Job Transitions and Employee Earnings After Acquisitions: Linking Corporate and Worker Outcomes*

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Abstract

This paper connects the dynamics of job transitions to employee earnings following mergers and acquisitions (M&As). Using firm balance sheet data linked to individual earnings data in Canada and a matched difference-in-differences design, we find that after M&As, acquirers expand while targets shrink substantially, relative to their matched control groups. Additionally, profit margins decrease for both acquirers and targets in the medium-run. Furthermore, workers in target firms suffer losses in earnings, and this decline in earnings is entirely driven by workers who move to other firms after an M&A event. We find that workers leaving target firms after M&As move to larger firms with higher wage premiums, but with worse match qualities on average. Taken together, it appears that job transitions to employers with poor match qualities, rather than a rise in market concentration, explain the post-M&A decline in worker earnings in our setting.

JEL Classification: E24, G34, J31, J42, L25
Keywords: Employment, Mergers and Acquisitions, Firm Performance: Size, Diversification, and Scope, Monopsony, Wage Level and Structure

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1 Introduction

Research has uncovered persistent evidence of imperfect competition in labor markets (Staiger et al., 2010; Manning, 2011; Naidu et al., 2016; Dube et al., 2020; Kline et al., 2019; Lamadon et al., 2022). These findings have led to renewed interest in understanding sources of monopsony power. One thread of this recent literature links poor labor market outcomes to a rise in market concentration (Barkai, 2020; Azar et al., 2022; Benmelech et al., 2022; Rinz, 2022). Subsequently, recent work has assessed impacts on workers of mergers and acquisitions (hereafter, M&As) that generate large shifts in concentration (Prager and Schmitt, 2021; Arnold, 2021). However, even absent anti-competitive impacts, M&A events may still have large impacts on workers. For workers who remain in the merging parties, changes in firm performance could impact workers, as firms are an important source of wage variation across workers (Card et al., 2013; Bryson et al., 2016; Song et al., 2018). Additionally, M&A events could lead to job transitions, which may have negative impacts on workers, as shown in the job displacement literature (Jacobson et al., 1993; Lachowska et al., 2020; Schmieder et al., forthcoming).

In this paper, we provide new empirical evidence on changes in workers' labor market outcomes following corporate M&As. Specifically, we assess the connection between the dynamics of job transitions and employee earnings after M&As, and compare characteristics of new employers to those of previous ones. While prior studies focus only on either firm-level outcomes or worker-level outcomes, in our work we are able to link detailed firm balance sheet data from corporate tax returns to worker-level earnings data from individual tax returns.[1] This allows us to connect and simultaneously evaluate both corporate and employee outcomes, and helps us pin down potential mechanisms behind our findings. For identification, we exploit a large number of M&A events from 2005 to 2016 in Canada and a matched difference-in-differences design, where we compare M&A firms and workers with control groups that share similar characteristics and operate in the same province and sector, but are never involved in M&As.

Conceptually, we expect target firms to shrink after M&As. The purpose of M&As is to sell a target's businesses to an acquirer, although in the case of a partial acquisition, the target still operates independently. However, it is unclear how the acquirer's size would change after an M&A event. The acquirer can hire workers from the target, but fire incumbent workers, so its size may stay the same. Also, it may take a while for an acquisition to start generating profits, so the acquirer may lose profits in the short run. By contrast, a productive M&A may help the acquirer to become more profitable and grow in the long run.

[1] While Arnold (2021) also uses employer-employee matched data in the U.S., the Longitudinal Employer-Household Dynamics (LEHD) data does not have detailed firm balance sheet information, such as revenue or profit margins, and therefore, cannot be used to simultaneously evaluate firm-level and worker-level outcomes.

We find that acquirers expand significantly, while targets shrink substantially after M&As. Furthermore, profit margins decrease significantly for both targets and acquirers after M&As. Acquirers' employment, average payroll, and revenue increase by 15.7 log points, 2.8 log points, and 22.5 log points, respectively, on average relative to their matched control groups after M&As. By contrast, targets' employment, average payroll, and total revenue decreased by 8.8 log points, 2.6 log points, and 47.2 log points, respectively, on average after M&As. Given that the majority (roughly 80 percent) of M&As in our setting involves partial acquisitions, target firms in our sample remain as independent and separate entities after acquisitions, and sharp declines in their sizes are consistent with the fact that they sold a substantial part of their businesses to acquirers.

At the worker-level, we estimate that their annual earnings increased by 1.6 percent for workers in acquiring firms, but decreased by 1.6 percent for workers in target firms. In target firms, the probability of job transitions increases substantially, by about 7.8 percentage points. Given that we observe the universe of workers in the formal labor market in Canada, we check that roughly 93 percent of these job transitions are to different companies, rather than to self-employment or unemployment. Importantly, we find that the decline in workers' earnings at target firms is almost entirely driven by those who transition jobs following the M&A event.

Our finding that earnings do not change for workers who remain in the original firms is suggestive evidence of a limited role for market-level impacts of M&As, such as increased monopsony power or increased product market power, driving wage changes. However, it is possible that our identification strategy (which compares merging firms with non-merging firms) nets out these equilibrium impacts. Nevertheless, in our setting, we find a limited role for either increased labor-market power or increased product market power. The vast majority of M&A events (99 percent) have essentially zero predicted impact on labor-market concentration. This finding arises because most labor markets in our sample are not concentrated to begin with, and the majority of firms going through M&As are located across different commuting zones. Turning to product market power, many of our firm-level outcomes suggest that an increase in product market power is not a primary factor in explaining our results. First, we do not find evidence that profits increase in either target or acquiring firms after an M&A event. If product market power rises, we would expect to see increases in profits. Second, we directly estimate markups following De Loecker et al. (2020) and find no evidence of increased markups for either target or acquiring firms.

While the firm-level results are inconsistent with a rise in market power driving the earnings losses for target workers after M&As, we additionally conduct heterogeneity analyses based on the initial labor market concentration or different types of M&A events to rule out a shift in market concentration as a potential channel behind the decline in target workers' earnings. These results contrast with Arnold (2021) and Prager and Schmitt (2021), who find M&A events that lead to

large shifts in labor market concentration cause wage declines. In our sample of M&A events, we find a limited role for market concentration. While the prior studies utilize variation across M&A events in terms of the size of concentration changes, we study impacts across firms engaging in M&As and firms not engaging in M&As. Therefore, we interpret our evidence as complementary to these prior studies.

Given that the decline in workers' earnings at target firms is almost entirely driven by those that move to other firms after the M&A event, we turn to the impacts on job movers. Workers who transition from target firms after an M&A event experience a decline in earnings of about 5 percent. While we find that most of these workers leave target firms voluntarily, we follow a recent displacement literature to decompose these earnings losses into firm-specific components and match-specific components. For example, the decrease in earnings for movers could be due to finding a new employer with a lower firm fixed effect or with a worse match quality. Broadly speaking, while firm fixed effects capture firm characteristics that result in above- or below-average earnings for all workers, match effects reflect a specific employee skill set that fits well with a firm's production function, or by firm benefit policies that enhance the productivity.

We find that workers from target firms move to larger firms (in employment and sales) with higher wage premiums on average. Despite this, these workers still suffer earnings losses from moving to these firms. To explore this further, we follow Woodcock (2015) and Lachowska et al. (2020) and estimate worker-firm match effects. We find that while the firms M&A workers move to are better on average, they are particularly poor matches for the workers. These results are qualitatively similar to Lachowska et al. (2020) who find that match effects for displaced workers explain a large portion of the wage decline following a job loss, with firm effects playing a relatively minor role. Taken together, it appears that after target firms shrink in size after the M&A event, workers move to larger firms and take a modest wage cut, possibly for better earnings growth in the future (Cahuc et al. 2006). Their earnings loss remains in the medium run due to worse matches with new employers. Relative to previous work documenting that M&A events create significant displacements of workers from target firms with higher wage premiums and reallocation to firms with lower wage premiums (He and le Maire 2022; Lagaras forthcoming), our work shows that most workers from target firms voluntarily leave target firms after the M&A event, and move to firms with higher wage premiums but with worse match effects.

This paper contributes to a few distinct literatures. Most directly, we contribute to a literature on the impacts of M&As on the labor market (Brown and Medoff, 1988; Siegel and Simons, 2010). Much of the recent work in this area has focused on particular mechanisms. For example, both Prager and Schmitt (2021) and Arnold (2021) study how M&A events that lead to large changes in labor market concentration affect worker earnings. In these papers, the goal of the analysis

is to argue that other changes, such as shifts in productivity or product market power, are stable across M&A events that differentially impact labor market concentration. In this paper, we seek to directly estimate these impacts using the firm-level balance-sheet data. Additionally, the sample of M&A events in this paper is quite different. We find that in our sample of M&A events, shifts in labor market concentration are relatively rare. However, we find these M&A events still have important impacts on job transitions that translate to changes in worker outcomes. This analysis also complements the study by He and le Maire (2022), which focuses on the role of replacing managers in target firms. Theoretically, high-wage managers may be replaced after M&A events (Shleifer and Summers, 1988) leading to declines in earnings in target firms. We study the impact of M&A events on workers who leave target firms voluntarily.

Second, there is a large literature in corporate finance and industrial organizations that studies how M&As affect firm outcomes and finds mixed empirical results on firm performance. For example, Braguinsky et al. (2015) report positive impacts on productivity in the Japanese cotton spinning industry, while Blonigen and Pierce (2016) show negative impacts on productivity in a sample of U.S. manufacturing mergers. Furthermore, while Boucly et al. (2011) find that leveraged buyouts in France allow target firms to grow and become more profitable by relaxing financial constraints, Malmendier et al. (2018) show that acquirers that win bidding contests suffer long-run losses relative to firms that lose the bidding contests. Declines in stock performance of acquiring firms have been attributed to potentially misaligned incentives, such as empire-building motives (Jensen, 1986) or CEO overconfidence (Malmendier and Tate, 2005). Our paper contributes to this literature by estimating the impact of M&As on a variety of firm-level outcomes and by finding results consistent with the latter set of studies reporting negative impacts of M&As on firm performance. We then use these firm-level outcomes to rule out alternative mechanisms behind the decline in workers' earnings.

Lastly, our paper relates to a literature on how job transitions impact wages. In particular, a large literature studies the role of firm-specific and match-specific components in explaining the changes of displaced workers' wages (Lachowska et al. 2020; Schmieder et al. forthcoming). Much of the recent work leverages mass layoffs to identify impacts of job transitions on workers earnings. In this paper, we find that M&A events could lead to significant job transitions for workers from target firms, and that workers moving to new employers with worse match quality could play an important role explaining the decline in their earnings after the M&A event.

This paper is organized as follows. Section 2 develops a conceptual framework. Section 3 provides institutional details on M&A regulations in Canada. Section 4 describes our data and Section 5 describes our research design. Section 6 shows our main results and Section 7 discusses potential mechanisms of our findings. Section 8 concludes.

2 Conceptual Framework

This section illustrates a model of wage bargaining following Abowd and Lemieux (1993) through which we will interpret the impacts of M&As. To begin, consider a group of $\bar{l}_j$ workers bargaining over both wages and employment level with firm j. The workers seek to maximize $l_j w_j + (\bar{l}_j - l_j)v$, where w_j is the bargained wage, l_j is the employment level, and v is the value of the outside option to the workers. We assume any workers who are not hired by the firm receive the outside option v.

The workers bargain with a firm with a profit function $p_j(q(l_j))q(l_j) - w_j l_j$. We assume that the price of firm j's output depends on the total output $q(l_j)$, implying that firms may have some level of product market power. The threat point for workers is the value of the workers' outside option, while the threat point for the firm is zero profits. We assume workers and firms bargain over both wages and employment. In particular, they choose l_j and w_j to maximize:

$$\max_{l_j, w_j} [l_j w_j + (\bar{l}_j - l_j)v - \bar{l}_j v]^{\gamma_j} [p_j(q(l_j))q(l_j) - w_j l_j]^{1-\gamma_j} \tag{1}$$

where γ_j is the bargaining weight associated with workers. A higher value γ_j implies placing a higher value on the utility of workers relative to firm profits. Taking the first order conditions for the bargaining problem yields the following two optimality conditions:

$$w_j = \gamma_j \underbrace{\left(\frac{p_j(q(l_j))q(l_j)}{l_j} \right)}_{\text{Rents Per Worker}} + \left(1 - \gamma_j\right) v \tag{2}$$

$$q'(l_j) p_j(q(l_j)) \left(\frac{1}{\varepsilon_j} + 1 \right) = v \tag{3}$$

Equation (2) controls the optimal wage of the firm and is governed by three terms: the bargaining parameter γ_j, the value of workers' outside option v, and the rents per worker, $\frac{p_j(q(l_j))q(l_j)}{l_j}$. We assume the rents per worker are greater than the value of the outside option, otherwise workers would just take the outside option. Therefore, in this model, wages are increasing in the bargaining power of workers, the outside option of workers, and the rents per worker at the firm.[2]

[2]Many alternative models of wage setting yield similar wage equations. For example, a wage posting model, as in Kline et al. (2019), shows that the wage for incumbents is an average of the marginal product of labor and the entrant wage (an object similar to the outside option in this model). Standard search models, as in Manning (2003), also produce a similar formulation of the wage as an average of marginal revenue of product and the outside option available to workers. The rent-sharing literature often writes out the wage equation as $w_j = \gamma_j QR_j + v$, where QR_j are the quasi-rents per worker at the firm and in our model are equal to $\frac{p_j(q(l_j))q(l_j) - v}{l_j}$ (See Van Reenen (1996)).

Equation (3) controls the optimal size of the firm.[3] The first term, $q'(l_j)p_j(q(l_j))$ is the marginal revenue product of the worker. The second term $\left(\frac{1}{\varepsilon_j+1}\right)$ allows for the possibility of imperfect competition in the product market. The term ε_j is the elasticity of demand. As $\varepsilon_j \to -\infty$, the size of the firm approaches the perfectly competitive optimal size, which is the size at which the marginal product of workers is equal to the outside option of workers. The more inelastic the demand (implying higher market power), the smaller the firm size, all else equal.

2.1 Potential Impacts of M&As on Wages

In terms of the model, M&As could impact workers' wages through a variety of channels. The first two channels we will discuss fall under the broader umbrella of market power: product market power and labor-market power. The next channel is about firm-specific components of the production process that might impact workers' wages, even without any market power impacts. The final component discusses how workers who exit the firm may be impacted relative to incumbents.

2.1.1 Market Power

Labor Market Power: In this wage-bargaining model, impacts on labor-market competition can be potentially interpreted through two parameters: the bargaining parameter and the value of outside options. In the model so far we have taken the bargaining parameter as exogenous. However, it is possible that the bargaining weight of workers decreases following an M&A event. A decline in γ_j implies workers get less of the overall rents in the firm; thus, wages would go down, with no impact on total employment in the firm. One mechanism through which bargaining power could decrease is by the replacement of high-wage managers (Shleifer and Summers 1988; He and le Maire 2022).

M&As may also impact labor-market power through the value of the outside option v. Before the merger, workers in the target and acquiring firms could potentially be employed at the other firm in the market. After a complete merger, the workers are in the same firm, which could reduce the value of the outside option to workers. In other words, monopsony power of firms could increase in the market due to a decrease in the value of outside options for workers. In product markets, such anti-competitive impacts are often predicted using either diversion ratios (Farrell and Shapiro, 2010), concentration (Farrell and Shapiro, 1990), or discrete-choice merger simulations (Nevo, 2000). This channel has been studied in prior work that focuses on impacts of labor-market concentration on wages, using M&A events as a shock to concentration (Arnold, 2021; Prager

[3] In this setup, we have assumed that firms and the union jointly bargain over wages and employment. This implies that the overall firm size depends on the outside option of workers v, rather than the negotiated wage w_j. This is referred to as a strongly efficient bargaining outcome.

and Schmitt, 2021). In our setting, however, most M&A events are partial acquisitions, where the target sells a part of the firm, and remains a separate entity. This distinction likely has implications for how much we expect a given event to shift the outside option of workers in these firms.

Product Market Power: In terms of antitrust policy, the key impact of M&As is a price increase due to increased product market power. In this wage-bargaining model, an increase in product market power can be interpreted as demand becoming more inelastic (i.e., a lower value in absolute terms of ε_j). Lower overall output also results in lower overall employment. In terms of wages, higher profits and fewer workers will generate increases in the size of rents available to bargain over, leading to an increase in workers' wages. Note that a wage-posting model has different implications for how increases in market power may impact wages. In wage-posting models, firms face upward sloping labor supply curves, implying declines in employment lead to declines in wages. Since increased market power will incentivize firms to lower employment, firms will cut wages in response to increased market power.

2.1.2 Production Function Changes

A common justification for M&As is the possibility of increased profitability through synergies. For example, Braguinsky et al. (2015) finds evidence of increased productivity in the Japanese cotton spinning industry after acquisitions, while Blonigen and Pierce (2016) finds little evidence of increased productivity in manufacturing acquisitions in the United States. If firms become more productive after M&As, they may become more profitable, which can be interpreted as an increase in the marginal revenue product of workers. This impact will increase both firm size and wages.

However, prior studies find negative impacts of M&As on firm performance. For example, Malmendier et al. (2018) finds that acquiring firms that win bidding contests for target firms suffer losses in stock returns relative to competitors. Possible motivations for productivity-reducing M&As include misaligned empire-building motives (Jensen, 1986) or CEO overconfidence (Malmendier and Tate, 2005). Decreases in productivity will decrease employment and wages.

2.1.3 Job Transitions

In this model, if a worker leaves their current firm, then the worker receives the outside option v. While this is common across all workers in this model, it likely in practice varies at the worker level. A large literature in economics finds that job displacement often leads to large and persistent earnings declines for workers (Jacobson et al., 1993; Lachowska et al., 2020; Schmieder et al., forthcoming). However, separations during an M&A event may impact workers very differently

than separations studied in the prior literature, which generally focus on mass-layoff events. In the aggregate, M&A events tend to be pro-cyclical (Rhodes-Kropf and Viswanathan 2004), which could imply workers who transition jobs during M&A events face different circumstances relative to workers displaced in a mass layoff. Additionally, as we will find in our data, most job transitions we study are voluntary rather than involuntary.

To understand how job transitions impact worker outcomes, we will decompose earnings changes into different components, following Lachowska et al. (2020). In particular, we will examine the characteristics of firms that workers transition to. To do so, we will estimate employer fixed effects (Abowd and Lemieux 1993), which capture the premium associated with working for a given employer, and examine whether workers who leave M&A firms move to firms with higher or lower wage premiums on average. Furthermore, using detailed firm balance sheet data, we will examine whether workers who leave their employers after an M&A event move to firms that are larger (in terms of employment and sales) or more profitable. We will then utilize an extension of the AKM model, proposed by Woodcock (2015) and implemented by Lachowska et al. (2020), to examine the role of match effects in explaining changes in workers' earnings. We discuss the estimation of these components and its interpretation in relation to our main findings in Section 7.

3 Institutional Background

This section describes relevant institutional details. Competition policy in Canada is set by the Competition Act, administered by the Competition Bureau, an independent law enforcement agency. In 2009, a major reform instituted a two-step process for merger reviews, similar to the American process with notification thresholds, a waiting period, and a supplementary information request. The thresholds for a pre-merger notification requirement are set by the Competition Act along three dimensions: (1) The parties together must have aggregate assets in Canada, or aggregate annual gross revenues from sales in, from or into Canada, in excess of 400 million Canadian dollars (Size of Parties), (2) the aggregate value of the assets in Canada to be acquired, or the aggregate annual gross revenue from sales in or from Canada generated from those assets, must be greater than 93 million Canadian dollars (Size of Transaction); or (3) the acquirer holds 20 percent of the shares of a public corporation, 35 percent of the share of a private corporation, 35 percent of the profits or assets on dissolution of non-corporate entity (Size of Equity). Exceeding any one of these thresholds triggers the pre-merger notification requirement. In our analysis sample, however, most M&A deals and involved parties are not large enough to trigger any of these thresholds.

The parties may close the deal when the statutory waiting period (30 days) has expired, been waived, or is terminated; unless extended by the Commissioner of Competition through a Sup-

plementary Information Request.[4] Furthermore, all mergers are subject to challenge from the Commissioner for up to one year after closing unless an Advance Ruling Certificate has been issued.[5] Reviewing a merger, the Commissioner considers multiple factors, such as concentration and barriers to entry, and may challenge the proposed merger if it substantially lessens competition.

Section 96 of the Competition Act explicitly lays out an "efficiencies defence" of mergers, which allows anti-competitive mergers to proceed if potential cost savings outweigh the losses to consumers through higher prices. In the United States and many other jurisdictions, efficiency can also be considered as a factor in anti-trust decisions for mergers but is given less weight.[6] A review of the Competition Act launched by the Government of Canada targets the efficiency defence, citing concerns about the realization of potential efficiency gains. In short, assessing how acquirers' and targets' performance change after M&As through a retrospective study may be beneficial for policymakers designing effective regulations on M&As.

4 Data

This section describes two datasets used for our analysis. First, we use the SDC Platinum database which contains information on M&A activities around the globe. Second, we use the Canadian Employer-Employee Dynamics Database, a matched employee-employer dataset that covers the universe of firms and workers in Canada from 2001 to 2017. To prevent disclosure of confidential information, Statistics Canada requires researchers to round estimates and observation counts.

4.1 SDC Platinum

The SDC Platinum database allows detailed search on M&A activities around the world, covering all corporate (public or private) transactions. This data set includes names of the parties, NAICS industry codes, and other identifying information such as addresses, websites, and phone numbers. After extracting the information on all M&A activities in Canada from 2001 to 2016, we transferred the data to the Canadian Centre for Data Development and Economic Research within Statistics Canada, which merged this M&A data with the Canadian Employer-Employee Dynamics Database

[4]The Supplementary Information Request is akin to a second request in the U.S. under the Hart-Scott-Rodino Antitrust Improvements Act of 1976 (the HSR Act).

[5]An Advance Ruling Certificate notifies the parties that the Commissioner does not intend to make an application under section 92 of the Act which is akin to "early termination" in the U.S. under the HSR Act.

[6]Ware and Winter (2016) assert (p. 366) for Canada that "...in no other jurisdiction in the world would a court accept evidence of substantial price effects from a merger and yet allow the merger." A comparison of efficiency defences across many OECD countries is found in OECD (2013).

at the firm level using all available identifying variables, such firm names and addresses. The match rate is about 75 percent on average from 2001 to 2016.

4.2 Canadian Employer Employee Dynamics Database (CEEDD)

The Canadian Employer-Employee Dynamics Database draws information from both individual (T1) and corporate (T2) tax return records, merged with job-level information using T4 employee tax records (like a W-2 in the United States, with information on annual earnings) and Record of Employment (ROE) data (with information on work history), and with firm-level information from the National Accounts Longitudinal Micro-data File (NALMF). This database has rich information on the universe of firms and workers in Canada from 2001 to 2017.

The main outcome variables used in the firm-level analysis are employment, average payroll, total revenue, and profit margins. Employment is defined as the average number of employees reported on the T4s in a given year. average payroll are defined as total wage bills divided by the number of employees. Profit margins are defined as total revenue minus total expenses, scaled by total revenue. Additionally, we look at realized capital gains at the firm level, and markups.

We link ownership data with the firm-level data in order to compute realized capital gains by owners for a given firm in each year. The ownership data contains unique individual IDs of investors in private firms and their ownership rates. After merging individual tax returns data with the ownership data at the investor-level, we aggregate owners' realized capital gains of a particular firm in each year to compute total realized capital gains by these investors at the firm level.

We define markup as the elasticity of output with respect to variable costs as well as the variable costs share (De Loecker and Warzynski, 2012). For the elasticity of output with respect to variable costs, we use estimates from De Loecker et al. (2020) that allow for different elasticities across two-digit NAICS industry codes and years. Given the elasticity estimates, this allows us to estimate firm-level markups as the output elasticity multiplied by the inverse of the variable costs (wages and material costs) share: $\hat{\theta}_{st} * \frac{Sales}{Costs\ of\ Goods}$.

At the worker-level, the key outcome variable is annual earnings, aggregated across all employers for that worker in a given year. While we include earnings across all employers, we associate workers with the "dominant" employer (i.e., the employer from which the employee receives the highest pay in the year). We also use information on workers' gender and age derived from the T1 income tax filing for creating a matched control group and for heterogeneity analyses.

5 Empirical Strategy

This section describes our empirical design and provides descriptive statistics on our matched sample. To estimate the effects of M&As on firm-level outcomes, we implement a matched difference-in-differences design by estimating a regression of the following form:

$$Y_{jt} = \sum_{k=-4}^{5} \beta_k^{MA} \mathbb{1}(t_j = t^* + k) \times MA_j + \sum_{k=-4}^{5} \mathbb{1}(t_j = t^* + k) + \psi_j + u_{jt} \tag{4}$$

where Y_{jt} is an outcome variable for firm j in time t, MA_j is an indicator for an M&A firm, $\mathbb{1}(t_j = t^* + k)$ indicates an M&A event occurred k years in the past relative to the period of the M&A event t^*, ψ_j are firm fixed effects, and u_{jt} is an error term. To absorb any industry specific shock in a given year, we include 4-digit industry dummies interacted with year dummies as control variables. Furthermore, we include quartics in firm age to ensure that our results are not driven by differences in financial constraints of firms. The standard errors are clustered at the firm level.

To assess worker-level impacts, we estimate a similar matched difference-in-difference design of the following form:

$$y_{it} = \sum_{k=-4}^{5} \beta_k^{MA} \mathbb{1}(t_i = t^* + k) \times MA_i + \sum_{k=-4}^{5} \mathbb{1}(t_j = t^* + k) + \omega_i + \mu_{it} \tag{5}$$

where y_{it} is an outcome variable for incumbent worker i in time t, ω_i are worker fixed effects, and all other variables are defined as in Equation (4). The standard errors are two-way clustered at the worker-by-firm level.[7]

The key identifying assumption is that outcomes for M&A firms and workers and for control firms and workers would have trended similarly in the absence of the M&A event. This assumption may be strong since M&As are the result of firms' endogenous decisions. For example, acquiring firms may target firms that will be profitable in the future, whose earnings may grow even absent the merger. By contrast, acquirers may target mismanaged and underperforming businesses whose employment and earnings would fall regardless of a merger. One way to determine the direction of the potential bias is by comparing outcomes for M&A firms and workers to the control firms and workers in the years prior to the M&A event. Parallel pre-trends in key outcomes, such as firm growth, profitability, and worker earnings, can build confidence in the key assumption by alleviating the aforementioned concerns.

[7] Our results are robust to two-way clustering standard errors at the commuting zone by 4-digit industry level (see Appendix A).

While verifying common pre-trends is reassuring for a causal interpretation, contemporaneous shocks that occur with M&A events could still bias our results. For example, there could be a negative demand shock that hits a commuting zone and causes both a decline in employment and an increase in merger activities as firms get purchased before they shut down. In this case, M&A activities are correlated with shocks that decrease labor demand. We can also have the opposite scenario; in fact, merger activities tend to be pro-cyclical on aggregate (Rhodes-Kropf and Viswanathan, 2004). We address this concern by also looking at M&As that are less likely to have been triggered by local economic conditions of the firm. Specifically, we consider the impact of national M&As that occur among domestic firms with multiple establishments across different commuting zones. The intuition is that that these changes in ownership are less likely to be driven by local economic conditions of the firms or workers (see Appendix A).

5.1 Matched Samples

During our sample period, the total number of M&A events is about 2,200 per year on average within our data. Before performing a matching procedure between M&A firms and potential control firms, we make the following restrictions. First, we require a firm to have at least 10 workers one year prior to the event and positive employment among years $[t-4, t-2]$. This choice focuses our sample on economically active firms with enough pre-period observations, and drops most small businesses that are not comparable to either acquiring or target firms. We then match each firm in the year prior to an M&A event to a "control" firm in the same province and 2-digit NAICS industry. A firm is a potential control firm for firm j if: (1) the firm is never involved in an M&A event during our sample period, (2) the firm has at least 10 employees in the year prior to the M&A event of firm j and positive employment in years $[t-4, t-2]$, and (3) the firm is in the same decile bin of average payroll and is in the same 15-quantile bin in total revenue and firm age in the year prior to the M&A event of firm j. Of all the possible counterfactual firms for a given M&A firm, we choose the firm with the closest propensity score, which is estimated by predicting treatment using a linear probability model with quadratics in average payroll, total revenue, and firm age in year $[t-1]$. This matching strategy is similar to a number of recent papers implementing a dynamic difference-in-differences research design (Goldschmidt and Schmieder, 2017; Smith et al., 2019). The matching strategy finds a counterfactual firm in 23 percent of all cases, leaving us with 513 M&A events per year on average.

Choosing one counterfactual control firm per M&A firm ensures that the treated and control groups are comparable on the matched variables. We construct an unbalanced panel of firms which extends 4 years prior to and 5 years after the M&A event. M&A firms in our analysis sample are

larger than those that fail to find a control group on average; therefore, the M&A deals in our analysis sample are meaningful and larger than an average M&A deal that happens in Canada during the sample period. Furthermore, our results remain similar when we focus on smaller M&A firms (based on pre-event firm size) within our analysis sample, implying that our results are not driven by a particular set of M&A firms for which we could find a comparable control group.

Matching on size, province, and sector finds treatment-control pairs that would plausibly exhibit common trends in the absence of M&A activity. While we do not explicitly match firms based on commuting zone, it is possible that firms are matched within the same commuting zone. This is a potential concern if M&As have impacts on local labor markets through increased concentration. If M&As have negative effects on firms in the same industry and commuting zone, then the impact of M&As on firms will be biased towards zero. However, as we discuss in Section 7, these potential spillover effects are minimal in our setting given that the number of M&A deals within the same market is relatively small and the number of competitors in a given market is so large that most M&A deals do not contribute to an increase in concentration. Still, to eliminate this concern, we do a robustness check by matching firms within the same province, but at different commuting zones, and find similar results to our main results without this restriction (see Appendix A).

To construct the worker-level sample, we extract all workers who were employed in the matched M&A firms during the pre-event period. This tenure restriction is chosen to obtain a sample of workers with attachment to the M&A firms and is similar to tenure restrictions used in the mass layoff literature (Jacobson et al., 1993; von Wachter et al., 2009; Lachowska et al., 2020). Additionally, we restrict workers to have at least 4,000 CAD in annual earnings to ensure that we study workers with stable income and attached to their firms (Card et al., 2013; Sorkin, 2018). Since we do not observe work hours in our data, we make these restrictions so that we mostly focus on full-time workers. For each worker in a treated firm, we choose a worker in its matched counterfactual firm in the same age bin (5 year bins) and gender. If more than one match is found, we choose the worker with the closest propensity score to the treated worker, where the propensity score is estimated by predicting treatment using a linear probability model with a quadratic in worker age. In total, a counterfactual worker is found in 60 percent of the treated and control firms. To compute earnings in the worker-level data, we aggregate annual earnings across all employers if a worker is employed at more than one firm in a given year.

A recent literature discusses a number of identification and interpretation issues that arise when using the timing of treatment to identify a treatment effect. By using a matched control group that is never treated, the specifications above do not suffer from the identification issues that arise in conventional event-study designs with never-treated units (Borusyak et al., 2021) or difference-in-differences designs with staggered timing (Goodman-Bacon, 2021). Identification here comes

solely from differences in always-treated and never-treated units over time, not from units coming in and out of treatment.

5.2 Descriptive Statistics

We close this section with descriptive statistics of our analysis sample. Panel A of Table 1 shows the averages for key variables across firms, comparing M&A firms to the set of matched control firms one year before the event. On average, M&A firms are a bit larger than their control firms, in terms of total revenue, the number of employees, and average payroll. However, for average payroll and leverage ratio, M&A firms are comparable to their control firms, suggesting that firms that go through M&As and firms that never get involved in M&As are comparable with regards to their average employee compensation and financing structure prior to the event. The dominant sectors are manufacturing, wholesale, and services; together these sectors make up almost three quarters of our sample.

Panel B of Table 1 shows the averages for key variables across workers in our analysis sample one year before the event. We distinguish between workers in acquiring firms and workers in target firms. Annual earnings are roughly 72,000 CAD among workers at acquiring firms and target firms. Annual earnings for workers are roughly 70,000 CAD among workers at their control firms on average prior to the M&A event. The difference between average payroll in Panel A and annual earnings in Panel C arises because not all the workers from treated firms are matched to workers at control firms, as we impose restrictions on worker age, gender and tenure for matching. Hence, the average payroll at a given firm may not equal the average annual earnings of workers in a given firm in our matched sample. The age and gender compositions are similar for workers at both acquiring and target firms, relative to their matched control firms.

6 Results

This section reports the results from the estimation of the difference-in-differences model in Section 5, and presents additional tests supporting the interpretations of the results.

6.1 Post-M&A Firm Size and Performance

Figure 2 plots estimates of β_k^{MA} from equation (4) across the main firm-level outcomes using our matched sample. Panel (a) shows that acquiring firms' and target firms' employment followed

a similar pattern as those of their matched control firms before the M&A event. This pre-event stability is important evidence in support of our empirical strategy. While acquirers' employment significantly increase after the event, targets' employment substantially decreased after the event, compared to those of non-M&A firms.

For Panel (b), the pre-event trends for average payroll are also similar between M&A firms and their matched control firms. While acquirers' average payroll remained flat following the M&A event on average, targets' average payroll substantially decreased after the event, compared to those of non-M&A firms.

Sales and profitability results are shown in Panels (c) and (d). There are parallel pre-trends in total revenue and profit margins between M&A firms and their control firms. For acquiring firms, while total sales increased, their profit margins decreased significantly after the M&A event on average, relative to their control group. For target firms, total revenue shrank drastically, and their profit margins decreased on average after the event, except for the initial spike in the first year. The initial increase in profit margins for targets is likely mechanical, due to larger cost savings from downsizing than the initial fall in sales.

Panel (e) shows similar pre-trends in realized capital gains for acquiring firms and target firms, relative to their matched control firms. While owners' realized capital gains at acquiring firms remained flat after M&A, those at target firms spiked significantly on the first year, as they sold their shares through M&A transactions. Finally, Panel (f) depicts parallel trends in markups between M&A firms and control firms prior to the event, and both lines remain relatively flat after the event.

Table 2 presents the difference-in-differences estimates on these outcomes, separately for acquirers and for targets. Column (1) shows that acquiring firms' employment increased by 15.7 log points on average, relative to non-M&A firms, whereas target firms' employment decreased by 8.8 log points after the event. Column (2) shows that acquiring firms' average payroll increased by 2.8 log points on average, relative to non-M&A firms, whereas target firms' average payroll decreased by 2.6 log points after the event. Column (3) shows that acquiring firms experienced 22.5 log points decline in total revenue, while target firms experienced a decrease of 47.2 log points in total revenue. Column (4) shows that acquiring firms' profit margins decreased by 1.6 percentage points on average relative to non-M&A firms, and target firms' profit margins decreased by a 1.1 percentage points on average after the event. Column (5) reports that realized capital gains of owners at acquiring firms decreased by an insignificant 9790 CAD after the event, while those of owners at target firms increased by 31,753 CAD on average after the event. Finally, Column (6) presents estimates suggesting that neither acquiring firms' nor target firms' markups changed after the event on average.

Overall, these firm-level results show that acquiring firms expanded significantly, but became less profitable after the M&A event. In contrast, target firms shrank substantially, become less profitable, and their initial investors cashed out by selling a part of their shares, relative to their control groups, after the event.

6.2 Post-M&A Worker-level Earnings and Job Transitions

Given the considerable turnover at target firms going through M&As, changes in average payroll may reflect changes in worker composition. Furthermore, while average payroll at the acquiring firms increased after M&As, earnings of their incumbent workers at the acquiring firms may not change after M&As if new entrants' wages increase. Therefore, we next turn to the worker-level data that allows us to flexibly control for composition by tracking the same workers over time.

In Panel (a) of Figure 3, we plot $\hat{\beta}_k^{MA}$ from estimating equation (5). As the figure shows, annual earnings for workers at target firms trend similarly to those of their matched control workers in the years prior to the event, but fall significantly afterwards. By contrast, annual earnings of workers at acquiring firms trend similarly to those of their matched control workers and increased, albeit statistically insignificantly, after the event. Column (1) of Table 3 shows that the average impacts on workers in target firms after an M&A event are a decline of 1.6 log points on average. This decline could be due to M&A workers moving to lower-paying firms or M&A firms reducing earnings for their incumbent workers.

The drop in employment at target firms, as shown in Table 2, suggests that job transitions could explain a part of the decline in worker-level earnings. The reduction in employment could come primarily through decreased hiring, implying incumbent workers may be relatively unaffected. We first consider the impact of M&As on the probability of worker transitions from a job. This transition could be to another firm or to non- or self-employment. In our data, most of the workers who leave their original employers do so voluntarily and find a job afterwards.[8] Panel (b) of Figure 3 plots the estimates of equation (5) with an indicator for a job transition as the outcome. Column (2) of Table 3 reveals that one year after an M&A, job transitions spike in target firms, with target workers 7.8 percentage points more likely to switch jobs relative to control workers on average. Given this notable increase in job separations, part of the effects on earnings may be coming from voluntary departures from their employers rather than within-firm decreases in earnings. We discuss potential reasons for workers moving to target firms voluntarily, despite the decrease in their earnings, in Section 7. By contrast, most workers at acquiring firms stay at their

[8]Our data has an indicator for reasons for job separations, which can be broadly categorized into involuntary (shortage of work) or voluntary (i.e., personal or medical reasons). Roughly 80% of movers from target firms moved voluntarily after the M&A event.

firms, compared to their matched control workers, after the event.

To study the impacts solely due to within-firm changes in compensation, Panel (c) of Figure 3 restricts the analysis to workers who stay in the same firm in the years following the event. We make this restriction for both M&A workers and control workers so that the treatment group does not mechanically contain workers who have more stable job histories. Column (3) of Table 3 shows that annual earnings for firm stayers in M&A firms do not change much for stayers in either target or acquiring firms on average in the years following the event. These results imply that the decline in earnings of workers at target firms is almost entirely driven by those that move to other firms after the M&A event. In the next section, we additionally examine workers at target firms that move to other firms after the event, and explore potential mechanisms behind our findings.

7 Potential Mechanisms and Economic Interpretations

In this section, we discuss and empirically test potential mechanisms behind the responses of worker-level earnings following M&As. Based on the model described in Section 2, the main channels through which M&As can induce lower wages are (1) decreased bargaining power of workers or outside options for workers via increased market concentration, (2) changes in firms' productivity which may affect rents per worker, and (3) job transitions which lead to changes in firm-specific or match-specific components in earnings of workers who move to other firms after the M&A event. Since we find the decline in earnings is almost entirely driven by movers, we focus on the first and the last channels, given that the second channel is relevant and specific to incumbent workers who continue to stay at their original employers after the event.

7.1 Increased Market Concentration

7.1.1 Labor Market Concentration

Our findings on the decreases in employment and worker-level earnings in target firms can be potentially rationalized by an increase in monopsony power of firms through increased concentration. In terms of the wage-bargaining model (Section 2), an increase in monopsony power could be interpreted as either a decrease in the bargaining parameter (γ_j) or a decrease in the value of the outside option of workers (v). However, several results presented below suggest a rise in monopsony power is not the main channel behind the decline in firm size and workers' earnings.

First, the results on profit margins are not consistent with increased monopsony power being the primary channel for changes in worker earnings. A decrease in the bargaining weight or a

decrease in the value of the outside option of workers will both increase firms' profits, as they now can pay less for labor. In contrast, we find decreases in both target firms' and acquiring firms' profit margins on average.

One way to directly test whether an increase in monopsony power explains our findings is to consider M&A events that would be more likely to have large impacts on monopsony power. We construct a measure of labor-market concentration and assess how M&As impact workers by varying levels of concentration changes. We define labor markets by a sector-by-commuting zone cell and measure concentration by the Herfindahl-Hirschmann Index (HHI), which is commonly used in antitrust analysis to predict anticompetitive effects of M&As.[9] In terms of predicting anticompetitive impacts of M&A events, antitrust authorities consider two factors: the initial concentration in the market and the predicted change in concentration in the market. One important caveat to this analysis, however, is that antitrust authorities use concentration in product markets.

In our sample, we find that roughly 99 percent of M&A events have a zero predicted change in local labor-market concentration. Furthermore, as shown in Panel (c) of Figure 1, the change in our measure of concentration (HHI) across labor markets is zero for markets that have any M&A activities relative to control labor markets without any M&A activity after the event. This is due to two facts. First, as Panel (b) of Figure 1 shows, most labor markets in our sample are not concentrated to begin with. Second, the majority of firms going through M&A events are located in different commuting zones.

To examine this in more detail, in Figure 4 and Table 4, we turn to a metric that antitrust authorities consider: the initial concentration level. To study this channel, we split the analysis sample by quartiles in the HHI measured one year before the event. In both the high-concentration markets (4th quartile) and the low-concentration markets (1st quartile), we find similar levels of declines in earnings of workers at target firms, while we do not find any impacts on worker-level earnings in acquiring firms regardless of the initial concentration level.[10] We additionally examine worker-level earnings in target firms, separately for M&As that happen within the same labor market and for for M&As that happen across different labor markets (Prager and Schmitt 2021), and find that the decline in earnings is similar for both types (see Appendix B). Taken together, these results suggest that increased monopsony power due to changes in local labor-market concentration or outside options is unlikely to be the primary driver of declines in worker earnings in our setting.[11]

[9] We also implement a flows-adjusted measure of labor-market concentration (Arnold 2021) that adjusts for substitutability in jobs across industries, and find similar results (see Appendix A).

[10] Given that the change in concentration after M&As was close to zero for about 99 percent of labor markets in our sample, cutting our analysis sample based on the predicted change in HHI after M&As, as in Arnold (2021), is not meaningful in our setting due to the lack of variation in the predicted change in HHI.

[11] Even if the results are not driven by changes in concentration, changes in bargaining power of workers may be independent of concentration changes. For example, He and le Maire (2022) finds that M&A events in Denmark result

7.1.2 Product Market Concentration

There are several results that suggest product market power is not the main driver of the observed labor-market impacts. First, we find that profit margins decrease for both target and acquiring firms. If product market power increased on average after M&A events, we would expect to see a rise in profits, not a decline. Additionally, we estimate markups and do not find any statistically significant impacts of M&A events on markups for either target or acquiring firms.

To further support this conclusion, we also conduct our analysis separately by tradable and non-tradable goods sectors. The intuition is that an M&A would have a larger impact on a firm's market power if the firm does not face competition outside its geographical (i.e., international) markets. We define firms as active in tradable good sectors if they fall under Agriculture, Forestry, Fishing and Hunting, Mining, Quarrying, and Oil and Gas Extraction, and Manufacturing. Firms active in other sectors (i.e., Construction, Retail, Real Estate, Services, etc) are defined as falling under non-tradable sectors (Berger et al., 2022; Delgado et al., 2014).

Figure 5 and Table 5 show the results on workers' earnings in acquiring firms and target firms, separately for tradable and for non-tradable sectors. The parallel trend holds prior to the event for both types of workers, and we see similar declines in magnitude for workers at target firms after the event. If anything, we see that a slight increase in earnings for workers at acquiring firms operating in non-tradable sectors, although the changes in worker-level earnings at acquiring firms remain statistically indistinguishable from zero. This provides further evidence against product market concentration driving the decline in worker earnings. In Appendix B, we additionally look at earnings of workers at target firms, separately for M&As that happen within the same 4-digit industry and for M&As that happen across different industries. The intuition is that M&As that happen within the same industry (i.e., horizontal M&As) would likely have a greater impact on firms' product market power, and therefore, may have a stronger impact on worker-level earnings. We find that the decline in workers' earnings is similar on both types of M&As.

7.2 Changes in Employer Fixed Effects or Match Effects via Job Transitions

As shown in Section 6, the decline in earnings of workers at target firms is almost entirely driven by those who move to other firms after the M&A event. While most of these workers leave their firms voluntarily, we follow the displacement literature to decompose the decline in earnings of movers into (1) firm-specific wage premiums (employer fixed effects) and (2) match-specific premiums (match effects).

in high-wage managers being replaced in target firms. Such a change in management may result in shifts in bargaining power of workers at target firms.

Panel (a) of Figure 6 shows annual earnings of workers at target firms that move to other firms after the M&A event. Relative to their control workers, movers at target firms show parallel trends in their earnings, but show a significant drop one year after the M&A event. Panel (b) shows that roughly half of these workers move to other firms one year after the M&A event. Panel (c) separates these movers into those that move to acquiring firms and to completely different firms, and show that while both types of workers experience a decline in earnings, workers who move to other firms experience more immediate and statistically significant decreases in their earnings. Table 6 shows that workers who move from target firms experience 4.9 log points decrease in earnings and 16.8 percentage points increase in job transition probabilities on average relative to their control workers. Furthermore, workers who move to completely different firms experience a larger and statistically significant decline (6.8 log points) in earnings after the event, relative to those who move to acquiring firms, on average. Next, we decompose this decline in earnings of movers into firm-specific and match-specific components.

7.2.1 Employer Fixed Effects

Following a growing body of literature that assesses the importance of firm-specific premiums (employer fixed effects) in determining wages, we examine whether there is any change in employer fixed effects for target workers who move to other firms after the M&A event. Tracking changes in firm fixed effects provides us one way to characterize the transitions that workers in target firms make after the event and put their earnings losses into context. For example, if workers are moving to firms with lower wage premiums, then the loss of the employer wage premium from the old firm would explain the decline in workers' earnings. In Lachowska et al. (2020), 70 percent of displaced workers in Washington State during the Great Recession moved to new employers with firm fixed effects in the same or better quintile. Consequently, employer fixed effects can explain only 17 percent of the long-run decline in hourly wages. In contrast, Lagaras (forthcoming) finds that the loss of employer wage premiums is the primary factor in explaining the lower earnings of employees displaced by M&As in Brazil. Evidence from Germany in Schmieder et al. (forthcoming) suggests that the state of the business cycle has important impacts on the firm-specific wage premiums where displaced workers find new jobs. Workers who lose their job in a recession suffer a much larger loss of employer-specific premiums than at other times in the cycle.

Using our matched data, we estimate an employer fixed effect for each firm. We then characterize a firm-specific wage premium of the old and new employer for each worker who undergoes a separation following an M&A event to understand the decline in earnings of workers who move to other firms. Since our M&A events are spread throughout the business cycle and not concentrated in recessions, our results may differ from displacements driven by a recession. Our implementa-

tion of the AKM model regresses log earnings observed for individual i working at firm j in year t (y_{ijt}) on employer-specific fixed effects which reflect firm characteristics that result in above- or below-average earnings for all workers at firm j ($\phi_{j(i,t)}$), individual fixed effects (ω_i), and year effects (τ_t):

$$y_{ijt} = \phi_{j(i,t)} + \omega_i + \tau_t + u_{ijt} \tag{6}$$

We can then assess the role played by employer fixed effects by estimating an analogue to equation (5), substituting in as the outcome variable the estimated firm fixed effects $\hat{\phi}_j$. The goal is to estimate the share of earnings losses following job transitions that can be attributed to a mover's reemployment by an employer with a different $\hat{\phi}_j$ than the employer from which the mover left.

Panel (a) of Figure 7 shows firm-specific wage premiums of workers at target firms that move to other firms after the M&A event. Relative to their control workers, movers from target firms show a significant increase in their firm fixed effects after the event, implying that on average, they move to employers with higher wage premiums. Table 7 shows that workers who move from target firms experience 2 log points increase in firm-specific wage premiums after the event.

Figure 8 shows average firm characteristics of target workers who move to other firms after the M&A event. Because of the tenure restriction, any change in pre-event firm characteristics is driven by yearly changes in target firms' characteristics (i.e., changes in firm size). The change in firm characteristics in event year ($t = 0$) still reflects the change in target firms' characteristics, given that most of the first job transitions happen one year after the event. Starting from one year after the event ($t = 1$), changes in firm characteristics reflect both changes in new employers where target workers moved, and changes in target firms of workers who had not left yet. Panels (a) and (c) show that workers who leave target firms move to larger firms (in terms of employment and sales) on average. Columns (1) and (3) of Table **??** show that after the M&A event, workers from target firms move to firms with 24 log points higher number of employees and 21 log points higher revenue on average than their original employers. These results are consistent with the findings that these workers move to firms with higher wage premiums on average after the event. However, Panels (b) and (d) of Figure 8 and Columns (b) and (d) of Table 8 show that these workers do not move to employers with higher average payroll or profit margins. Again, the initial drop in average payroll and the initial spike in profit margins in the event year ($t = 0$) are driven by changes in target firms.

One may find it surprising that these workers moving from target firms find new employers with higher-wage premiums, even though their actual earnings are 4.9 log points lower on average. There exist a couple of potential explanations for this. First, while they have to first take a wage cut

by moving to firms with higher wage premiums, they may expect that their earnings growth will be higher in the future (Cahuc et al. 2006). As long as they expect that the growth in their earnings is higher in larger firms with higher employer fixed effects, these workers may be willing to take an entry-level position at these firms, especially given that their original employers shrank after the M&A event. Second, firms with higher wage premiums could also offer non-pecuniary benefits or other pecuniary benefits (i.e., stock-based compensation) unobserved in our data, so even though these workers experience a decline in their annual earnings, they may not be worse off once we account for unobserved intangible benefits.

7.2.2 Match Effects

The second factor we consider for explaining earnings losses following M&A-driven job separations is employer-employee match effects. That is, an earnings premium that comes from a specific match of an employee and an employer over and above what that employee would receive when matched with other employers. These match effects could be driven by a specific employee skill set that fits well with a firm's production function, or by firm benefit policies that enhance the productivity and pay of a worker with specific needs. In the case of M&A-driven separations, match effects would be important if an earnings loss results from an employee finding new employment with a firm for which she was a worse match.

We estimate match effects following Lachowska et al. (2020) that implements a strategy based on Woodcock (2015). For each employee-employer spell, we first calculate the average of residualized log earnings ($\overline{y_{ij}}$) by removing calendar-year effects, regressing this adjusted log earnings on years of job tenure and worker-employer match indicators. We then compute within-match averages of the outcome after subtracting the contribution of job tenure. Then we estimate a model similar to the AKM model in equation (6), but using within-match averages as dependent variables:

$$\overline{y_{ij}} = \alpha_i + \pi_{j(i,t)} + e_{ij} \tag{7}$$

where α_i, $\pi_{j(i,t)}$, and e_{ij} denote the worker fixed effects, employer fixed effects (corresponding to the firm j where worker i workers in year t), and an error term independent of individual and firm fixed effects, respectively.

We then calculate the residuals from equation (7) and interpret them as worker-employer match effects averaged over the years we observe a given worker-employee match:

$$\hat{e_{ij}} = \overline{y_{ij}} - \hat{\alpha_i} - \hat{\pi_{j(i,t)}} \tag{8}$$

We proceed to take the estimated $\hat{e_{ij}}$ terms relevant for the employee in each time period and use them as the dependent variable in equation (5) to see the contribution of match effects in explaining the earnings loss of target workers who move to other firms after the event.

Panel (b) of Figure 7 shows match effects of workers at target firms that move to other firms after the M&A event. Relative to their control workers, movers at target firms show a significant and large decrease in their match effects after the event, implying that on average, they move to employers with lower match quality. Table 7 shows that workers who move from target firms experience 6.5 log points decrease in match effects after the event.

The decline in match effects may imply that these workers lose a specific employee skill set that fits better with the previous employer. A possible explanation for worse match effects is that 53 percent of these workers move to different industries, and 32 percent of them move to different sectors. While the match effect is firm-specific (rather than industry- or sector-specific), the chance of having a worse match with the new employer increases when the employee moves to a completely different sector (possibly indicating a switch in occupation). Furthermore, the decrease in match effects could simply indicate that these workers lose an employer-specific contract that yielded a better work environment or amenity. Note that the decline in match effects is larger than the decline in actual earnings on average; however, the combined employer fixed effects and match effects is 4.5 log points, which is almost equal to the decline in earnings (4.9 log points) for workers who leave target firms after the event.[12] Therefore, we conclude that the decrease in match effects is the primary factor explaining the earnings losses for workers who leave target firms after the M&A event. Taken together, it appears that after target firms shrink through an M&A event, workers move to larger firms with higher wage premiums and take a modest wage cut in the medium run due to worse matches with new employers, possibly for a better chance at earnings growth in the future. Relative to previous work (Lagaras forthcoming; He and le Maire 2022) documenting that M&A events create significant displacements of workers from target firms with higher wage premiums and reallocation to firms with lower wage premiums, our work shows that most workers from target firms voluntarily leave target firms after the M&A event, and move to firms with higher wage premiums but with worse match effects.

[12]The third potential factor is the direct effect of a job loss, which is the residual after accounting for time-invariant employer fixed effects and match effects. Direct effects encompass time-varying factors emanating from the worker, such as scarring driven by asymmetric information. Direct effects also include time-varying aspect within a specific employee-employer match, such as career progression through a firm's salary scale for a particular kind of worker. Estimates of the contribution of direct effects to wage losses in Lachowska et al. (2020) suggest that for the first couple of years after a separation, direct effects explain the majority of wage losses, but this effect shrinks by more than half over the span of five years post-separation.

8 Conclusion

In this paper, we use linked employer-employee data to connect the impact of M&A events on firms to the impact on their employees. Previous research has looked at the financial impact on firms and the impact on workers' outcomes separately, but our paper is the first to link these impacts directly using our administrative data from tax records on both firms and workers. This allows us to look deeper into firm-based mechanisms than has been possible in previous research.

Using a matched difference-in-differences design, we compare firms that went through an M&A to matched control firms of the same size deciles, province, and sector. Our results show that acquiring firms expand, but target firms shrink significantly. Furthermore, both targets and acquirers experience a significant decline in profit margins on average in the medium-run. This is consistent with parts of the literature that show negative impacts of M&A activities on firm performance. For workers at target firms, we find that their earnings decline and job separations increase significantly after an M&A event.

Leveraging detailed firm balance sheet data, we can investigate different potential mechanisms for the decline in workers' earnings at target firms. Since we see almost no change in labor market concentration after M&As, we conclude that a rise in market concentration is unlikely the key mechanism behind post-M&A wage declines. Furthermore, since profit margins decrease at both targets and acquirers, without any meaningful changes in markups, a rise in product market concentration ie unlikely to have driven the decline in worker earnings either. Instead, we find that the decrease in earnings of workers at targets is almost entirely driven by those that move to other firms after the M&A event. While these workers move to larger firms with higher wage premiums on average, their new employers turn out to be worse matches for these job movers, and they continue to experience a lower earnings within five years after the M&A event.

Our findings provide important context for research investigating the labor market consequences of corporate M&A. Whichever mechanism is under investigation, care should be taken to account for how changes in firm outcomes, especially their profitability and growth, may affect worker outcomes. Our results also matter for policy. In Canada, a review of the Competition Act targets both the impact of M&As on labor and how potential efficiency gains are weighed in merger decisions. Similar debates are happening in other countries, including the United States (Naidu et al. 2018). Our results provide new evidence of the negative impact of M&As on wages that add perspective to these policy debates, and our findings on post-M&A firm performance raise doubts about the efficiency arguments made in support of M&As.

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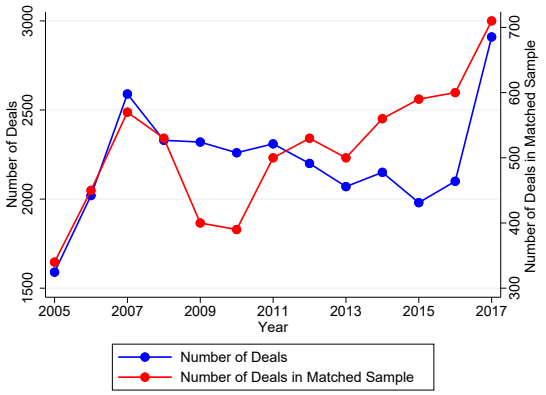
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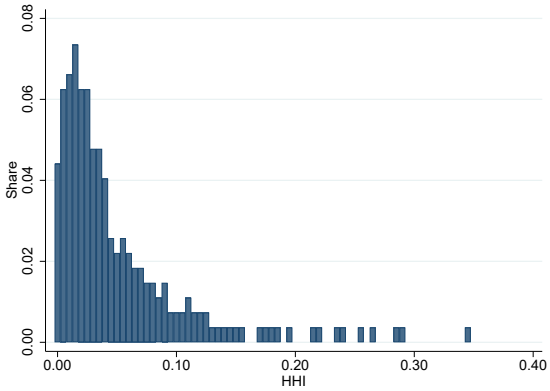
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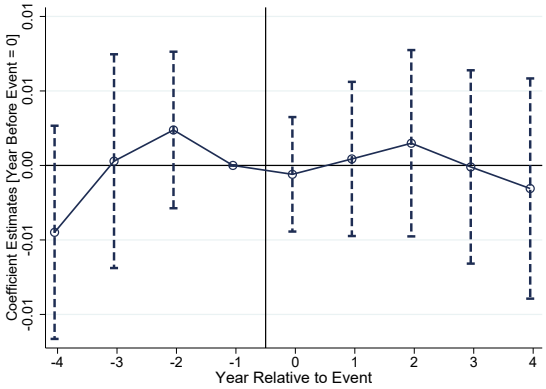
Figure 1: Number of M&As, Distribution of Markets Across HHI, and Change in HHI



(a) Distribution of Labor Markets Across HHI

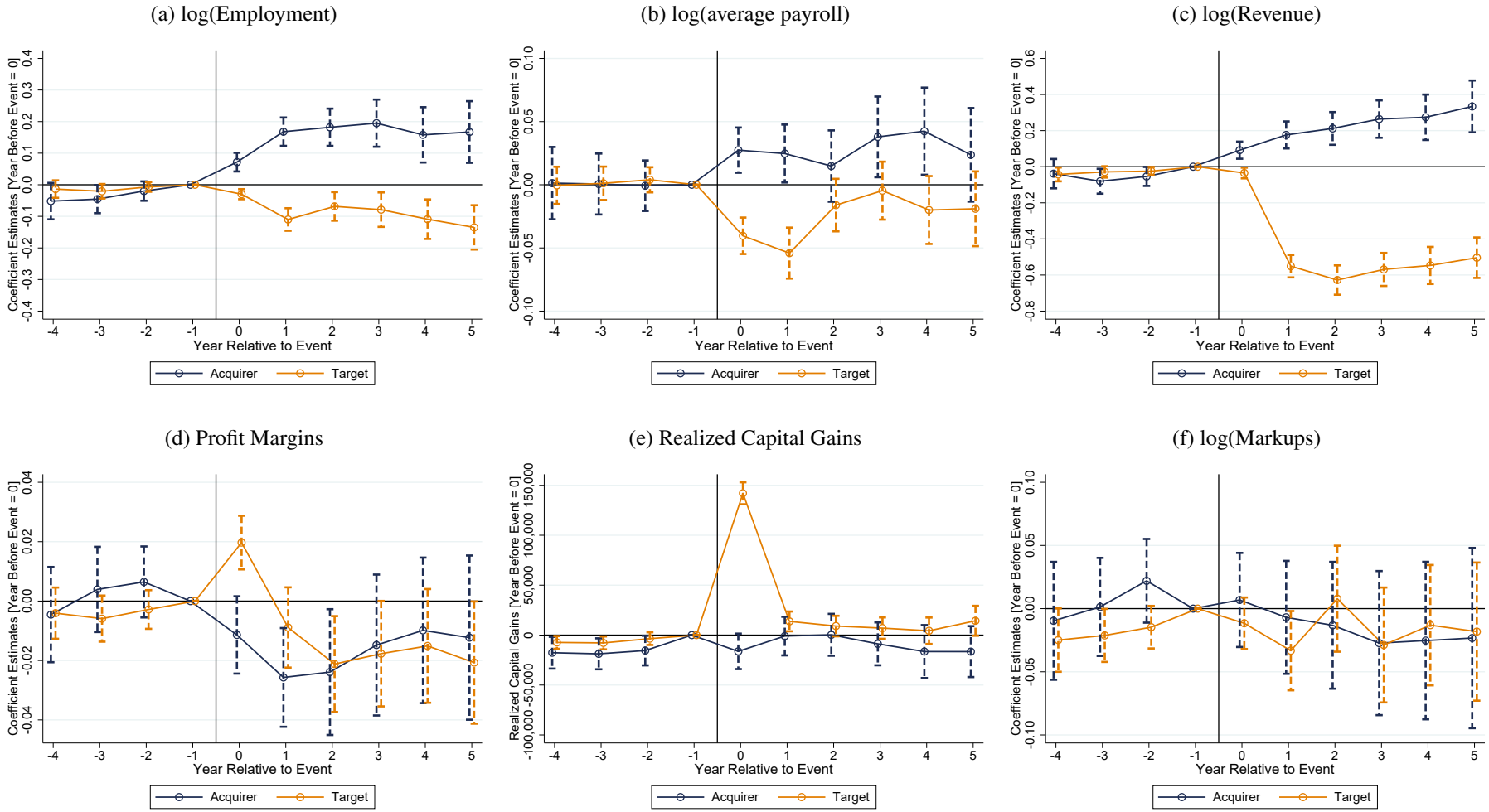


(b) Change in HHI before and after M&As



Notes: This figure plots the total number of completed M&A deals (blue line) and the total number of completed M&A deals in the matched sample (red line) over time during our sample period. See Section 5 for how we construct our matched sample. Panel (b) plots the distribution of labor markets, defined as 2-digit NAICS by commuting zone cell, across our measure of concentration (HHI) during our sample period. Panel (c) shows event-study estimates for the impact of M&As on concentration, comparing markets with any M&A activity with markets without any M&A activity before and after the event. The dashed lines indicate 95 percent confidence intervals where the standard errors are clustered at the market level.

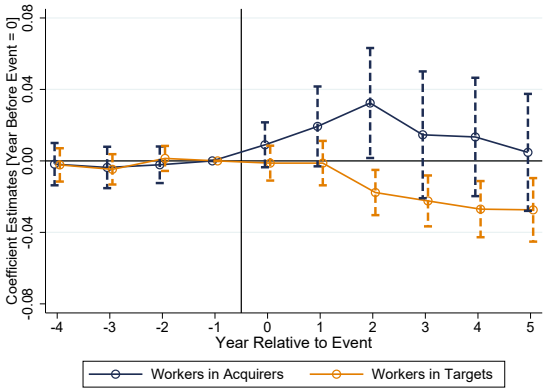
Figure 2: Firm Growth and Performance After M&As



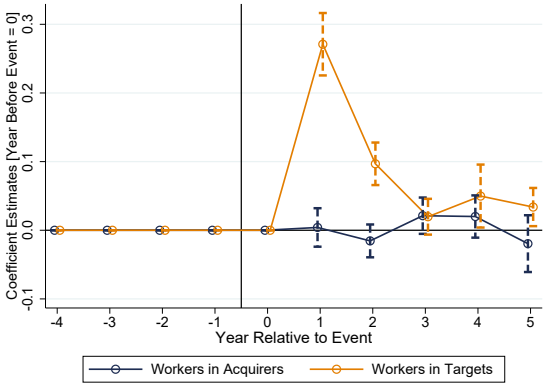
Notes: These figures display event-study estimates for the impact of M&A on firm-level outcomes. Panel (a) shows the estimates for log of employment. Panel (b) shows the estimates for log of average payroll. Panel (c) shows the estimates for log of total revenue. Panel (d) shows the estimates for profit margins. Panel (e) shows the estimates for owners' realized capital gains aggregated at the firm level. Panel (f) shows the estimates for log of markups. The dashed lines indicate 95 percent confidence intervals where the standard errors are clustered at the firm level. The solid vertical line indicates the event year. The navy blue dots correspond to the estimates for acquiring firms and the orange dots indicate the estimates for target firms.

Figure 3: Worker Earnings and Job Transitions After M&As

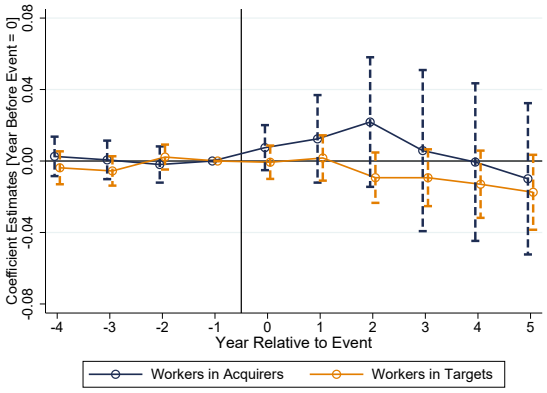
(a) log(Total Earnings)



(b) Job Transition



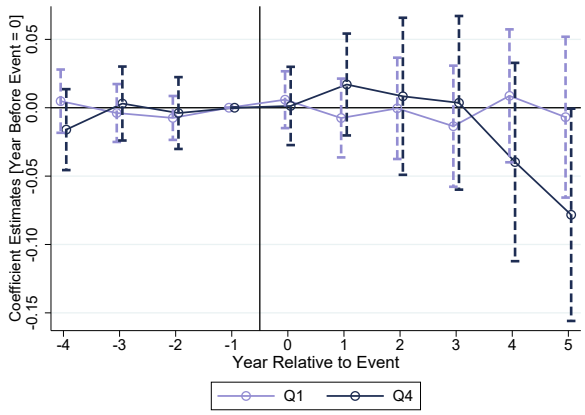
(c) log(Total Earnings) for Stayers



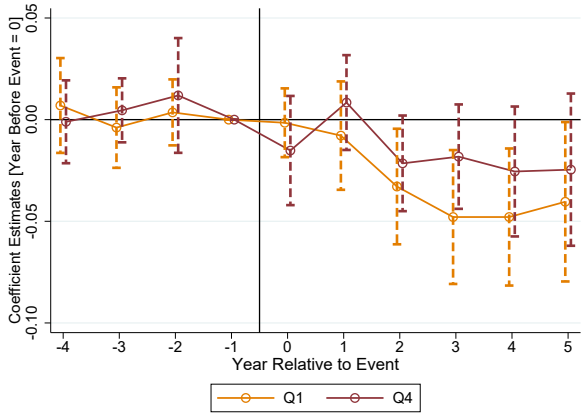
Notes: These figures display event-study estimates for the impact of M&As on worker-level outcomes. Panel (a) shows the estimates for log of total earnings for workers in the matched sample. Panel (b) shows the estimates for job transition probabilities. Panel (c) shows the estimates for log of total earnings for stayers. The dashed lines indicate 95 percent confidence intervals where the standard errors are two-way clustered at the worker and firm level. The solid vertical line indicates the event year. The navy blue dots correspond to the estimates for workers at acquiring firms and the orange dots indicate the estimates for workers at target firms.

Figure 4: By Initial Level of Labor Market Concentration

(a) Worker Earnings at Acquirers



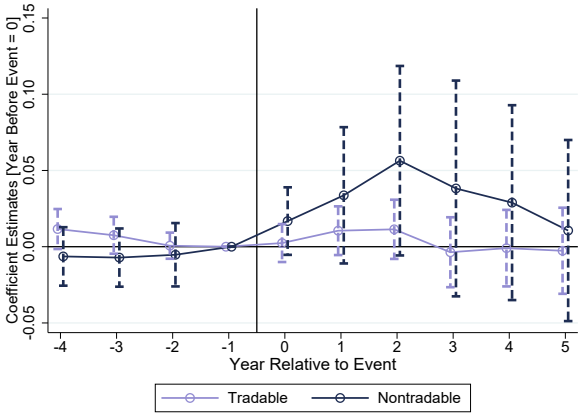
(b) Worker Earnings at Targets



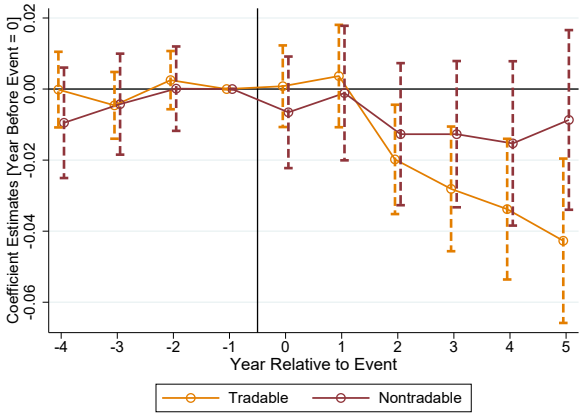
Notes: These figures display event-study estimates for the impact of M&As on log of total earnings, separately for workers in markets with low initial level of concentration (1st quartile in HHI) and for workers in markets with high initial level of concentration (4th quartile in HHI). We define labor markets by 2-digit NAICS by workers' commuting zone cell. Panel (a) shows the estimates for workers at acquiring firms. Panel (b) shows the estimates for workers at target firms. The dashed lines indicate 95 percent confidence intervals where the standard errors are two-way clustered at the worker and firm level. The solid vertical line indicates the event year.

Figure 5: By Tradable Sectors vs. Non-tradable Sectors

(a) Worker Earnings at Acquirers



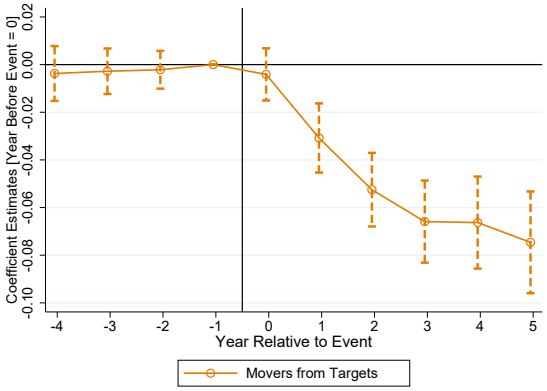
(b) Worker Earnings at Targets



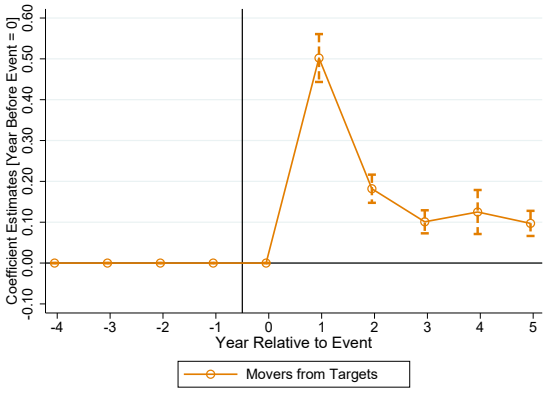
Notes: These figures display event-study estimates for the impact of M&A on log of total earnings, separately for workers at firms in tradable sectors and for workers at firms in non-tradable sectors. Tradable sectors belong to the following 2-digit NAICS codes: 11, 21, 31, 32, 33 and 55. Panel (a) shows the estimates for workers at acquiring firms. Panel (b) shows the estimates for workers at target firms. The dashed lines indicate 95 percent confidence intervals where the standard errors are two-way clustered at the worker and firm level. The solid vertical line indicates the event year.

Figure 6: Workers Moving from Targets

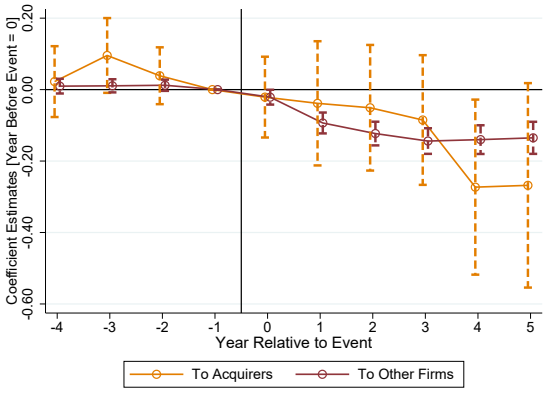
(a) log(Total Earnings)



(b) Job Transition



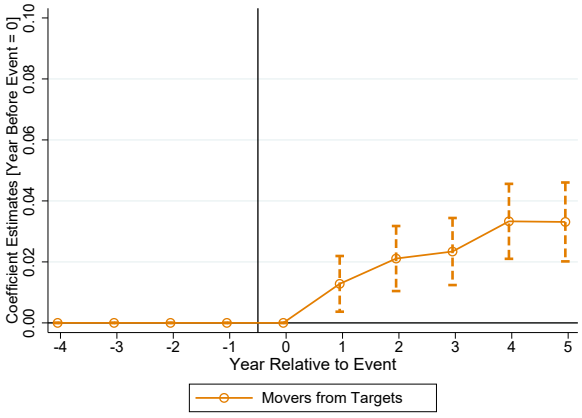
(c) log(Total Earnings) - By Destination



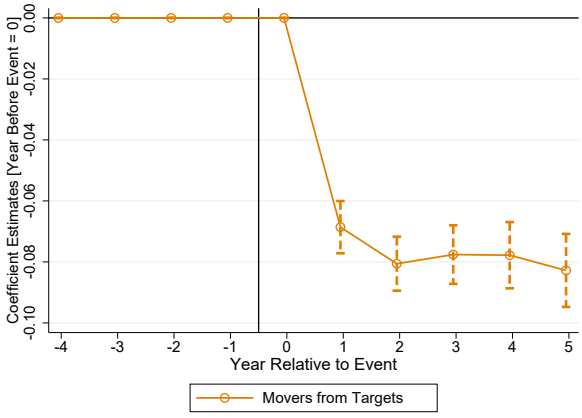
Notes: These figures display event-study estimates for the impact of M&As on workers' outcomes for movers from target firms. Panel (a) shows the estimates for log of total earnings. Panel (b) shows the estimates for job transition probabilities. Panel (c) shows the estimates for log of total earnings based on their destination. A small share of workers also move within their original parent company; however, we do not observe any impact for these workers, so we do not report their estimates here. The dashed lines indicate 95 percent confidence intervals where the standard errors are two-way clustered at the worker and firm level. The solid vertical line indicates the event year.

Figure 7: Workers Moving from Targets: Employer Fixed Effects and Match Effects

(a) Employer Fixed Effect

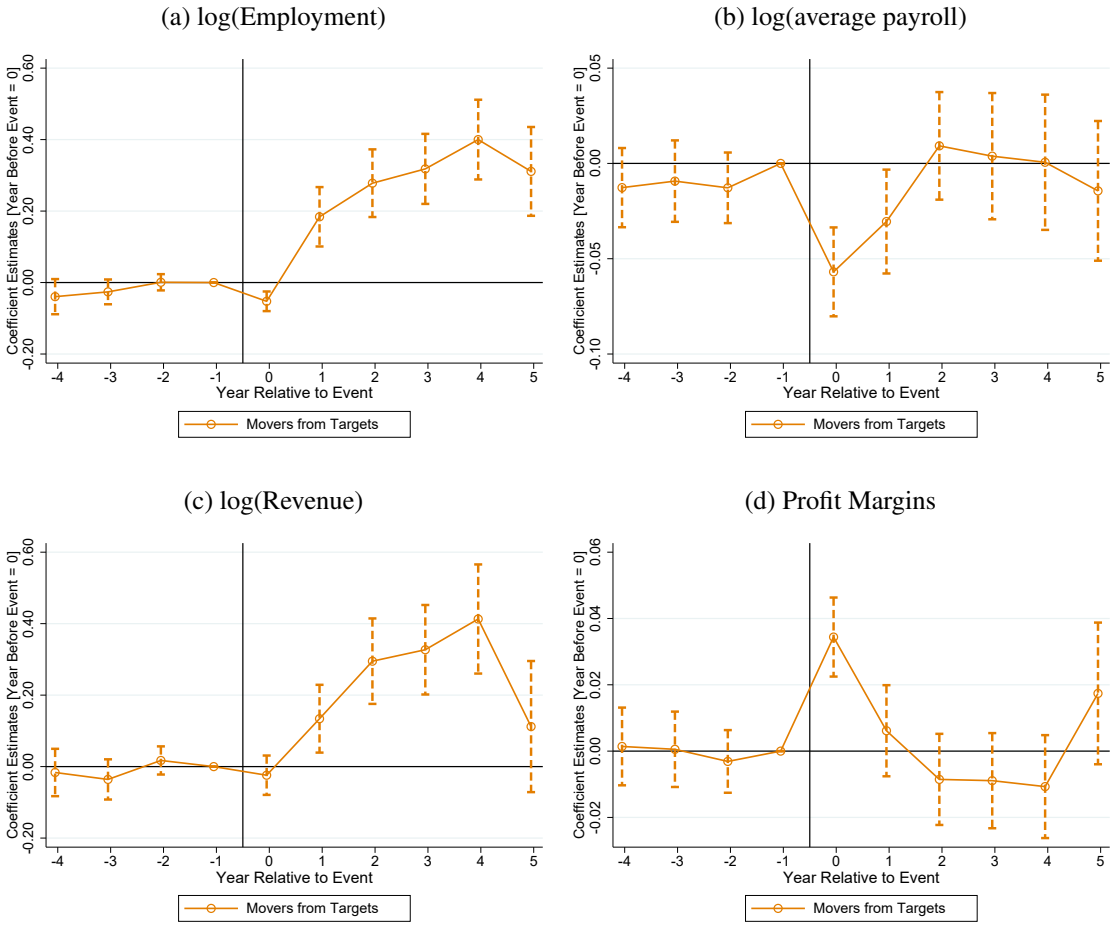


(b) Match Effect



Notes: These figures display event-study estimates of employer fixed effects and worker-employer match effects for movers from target firms, as described in Section 7. Panel (a) shows the estimates for employer fixed effects. Panel (b) shows the estimates for worker-employer match effects. The dashed lines indicate 95 percent confidence intervals where the standard errors are two-way clustered at the worker and firm level. The solid vertical line indicates the event year.

Figure 8: Firm Characteristics of Workers Moving from Targets



Notes: These figures display event-study estimates for average firm characteristics of movers from target firms, as described in Section 7. Panel (a) shows the estimates for log of employment. Panel (b) shows the estimates for log of average payroll. Panel (c) shows the estimates for log of revenue. Panel (d) shows the estimates for profit margins. The dashed lines indicate 95 percent confidence intervals where the standard errors are two-way clustered at the worker and firm level. The solid vertical line indicates the event year.

Table 1: Descriptive Statistics on Firms and Workers

	(1) Acquirer	(2) Control	(3) Target	(4) Control
Panel A: Firm Characteristics				
Total Revenue (in million)	61	47	33	29
Profit Margin	0.02	0.05	0.02	0.05
Number of Employees	183	124	105	87
Average Wage Bill	70972	71168	68700	67719
Leverage Ratio	0.65	0.68	0.70	0.65
Markup	1.86	1.67	1.87	1.66
Number of Firms	1100	1100	3100	3100
Panel B: Sectors (Firms)				
Construction (23)	0.06	0.06	0.05	0.05
Manufacturing (31)	0.23	0.23	0.26	0.26
Wholesale (41)	0.15	0.15	0.14	0.14
Retail (44)	0.03	0.03	0.05	0.05
Transportation (48)	0.03	0.03	0.04	0.04
Information (51)	0.05	0.05	0.04	0.04
Services (54)	0.33	0.33	0.32	0.32
Other Sectors	0.13	0.13	0.11	0.11
Panel C: Worker Characteristics				
Total Earnings	72073	69387	72773	70101
Age	46.4	46.6	47.4	47.2
Female	0.31	0.31	0.28	0.28
Number of Workers	22700	22700	36500	36500
Panel D: Sectors (Workers)				
Construction (23)	0.02	0.02	0.05	0.05
Manufacturing (31)	0.49	0.49	0.52	0.52
Wholesale (41)	0.11	0.11	0.13	0.13
Retail (44)	0.03	0.03	0.01	0.01
Transportation (48)	0.04	0.04	0.03	0.03
Information (51)	0.01	0.01	0.03	0.03
Services (54)	0.19	0.19	0.14	0.14
Other Sectors	0.10	0.10	0.08	0.08

Notes: This table reports descriptive statistics on the matched sample of firms and workers, measured one year prior to the event. Panel A reports characteristics of firms such as total revenue, profit margins, number of employees, average payroll, and leverage ratio. Columns (1) and (3) report these statistics for acquiring firms and for target firms, respectively, and column (2) and (4) report these statistics for their respective matched control firms. Panel B reports the distribution of firms in the matched sample across 2-digit NAICS codes. Panel C reports characteristics of workers such as total annual earnings, age, and gender. Column (1) and (3) report these statistics for workers at acquirers and for workers at targets, respectively, and column (2) and (4) report these statistics for their respective matched control workers. Panel D report the distribution of workers in the matched sample across 2-digit NAICS sectors. Other sectors include (1) Agriculture, forestry, and fishing [11], (2) Mining, quarrying, and oil and gas extraction [21], (3) utilities [22], (4) Real estate and rental and leasing [53], (5) Arts, entertainment and recreation [71], (6) Accommodation and food services [72], (7) Other services [81], and (8) Public administration [91].

Table 2: Difference-in-differences Estimates on Firm Outcomes

	(1) log(Employment)	(2) log(Average Payrolls)	(3) log(Revenue)	(4) Profit Margins	(5) Realized Capital Gains	(6) log(Markups)
Target	-0.088***	-0.026***	-0.472***	-0.011*	31753***	-0.016
	(0.020)	(0.008)	(0.033)	(0.006)	(3832)	(0.016)
Mean at t = -1	3.97	11.04	16.35	0.02	36466	0.42
Adj. R squared	0.866	0.760	0.817	0.371	0.284	0.756
Firm-Year	78800	78300	80600	81000	51500	48400
Acquirer	0.157***	0.028**	0.225***	-0.016**	-9790	-0.015
	(0.028)	(0.011)	(0.011)	(0.007)	(7687)	(0.021)
Mean at t = -1	4.54	11.09	17.01	0.02	52241	0.40
Adj. R squared	0.883	0.769	0.849	0.374	0.211	0.791
N	27400	27300	27500	27600	13700	16000

Notes: This table reports the difference-in-differences estimates for the effects of M&As on firm-level outcomes, separately for acquiring firms and for target firms. The dependent variables in column (1) to (6) are log of employment, log of average payroll, log of total revenue, profit margins, log of markups, and owners' realized capital gains aggregated at the firm level. The standard errors are clustered at the firm level.

Table 3: Difference-in-differences Estimates on Worker Outcomes

	(1) log(Earnings)	(2) Job Transitions	(3) log(Earnings) - Stayers
Target	-0.016***	0.078***	-0.008
	(0.006)	(0.008)	(0.006)
Mean at t = -1	11.05	0.00	11.05
Adj. R squared	0.754	0.231	0.804
Worker-Year	1148500	1150700	910500
Acquirer	0.016	0.003	0.006
	(0.013)	(0.009)	(0.016)
Mean at t = -1	11.01	0.00	11.01
Adj. R squared	0.749	0.244	0.797
Worker-Year	711400	712700	569100

Notes: This table reports the difference-in-differences estimates for the effects of M&As on worker-level outcomes, separately for those at acquiring firms and for those at target firms. The dependent variables in columns (1) and (2) are log of total earnings and the probability of job transitions for all workers in the matched sample. Column (3) reports the estimates on log of total earnings for stayers. The standard errors are two-way clustered at the worker and firm level.

Table 4: Worker Earnings By Initial Level of Labor Market Concentration

	Acquirer	**Target**
	(1)	(2)
	log(Earnings)	log(Earnings)
Post × Treated	-0.012	-0.033***
	(0.014)	(0.009)
Mean at t = -1	11.00	11.08
Worker-Year	107000	181700
Post × Treated × Q4	-0.003	0.001
	(0.019)	(0.011)
Mean at t = -1	11.04	11.13
Worker-Year	38100	123000

Notes: This table reports the difference-in-differences estimates of the impact of M&As on log of total earnings for workers in markets with initially low level of concentration (Q1). The triple interaction term captures the triple-difference estimates for workers in markets with initially high level of concentration (Q4). Labor markets are defined by 2-digit NAICS and workers' commuting zone. Columns (1) shows the estimates for workers at acquiring firms and column (2) shows the estimates for workers at target firms. The standard errors are two-way clustered at the worker and firm level.

Table 5: Worker Earnings By Tradable vs. Non-tradable Sectors

	Acquirer	**Target**
	(1)	(2)
	log(Earnings)	log(Earnings)
Post × Treated	0.019	-0.017**
	-0.024	(0.008)
Mean at t = -1	10.96	11.01
Worker-Year	367400	565400
Post × Treated × Nontradable	-0.026	-0.010
	-0.027	(0.011)
Mean at t = -1	11.06	11.09
Worker-Year	344100	583100

Notes: This table reports the difference-in-differences estimates of the impact of M&As on log of total earnings for workers in tradable sectors. The triple interaction term captures the triple-difference estimates for workers in non-tradable sectors. Tradable sectors belong to the following 2-digit NAICS codes: 11, 21, 31, 32, 33 and 55. Columns (1) shows the estimates for workers at acquiring firms and column (2) shows the estimates for workers at target firms. The standard errors are two-way clustered at the worker and firm level.The standard errors are two-way clustered at the worker and firm level.

Table 6: Workers Moving from Targets

			log(Earnings) - By Destination	
	log(Earnings)	Transition	To Acquirer	To Other Firms
	(1)	(2)	(3)	(4)
Movers from Targets	-0.049***	0.168***	-0.037	-0.068***
	(0.006)	(0.011)	(0.029)	(0.007)
Mean at t = -1	11.03	0.00	10.79	11.01
Adj. R squared Worker-Year	0.739	0.305	0.816	0.739
Worker-Year	564800	566000	20200	419600

Notes: This table reports the difference-in-differences estimates for the effects of M&As on worker-level outcomes for movers from target firms. Columns (1) displays the estimates for log of total earnings. Column (2) displays the estimates for the job transition probabilties. Column (3) and Column (4) displays the estimates for log of total earnings based on their destination, respectively, to acquiring firms and to other firms. A small share of workers also move within their original parent company; however, we do not observe any impact for these workers, so we do not report their estimates here. The standard errors are two-way clustered at the worker and firm level.

Table 7: Employer Fixed Effects and Match Effects

	(1) Employer Fixed Effect	(2) Match Effect
Movers from Targets	0.020***	-0.065***
	(0.004)	(0.004)
Mean at t = -1	0.26	0.10
Adj. R squared	0.898	0.224
Worker-Year	577800	572400

Notes: This table reports the difference-in-differences estimates of employer fixed effects and worker-employer match effects for movers from target firms, as described in Section 7. Columns (1) displays the estimates for employer fixed effects and Column (2) displays the estimates for worker-employer match effects. The standard errors are two-way clustered at the worker and firm level.

Table 8: Firm Characteristics of Workers Moving from Targets

	(1) log(Employment)	(2) log(Average Payrolls)	(3) log(Revenue)	(4) Profit Margins
Movers from Targets	0.240***	-0.015	0.209***	0.005
	(0.038)	(0.011)	(0.048)	(0.005)
Mean at t = -1	6.06	11.08	18.76	0.04
Adj. R squared	0.958	0.882	0.950	0.688
Worker-Year	460400	460400	433800	434000

Notes: This table reports the difference-in-differences estimates for average firm characteristics of movers from target firms, as described in Section 7. Columns (1) displays the estimates for log of employment. Column (2) displays the estimates for log of average payroll. Column (3) displays the estimates for log of revenue. Column (4) displays the estimate for profit margins. The standard errors are two-way clustered at the worker and firm level.

ONLINE APPENDIX:

Job Transitions and Employee Earnings After Acquisitions: Linking Corporate and Worker Outcomes

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A Robustness Checks

In Appendix A, we provide results from robustness tests discussed in Sections 5 and 7.

A.1 Different Clustering

Our main firm-level results are based on clustering at the firm level and our main worker-level results are based on two-way clustering at both firm-level and worker level. We also do robustness tests on key firm-level and worker-level outcomes, where standard errors are clustered at the market-level (commuting zone by sector) for firm-level results, and are two-way clustered at the worker level and market level for worker-level results. Figure A1 and Table A1 show that the results on employment, total revenue, profit margins, and worker-level earnings are similar to the main estimates. Note that the coefficient estimates on these outcomes are slightly different from our main estimates, even though we only change the way we cluster our standard errors. This is because some firms and workers have missing observations on their commuting zones, so they are dropped from our main analysis sample when we cluster our standard errors at the market level.

A.2 Using Matched Control firms Across Different Commuting Zones

Matching on size, province, and sector finds firms that would plausibly exhibit common trends in the absence of an M&A activity. However, it is possible that firms can be matched within the same commuting zone, which is potentially concerning if M&As have impacts on local labor markets through increased concentration. If M&As have negative effects on firms in the same sector and commuting zone, then the impact of M&As on firms will be biased towards zero. To eliminate this concern, we do a robustness check by matching firms within the same province, but across different commuting zones, and find similar results to our main results where we allow M&A firms to be matched with control firms within the same commuting zone. Figure A2 and Table A2 show that the effects on key firm-level and worker-level outcomes from this approach are quantitatively similar to our main estimates.

A.3 By Local vs. National M&As

While checking common pre-trends is reassuring for a causal interpretation when implementing a difference-in-differences design, contemporaneous shocks that occur with M&A events could still bias our results. For example, there could be a negative demand shock that affects a commuting

zone and causes both a decline in employment and an increase in M&A activities as firms get purchased before they shut down. In this case, M&A activities are correlated with shocks that decrease labor demand. We can also have the opposite scenario.

We address this concern by also looking at M&As that are less likely to have been triggered by local economic conditions of the firm. Specifically, we consider the impact of national M&As that occur among domestic firms with multiple establishments across different commuting zones. The intuition is that that these changes in ownership are less likely to be driven by the local economic conditions of the firms or workers. Figure A3 and Table A3 show that the effect of local M&As on earnings of target workers is statistically indistinguishable from the effect of national M&As on the same outcome. Therefore, the decline in earnings of workers at target firms is unlikely driven by local economic conditions of firms where M&A activities occur.

A.4 By Initial Level of (flow-adjusted) Concentration

In Section 7, we show our estimates on worker earnings, separately for markets with low level (below the first quartile) of HHI and for markets with high level (above the last quartile) of HHI measured one year before the event. A standard Herfindahl-Hirschmann Index (HHI) takes as given the definition of the market and then computes

$$HHI = \sum_j s_j^2, \tag{A1}$$

as the measure of concentration. We describe a flows-adjusted concentration measure that takes into account transitions across markets, following Arnold (2021). To begin, let market m be defined by the interaction between 4-digit NAICS and commuting zone. The flows-adjusted concentrated measure (denoted C) requires computing transition rates across markets. While, in theory, transition rates across markets may change, we instead choose to pool the entire sample in order to retrieve a consistent and more precise measure of the rate of transitions across markets. The share of firm j in market m is given by:

$$\tilde{s}_{jm} = \frac{l_{jm}}{\sum_k \alpha_{m\to k} L_k} \tag{A2}$$

where

$$\alpha_{m\to k} = \frac{P(k|m)}{P(m|m)} \frac{L_m}{L_k} \tag{A3}$$

where $P(k|m)$ is the probability an individual from market m transitions to market k conditional

on experiencing a transition. The intuition behind this formulation is that jobs in other markets likely provide viable options for workers. Arnold (2021) shows that one can use a discrete choice model and empirical flows across markets (*i.e.*$\alpha_{k\to m}$) to measure the value a worker from a given market places on another market.

Intuitively, if we observe a large number of flows from market m to k, then k likely serves as a viable outside option. Additionally, we need to take into account the relative sizes of the markets. For example, if k is a relatively small market, but we still observe high rates of flows to this market, it must provide a particularly good option for the workers. This is why the relative size between m and k is taken into account when determining the value individuals from m place in receiving a job in market k. The concentration in market m is given by:

$$\tilde{C} = \sum_j \tilde{s}_{jm}^2 \tag{A4}$$

One key difference in this formulation relative to Arnold (2021) is that transitions across both industries and locations are taken into account. In Arnold (2021), the market shares depend only employment in other industries within the same commuting zone. In this more general version, the market share depends on employment in other commuting zones as well.

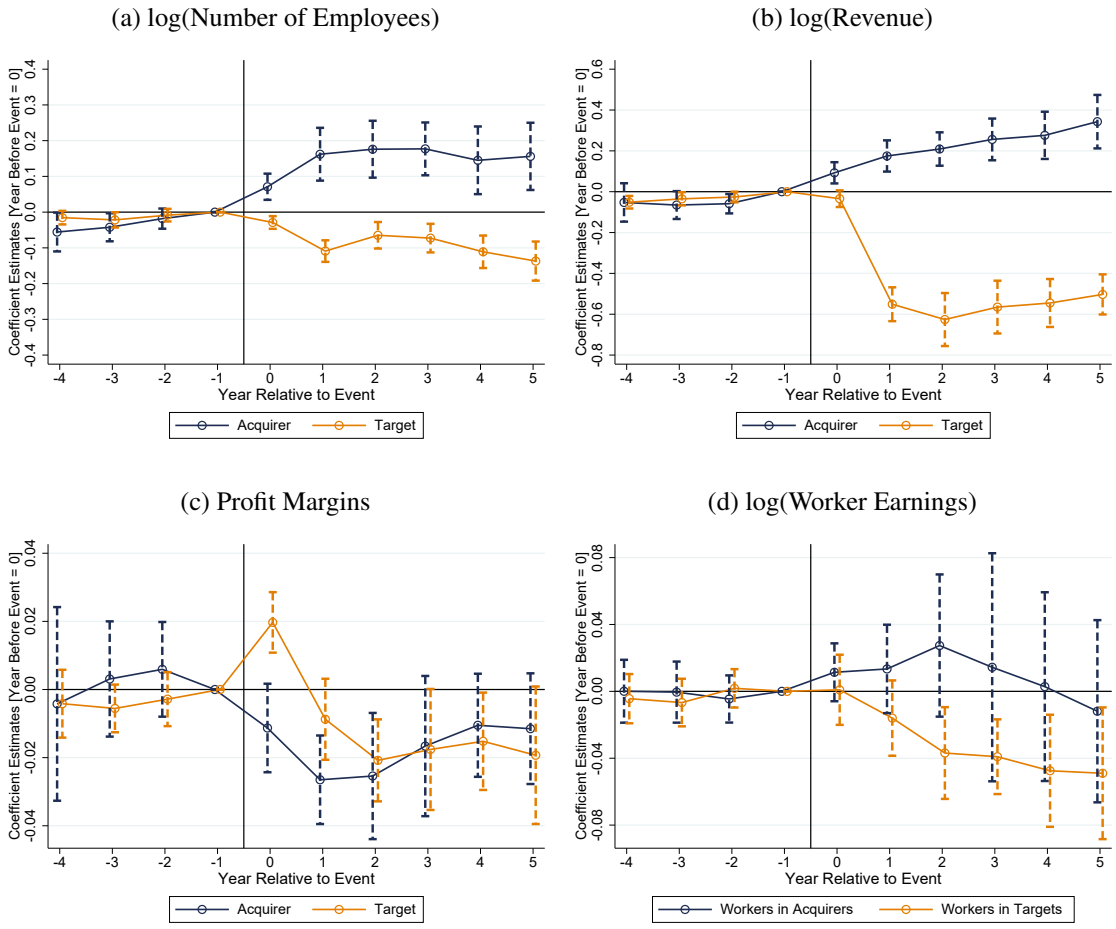
Second, the relative size term in $\alpha_{m\to k}$ (i.e. $\mathbb{E}[\frac{L_k}{L_m}]$) is now the expected relative size of industries across commuting zones. To understand this factor, imagine there are two equally sized industries that use similar workers but are generally located in different areas. For example, imagine plastic manufacturing and rubber manufacturing plants hire similar workers, but plastic manufacturing primarily takes place in Texas while rubber manufacturing primarily takes place in Ohio. In this case, the aggregate relative size of the industries will be quite different than the expected relative size within a commuting zone given the two industries primarily operate in different commuting zones. Therefore, a low volume of flows between the two industries does not necessarily reflect low substitutability, but rather they are generally located in different areas.

The flows-adjusted local labor market concentration measure, C_{mc}, is defined as:

$$C_{mc} = \sum_{j\in c} (\tilde{s}_{jmc})^2 \tag{A5}$$

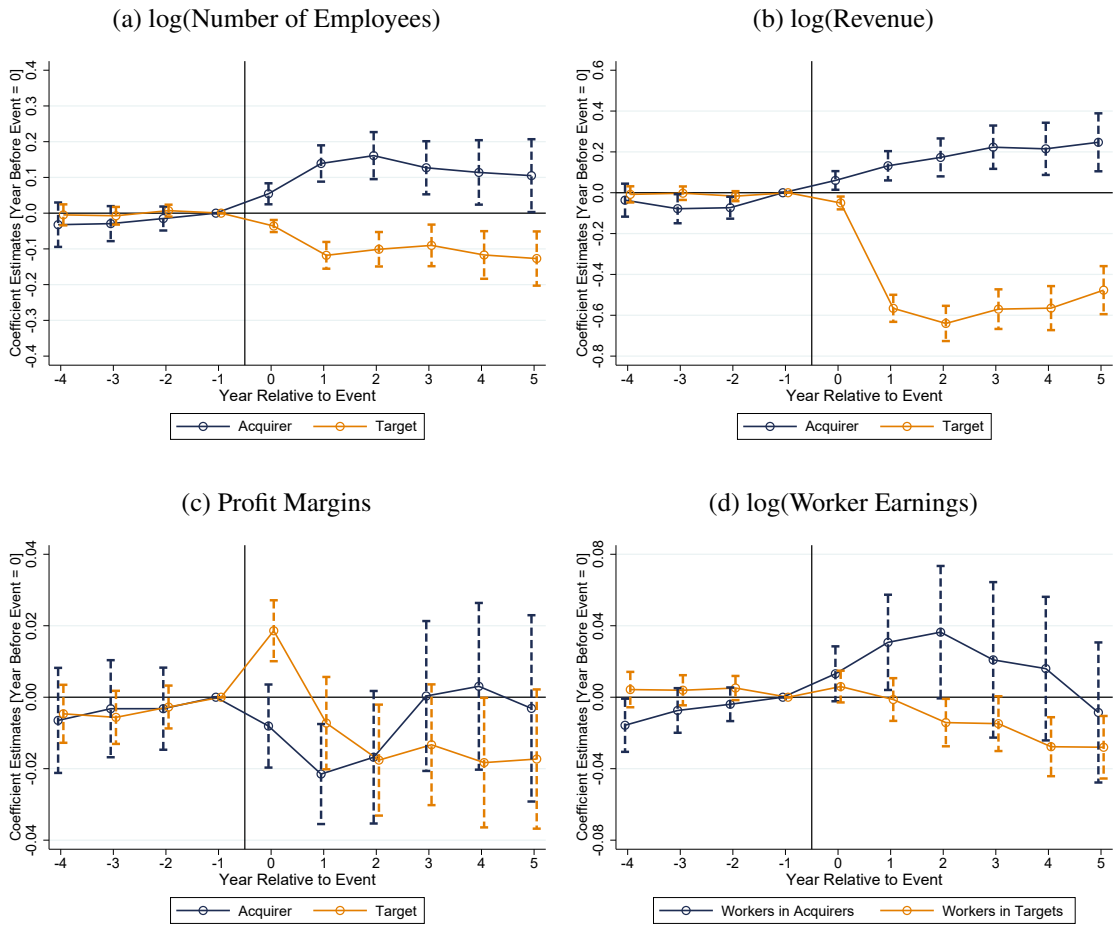
Figure A4 and Table A4 show the effects of M&As on earnings of workers at target firms, separately for markets with high (flow-adjusted) HHI and for markets with low (flow-adjusted) HHI. Similar to our main results based on the regular HHI, these results show that the decline in worker earnings are not larger for high HHI markets.

Figure A1: Different Clustering



Notes: These figures display event-study estimates for the impact of M&A on firm-level outcomes. Panel (a) shows the estimates for log of employment. Panel (b) shows the estimates for log of total revenue. Panel (d) shows the estimates for worker-level earnings. The dashed lines indicate 95 percent confidence intervals where the standard errors are clustered at the market-level for Panels (a) – (c) and at the worker and market level for Panel (d). The solid vertical line indicates the event year. The navy blue dots correspond to the estimates for acquiring firms and the orange dots indicate the estimates for target firms.

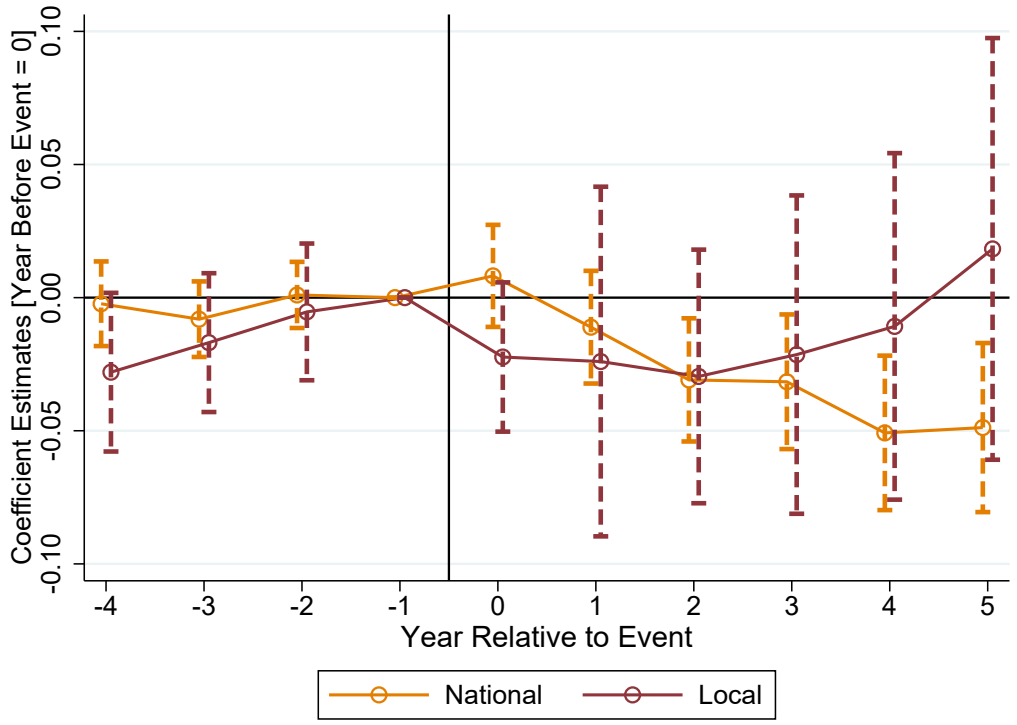
Figure A2: Matched Control Firms in Different Commuting Zones



Notes: These figures display event-study estimates for the impact of M&A on firm-level outcomes. When matching, we restrict M&A firms to be at different commuting zones from matched control firms. Panel (a) shows the estimates for log of employment. Panel (b) shows the estimates for log of total revenue. Panel (d) shows the estimates for worker-level earnings. The dashed lines indicate 95 percent confidence intervals where the standard errors are clustered at the firm level for Panels (a) – (c) and at the worker and firm level for Panel (d). The solid vertical line indicates the event year. The navy blue dots correspond to the estimates for acquiring firms and the orange dots indicate the estimates for target firms.

Figure A3: Worker Earnings By National M&As vs. Local M&As (Targets)

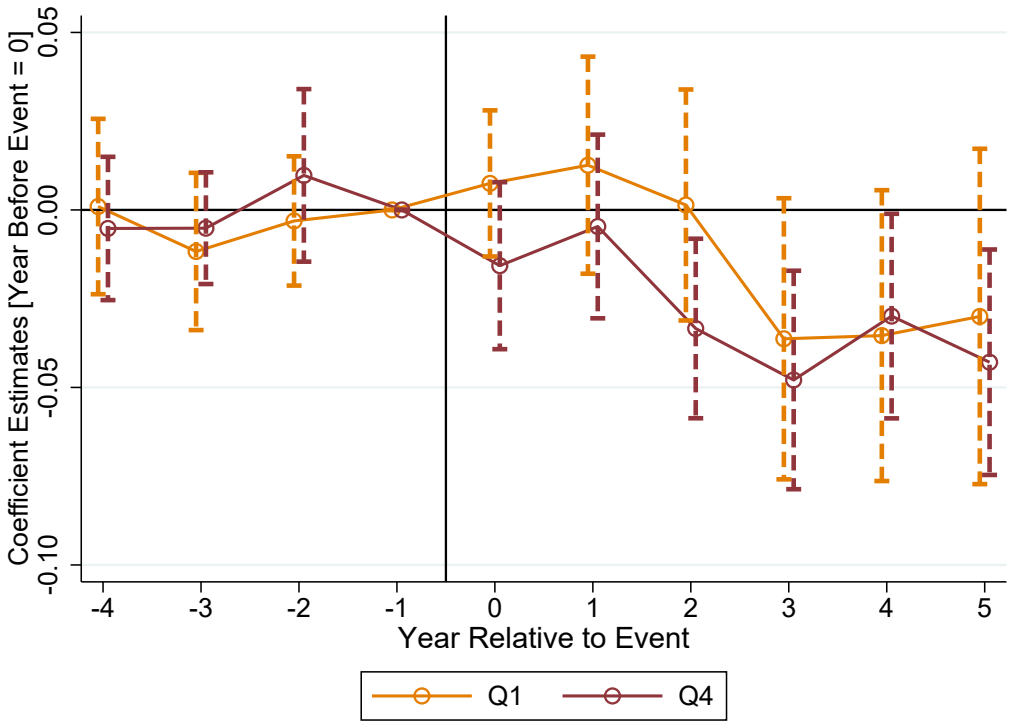
(a) log(Earnings)



Notes: This figure displays event-study estimates for the impact of M&A on log of total earnings for workers at target firms, separately for national M&A deals and for local M&A deals as defined in Section A3. The dashed lines indicate 95 percent confidence intervals where the standard errors are clustered at the worker and firm level. The solid vertical line indicates the event year.

Figure A4: Worker Earnings By Initial Level of Generalized HHI (Targets)

(a) log(Earnings)



Notes: This figure displays event-study estimates for the impact of M&As on log of total earnings for workers at target firms, separately, for workers in markets with low initial level of concentration (1st quartile in Generalized HHI) and for workers in markets with high initial level of concentration (4th quartile in Generalized HHI). The dashed lines indicate 95 percent confidence intervals where the standard errors are two-way clustered at the worker-firm level. The solid vertical line indicates the event year.

Table A1: Different Clustering

	(1) log(Employment)	(2) log(Revenue)	(3) Profit Margins	(4) log(Earnings)
Target	-0.087***	-0.471***	-0.010**	-0.016**
	(0.013)	(0.044)	(0.005)	(0.007)
Mean at t = -1	3.97	16.35	0.02	11.05
Adj. R squared	0.867	0.821	0.375	0.757
Obs	78500	79900	80300	1107900
Acquirer	0.148***	0.225***	-0.017***	0.015
	(0.034)	(0.038)	(0.005)	(0.015)
Mean at t = -1	4.54	17.01	0.02	11.01
Adj. R squared	0.885	0.854	0.375	0.753
Obs	27300	27300	27400	685700

Notes: This table reports the difference-in-differences estimates for the effects of M&As on firm-level and worker-level outcomes, separately for acquiring firms and for target firms. The dependent variables in column (1) to (4) are log of employment, log of total revenue, profit margins, and log of worker-level earnings. The firm-level estimates' standard errors are clustered at the market level (defined by 2-digit NAICS $\times$ commuting zone). The worker-level estimates' standard errors are two-way clustered at the worker and market level.

Table A2: Matched Control Firms in Different Commuting Zones

	(1) log(Employment)	(2) log(Revenue)	(3) Profit Margins	(4) log(Earnings)
Target	-0.098***	-0.478***	-0.009*	-0.016***
	(0.022)	(0.035)	(0.005)	(0.006)
Mean at t = -1	3.96	16.37	0.03	11.01
Adj. R squared	0.871	0.824	0.342	0.769
Obs	67700	69100	69500	850300
Acquirer	0.117***	0.175***	-0.008	0.015
	(0.029)	(0.039)	(0.007)	(0.017)
Mean at t = -1	4.57	17.05	0.03	11.00
Adj. R squared	0.887	0.861	0.359	0.747
Obs	23000	23100	23200	548000

Notes: This table reports the difference-in-differences estimates for the effects of M&As on firm-level and worker-level outcomes, separately for acquiring firms and for target firms. When matching, we restrict M&A firms to be at different commuting zones from matched control firms. The dependent variables in column (1) to (4) are log of employment, log of total revenue, profit margins, and log of worker-level earnings. The firm-level estimates' standard errors are clustered at the firm level. The worker-level estimates' standard errors are two-way clustered at the worker and firm level.

Table A3: Worker Earnings By National M&As vs. Local M&As (Targets)

	(1) log(Earnings)
Post × Treated	-0.022***
	(0.005)
Mean at t = -1	11.04
Worker-Year	903700
Post × Treated × Local	-0.014
	(0.014)
Mean at t = -1	11.11
Worker-Year	219800

Notes: This table reports the difference-in-differences estimates of the impact of M&As on log of total earnings for workers at target firms involved in national M&As, as defined in Section A3. The triple interaction term captures the triple-difference estimates for workers at target firms in local M&As. The standard errors are two-way clustered at the worker and firm level.The standard errors are two-way clustered at the worker and firm level.

Table A4: Worker Earnings By Initial Level of Generalized HHI (Targets)

	(1) log(Earnings)
Post × Treated	-0.031***
	(0.011)
Mean at t = -1	11.06
Worker-Year	115700
Post × Treated × Q4	-0.012
	(0.013)
Mean at t = -1	11.11
Worker-Year	138900

Notes: This table reports the difference-in-differences estimates of the impact of M&As on log of total earnings for workers at target firms in markets with initially low level of concentration (1st quartile in Generalized HHI). The triple interaction term captures the triple-difference estimates for workers at target firms in markets with initially high level of concentration (4th quartile in Generalized HHI). The standard errors are two-way clustered at the worker and firm level.The standard errors are two-way clustered at the worker and firm level.

B Additional Heterogeneity Results

In Appendix B, we provide additional heterogeneity results in addition to those discussed in Section 7.

B.1 By Within vs. Across Markets

In Section 7, we show that the decline in earnings of workers at target firms is similar between markets with initially low level of concentration and markets with initially high level of concentration. We further explore whether impacts on worker earnings are larger in markets where merging firms are located in the same labor market (defined at the sector by commuting zone level), following Prager and Schmitt (2021). In Figure B1 and Table B1, we find that decreases in workers' earnings in target firms where M&As occur within the same market were not larger than decreases in workers' earnings where M&As occur across different markets, suggesting a limited role for the change in concentration in explaining the change in worker earnings after M&As.

B.2 By Within vs. Between Industry M&As

In Section 7, we show that the decline in earnings of workers at target firms is similar between M&As that happen in tradable sectors and those that happen in non-tradable sectors, suggesting a limited role for the change in product market power in explaining the change in worker earnings. To further support this conclusion, we also conduct our analysis separately by within-industry M&As and between-industry M&As. The intuition is that an M&A would have a larger impact on firms' market power if the acquirer buys another firm within the same industry (i.e., horizontal mergers). We divide our sample of all M&A firms based on the industries of the parties involved in a transaction. A merger is a within-industry M&A if the industries (4-digit NAICS) of both parties are identical and it is between-industry M&A (i.e., vertical mergers) if the industries are different. For firms with one transaction, we define a firm as "within" if it participated in a within-industry M&A and as "between" if it participated in a between-industry M&A. For firms with multiple M&A deals, we consider the majority of transactions to determine the within- and between-indicator.

Figure B2 and Table B2 show the results on worker earnings in target firms, separately for within-industry M&A events and between-industry M&A events. The parallel trend holds prior to the event for both types of workers, and we do not find that the decline is larger for workers involved in within-industry M&As. Table B1 confirms that the difference in the decline in worker earnings is statistically indistinguishable from zero between within-industry M&As and across-industry

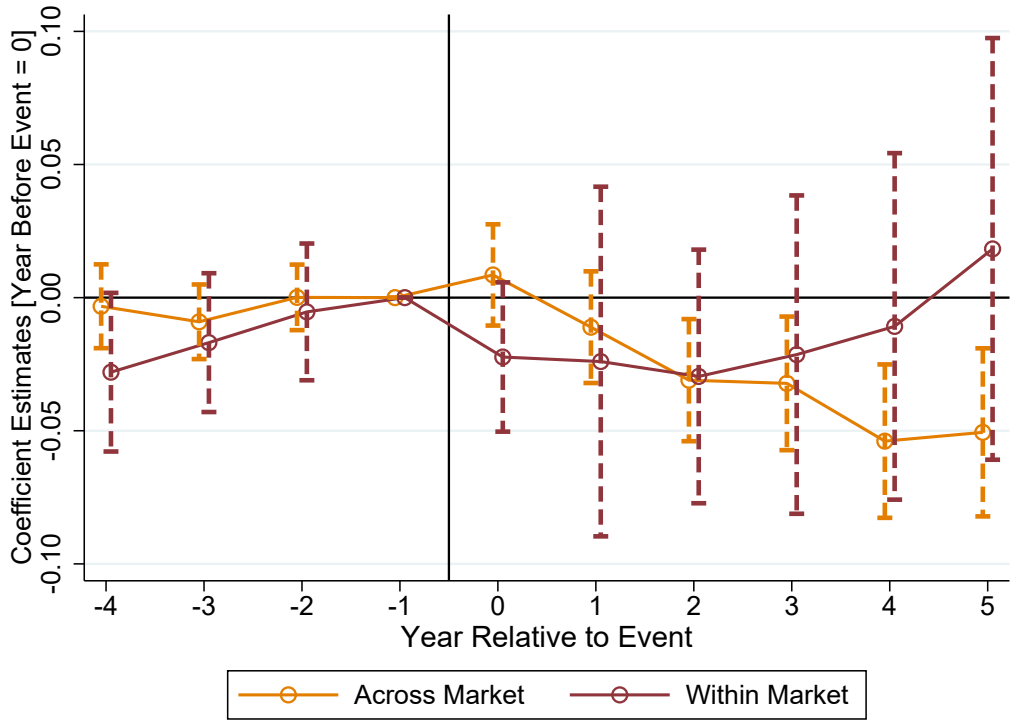
M&As, and if anything, the decline is slightly higher for across-industry M&As for workers in target firms. These results imply that a rise in product market power is unlikely the main driver behind the results on worker earnings.

B.3 By Worker Characteristics (Gender and Age)

We additionally explore whether the decline in earnings of workers in target firms is different based on worker characteristics, such as gender and age. Prior studies have found differential impacts of firm-level shocks on worker earnings depending on their gender and age (Kline et al. 2019; Saez et al. 2019). Figure B3 and Table B3 show that the decline of workers' earnings in target firms is similar between males and females. By contrast, Figure B4 and Table B4 show that most of the decline in earnings at target firms is concentrated on workers who are at least 50 years old.

Figure B1: Worker Earnings By Within Market M&As vs. Across Market M&As (Targets)

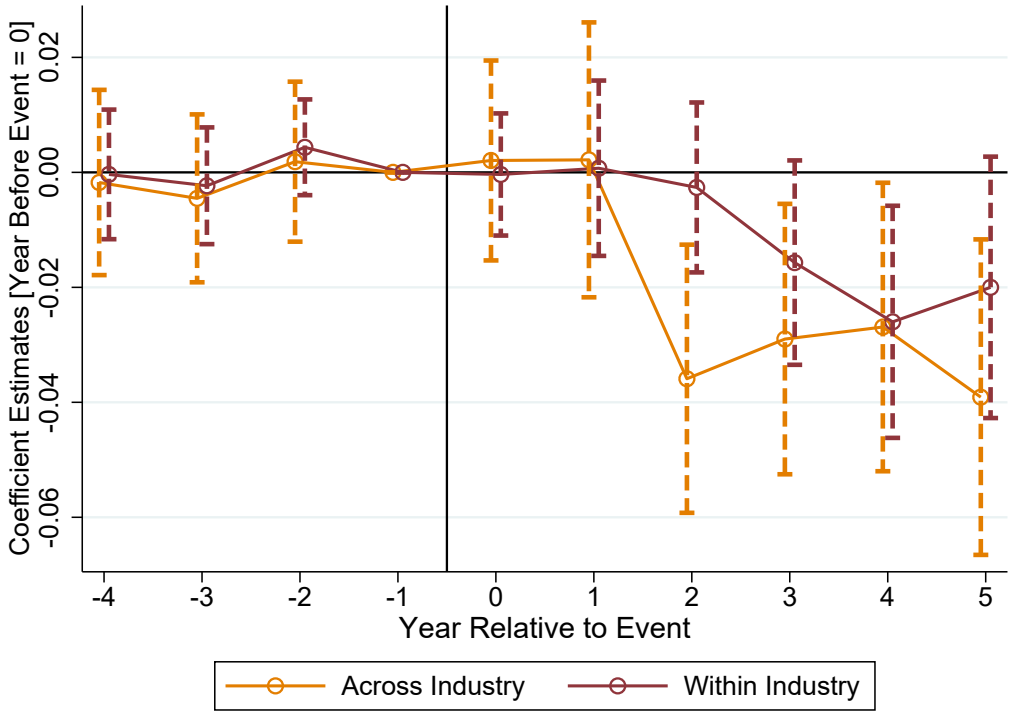
(a) log(Earnings)



Notes: This figure displays event-study estimates for the impact of M&A on log of total earnings for workers at target firms, separately for M&As that happen within the same labor market and for M&As that happen across labor markets. The dashed lines indicate 95 percent confidence intervals where the standard errors are clustered at the worker and firm level. The solid vertical line indicates the event year.

Figure B2: Worker Earnings By Within Industry vs. Across Industry (Targets)

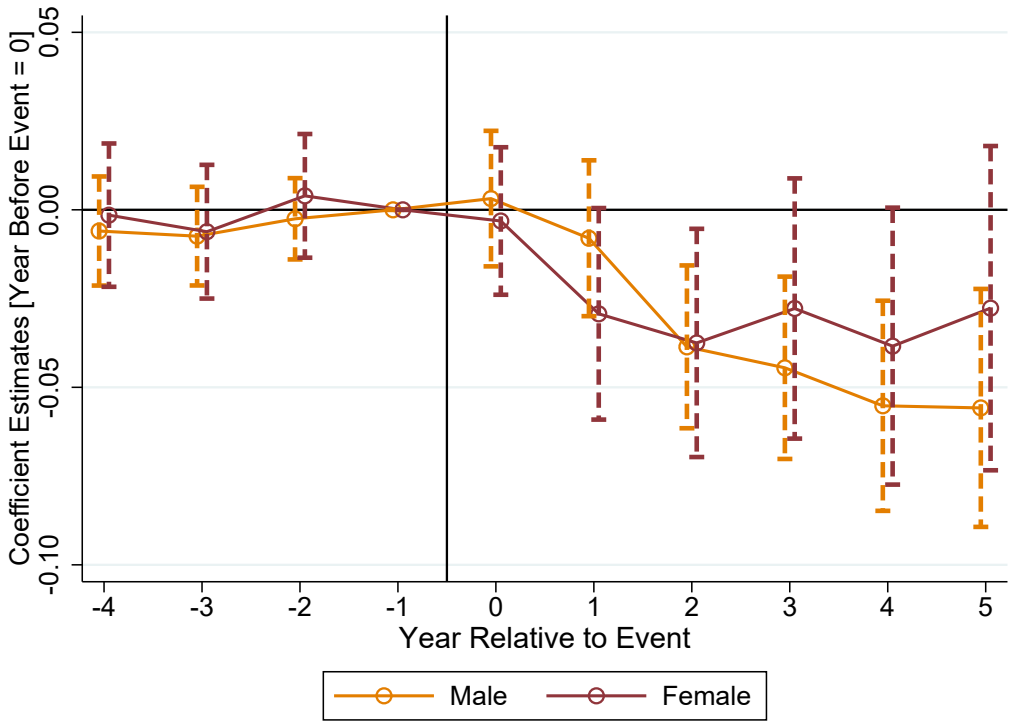
(a) log(Earnings)



Notes: This figure displays event-study estimates for the impact of M&A on log of total earnings for workers at target firms, separately for M&As that happen within the same 4-digit industry and for M&As that happen across different industries. The dashed lines indicate 95 percent confidence intervals where the standard errors are clustered at the worker and firm level. The solid vertical line indicates the event year.

Figure B3: Worker Earnings By Worker Gender (Targets)

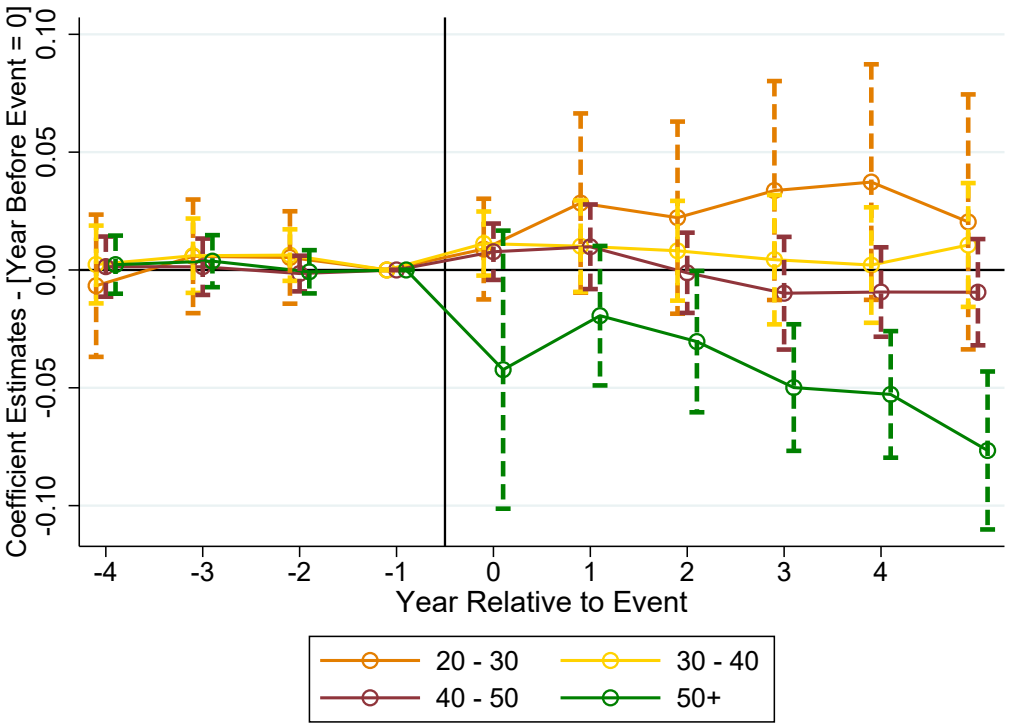
(a) log(Earnings)



Notes: This figure displays event-study estimates of the impact of M&As on log of total earnings for workers at target firms, separately, for male and female workers. The dashed lines indicate 95 percent confidence intervals where the standard errors are two-way clustered at the worker and firm level. The solid vertical line indicates the event year.

Figure B4: Worker Earnings By Worker Age (Targets)

(a) log(Earnings)



Notes: This figure displays event-study estimates of the impact of M&As on log of total earnings for workers at target firms, separately, for various age groups. The dashed lines indicate 95 percent confidence intervals where the standard errors are two-way clustered at the worker and firm level. The solid vertical line indicates the event year.

Table B1: Worker Earnings By Within Market M&As vs. Across Market M&As (Targets)

	(1) log(Earnings)
Post × Treated	-0.031***
	(0.011)
Mean at t = -1	11.06
Worker-Year	115700
Post × Treated × Within Market	-0.012
	(0.013)
Mean at t = -1	11.11
Worker-Year	138900

Notes: This table reports the difference-in-differences estimates of the impact of M&As on log of total earnings for workers at target firms involved in national M&As, as defined in Section A3. The triple interaction term captures the triple-difference estimates for workers at target firms in local M&As. The standard errors are two-way clustered at the worker and firm level.The standard errors are two-way clustered at the worker and firm level.

Table B2: Worker Earnings By Within Industry vs. Across Industry (Targets)

	(1) log(Earnings)
Post × Treated	-0.029***
	(0.008)
Mean at t = -1	11.04
Worker-Year	454600
Post × Treated × Within Industry	0.011
	(0.011)
Mean at t = -1	11.06
Worker-Year	693500

Notes: This table reports the difference-in-differences estimates of the impact of M&As on log of total earnings for workers at target firms involved in M&As that happen within the same 4-digit industry. The triple interaction term captures the triple-difference estimates for workers at target firms involved in M&As that happen across different industries. The standard errors are two-way clustered at the worker and firm level.The standard errors are two-way clustered at the worker and firm level.

Table B3: Worker Earnings By Worker Gender (Targets)

	(1) log(Earnings)
Post × Treated	-0.026***
	(0.006)
Mean at t = -1	11.15
Worker-Year	821400
Post × Treated × Female	0.007
	(0.009)
Mean at t = -1	10.80
Worker-Year	327100

Notes: This table reports the difference-in-differences estimate of the impact of M&As on log of total earnings for male workers at target firms. The triple interaction term captures the triple-difference estimate for female workers at target firms. The standard errors are two-way clustered at the worker and firm level.The standard errors are two-way clustered at the worker and firm level.

Table B4: Worker Earnings By Worker Age (Targets)

	(1) log(Earnings)
20s	0.025
	(0.017)
Mean at t = -1	10.67
Adj. R squared	0.782
Worker-Year	35059
30s	0.008
	(0.009)
Mean at t = -1	11.01
Adj. R squared	0.751
Worker-Year	215100
40s	-0.002
	(0.008)
Mean at t = -1	11.11
Adj. R squared	0.777
Worker-Year	406900
50s+	-0.045***
	(0.013)
Mean at t = -1	11.05
Adj. R squared	0.748
Worker-Year	490300

Notes: This table reports the difference-in-differences estimates for the effects of M&As on log of earnings of workers at target firms, separately for workers between 20 and 29 years of age, for workers between 30 to 39 years of age, for workers between 40 to 49 years of age, and for workers above 50 years of age. The standard errors are two-way clustered at the worker-firm level.