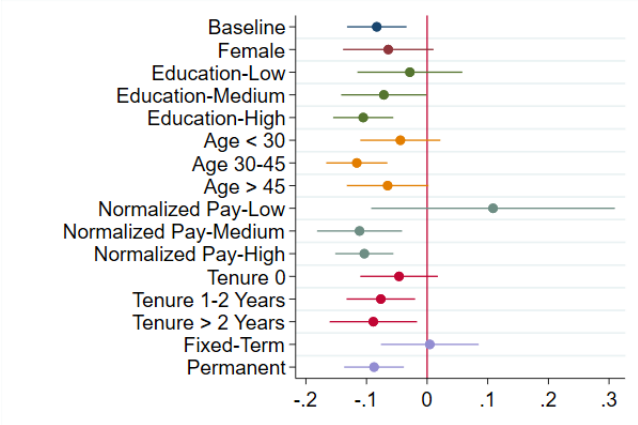
Note: This figure shows the event-study coefficients for target firms using $t-2$ as the omitted time-period. Event-study coefficients were estimated using the Sun and Abraham estimator (Sun, 2021; Sun and Abraham, 2021).

Figure 5: Outcomes of Target Workers: Worker-Level Heterogeneity in Retention

(a) Retained at Consolidated Firm



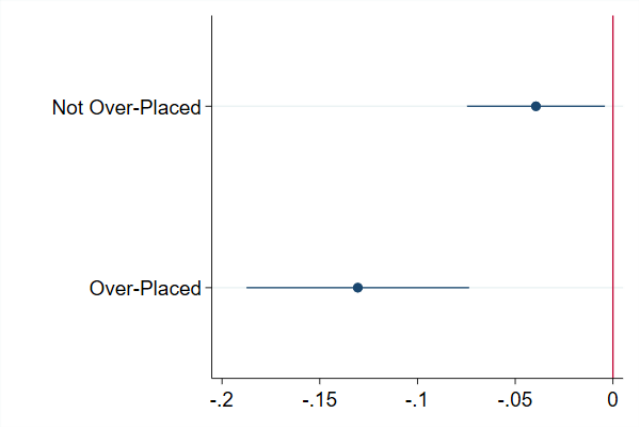
(b) Hours at Consolidated Firm



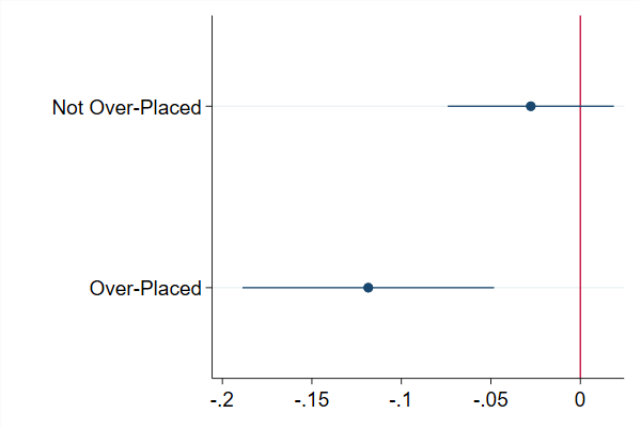
Note: This figure shows the percentage change in retention (panel (a)) and hours (panel (b)) at the consolidated firm in the year of the takeover and the four years subsequent. The percentage change is derived from the difference-in-differences estimate from the Sun and Abraham estimator (Sun, 2021; Sun and Abraham, 2021) divided by the base average of the treated workers in $t-2$. Each line corresponds to an estimate from a different regression where regressions are run over different samples. The first line corresponds to the baseline sample that includes all observations in the main analysis. The remaining regressions impose a number of restrictions at the worker level.

Figure 6: Outcomes of Target Workers: Worker-Level Heterogeneity in Retention of Not Over-Placed vs Over-Placed Workers

(a) Retained at Consolidated Firm

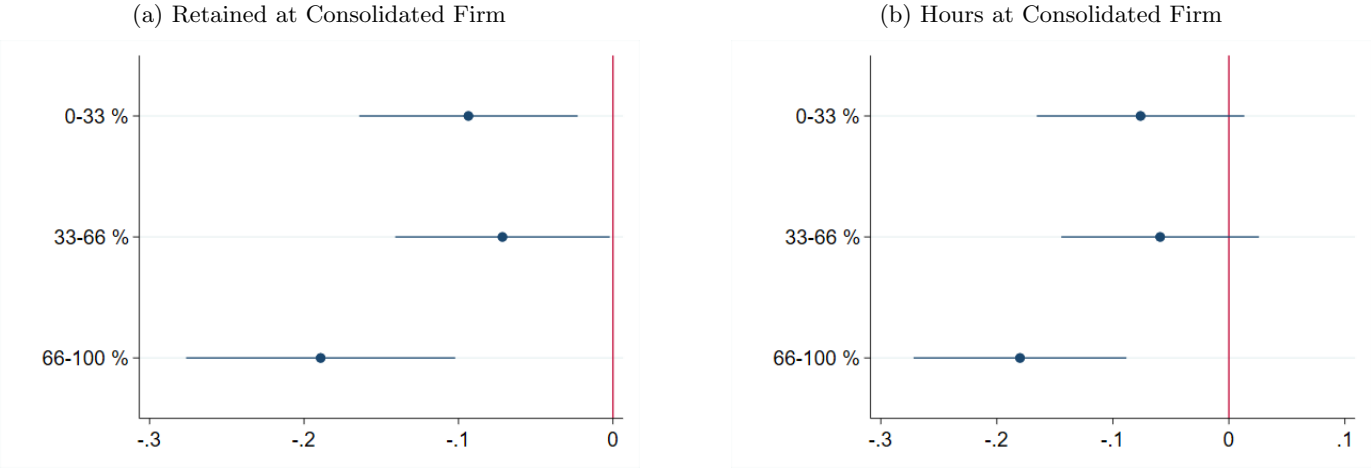


(b) Hours at Consolidated Firm



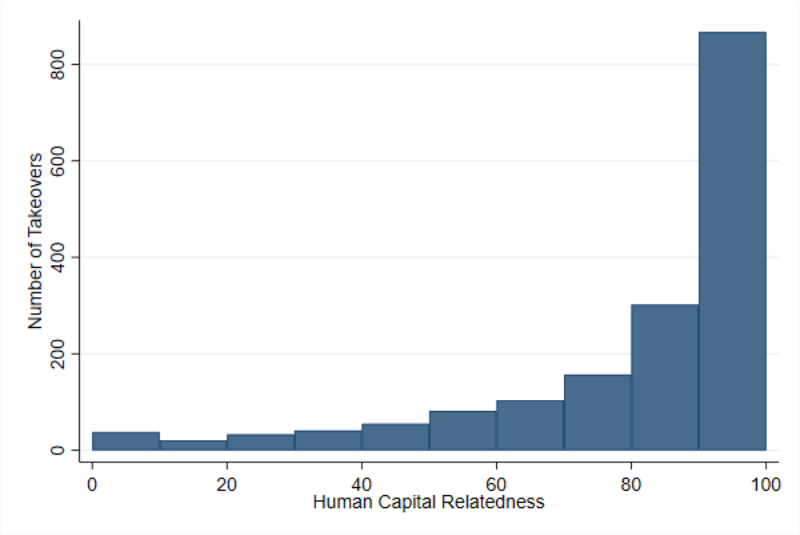
Note: This figure shows the percentage change in retention (panel (a)) and hours (panel (b)) at the consolidated firm in the year of the takeover and the four years subsequent. The percentage change is derived from the difference-in-differences estimate from the Sun and Abraham estimator (Sun, 2021; Sun and Abraham, 2021) divided by the base average of the treated workers in $t-2$. Each line corresponds to an estimate from a different regression where regressions are run over different samples. The first line corresponds to regressions run on not over-placed workers, workers at lower-paying firms than would be expected based on the workers' human capital. The bottom line is run on over-placed workers, workers at higher-than-expected paying firms.

Figure 7: Outcomes of Target Workers: Retention by Human Capital Relatedness of Incumbent Target and Acquirer Workers



Note: This figure shows the percentage change in retention (panel (a)) and hours (panel (b)) at the consolidated firm in the year of the takeover and the four years subsequent. The percentage change is derived from the difference-in-differences estimate from the Sun and Abraham estimator (Sun, 2021; Sun and Abraham, 2021) divided by the base average of the treated workers in $t-2$. Each line corresponds to an estimate from a different regression where regressions are run over different samples. The first line corresponds to a regression run on workers at target firms where fewer than a third of its acquirer's workers have the same skill level. The second line corresponds to target workers where between a third and two-thirds of workers at the acquirer have the same skill and the bottom line corresponds to target workers where there is high overlap, over two-thirds of target and acquirer workers have the same skill level.

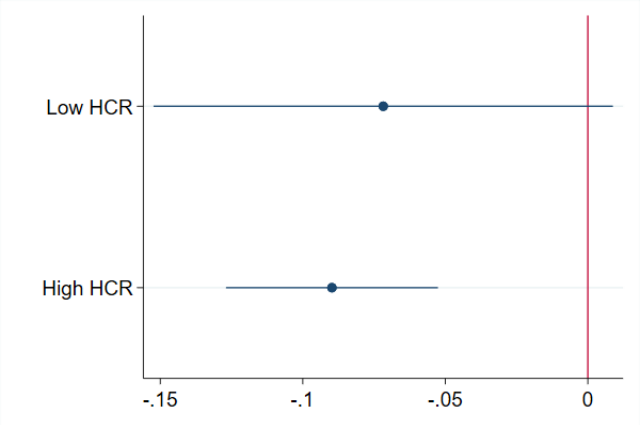
Figure 8: Histogram of Human Capital Relatedness



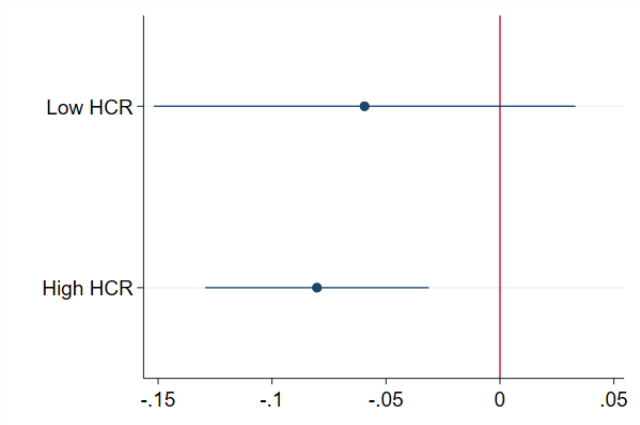
Note: This histogram shows the distribution of human capital relatedness for treated firms in our sample.

Figure 9: Outcomes of Target Workers: Retention by Human Capital Relatedness of Acquirer and Target

(a) Retained at Consolidated Firm



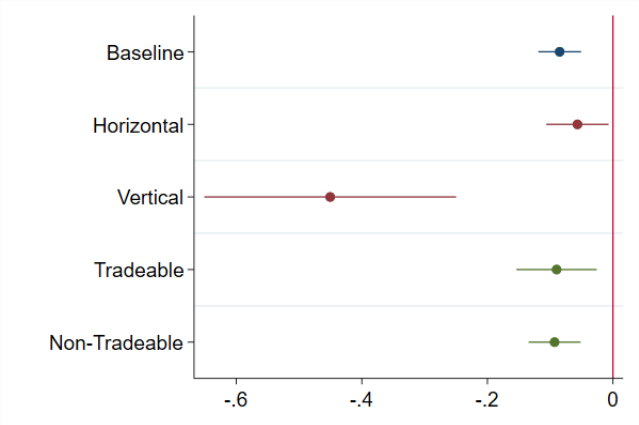
(b) Hours at Consolidated Firm



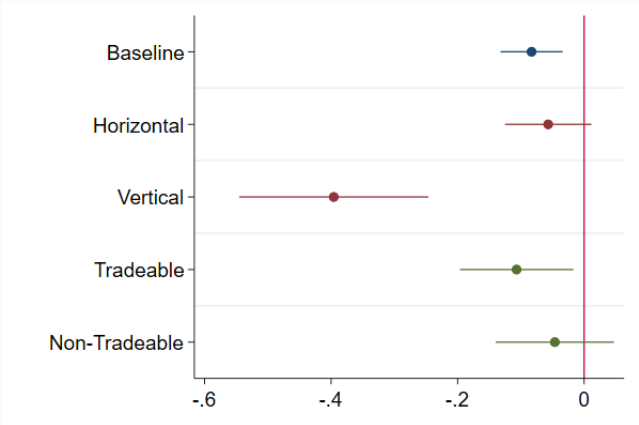
Note: This figure shows the percentage change in retention (panel (a)) and hours (panel (b)) at the consolidated firm in the year of the takeover and the four years subsequent. The percentage change is derived from the difference-in-differences estimate from the Sun and Abraham estimator (Sun, 2021; Sun and Abraham, 2021) divided by the base average of the treated workers in $t-2$. Each line corresponds to an estimate from a different regression where regressions are run over different samples. The top line corresponds to a regression run on events between firms with lower-than-median human capital relatedness (HCR). The bottom line corresponds to a regression run on events between firms with a higher-than-median HCR.

Figure 10: Outcomes of Target Workers: Heterogeneity By Change in Product Market Concentration

(a) Retained at Consolidated Firm



(b) Hours at Consolidated Firm



Note: This figure shows the percentage change in retention (panel (a)) and hours (panel (b)) at the consolidated firm in the year of the takeover and the four years subsequent. The percentage change is derived from the difference-in-differences estimate from the Sun and Abraham estimator (Sun, 2021; Sun and Abraham, 2021) divided by the base average of the treated workers in $t-2$. Each line corresponds to an estimate from a different regression where regressions are run over different samples. The first line corresponds to the baseline sample that includes all observations in the main analysis. The remaining regressions impose a number of restrictions at the event level.

A Technical Appendix

A.1 Firm Definitions, Event Data Construction, and Event Selection

In the Statistics Netherlands (CBS) administrative data, there are three levels of firm labels. The first level is an OG, which is the broadest level and corresponds to a single corporate taxable unit. The second level is a BE, which corresponds to subsidiary companies of OGs. Each OG is associated with at least one but potentially many BEs, however, most OGs are associated with a single BE.[15] Industry, location, and linkage to individual worker data is at the BE level. The third level is the establishment level, which corresponds to the physical location of the different establishments within a BE.

For this analysis, we first use the General Business Register (ABR) to create a monthly dataset linking each OG with all of its BEs. We then link this dataset to the ABR Eventbijdragen data which administratively identifies various OG- and BE-level events including takeovers, mergers, entry, and exit. Merging these two datasets together, we select OG-level takeovers, that is, events where one OG firm is absorbed by another OG firm and all BEs within the former OG are administratively linked to the latter OG from the takeover date onwards. From this set of events, we impose a number of restrictions. We restrict to events where both OGs have one-to-one matches with BEs (that is, an OG does not have multiple subsidiary BEs). To allow for sufficient pre- and post-period observations, we restrict to events between 2011 and 2015. We also restrict to events where both OGs are active at least four years prior to the takeover and neither entities have any OG- or BE-level events (i.e., takeovers, mergers, entry, exit) in the preceding four years. This dataset of events that satisfy these exclusions are then used to match to control firms.

The set of potential control firms that are selected are similarly restricted to firms where there is a one-to-one match between OGs and BEs and there is no event in the four years preceding the event.

[15] For all OGs that have some type of consolidation event, less than 1% are associated with multiple BEs prior to the event.

A.2 Contract Types and Worker Selection

The Netherlands has a number of legally pre-defined contract arrangements and worker classifications. To make our sample comparable to US workers, we impose a number of sample restrictions on our workers. We use the contract information and worker affiliation information in the POLIS dataset to restrict to workers who satisfy either of the following conditions: (1) have a permanent contract or (2) have a fixed-term contract, but have a worker classification that excludes workers with on-call arrangements. We impose these restrictions using a given worker's classification and contract type four years prior to the takeover ($t-4$), so by the time the takeover occurs, individuals may have changed their status. For example, individuals with a fixed-term contract would likely be upgraded to a permanent contract if they are still at the same firm four years later.

B Imputation of Skill Level

Education data is provided by the Education Database (Hoogsteopltab), which contains education information for a subset of workers. Because the coverage of this dataset is incomplete (47% in 2006, 71% in 2019), we use an imputation method to predict the skill level of individuals whose education data is missing. This takes the following procedure

1. On data at worker i by firm j by year t level, restrict to workers' main firm (i.e. the one where they received the most pay within a year). Restrict to workers over the age of 25.

2. Categorize educational attainment into low, medium, and high categories, where low-skill is up to lower (junior) secondary education, medium-skill is up to post-secondary education excluding tertiary education, and high-skill is tertiary education.

3. Estimate the following ordered probit regression of skill level on annual earnings Y_{ijt}, hours h_{ijt}, worker characteristics θ_{it} and firm characteristics ω_{jt}.

$$Pr(\text{Skill Level}_{it} = n|\ Y_{ijt}, h_{ijt}, \theta_{it}, \omega_{jt}) = Pr(k_{n-1} < \beta^Y Y_{ijt} + \beta^h h_{ijt} + \beta^i \theta_{it} + \beta^j \omega_{jt} + \varepsilon_{it} \leq k_n)$$

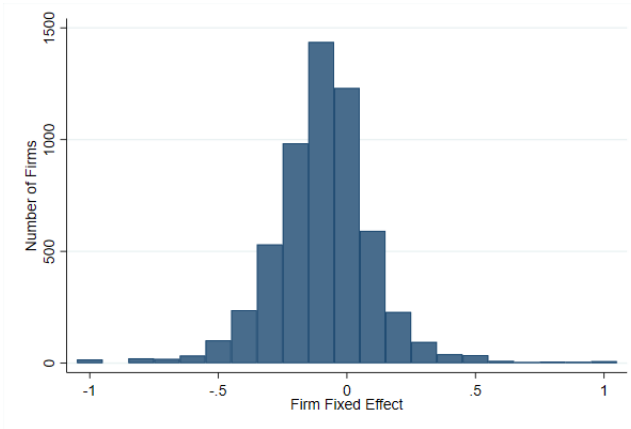
4. Because the Education Database is skewed towards higher-educated, younger workers, we do

not directly predict the skill level based on cutoffs k_n. Instead, we estimate the latent score and assign cutoffs based on national aggregate data.

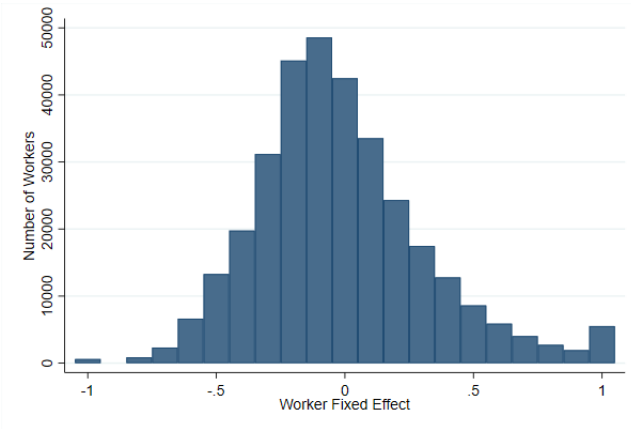
C AKM Model Fixed Effects

Appendix Figure C1: AKM Model: Firm and Worker Fixed Effects

(a) Firm Fixed Effects



(b) Worker Fixed Effects



Appendix Table C1: Average Firm and Worker Fixed Effects from AKM Model

	Acquirer	Target	Target (Control)	Treat vs. Control Difference	Normalized Difference
	(1)	(2)	(3)	(4)	(5)
Firm FE	-0.05	-0.02	-0.06	0.04	0.14
	(0.19)	(0.17)	(0.24)	(0.01)	
Worker FE	0.07	0.03	0.04	-0.01	-0.02
	(0.34)	(0.36)	(0.34)	(0.00)	
Number of Firms	1,013	1,013	1,013		

Note: The first row shows average firm fixed effects from the AKM model for acquirers as well as treatment and control targets. The second row shows average worker fixed effects from the AKM model for incumbent acquirer workers as well as treatment and control target workers. The fourth columns shows the mean difference between the fixed effects at the treated and control target firms. Standard deviations are in parentheses. The fifth column shows the normalized difference between fixed effects at the treated and control target firms (see Imbens and Wooldridge, 2009).

D Numeric Results

Appendix Table D1: Average Results: Employment

	Consolidated Firm		All Firms	
	Retention	Hours	Retention	Hours
$t-4$	0.0134	14.2716	-0.0008	-2.6822
	(0.0172)	(28.6386)	(0.0032)	(11.5232)
$t-3$	-0.0061	-1.3839	-0.0023	-2.0642
	(0.0153)	(17.0756)	(0.0023)	(12.6053)
$t-1$	-0.0236	-19.7776	-0.0057	-3.8738
	(0.0056)	(9.7244)	(0.0027)	(7.3583)
$t+0$	-0.0057	-20.1035	-0.0069	-9.5678
	(0.0082)	(15.3707)	(0.0040)	(10.1291)
$t+1$	-0.0458	-82.9995	-0.0087	-17.1594
	(0.0117)	(21.9755)	(0.0054)	(11.7470)
$t+2$	-0.0829	-102.7492	-0.0117	-12.4012
	(0.0171)	(28.8367)	(0.0064)	(14.8518)
$t+3$	-0.0849	-92.7758	-0.0114	3.7943
	(0.0174)	(31.9967)	(0.0070)	(20.1258)
$t+4$	-0.0808	-89.4091	-0.0086	4.7809
	(0.197)	(35.8352)	(0.0096)	(21.5870)
Diff in Diff Estimates	-0.06	-77.6074	-0.0098	-6.1107
	(0.0123)	(23.3986)	(0.0059)	(14.3063))
Percent Change	-0.0848	-0.0725	-0.0098	-0.0041
N	327,735	327,735	327,735	327,735

Note: This table shows event-study coefficients for target firms using $t-2$ as the omitted time-period. Standard errors are below each coefficient. Event-study coefficients were estimated using the Sun and Abraham estimator (Sun and Abraham, 2021; Sun, 2021). The difference-in-differences coefficient, standard error, percent change (using $t-2$ as the normalization year), and sample size are shown at the bottom of the table.

Appendix Table D2: Average Results: Income

	Labor Market Income	Total Income Including Social Safety Net
$t-4$	347.0136	187.1187
	(377.7815)	(305.9953)
$t-3$	212.2287	-44.8195
	(255.3058)	(205.3242)
$t-1$	-287.4016	-182.2956
	(248.5304)	(191.7499)
$t+0$	-1,181.8362	-894.6916
	(487.0068)	(438.6882)
$t+1$	-766.7080	-408.3040
	(519.5314)	(397.3770)
$t+2$	-1,085.1990	-712.2943
	(577.0682)	(414.8308)
$t+3$	-1,14534362	-935.3616
	(640.7154)	(450.4235)
$t+4$	-1,168.3575	-996.1798
	(812.2826)	(587.5182)
Diff in Diff Estimates	-1,069.5074	-789.3663
	(543.3954)	(373.5648)
Percent Change	-0.0256	-0.0185
N	327,735	327,735

Note: This table shows event-study coefficients for target firms using $t-2$ as the omitted time-period. Standard errors are below each coefficient. Event-study coefficients were estimated using the Sun and Abraham estimator (Sun and Abraham, 2021; Sun, 2021). The difference-in-differences coefficient, standard error, percent change (using $t-2$ as the normalization year), and sample size are shown at the bottom of the table.

Appendix Table D3: Outcomes of Target Workers: Income, Wages, and Hours Worked, Conditional on Retention

	Labor Income	Wages	Hours Worked
$t-4$	366.7619	-3.1893	-2.1902
	(400.6919)	(2.9026)	(10.3455)
$t-3$	327.1203	-2.578	3.9869
	(253.1955)	(1.9942)	(8.546)
$t-1$	127.9773	-1.0159	-3.6209
	(310.1586)	(2.4955)	(9.5782)
$t+0$	-1147.4718	1.4644	-34.4356
	(571.1602)	(3.02)	(11.4152)
$t+1$	-878.1726	-1.2519	-31.7374
	(519.672)	(1.719)	(12.0228)
$t+2$	-1110.0917	0.818	-26.6146
	(595.0456)	(2.4105)	(14.5338)
$t+3$	-1075.0908	-1.1671	-0.5519
	(782.6187)	(1.7094)	(24.1049)
$t+4$	-1574.0415	-1.0785	-9.4245
	(979.0976)	(1.7479)	(17.841)
Diff in Diff Estimates	-1,242.0553	0.8480	-20.5528
	(619.0921)	(1.7597)	(12.5176)
Percent Change	-0.0282	0.026	-0.0124
N	201,381	201,381	201,381

Note: This table shows event-study coefficients for target firms using $t-2$ as the omitted time-period. Standard errors are below each coefficient. Event-study coefficients were estimated using the Sun and Abraham estimator (Sun and Abraham, 2021; Sun, 2021). The difference-in-differences coefficient, standard error, percent change (using $t-2$ as the normalization year), and sample size are shown at the bottom of the table.

Appendix Table D4: Current Firm Fixed Effect

	Current Firm Fixed Effect
$t-4$	0.0003
	(0.0037)
$t-3$	0.0010
	(0.0019)
$t-1$	-0.0006
	(0.0020)
$t+0$	0.0023
	(0.0048)
$t+1$	-0.0007
	(0.0048)
$t+2$	-0.0012
	(0.0045)
$t+3$	-0.0010
	(0.0047)
$t+4$	-0.0007
	(0.0049)
Diff in Diff Estimates	-0.0003
	(0.0041)
Percent Change	0.0652
N	327,636

Note: This table shows event-study coefficients for target firms using $t-2$ as the omitted time-period. Standard errors are below each coefficient. Event-study coefficients were estimated using the Sun and Abraham estimator (Sun and Abraham, 2021; Sun, 2021). The difference-in-differences coefficient, standard error, percent change (using $t-2$ as the normalization year), and sample size are shown at the bottom of the table.

Appendix Table D5: Percent Change in Retention: Worker-Level Heterogeneity

	Retention at Consolidated Firm	Hours at Consolidated Firm
Baseline	-0.0848	-0.0830
	(0.0174)	(0.0250)
Female	-0.1010	-0.0641
	(0.0274)	(0.0381)
Skills		
Low	-0.0724	-0.0284
	(0.0306)	(0.0442)
Medium	-0.0987	-0.0714
	(0.0290)	(0.0359)
High	-0.1081	-0.1054
	(0.0224)	(0.0253)
Age		
< 30	-0.0741	-0.0441
	(0.0351)	(0.0337)
$30 - 45$	-0.1158	-0.1160
	(0.0213)	(0.0257)
> 45	-0.0966	-0.0651
	(0.0246)	(0.0343)
Normalized Pay		
Low	-0.0881	0.1088
	(0.0499)	(0.1025)
Medium	-0.1241	-0.1115
	(0.0309)	(0.0358)
High	-0.0917	-0.1036
	(0.0214)	(0.0245)
Tenure Group		
0 Years	-0.0737	-0.0463
	(0.0266)	(0.0326)
1-2 Years	-0.0873	-0.0763
	(0.0219)	(0.0289)
> 3 years	-0.0906	-0.0887
	(0.0320)	(0.0367)
Worker Contract Type		
Fixed-Term	-0.0785	0.0044
	(0.0309)	(0.0411)
Permanent	-0.0864	-0.0875
	(0.0203)	(0.0251)

Note: This table shows difference-in-differences estimates for separate regressions, expressed as percentage changes (using $t - 2$ as the normalization year). Standard errors are below each estimate.

Appendix Table D6: Percent Change in Retention: Human Capital Relatedness

HCR Group	Retention at Consolidated Firm	Hours at Consolidated Firm
Below Median HCR	-0.0718	-0.0594
	(0.0411)	(0.0472)
Above Median HCR	-0.0898	-0.0803
	(0.0190)	(0.0250)

Note: This table shows difference-in-differences estimates for separate regressions, expressed as percentage changes (using $t-2$ as the normalization year). Standard errors are below each estimate.

Appendix Table D7: Percent Change in Retention: Duplicative Workers

Skill Overlap	Retention at Consolidated Firm	Hours at Consolidated Firm
$< 33\%$	-0.0936	-0.0761
	(0.0361)	(0.0456)
$33-66\%$	0.0382	-0.0592
	(0.0354)	(0.0435)
$> 66\%$	-0.1892	-0.1800
	(0.0444)	(0.0468)

Note: This table shows difference-in-differences estimates for separate regressions, expressed as percentage changes (using $t-2$ as the normalization year). Standard errors are below each estimate.

Appendix Table D8: Percent Change in Retention: Over-Placed Workers

	Retention at Consolidated Firm	Hours at Consolidated Firm	N
Not Over-placed	-0.0394	-0.0277	
	(0.0180)	(0.0237)	
Over-Placed	-0.1305	-0.1185	
	(0.0291)	(0.0359)	

Note: This table shows difference-in-differences estimates for separate regressions, expressed as percentage changes (using $t-2$ as the normalization year). Standard errors are below each estimate.

Appendix Table D9: Percent Change in Retention: Event-Level Heterogeneity

	Retention at Consolidated Firm	Hours at Consolidated Firm
Baseline	-0.0848	-0.0830
	(0.0174)	(0.0250)
Horizontal	-0.0565	-0.0568
	(0.0253)	(0.0348)
Vertical	-0.4504	-0.3957
	(0.1023)	(0.0763)
Tradeable	-0.0898	-0.1068
	(0.0326)	(0.0457)
Non-Tradeable	-0.0930	-0.0463
	(0.0211)	(0.0477)

Note: This table shows difference-in-differences estimates for separate regressions, expressed as percentage changes (using $t-2$ as the normalization year). Standard errors are below each estimate.

E Additional Results

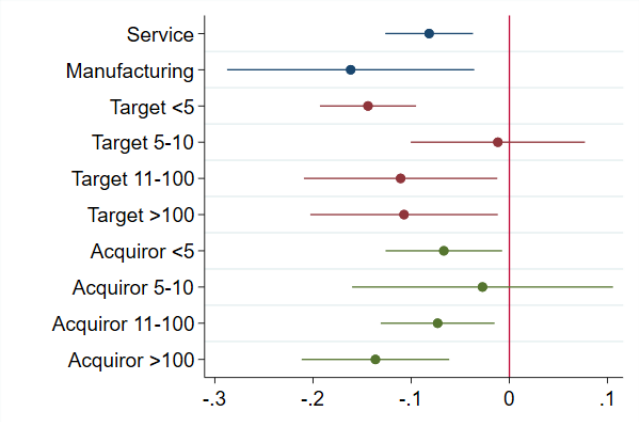
Appendix E presents additional results. Specifically, Appendix E.1 presents a heterogeneity analysis by event type and Appendix E.2 presents summary statistics and event-study estimates for a joint analysis of incumbent workers of acquirer and target firms.

E.1 Heterogeneity by Event Types

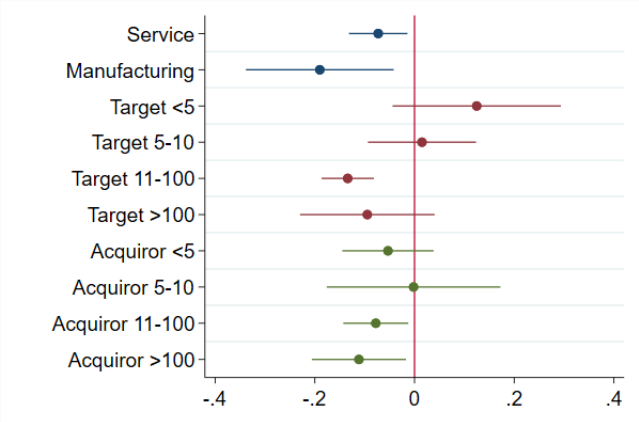
Appendix Figure E1 presents event-study estimates by various firm characteristics. We study differences by the industry sector: workers in the service sector experience a 8.2% reduction in retention. For those in the manufacturing industry, the reduction in retention is 16.2%. Finally, we look at variation across target and acquirer firm size. We find that retention effects are present for takeovers across many size categories (where size is measured by employment) and is particularly large when takeovers involve larger target and acquirer firms. These patterns are similar in hours worked as well.

Appendix Figure E1: Outcomes of Target Workers: Event-Level Heterogeneity in Retention

(a) Retained at Consolidated Firm



(b) Hours at Consolidated Firm



Note: This figure shows the percentage change in retention (panel (a)) and hours (panel (b)) at the consolidated firm in the year of the takeover and the four years subsequent. The percentage change is derived from the difference-in-differences estimate from the the Sun and Abraham estimator (Sun, 2021; Sun and Abraham, 2021) divided by the base average of the treated workers in $t-2$. Each line corresponds to an estimate from a different regression where regressions are run over different samples.

E.2 Acquirer Workers

Table E1 shows retention effects for acquirer workers for events where we match both the target and acquirer firm to control firms. Because of this additional restriction of matching acquirers, the sample is smaller (399 compared to 1,031 events in our main sample). We note that the composition of our main sample and this further restricted sample differs in a number of ways: this more restricted match has a higher share of horizontal takeovers and a higher share of takeovers between non-tradeable firms. Further, acquirers tend to be larger in this restricted sample. Despite these differences, we find that outcomes for target workers are consistent with our main results: we find that target workers experience reduced retention and hours at the consolidated firm, reduced overall employment, and reduced income. For acquirer workers, however, we do not observe statistically significant changes in any of these outcomes.

Appendix Table E1: Takeover Characteristics

Event Type	Share (%)
Horizontal	44.4
Same 2-digit industry	52.9
Same province	71.2
Same province and 3-digit industry	30.1
Same province and 2-digit industry	36.1
Vertical	8.5
Between tradeable firms	11.0
Between non-tradeable firms	56.6
High Labor Market HHI Change (> 0.21)	0.0
Number of Takeovers	399

Note: This table shows the characteristics of takeovers in our restricted sample. All industry definitions rely on Standard Industry Classifications. A horizontal takeover is defined as a takeover between firms in the same 3-digit industry. A vertical takeover is defined as a takeover between a service-industry firm and a manufacturing firm. There are 12 provinces in the Netherlands. High HHI changes in the labor market correspond to takeovers that generate a change in HHI greater than or equal to the change of labor market concentration of 0.21 (see Arnold, 2021).

Appendix Table E2: Firm Characteristics

	Acquirer (1)	Acquirer (control) (2)	Treat vs. Control Difference (3)	Normalized Difference (4)	Target (5)	Target (Control)	Treat vs. Control Difference	Normalized Difference
Employment	148.22	187.05	38.82	-0.05	29.73	25.84	-3.88	0.03
	(467.49)	(615.50)	(11.88)		(103.15)	(67.92)	(3.79)	
Establishments	2.17	2.28	0.11	-0.02	1.29	1.36	0.07	-0.06
	(4.52)	(5.09)	(0.18)		(0.72)	(0.95)	(0.06)	
Firm Age (yrs)	18.74	17.67	-1.07	0.05	14.17	14.17	-0.00	0.00
	(16.07)	(13.27)	(0.85)		(13.26)	(13.63)	(0.69)	
Average Labor Income (EUR)	36,656.32	37,991.02	1,334.69	-0.05	38,096.97	40,573.62	2,470.21	-0.07
	(17,687.78)	(17,053.20)	(626.37)		(20,958.20)	(25,525.50)	(1,145.11)	
Service	0.66	0.66	0.00	0.00	0.70	0.70	0.00	0.00
	(0.48)	(0.48)	(0.00)		(0.46)	(0.46)	(0.00)	
Manufacturing	0.10	0.10	0.00	0.00	0.09	0.09	0.00	0.00
	(0.30)	(0.30)	(0.00)		(0.28)	(0.28)	(0.00)	
Construction	0.09	0.09	0.00	0.00	0.06	0.06	0.00	0.00
	(0.29)	(0.29)	(0.00)		(0.24)	(0.24)	(0.00)	
Healthcare	0.08	0.08	0.00	0.00	0.07	0.07	0.00	0.00
	(0.27)	(0.27)	(0.00)		(0.26)	(0.26)	(0.00)	
South-Holland	0.27	0.27	-0.01	0.00	0.24	0.24	-0.01	0.00
	(0.45)	(0.44)	(0.00)		(0.43)	(0.42)	(0.00)	
North-Holland	0.17	0.17	0.01	-0.02	0.20	0.19	-0.01	0.02
	(0.38)	(0.38)	(0.00)		(0.40)	(0.39)	(0.00)	
Groningen	0.14	0.14	-0.00	0.00	0.17	0.16	-0.01	0.02
	(0.35)	(0.34)	(0.00)		(0.37)	(0.37)	(0.00)	
Gelderland	0.10	0.10	-0.00	0.00	0.09	0.10	0.00	0.02
	(0.30)	(0.30)	(0.00)		(0.29)	(0.29)	(0.00)	
Number of Firms	399	399			399	399		

Note: This table shows the characteristics of firms in our restricted sample four years prior to the takeover. The first column corresponds to average characteristics of acquirer firms, the second column corresponds to average characteristics of target firms, and the third column corresponds to firms selected as controls for the target firm. The fourth column shows the mean difference of characteristics between treated and control target firms. Standard deviations are in parentheses. The fifth column shows the normalized difference of characteristics between treated and control target firms (see Imbens and Wooldridge, 2009). The table only reports the dominant industries (service, manufacturing, construction) and provinces (South-Holland, North-Holland, Groningen, Gelderland) in our restricted sample.

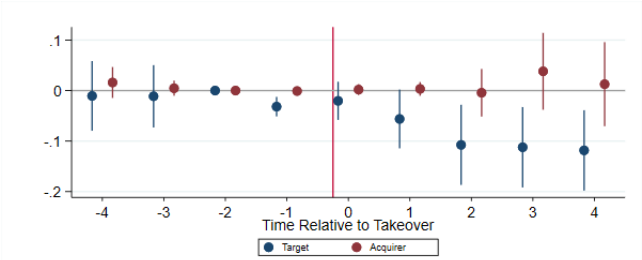
Appendix Table E3: Worker Characteristics

	Acquirer	Acquirer (control)	Treat vs. Control Difference	Normalized Difference	Target	Target (Control)	Treat vs. Control Difference	Normalized Difference
Female	0.58	0.53	-0.01	0.07	0.40	0.47	0.01	-0.10
	(0.49)	(0.50)	(0.00)		(0.50)	(0.50)	(0.01)	
Age (years)	41.57	41.21	-0.52	0.02	39.15	40.15	1.83	-0.06
	(11.86)	(11.82)	(0.07)		(11.73)	(11.85)	(0.22)	
Born in the Netherlands	0.90	0.87	-0.02	0.07	0.75	0.83	0.03	-0.14
	(0.30)	(0.33)	(0.00)		(0.44)	(0.37)	(0.01)	
Tenure (0 years)	0.13	0.15	0.02	-0.04	0.29	0.25	-0.00	0.06
	(0.34)	(0.36)	(0.00)		(0.45)	(0.44)	(0.01)	
Tenure (1-2 years)	0.38	0.37	0.01	0.01	0.41	0.47	0.01	-0.09
	(0.49)	(0.48)	(0.00)		(0.49)	(0.50)	(0.01)	
Tenure (3+ years)	0.49	0.47	-0.04	0.03	0.30	0.28	-0.00	0.03
	(0.50)	(0.50)	(0.00)		(0.46)	(0.45)	(0.01)	
Low Skill	0.12	0.13	-0.00	-0.02	0.22	0.22	0.01	0.00
	(0.33)	(0.33)	(0.00)		(0.42)	(0.41)	(0.01)	
Medium Skill	0.20	0.19	-0.00	0.02	0.25	0.26	0.01	-0.02
	(0.40)	(0.40)	(0.00)		(0.43)	(0.44)	(0.01)	
High Skill	0.67	0.68	0.01	-0.02	0.51	0.51	-0.02	0.00
	(0.47)	(0.47)	(0.00)		(0.50)	(0.50)	(0.01)	
Labor Income	44,262.47	46,374.81	-161.03	-0.05	42,652.33	40,357.23	1,808.19	0.05
	(31,865.57)	(33,154.49)	(180.92)		(32,749.73)	(32,334.68)	(544.06)	
Person FE	0.08	0.11	0.02	-0.06	0.02	-0.00	0.02	0.04
	(0.33)	(0.33)	(0.00)		(0.33)	(0.35)	(0.01)	
Permanent Contract	0.82	0.79	-0.03	0.05	0.67	0.77	0.10	-0.16
	(0.39)	(0.40)	(0.00)		(0.47)	(0.42)	(0.01)	
Fixed Contract	0.18	0.21	0.03	-0.05	0.33	0.23	-0.10	0.16
	(0.39)	(0.40)	(0.00)		(0.47)	(0.42)	(0.01)	
Number of Incumbent workers	44,301	56,919			8,466	7,001		

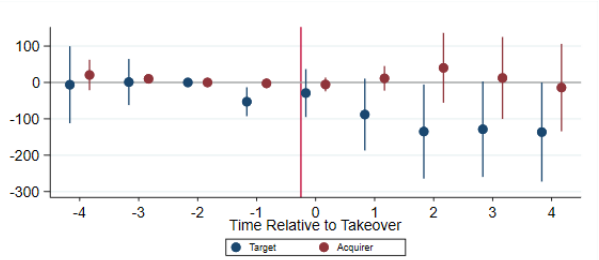
Note: This table shows the characteristics of incumbent workers in our restricted sample who were employed at various firms four years prior to the takeover. The first column corresponds to average characteristics of workers at acquirer firms, the second column corresponds to average characteristics of workers at target firms, and the third column corresponds to workers at firms selected as controls for the target firm. The fourth column shows the mean difference between worker characteristics at the treated and control target firms. Standard deviations are in parentheses. The fifth column shows the normalized difference between worker characteristics at the treated and control target firms (see Imbens and Wooldridge, 2009).

Appendix Figure E2: Labor Market Outcomes of Workers

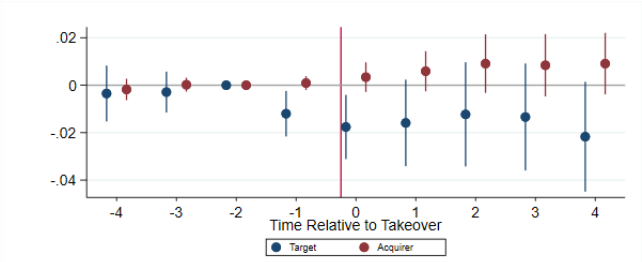
(a) Retention at Consolidated Firm



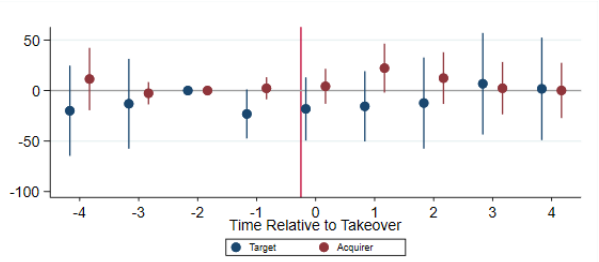
(b) Hours at Consolidated Firm



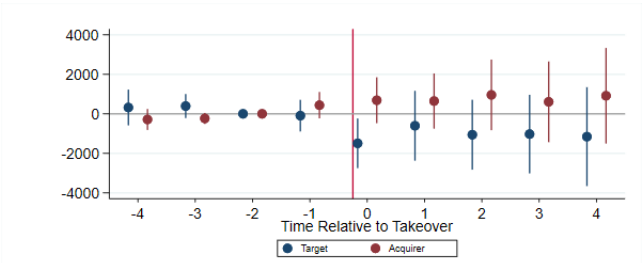
(c) Employed at Any Firm



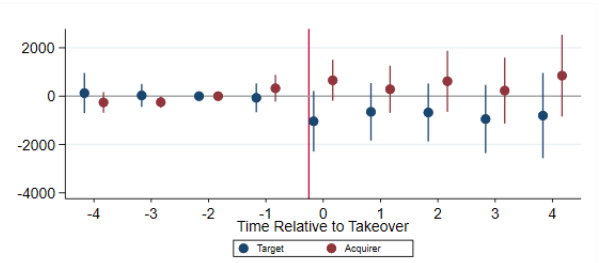
(d) Total Hours at Any Firm



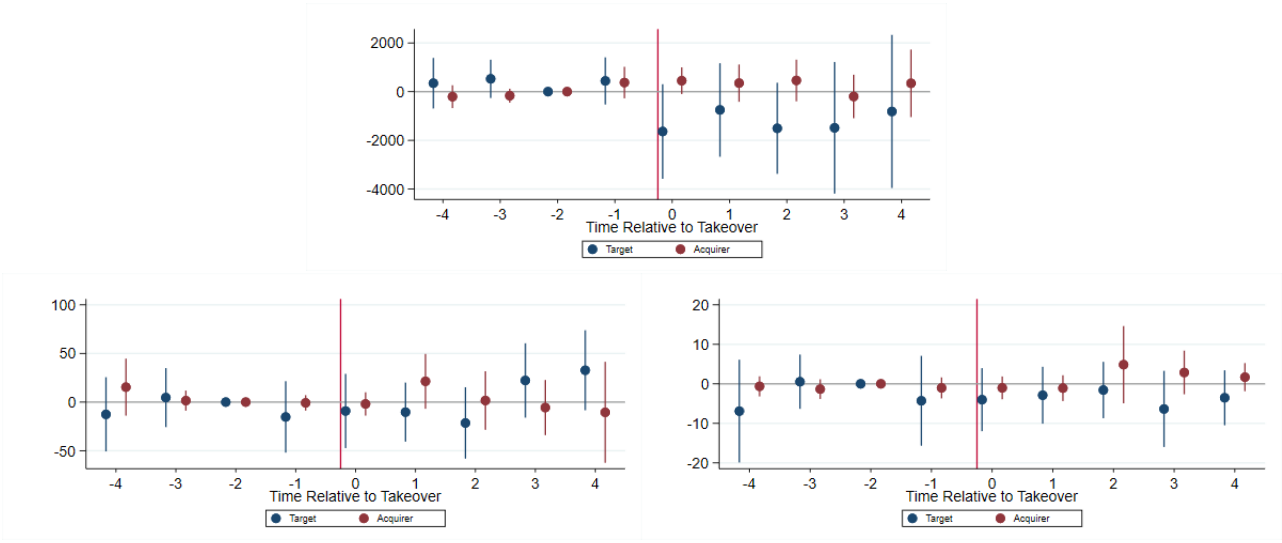
(e) Labor Market Income



(f) Total Income (Including Labor Market Income and Income from various government benefits)



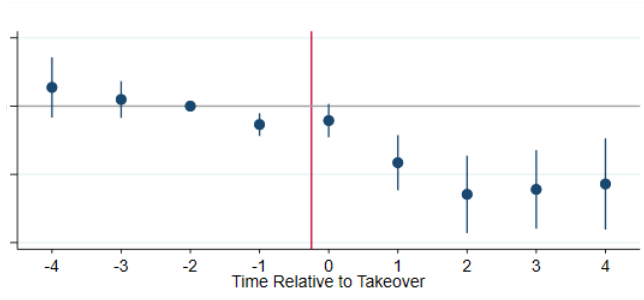
Appendix Figure E3: Outcomes of Target and Acquirer Workers: Income, Wages, and Hours Worked,
Conditional on Retention



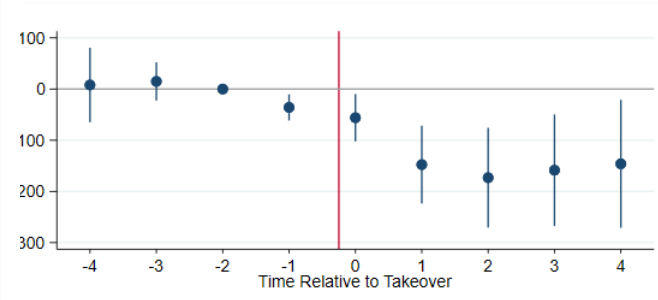
E.3 Over-placed Workers

Appendix Figure E4: Average Outcomes Among Over-placed Workers

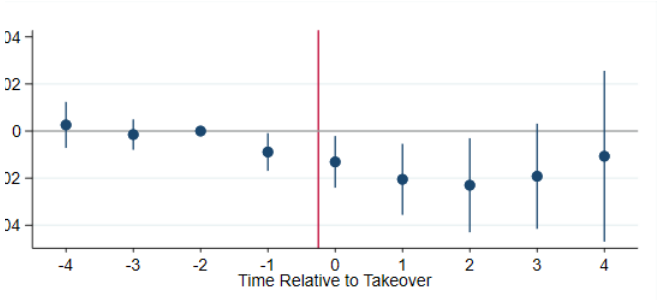
(a) Retention at Consolidated Firm



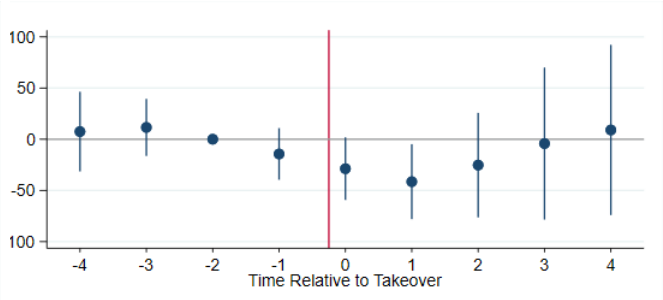
(b) Hours at Consolidated Firm



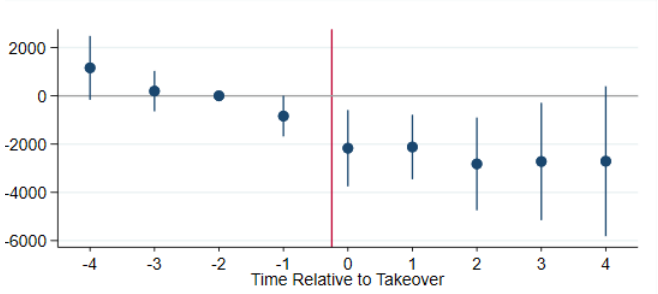
(c) Employed at Any Firm



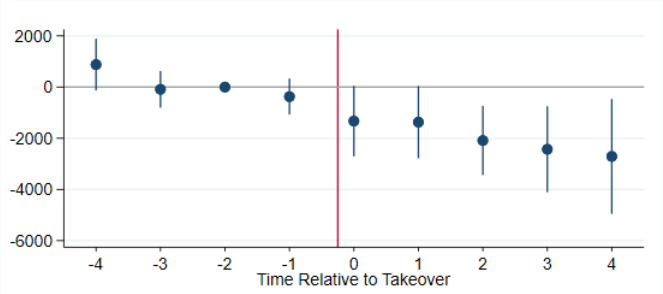
(d) Total Hours at Any Firm



(e) Labor Market Income



(f) Total Income (Including Labor Market Income and income from various government benefits)



Note: This figure shows the timeseries for actual target firms and control firms as well as the event-study coefficients for target firms using $t-4$ as the omitted time-period. Event-study coefficients were estimated using the Sun and Abraham estimator (Sun, 2021; Sun and Abraham, 2021).