Post-merger Restructuring of the Labor Force*

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Abstract

We study the restructuring of the labor force after M&As. Restructuring is large. Net employment of targets declines by half within two years after acquisitions relative to matching firms. Employee turnover is very large, particularly for managers, and most turnover is through the external labor market, whereas internal transfers play a more moderate role. Jobs migrate from targets to acquirers. Turnover affects the composition of the labor force, since acquirers hire new employees who are younger and less expensive than those who leave. Acquirers also start out with a better-educated, better-paid, and more qualified workforce than targets. Mergers create more hierarchical firms with more managers, but the patterns differ between horizontal, vertical, and diversifying mergers. Labor productivity increases after mergers. The findings are supportive of theories that focus on the role of management, management practices, and the organization of the firm as key factors of restructuring.

Keywords: M&A, Restructuring, Employment, Internal Labor Markets

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1 Introduction

How do firms restructure their operations after mergers? A large literature analyzes the sources of synergies in mergers, usually by associating the pre-acquisition characteristics of the merging firms with their short-run and long-run stock returns.[1] Little is known about how firms restructure their operations to realize synergies after mergers.[2] Yet, much can be learned from analyzing how acquirers integrate the target by changing the composition and size of the workforce of the combined firm, reassigning employees to new jobs, and moving them to different plants. This perspective from the human side complements research on the asset side of restructuring, and extant research on the impact of mergers and acquisitions on employees, which has mostly looked at changes in net employment and aggregate wage bills.[3]

Hence, we take a detailed look at the post-merger reallocation of labor. We ask how many and which employees are hired externally after acquisitions? How many and which employees leave the firm, or are transferred between acquirers and targets in the post-acquisition period? Specifically, we are interested in how employee flows affect the composition of the workforce, how firms build managerial capacities, and how managerial capacities and the organizational structure of the acquirer influence labor flows. As such, ours is one of the very few papers that analyze the human-capital consequences of mergers by taking a comprehensive view at the combined firm, and focus not only on targets (see Section 2 for details). Finally, we analyze the activities of internal labor markets, and how important they are relative to the external labor market.

We analyze 1,043 acquisitions in Germany between 1997 and 2014 and investigate an employer-employee linked data set with over 500,000 employees. Germany is ideally suited to study these issues, because the strictness of its employment protection legislation puts it at the median of the OECD, and we have detailed data on the compensation, education, occupations, and skill levels of the German labor force.[4] We perform matched-sample difference-in-difference

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[1]The literature on M&As and the sources of synergies discussed in this literature is far too large to survey here. See Eckbo (2014) and Mulherin, Netter, and Poulsen (2017) for recent surveys.

[2]On the asset side of restructuring, see Maksimovic, Phillips, and Prabhala (2011) on plant closures, Kaplan and Weisbach (1992) on divestitures, and Bena and Li (2014) on patents.

[3]We provide a comprehensive discussion of the literature of the labor consequences of M&As in Section 2.

[4]There is no prior study on post-merger employment restructuring in Germany among the more than 30

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analyses and match each target firm and each acquirer firm to a control firm. We conduct analyses at the establishment level and track the flows between establishments, in particular, internal flows between acquirer establishments and target establishments, and external flows to and from the outside labor market. We track these flows from the beginning of the year of the acquisition to the end of the second year after the acquisition. We establish a number of stylized facts about post-merger restructuring: the net employment decline is large; the increase in employee turnover is very large; and restructuring is heavily tilted toward the turnover and reorganization of management, which is also reflected in the hierarchical structure of the firm.

Overall restructuring activity is very large. On average, targets lose more than half of their workforce by the end of the second calendar year after the acquisition. The abnormal decline of the combined workforce of acquirer and target is 7.2%, whereas acquiring firms grow. All these changes are calculated relative to the matched control group of employees from non-merging firms, which forms our counterfactual. The employment decline is concentrated in those targets that are closed completely, which account for about one-third of the sample: their plants have no employees two years after the acquisition, whereas employment in surviving targets is stagnant. The majority of those employees who leave the merged firms switch to better-paid jobs, but still about 40% of those who leave lose some of their human capital, mostly by accepting lower-paid jobs, and less frequently by becoming unemployed.

There is a surprisingly large increase in employee turnover, so that net employment changes alone do not reveal the full extent of restructuring.[5] Two years after the acquisition, abnormal separations are almost 17% of the workforce of the merging partners, hence about one in six employees left their pre-merger jobs, in addition to the normal fluctuations, accounted for by the matching controls. These separations are matched by almost 10% abnormal inflows. Increased hiring occurs only at acquirers, whereas job losses are concentrated at the target, so

studies we survey in Section 2. None of the studies on other countries addresses the questions we focus on in this paper. See Section 2 for a discussion of the literature and OECD (2020) for country-level scores on employment protection legislation. See also Kim, Maug, and Schneider (2018) for further detail on labor market regulation in Germany compared to other countries.

[5]In this paper, we define turnover formally as the minimum of inflows and outflows to emphasize the aspect of replacing workers, and to separate this aspect from net employment growth.

turnover shifts jobs from the target to the acquirer. The extent to which this happens depends on whether targets close or not. If targets do close, then acquirers grow more and absorb some of the target's employees by transferring them to the establishments of the acquirer. These transfers from closing targets cause displacements and additional turnover, since many of the acquirer's employees then leave.

Internal transfers account for a small part of turnover. When targets close and acquirers absorb some of their workforce, then these acquirers still hire almost three times as many employees from the external labor market as they hire from the target. When targets are not closed, internal transfers are negligible, and almost all hiring is external. Internal and external flows are also positively correlated, which indicates that they are complements: presumably, firms satisfy their recruiting needs depending on the availability of good matches for their jobs, but they do not systematically substitute external hiring with internal hiring.

Turnover has a systematic impact on the composition of the workforce. A comparison of the skills and compensation of target and acquirer employees confirms that acquirers start out with a significantly better-educated, more highly-qualified, better-paid, and slightly younger workforce than targets before the merger. Merging firms then hire new employees with similar qualifications and a slightly better education compared to departing employees. In these respects, they follow the same blueprint as non-merging control firms; they only turn over their workforce much faster. However, new hires of merging firms are on average much younger, about four years or 10% of the average pre-acquisition age of the work force; and they are less expensive than the departing employees, and receive about 11% less in daily compensation. On these dimensions, merging firms differ significantly from control firms. Hence, merging firms save costs when they replace workers by hiring younger, less-experienced workers, who may also be more adaptable to the processes of the acquirer. However, they do not reduce costs by hiring workers with lower education or qualification.

We investigate the performance of merging firms, based on the limited data we have to this end. We use data on sales to construct measures of labor productivity, and the growth of labor productivity. Moreover, we argue that wages measure individual labor productivity, so that the wages of those employees who have been with the merging firms before the merger and

stay with them should be affected positively if their productivity increases. All measures we can construct point in the same direction and suggest that post-merger restructuring increases labor productivity.

We find several of the salient observations on the post-merger restructuring of the labor force striking. Given that replacing employees is costly, and both, hiring and layoffs are associated with significant costs, it is surprising to see such large turnover of the labor force. For the same reason, we would have expected merging firms to rely more strongly on internal labor markets, and substitute external hiring with internal transfers, yet about three-quarters of the acquisitions in our sample see no internal transfers of employees at all, and internal transfers do not play a major role, even when targets are closed and absorbed by the acquirer. Given that we observe a positive effect of M&As on labor productivity, we conclude that these restructuring activities, on average, create value, and must therefore be explained as the result of creating synergies.

We discuss a range of theories of synergies in M&As, many of which are conventionally advanced in the literature, and argue that they do very little to help us understand these observations. The salient patterns we observe in post-merger restructuring are unlikely to be caused by relaxing financial constraints, anti-competitive mergers, a breach of implicit contracts at the expense of employees, improved matching of employees and tasks in internal labor markets, or the acquisition of targets for the purpose of hiring ("acqui-hiring") workers with scarce skills. In particular, and among many aspects we discuss, none of these theories would predict the large amount of employee turnover we observe. We point out that all of these theories probably identify important factors that are relevant for some transactions, and we certainly cannot reject them. However, we simply note that these theories do not identify the key economic drivers that can explain the stylized facts we assemble in our empirical analysis, most likely because the forces identified by these theories are not relevant for sufficiently large groups of transactions in our sample.

Instead, we draw on theories that focus on the composition and organization of the workforce, and which put a major emphasis on the role of management. Broadly, we build on three strands of the literature, which emphasize different aspects of this argument. First, the

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literature on "management as a technology" (Bloom, Sadun, and Reenen, 2017), which argues that management practices are a key driver in increasing firms' productivity, and comparable to technology in this respect.[6] Second, the literature on knowledge-based hierarchies (Garicano, 2000), which holds that firms can create economies of scale when they grow by adding hierarchical layers to their organization, which increases fixed costs for the top layer, but reduces the skill and experience requirements in the middle of the organization. Third, we draw on the literature on embedded managerial practices, which emphasizes that managerial practices cannot be transferred as blueprints, since they are embedded in managers (e.g., Atalay, Hortacsu, and Syverson, 2014). The arguments of these theories overlap, and they all imply that restructuring is predominantly a reorganization of management. Moreover, the second and third paradigm also predict significant employee turnover, as well as internal transfers, since the reorganization of the labor force also changes the skill requirements on employees.

Accordingly, the next step of our analysis focuses on middle managers, who we can identify through the occupational codes in our data. For managers, we observe a smaller and insignificant decline in net employment, which indicates that firms build managerial capacities. Moreover, we observe about twice as much turnover for managers as for the general workforce, consistent with the notion that most restructuring happens at the top of the organization.

Next, we again distinguish transactions in which targets are closed from transactions in which targets survive. If targets survive, then target managers leave at a higher rate than the target's other employees. Moreover, many new managers are hired, but they are recruited at the establishments of the acquirer. We interpret this as a (partial) replacement of target managers, with a build-up of new managerial capacities at the acquirer. In contrast, if targets are closed, the proportion of target managers that is retained, and transferred to the acquirer is larger than for other employees. In these transactions, more of the acquirer's managers leave, evidently being displaced by the new transfers from the target. Hence, all transactions

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[6]This literature goes back at least to Bloom and Van Reenen (2007), who started to assemble systematic evidence on managerial practices in the World Management Survey, see Scur et al. (2021), for a survey of this literature. This literature has also established that private equity transactions enhance productivity by applying improved management practices (Bloom, Sadun, and Van Reenen, 2015).

combine newly-recruited managers while retaining some of target's managers as well as most of the acquirer's managers, independently of whether the target is closed or not. We conclude that the acquirer's and the target's managers have complementary skills, so that neither is dispensable. In all likelihood, target managers know the target's technology and markets, whereas acquirer managers are trained in the - presumably superior - management practices of their firm.

Next, we investigate how M&As affect the hierarchical structure of the firm and present two findings, both of which are consistent with the theoretical paradigms we rely on. First, there is a significant association of the growth of the firm after the merger and the increase in the number of hierarchical layers, which is consistent with the hypothesis that this form of reorganization is one avenue through which firms realize economies of scale. Second, firms add more hierarchical layers if their operations become more complex and they increase their scope, which we measure by the number of industries in which firms are active. A further break-down of the sample by the industrial relatedness of acquirers and targets reveals an intuitive pattern: horizontal mergers - almost half of our sample - involve larger, slower-growing firms that are less hierarchical before the merger and add fewer layers after; we call them *consolidating.* By contrast, diversifying mergers involve faster-growing, smaller firms, which are more hierarchical and more likely to add further layers; they are also less likely to close the target, and, accordingly, have overall less employee turnover; we think about these mergers as being about the *acquisition of growth options.* Finally, vertical mergers have the highest incidence of target closures, the highest decline of employment and of employee turnover, and are undertaken by the smallest acquirers; we call them *integration* mergers.

In the final section, we perform multivariate analyses to determine the drivers of some of our key outcome variables. Employee turnover depends on the pre-acquisition growth of the acquirer, and (to a lesser extent), of the target, hence, a higher growth potential is associated with more turnover. We interpret this as saying that growth is associated with a permanent change of operating processes, and accordingly, skill requirements, so that faster-growing firms need to permanently reconfigure their processes and adapt their workforce. Turnover is also driven by the similarity of acquirers' and targets' workforce, which we measure through an

index of human-capital relatedness (following Lee, Mauer, and Xu, 2018). The last observation is interesting, because human-capital relatedness does not affect net employment growth: Firms with a more similar workforce find it more important to adapt their workforce, but do not see more potential in eliminating duplicate jobs.

Overall, we show that mergers and acquisitions allow firms to economize on the costs of the labor force in three ways: First, by reducing the size of the labor force to streamline production. Second, by adapting the labor force towards better-educated, but younger and less expensive employees. Third, by building and transferring managerial capacities.

2   Contribution to the literature

This paper contributes to three broad strands of the literature: On the impact of M&As on labor market outcomes, on the impact of labor market institutions on M&As, and on internal labor markets. In this section, we provide a brief survey of each of these strands of the literature by introducing the key topics and findings, but note that the size of the literature may warrant a more detailed survey or meta-study, which is beyond the scope of this paper. We refrain from discussing the much broader literature on M&As, for which multiple excellent surveys exist.[7] We also do not discuss the human-capital consequences of other forms of restructuring, e.g., through private-equity buyouts or bankruptcy, in which the synergies we are focusing on do not play a role.[8]

The influence of M&As on labor market outcomes.   In Table A1 in Appendix A.5, we survey a total of 39 studies that analyze labor market outcomes as consequences of mergers and acquisitions, two of which analyze cross-country data sets. The 37 single-country studies cover predominately the US, the UK, and other countries with lenient employment protection

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[7]See, for example, Betton, Eckbo, and Thorburn (2008), Renneboog and Vansteenkiste (2019), Mulherin, Netter, and Poulsen (2017), and Tarba, Brock, and Calipha (2010) and the literature mentioned in footnote 24 below.

[8]Private equity: Davis et al. (2014), Olsson and Tåg (2017), Antoni, Maug, and Obernberger (2019); bankruptcy: Brown and Matsa (2016), Baghai et al. (2020), Graham et al. (2021).

regulation.[9] There is no prior study on Germany, which is close to the median of the OECD in terms of the strictness of employment protection regulation. Overall, 13 studies discuss employment as well as wage outcomes, 14 only employment and ten only wages; two studies focus on other labor market outcomes.[10] The table provides information on whether the effects of M&As on labor market outcomes are positive (P), negative (N), insignificant (I), or ambiguous (A, i.e., they depend on moderating factors). While the majority of papers documents negative effects of M&As on employment (17 studies, compared to 4 studies with positive effects), the literature is about evenly divided on the direction of wage effects (23 studies: 6 negative, 7 positive, 10 insignificant or ambiguous). Note, however, that several studies explicitly attribute employment losses to the decisions of employees to leave their jobs (e.g., Kim, 2020; Ranft and Lord, 2000). Our study contributes to this literature by studying the economic mechanisms that drive the net effect on employment. In particular, we show how the aggregate employment effect is associated with large employee turnover, especially additional hiring at the acquirer, and correspondingly larger job losses at the target; how it is related to job rotations within the merged firm; its association with changes in the composition of the workforce; and how it is related to changes in the organizational structure of the firm.

Post-merger restructuring.

Only few papers discuss post-merger restructuring of the labor force beyond effects on aggregate employment and wages. Our study is most closely related to Lagaras (2020a), who analyzes the employment dynamics after M&As for a Brazilian sample. However, Lagaras (2020a) focuses on the labor force of targets, whereas we analyze the labor force of the target and the acquirer, which allows us to explicitly analyze target employees who are transferred to the acquirer, especially after target closures, the knowledge transfer of the acquirer to (surviving) targets, and the post-merger changes in the organization of the acquirer. Ma, Ouimet, and Simintzi (2021) analyze a US sample and study post-merger changes in

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[9]This statement is based on the 2019 OECD scores for the strictness of employment protection legislation (EPL), which are 1.3 for the US (22 studies), 1.6 for Canada (one study), 1.7 for the UK (4 studies), and 1.8 for Denmark (2 studies). The score for Germany is 2.2. The other six single-country studies with OECD EPL scores are from countries with stricter EPL regulation compared to Germany. See OECD (2020), Table 3.3.

[10]Tate and Yang (2016) analyze the cross-industry migration of employees and Li and Wang (2020) the post-merger collaboration of inventors.

the occupational composition of the labor force. They also focus on targets and find that post-merger restructuring displaces workers in routine-based jobs and that wage inequality increases, in line with their hypothesis that mergers implement technological change. Their focus on technology is complementary to our focus on organizational structure. Smeets, Ierulli, and Gibbs (2016) study a sample of Danish M&As in the 1980s and 1990s and focuses on the mixing of target and acquirer employees. They also document that internal transfers between acquirer and target plants are low, and that employee turnover increases after mergers. However, they do not associate these changes with explanatory variables or changes in managerial structures. As such, their inference that post-merger integration may be possible by "reconciling policies and coordinating across groups [of employees] without much need to disturb day-to-day operations" (p. 464) is different from ours.

The influence of labor markets on M&As.

The second strand of the literature identifies three broad categories of factors about how labor markets influence M&As. The first hypothesis is that unions and employment protection laws create frictions in the restructuring process, and thereby reduce the profitability and the incidence of M&As. Three cross-country studies (Ahmad and Lambert, 2019; Dessaint, Golubov, and Volpin, 2017; Levine, Lin, and Shen, 2015) and one study that compares states within the United States (John, Knyazeva, and Knyazeva, 2015) all find that labor regulations that provide employees with stronger employment protection have the predicted effect . Surprisingly, the effect of unionization on M&As is ambiguous. Whereas Tian and Wang (2021) find the predicted deterring effect of unions on takeovers, in line with the theory of Pagano and Volpin (2005), Ahmad and Lambert (2019) find that stronger unions facilitate takeovers. The literature on non-compete agreements is complementary to these studies on labor-market regulations that protect employees. Non-compete agreements protect acquirers, because they prevent key employees from leaving the target after the acquisition. Younge, Tong, and Fleming (2015) and Chen, Gao, and Ma (2020) both find that such regulations, which increase employee retention after acquisitions, increase the likelihood of acquisitions. Since our study is on a single country, a comparative analysis of labor market institutions, such as unions, employment protection regulation, and non-compete agreements, is outside

the scope of our analysis.

Finally, a third group of studies hypothesizes that the benefits from mergers depend on the overlap between the acquirer's and the target's labor force, which may be related to the potential to consolidate the workforce, but also provide a measure for how closely the operations of the merging partners are related. Neffke and Henning (2013), Tate and Yang (2016), and Lee, Mauer, and Xu (2018) all develop measures of human-capital relatedness and find that they positively predict the likelihood of mergers. We contribute to this literature by using the measure of Lee, Mauer, and Xu, 2018 of human-capital relatedness to show that it positively affects the turnover of employees, especially managers, and the activity of internal labor markets.

Internal labor markets.

The literature on internal labor markets goes back at least to Doeringer and Piore (1966) and Doeringer and Piore (1970). The earlier literature focuses on how internal labor markets shield themselves from the outside labor market by limiting the ports of entry into the firm, and how they structure employees' promotions along career ladders.[11] By contrast, the literature on internal capital markets builds on earlier work on the boundaries of the firm and compares the efficiency of resource allocation in internal and external markets.[12] The literature on internal labor markets started to address these questions on efficiency and the boundaries of the firm only recently, initially by emphasizing the (partial) complementarity of labor and capital in internal markets (Giroud and Mueller, 2015; Belenzon and Tsolmon, 2016). Tate and Yang (2015) may be the first to analyze the potential of internal labor markets to add value by facilitating transfers of employees from shrinking to expanding industries after adverse shocks.

Theories of internal labor markets argue that conglomerates or business groups create value by providing firms with internal, and therefore less expensive, access to skilled labor; by allowing firms to better match tasks and employees; by creating employment insurance and avoiding costly layoffs after negative shocks; by creating incentives for employees to invest in

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[11]See Baker, Gibbs, and Holmstrom (1994a), Baker, Gibbs, and Holmstrom (1994b), and Baker and Holmstrom (1995) for foundational empirical work on these questions, Napari and Kauhanen (2015) for more recent results, and Groshen and Levine (1998) for a longitudinal study of internal labor markets.

[12]We do not survey the literature on internal capital markets here. See Stein (2003), Maksimovic and Phillips (2007), and Maksimovic and Phillips (2013) for comprehensive surveys.

firm-specific human capital; and by allowing firms to transfer management practices across units of the same firm.[13] However, internal labor markets may also be costly if they lead to wage convergence as workers from low-paid industries demand higher wages in a conglomerate that is active in high-wage industries (Silva, 2017).

Our study contributes to the analysis of internal labor markets by studying the role of internal transfers in post-merger restructuring, and by comparing internal transfers with external labor flows. While M&As create statistically significant but economically relatively moderate internal labor flows in merged firms; post-merger restructuring is dominated by hiring from and releases of employees to the external labor market.

3 Sample and data

3.1 Sample construction

We start with the universe of all mergers and acquisitions in the Bureau van Dijk (BvD) Zephyr database for which the target and the acquirer are headquartered in Germany. After applying the standard filters, we arrive at 3,602 transactions for the period 1997 to 2014. Table OA1 in the Online Appendix provides an overview of all steps of the data set construction. In the next step, we link our list of transactions to the Orbis-ADIAB data set provided by the Research Data Center of the Institute of Employment Research (IAB) using the BvD identifier. Details on the record-linkage between BvD and IAB data are described in Antoni et al. (2018). The Orbis-ADIAB data set contains the standard IAB establishment identifier, which we use to match our data to the Establishment History Panel (BHP, see Schmucker et al. 2016). The BHP contains aggregated information on employees and establishment characteristics. After identifying all establishments involved in an acquisition, we aggregate these establishments to the firm (target or acquirer) level. About one-third of the firms covered by our M&A

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[13]Access to skilled labor: Giroud and Mueller (2015); better matching of capital and tasks to employees: Berk, van Binsbergen, and Liu (2017), Luo, Manconi, and Schumacher (2018); avoid costly layoffs: Belenzon and Tsolmon (2016); provide employment insurance: Sraer and Thesmar (2007), Cestone et al. (2017), Ellul, Pagano, and Schivardi (2017), Kim, Maug, and Schneider (2018), Faccio and O'Brien (2020); investments in firm-specific human capital: Tate and Yang (2015); transfers of management practices: Atalay, Hortacsu, and Syverson (2014), Huneeus et al. (2021).

sample can be linked to the establishment data. For each acquisition, we require that both, the target and the corresponding acquirer be successfully linked, otherwise we remove them from the sample. We obtain 1,147 transactions with aggregate employment data for both firms involved in the deal. After matching target firms and acquirer firms to control firms, we are left with 1,043 transactions for our analysis (details on matching below). For the matched transactions, we select all employees, who work for either the treated or the control firms during the period from one year prior to two years after the transaction. Our individual employee-level data come from the Integrated Employment Biographies (IEB) at the IAB. [14] These steps leave us with 1,043 transactions and 2,086 acquirer and target firms. Summary statistics for the treated and control firms as well as employees are in Table 1.

3.2 Constructing a matched firm sample

We follow earlier contributions in the literature (e.g., Davis et al., 2014; Antoni, Maug, and Obernberger, 2019) and apply nearest-neighbor matching. The objective of this approach is to make treatment random conditional on the matching variables. Hence, for each target firm and acquirer firm, we identify one control firm using the firm-level aggregated BHP data and the following criteria.[15] First, we remove all target firms from the list of potential controls that have been involved in an acquisition themselves at any time during the sample period. Acquiring firms are not part of the list of potential controls from one year before to one year after the transaction. Second, we build matching cells based on two-digit industry affiliation (88 categories), calendar year, region, and number of establishments. We pick the nearest neighbor in terms of the Euclidean distance based on our numerical matching variables: the firm-level averages of *Wage* and *Age*, the number of employees, and the shares of, respectively, high-qualified, medium-qualified, and female employees. In the last step, we identify one control firm from the set of nearest neighbors for each target and for each acquirer firm. We

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[14]For an overview and definitions of all variables see Table A2 in the Appendix. The IEB contain detailed longitudinal data on almost the entire German workforce.

[15]As a basis for the aggregation, we use the record-linkage from the IAB, which links 1,365,323 establishments to 955,784 German firms. The firm-level categorical variables are based on the firms' largest establishment, i.e., a firm's region is determined by the location of its largest establishment.

match with replacement, i.e., a control firm may be matched to more than one target or acquirer. Of the 1,147 target and acquirer companies, we can match 1,136 (1,069) targets (acquirers). For a deal to be considered in the analysis, we require data on both target and acquirer simultaneously which leaves us with 1,043 jointly matched firm-pairs.

Table OA2 in the Online Appendix shows the matching results. For all numerical variables, the relative differences between the target group and the control group are below 5%. We further use the normalized differences proposed by Imbens and Wooldridge (2009) and used by Imbens and Rubin (2015) to examine significant differences between two groups of observations. Imbens and Wooldridge (2009) recommend that normalized differences be below 0.25 in absolute value. For all matching variables, the test statistic is never higher than 0.04, and we conclude that our control groups match target and acquirer firms very closely on all relevant criteria. Unmatched target and acquirer firms differ substantially in the matching variables from the matched sample averages. In particular, very large acquirers cannot be matched satisfactorily to a non-acquirer control firm. Since it is impossible to find a sufficiently close counterfactual firm, we prefer to eliminate these deals from the sample.

3.3   Variable construction

Employee flows.   We define *Net employment growth* from time t to time $t+k$ as $g_{j,t,t+k} = \frac{E_{j,t+k}-E_{jt}}{0.5\left(E_{j,t+k}+E_{jt}\right)}$, where E_{jt} denotes the level of employment in firm j at time t.[16] We follow Antoni, Maug, and Obernberger (2019) and decompose firm-level employment growth into inflows and outflows. We define the normalized inflow of newly-hired employees (*Inflow*) from time t to time $t+k$ as $h_{j,t,t+k} = \frac{\sum_{\tau=1}^{\tau=k} H_{j,t+\tau}}{0.5(E_{jt}+E_{j,t-1})}$, where H_{jt} is the number of employees who enter firm j in period t ("hiring"). Analogously, we define *Outflow*, $s_{j,t,t+k}$, where S_{jt} is the number of employees who leave firm j in period t ("separations"). It follows that $g_{j,t,t+k} = h_{j,t,t+k} - s_{j,t,t+k}$. (See Appendix A.1 for further details.) We further decompose employee flows into flows within the same company (*Internal inflow/outflow within*), flows between

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[16]Davis et al. (2014) point out that this growth rate measure has become standard in analyses of establishment and firm dynamics. See Davis, Haltiwanger, and Schuh (1996) and Tornqvist, Vartia, and Vartia (1985) for detailed discussions. This definition of growth rates is less skewed and can take values between -200% and +200%. Further properties are discussed in Appendix A.1.

the corresponding target/acquirer firm (*Internal inflow/outflow between*), and external flows (*External inflow/outflow*), which includes all other flows, in particular those to and from other companies, unemployment, training and education, or foreign establishments. For some analyses, we need to break down employee flows into subgroups of employees, e.g., by education or qualification. We explain these additional breakdowns when we discuss the respective results.

Turnover. We are interested in employee turnover, i.e., the degree to which employees are replaced. We conceive of replacements of employees as equal numbers of hirings and separations. Accordingly, we define turnover as

$$TO_{j,t,t+k} = Min\left(h_{j,t,t+k}, s_{j,t,t+k}\right). \tag{1}$$

Other contributions in the literature define turnover alternatively as $\frac{s+h}{2}$ (e.g., Davis and Haltiwanger, 1999; Cahuc, Carcillo, and Zylberberg, 2014). In Appendix A.1, we show that $\frac{s+h}{2} = TO + \frac{|g|}{2}$, i.e., this alternative measure of turnover also captures the absolute value of net employment growth, which renders it less useful for our purpose, since we want to capture new employment growth separately.[17]

Hierarchical structure. We construct layers of managers following Caliendo, Monte, and Rossi-Hansberg (2015) and Gumpert, Steimer, and Antoni (2019). The layers are inferred from occupational codes, with the lowest layer being layer 1 (production workers) and the highest potential layer being layer 4 (CEOs and managing directors). Layers 2 and 3 include different ranks of middle managers. See Appendix A.2 for further details.

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[17]To illustrate the point, consider a firm that has 20 separations and 3 new hires. Hence, our measure of turnover is 3 and captures the low number of replacements. By contrast, the alternative definition would be 11.5 and reflect half of the new employment decline of 17.

3.4 Descriptive statistics

Table 1 presents descriptive statistics of the numerical variables for the treated and the control firms. Our final firm-level data set covers a cross-section of 1,043 acquirer-target pairs. On average, the merged firm employs 565 domestic employees (*Size*) in the year prior to the announcement, 102 at the target and 463 at the acquirer. Pre-acquisition employment growth (*Growth*) is very similar for targets and acquirers. We observe each target (acquirer) firm from two years before the acquisition to two years after the acquisition. Acquirer employees and target employees are of similar age, but earn on average 17% more than target employees (average daily wage of €104.45 compared to €89.33).

4 Post-merger restructuring and labor flows: Stylized facts

In this section, we provide an extensive analysis of labor flows after acquisitions, which provides the stylized facts on how post-merger restructuring affects the labor force and lays the ground for subsequent tests of our hypotheses. Section 4.1 introduces our regression design and Section 4.2 presents the results.

4.1 Methodology: Regression design

To provide a generic representation of employee flows, let $f_{j,t-1,t+2}$ be a labor flow relating to firm j from $t-1$ to $t+2$, where f can be an inflow ($f = h$), an outflow ($f = s$), a net employment change ($f = g$), or turnover ($f = TO$). We adapt the approach of Davis et al. (2014) and regress three-year flows on a target (acquirer)-firm indicator, control variables, and a set of fixed effects:

$$f_{j,t-1,t+2} = \theta \times Treated_j + \lambda g_{j,t-3,t-1} + \beta X_{j,t-1} + \sum_c D_{cj}\delta_c + \varepsilon_j, \tag{2}$$

where $Treated_j$ is a dummy variable equal to one for target and acquirer firms in all sample years. We control for past employment growth using $g_{j,t-3,t-1}$, the two-year pre-acquisition growth rate. In the baseline regression, the only control variable included in the vector $X_{j,t-1}$ is the driving distance between the headquarter of the target and the acquirer. Like Davis et al. (2014) and Antoni, Maug, and Obernberger (2019), we use non-parametric controls by including a set of dummy variables D_{cj}, which equal one for cell c for firm j, and cells are defined by the full cross product of acquisition year; industry; firm size category, based on the number of establishments; and geographic region.[18] The coefficients of interest are the difference-in-differences estimates of θ, which denotes the differences in flows (net growth, inflow, outflow) between sample firms and matching firms. Throughout the paper, we report t-statistics and significance levels based on standard errors clustered at the firm level. Precise definitions of all variables can be found in Table A2 in the Appendix.

4.2 Restructuring after mergers

We begin the discussion of employee flows by analyzing the flows of employees between targets and acquirers. Table 2 presents our results for all employees of the merged firms (column 1), targets (columns 2 and 3) and acquirers (columns 4 and 5). For targets and acquirers, we report the results with flows scaled by the employment of the respective firm (columns 2, 4) and with flows scaled by the employment of the merged firm (columns 3, 5), to provide comparability with column 1. Column 6 reports turnover as defined in equation (1). The tables report only the coefficient estimates of θ as denoted in Equation (2), which measure the treatment effects after controlling for distance and pre-acquisition growth; we refer to these as abnormal flows, but will often omit the labeling as "abnormal." Indented flows are breakdowns of the flows shown directly above them.

Loss of employment is large. The first salient observation is that post-merger restructuring involves a large reduction of employment at the establishments of the target firm, which

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[18]We group firms into five size brackets according to their number of establishments. These brackets are: 1, 2, 3-5, 6-10, and larger than 10.

declines by 55.4% from the beginning of the year of the acquisition until the end of the second calendar year after the acquisition. By contrast, acquirers grow (*Net employment growth*: +14.5%), whereas the overall employment of the merged firm declines by 7.2%. Hence, our overall result is in line with the majority of the previous literature surveyed in Section 2, which finds declines in employment.

The majority of the employees who leave the merging firms experience wage increases, and we expect that many of them will have left the firm voluntarily. Some studies (Kim, 2020; Chen, Gao, and Ma, 2020) discuss the difficulties of acquirers to retain the key employees of the target, and identify reasons such as the "cultural fit" of target employees to the acquirer's organization. However, the proportion of employees who leave the firm for a better-paid job (indicated by "wage increase" in the table), expressed as a fraction of all employees who leave the merging firms (*External outflow*), is almost identical for targets (0.60=5.26/8.82; see column 3) and for acquirers (0.57=2.49/4.34; see column 5). If the issue were simply a lack of cultural fit of target employees, we should see a much higher fraction of target employees than of acquirer employees. We take this puzzling fact up further below, when we comment on the displacement of acquirer employees by target employees. Note also that a smaller but still significant proportion of the employees who leave incur losses to their human capital. The *External outflow* of the merged firm amounts to 13.4% of the merged firm's labor force and of these, 3.86 percentage points (pp) experience a wage decline, and a further 1.73 pp become unemployed, hence, about two-fifth ((3.86+1.73)/13.4=0.42) of those who leave the merged firm incur losses to their human capital.

Many targets close and lose all employees. We find that in 373 transactions (36% of the sample), all targets have zero employees at the end of year two after the acquisition, and we refer to these targets as being closed. In their study of asset restructuring, Maksimovic, Phillips, and Prabhala (2011) find that acquirers close or divest 46% of acquired plants within three years of the acquisition, which is broadly consistent with our findings. The change in employment and labor flows differ depending on whether targets are closed or not. To see this, we define an indicator variable *Target closure*, which is one if the target has zero employees

in the second calendar year following the acquisition. Note that targets may close some but not all establishments, in which case *Target closure* equals zero. In Table 3, we report the selected abnormal employee flows separately for surviving and for closing targets. Table OA4 in the Online Appendix reports the full set of abnormal labor flows for closed and surviving targets, using the same format as Table 2. The overall employment of merged firms that close their targets declines by 27.6%, compared to a small and marginally significant increase of 3.8% for firms with surviving targets. The growth of firms with surviving targets happens entirely at the acquirer plants (12.3% of the acquirer's labor force, see column 4 of Table OA4, Panel A), whereas target growth is statistically and economically small. External outflows are insignificant for surviving targets, but large and significant for closing targets, including outflows to unemployment or to other firms with wage declines. Hence, a significant portion of restructuring and human capital losses is associated with target closures.

Turnover is high and shifts jobs from targets to acquirers. Net employment changes do not reveal the overall extent of restructuring activity. From Table 2, the merged firm has abnormal outflows of 16.9%, matched by abnormal inflows of 9.7% over the same period; both numbers include internal flows (3.50%), defined as movements between plants of the merged firm. Hence, the separation rate is about one in six employees among the merged firms, and most separations lead to new hiring. *Turnover*, defined in equation (1), increases by 7.8% after acquisitions relative to control firms (Table 2, column 6), and is much larger when targets close (12.3%) than when they survive (5.2%). Together with the findings on net employment decline, this observation suggests that target closure is associated with much more radical restructuring.

We explore the cross-sectional dimension by looking at the correlations between inflows and outflows. If firms would mainly try to adjust the size of their workforce, then we would expect inflows and outflows to be negatively correlated, as firms with more (fewer) layoffs would also hire less (more). However, we observe the opposite: Panel B of Table 1 shows the correlations between the four main flow variables separately for acquirers (above the diagonal) and for targets (below the diagonal). For both groups, the correlations between inflows and outflows

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are positive, and for acquirers they are remarkably large. For example, the correlation of acquirer's *External inflow* with their *External outflow* is 66%, and with their *Internal outflow* it is 77%; both correlations are statistically highly significant. Hence, those firms that have more (fewer) separations also hire more (less). We see two possible explanations, and both are likely to account for a part of the high turnover, and may also overlap: First, if firms mainly attempt to adjust the composition of their workforce and replace employees, we would expect a positive correlation of separations and hirings. Second, if employees leave voluntarily, then most of them will need to be replaced to fill vacant positions.

Turnover does not take the form of separations and new hirings in the same establishment. Rather, outflows affect mostly targets: *Outflow* for the merged firm (16.93%) can be broken down into 11.11% at targets and 5.56% at acquirers (Table 2, columns 1, 3, and 5). However, all additional hiring is only at acquirer establishments, which is up by 12.52%, and much larger when targets are closed: *Inflow* of acquirers increases by 22.02 when targets close, about three times as much as the inflow if 7.33% when targets survive (Table 7). Interestingly, acquirers' *Outflow* is insignificant when targets survive. Hence, in this case the increased turnover of the merged firm results from a movement of jobs from targets to acquirers. However, when targets close, acquirers experience not only significant inflows and a movement of jobs from the target, but also a large *Outflow* of 12.8%, indicating a significant turnover of acquirers' workforce.

Internal transfers become more important but remain small. There is a significant increase in the activity of internal labor markets after acquisitions, with an increase of 3.5% of the flows between establishments of the merged firm (by construction, *Internal inflow* = *Internal outflow* at this level). However, internal transfers are important only when targets are closed, when more than half of the acquirer's growth (9.2% of the merged firm's workforce) is accounted for by inflows from the closing target. When the target survives, internal transfers from the acquirer to the target amount to only 0.4% relative to the merged firm's workforce, which represents less than one-tenth of the overall hiring (*Inflow* of acquirer: of 7.33%) and also of the growth: *(Net employment growth*: 6.0%) of the acquirer. Overall, we cannot

conclude that mergers establish a vibrant internal labor market, in which employees regularly rotate between target plants and acquirer plants. In fact, the transfers between acquirers and targets are different from zero in only 266 transactions (see also Table 6, Panel B), barely one-quarter of the sample, and mostly concentrated in the subsample in which targets are closed. Therefore, we view the internal transfers after mergers and acquisitions as a one-off phenomenon that is mostly associated with acquirers absorbing a minority of the employees of closing targets.

Note that our findings are consistent with the results of Cestone et al. (2017) and Huneeus et al. (2021), who find significant increases in internal labor market activities after exogenous shocks in business groups. We also find statistically significant and economically meaningful transfers, which represent a substantial increase compared to the pre-merger exchanges of employees; such transfers almost never exist between merging partners before the merger.[19] Some of the internal transfers we observe may also be explained by the theory of implicit contracts, which holds that internal labor markets provide employees with insurance against losses in their productivity. However, their role in this regard is small, since most target employees who leave find new jobs at other firms.[20] Hence, the external labor market plays a more significant role in providing target employees with new employment opportunities.

To evaluate the acqui-hiring argument as a potential explanation of internal flows, we provide two benchmarks. First, we compare the amount of internal hiring from the target (*Internal inflow between* from the target to the acquirer) to the overall hiring after acquisitions (total *Inflow* of the acquirer). This ratio is 0.25 (=5.40/22.02) with closing targets and 0.06 (0.41/7.33) with surviving targets, which suggests that internal transfers play a minor role in the acquirer's recruiting, even when targets are closed. Second we compare the number

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[19]This literature asks slightly different questions. Cestone et al. (2020) study how the relative importance of internal flows compared to total (external plus internal) flows in business groups *changes* after industry shocks. By contrast, the analysis above compares the size of internal relative to external flows and not its change. Similarly, Huneeus et al. (2021) compare flows between pairs of business group-affiliated firms to flows between pairs of non-affiliated firms and find that the former are four to five times larger than the latter. We would expect similar findings within merged firms, since the external transfers spread across a far larger set of firms than the internal transfers. Our approach aggregates all firms that are not part of a merger to one aggregate external market. The activity level is high when viewed at this aggregate level, which is the relevant benchmark in view of our research interest.

[20]See Ellul, Pagano, and Schivardi (2017), Kim, Maug, and Schneider (2018), and Cestone et al. (2017) for recent work on insurance provision within firms.

of employees who leave the merging firms (total *Outflow* of merged firm) to the number who are "acqui-hired" (same *Internal inflow between* again). This ratio is 7.6 (=40.80/5.40) with closing targets, and 9.2 (=3.78/0.41) with surviving targets, which suggests that acquisitions are unlikely to be undertaken mostly for the purpose of acqui-hiring, since the firms lose eight or nine employees for each employee who is acqui-hired from the target.

Finally, we ask whether internal labor markets and external labor markets are substitutes or complements. If firms that operate more active labor markets rely comparatively less on external recruiting, then they would be substitutes and we should see that internal and external flows are negatively correlated. We see in Panel B of Table 1 that the correlations between internal and external flows are always positive and statistically significant for acquirers, and always small in absolute value and statistically insignificant for targets; this holds for inflows as well as for outflows. We conclude from this bivariate analysis that internal and external markets tend to be complements rather than substitutes. Firms appear to rely on external and internal markets in relatively similar proportions, and differ mainly in the overall turnover of their labor force.

4.3 The composition of the workforce

In this section, we analyze turnover further by analyzing how it affects the composition of the labor force. To begin, we compare the composition of the labor force of acquirers and targets before the merger. Table 4 provides descriptive evidence on the qualification and education of employees in the year before the merger. Acquirers employ a much higher proportion of employees in management (7.1% vs. only 4.4% for targets), have more technicians and engineers (14.7% vs. 11.6% for targets) and fewer employees in simple commercial and administrative occupations (7.6% vs. 12.7% for targets). Acquirer employees are also better educated, with 27.2% of them holding a university degree (17.5% for targets), whereas more target employees have only vocational training (60.5%, compared to 52.3% for acquirers). Hence, acquirers have more highly-qualified, better-educated and better-paid employees compared to targets (Table 1, Panel A reports a difference of €15.12 in daily wages).

Next, we analyze the characteristics of inflows and outflows to merged firms regarding wages, education, qualification, and age in Table 5. To analyze qualification and education, we define indices. *Qualification index* is constructed by mapping occupational codes into three categories (low, middle, high), and *Education index* is constructed based on educational attainments grouped into five categories (see Appendix A.2 for details). Panel A of Table 5 reports the averages of these indicators of the flows to and from the external labor market before and after the merger, for merged firms and for their synthetic controls. Panel B shows the same information for the internal flows of merged firms. Note that the number of observations differs across panels because the averages can only be calculated for firms for which the respective flows are positive.

We observe that inflows and outflows to merged firms differ regarding all four characteristics. Newly-hired employees are, on average, slightly more qualified and better educated than those who leave the firm. However, these effects are economically small and amount to 3.2% (Education) and 0.7% (Qualification) of the pre-merger level, which is less than one-tenth of the standard deviations of these variables. Moreover, these changes are almost identical for control firms, for which we observe relative changes of 2.6% and 1.0% for *Education* and *Qualification*, respectively. Hence, it is not the case that employee turnover leads to a significant improvement in the quality of the labor force. Rather, the similarity of the changes in merging firms relative to control firms suggests that both follow a similar blueprint, only that merging firms turn over the work force at a much higher rate. By contrast newly-hired employees are, on average, 3.97 years younger than leaving employees, which is 10.0% of the pre-merger age, and they receive €11.2 or 11.2% less of *Daily wage*. These effects are economically large and statistically highly significant. Moreover, the corresponding changes at control firms are one order of magnitude smaller, with a decline of 0.9 years of *Age* and €0.6 of *Daily wage*. Hence, regarding these characteristics, merging firms and their controls follow very different strategies.

Interestingly, the average education and qualification of employees who leave is slightly higher than the corresponding averages before the merger, whereas the *Age* of outflows is about the same as the pre-merger age, and *Daily wage* is lower for both, inflows and outflows,

compared to the average *Daily wage* of pre-merger employees. Hence, it is also not the case that post-merger restructuring replaces predominantly the more expensive employees, since the employees who leave are fairly representative of the pre-merger labor force.[21]

Our findings can be interpreted in the context of the theory of knowledge-based hierarchies (see Garicano, 2000, and the survey of Garicano and Rossi-Hansberg, 2015, which contains further references). This theory argues that firms choose the composition and organization of their workforce to optimally use the skill and knowledge required in production. It predicts that firms can achieve economies of scale when they grow by adding management layers at the top of the organization (higher fixed costs), which then releases the skill requirements for employees in the middle of the hierarchy (hence, lower variable costs), as they can refer complex issues to their superiors in the newly-created top layer. We have shown that acquirers grow significantly on average and hypothesize that firms reorganize themselves by building such knowledge-based hierarchies, so that the demands on skills and training of employees in the middle of acquirers' hierarchies falls, thus reducing their compensation. The literature characterizes this effect, in which highly-skilled managers at the top of the hierarchy relieve the skill requirements on those in the middle as casting the "shadow of the superstars" (Garicano and Rossi-Hansberg, 2015). We will further test some of the implications of this argument below.

In Panel B we provide the same analysis as in Panel A, but for internal inflows and internal outflows. (These flows are not defined for synthetic controls of merged firms, which do not have internal flows.) Recall from our discussion of internal labor flows that only 266 observations have non-zero flows. The most remarkable feature of internal flows is that they involve more highly-paid employees: The average *Daily wage* is 44% (= €122.82/€85.25) higher for internal inflows relative to external inflows. Similarly, the average *Education index* of internally transferred employees is 15% higher, the average *Qualification index* is still 9% higher, and the average *Age* is 11% (3.74 years) higher compared to externally hired employees.

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[21]Note that the averages in Table 5 are different from those in Tables 1 and OA2, because in Table 5 we average first across all employees in each firm, and then average across all firms, which gives employees in smaller firms (respectively, firms with smaller inflows or outflows) a higher weight compared to the averaging procedure in Table Y, in which all employees are weighed identically.

Hence, external hiring differs substantially from internal hiring: externally-hired employees are better-educated, better-qualified, older, and better-paid.

4.4 Performance

We are interested in whether M&As affect performance. In this regard, our analysis limited by the availability of data, since our data provider does not have access to firm-level data and financial statements are often missing, in particular for non-listed firms.[22] However, we can use two strategies to assess performance based on the data we have. First, we can establish sales and sales growth for a larger number of firms, which allows for some inference. Accordingly, we calculate *Sales growth* from one period prior to two periods after the transaction, using the same definition of growth rates as for employment (see Section 3.3 and equation (4)) at the level of the merged firm. Similarly, we construct a variable *Labor productivity*, which is defined as the ratio of *Sales* to the number of employees; we calculate the growth in *Labor productivity* accordingly. We then perform regressions on the *Treatment* indicator, with *Sales growth* and *Labor productivity* as the dependent variables. Table 6 reports the results for all 835 observations for which we can calculate *Sales growth* (columns 1, 2), and for all observations for which we can calculate *Sales growth* for the treated as well as for the matching control observations (columns 3, 4). The even-numbered columns include non-parametric cell indicators, whereas the odd-numbered columns do not. There is only limited evidence that *Sales growth* is higher for merged firms compared to matching control firms. However, there is consistent evidence that *Labor productivity* increases after mergers if we measure the change in *Labor productivity* in dollars (Panel B), and somewhat weaker evidence if we use the percentage growth in *Labor productivity* as the dependent variable (Panel C).

Our second approach uses the high-quality wage data we have access to more directly, and builds on the notion that wages per employee measure labor productivity in a competitive equilibrium (see Huneeus et al., 2021, for a similar argument and analysis). Since the composition of the labor force changes dramatically after M&As, our focus is on those employees who were

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[22]During most of our sample period, the penalty for not complying with reporting requirements was only €25,000. Apparently, many firms treated this as an opt-out fee.

employed with either the acquirer or the target in the year before the acquisition, and who remain with the merged firm until two years after the acquisition. We report the changes in their wages in Panel D. For completeness, we also report wage changes for the entire labor force and continue to employ the same research design and matching strategy as in Panels A to C, and obtain very consistent results. All measures show that wages go up consistently and all increases are statistically significant and indicate wage increases for the employees who stay of about 0.7% to 0.8%; including all employees indicates increases of about 4.1% to 4.6%, which also includes composition effects. Hence, the wage-based analysis corroborates the results from Panels A to C that labor productivity increases after mergers. The results for employees who stay also provides evidence against the hypothesis that mergers involve a "breach of trust" (Shleifer and Summers, 1988), which implies that employees who are locked into their employment relationship with the firm have to accept wage cuts after mergers (see Rosett, 1990, for an earlier critical assessment of this hypothesis).

4.5 Discussion

The analysis so far has established three important stylized facts about the post-merger restructuring of the labor force: (1) the decline of employment is substantial; (2) turnover is very large and shifts jobs from targets to acquirers; and (3) most restructuring is through the external labor market and not through internal labor markets. Facts (2) and (3) taken together can be summarized as implying that post-merger restructuring involves a significant movement of jobs, but not of employees, from acquirers to targets.

Before we move on to further analyses that investigate additional facets and potential drivers of these facts, we provide some preliminary discussion of potential explanations. This allows us also to assess which further analyses are required to provide a more complete understanding. The decline in employment (Fact 1) is not entirely surprising in light of the literature we review above (see Table A1 and the discussion in Section 2), although the size of this effect is larger than found in most but not all prior studies on M&As. It is also larger than what related studies find for restructuring after private-equity buyouts.[23] We would expect

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[23]See Olsson and Tåg (2017) for Sweden, Antoni, Maug, and Obernberger (2019) for Germany, and García-

large employment declines to particularly likely if mergers consolidate similar operations to achieve economies of scale, hence, they should be prominent in horizontal mergers. We will follow up on this notion by breaking down key results by the industrial relatedness of merging partners.

The turnover we find (Fact 2) is a novel effect that has not been documented in the prior literature. It is also puzzling, because hiring and separations are associated with significant costs, so we would expect firms to minimize turnover to reduce hiring and separation costs. Some separations are arguably voluntary, but firms could probably prevent these if they wanted to by increasing compensation or fringe benefits. However, we show that more than 40% of the separated employees become unemployed or accept lower-paying jobs, and these are unlikely to be voluntary. Based on these considerations, and also on the observation reported above that inflows and outflows are positively correlated, it seems more plausible that the turnover after acquisitions is intentional, and that firms are trying to affect the composition rather than just the size of their workforce.

From the perspective of most theories on how M&As may create value for shareholders that are current in M&A research, the large employee turnover after transactions is difficult to explain. Briefly, we consider the following theories, and evaluate them in light of the evidence we present above:[24] (1) M&As relax financial constraints. Then employment should increase after transactions, as financial constraints have been relaxed, which is the opposite of what we observe. (2) Mergers are anti-competitive. Theories of consolidation can explain reductions in output and, accordingly, declines in net employment. However, the size of the decline would still be surprising, most transactions in our sample are too small to have an effective impact on market structure, and the increase in turnover still remains unexplained. (3) Breach of implicit contracts ("breach of trust"). We comment on this approach above, which is difficult

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Gómez, Maug, and Obernberger (2022) for the Netherlands, who find employment declines that are either negligible (Sweden) or about 10% (Germany, Netherlands) and, therefore, of much smaller magnitude.

[24]We do not attempt a comprehensive evaluation of theories of synergies in M&As here. An incomplete list of theories, with selected references includes: Creation of monopoly power: Eckbo (1983); Cai, Song, and Walkling (2011); creation of monopsony power in labor markets: Fulghieri and Sevilir (2011); overcoming contracting inefficiencies along the supply chain: Kedia, Ravid, and Pons (2011); product differentiation: Hoberg and Phillips (2010), Sheen (2014); recombining assets: Maksimovic, Phillips, and Prabhala (2011); efficiency gains: Erel (2011); relaxing financial constraints: Erel, Jang, and Weisbach (2015), Almeida, Kim, and Kim (2015).

to reconcile with the wage increases of employees who stay with the firm, which we document above; this approach would also not predict increases in employee turnover. (4) The creation of internal labor markets. We have discussed this paradigm above, which has only limited explanatory power, in particular for the large portion of restructuring that involves external labor markets. (5) Acqui-hiring: as noted above, we are skeptical of this argument as a general explanation for synergy creation in mergers, since the size of employees who are transferred from the target to the acquirer is small, and there seem to be too many employees who leave relative to those that are acqui-hired.

As noted in the Introduction, we do not claim to test and "reject" any of these theories. To the contrary, we assume that all these theories identify factors that are relevant for synergy creation and corresponding changes to the labor force in some transactions. We simply conclude that these theories will not help with explaining the stylized facts, presumably because they are not relevant for a sufficiently large part of our sample. Consequently, from now on, the remainder of the discussion draws on those theories that focus on two groups of economic factors: product-market considerations (other than anti-competitive motivations) and changes in the management, organization, and composition of the workforce.

5 Management and organization

In this section, we pursue the analysis of the organization and composition of the workforce. Section 5.1 focuses on changes of management, which plays a critical role in post-merger restructuring, whereas Section 5.2 analyzes the hierarchical structure of firms. Finally, Section 5.3 creates a typology of mergers and analyzes management and organization for subsamples based on the industrial relatedness of acquirers and targets.

5.1 Management

A literature in organizational economics argues that the quality of management and managerial practices have a significant role in creating productivity improvements, which is as important as changes in technology (e.g., Bloom and Van Reenen (2007); Bloom et al. (2013); Atalay,

Hortacsu, and Syverson (2014)). However, managerial practices can often not be transferred like technological blueprints and are embedded in the managers who are familiar with these practices. Hence, we hypothesize that the restructuring of management serves the purpose of applying the management practices of acquirers to the operations of targets, and that firms that grow through acquisitions will build managerial capacities after mergers.

Table 7 shows the flows for managers, broken down by the status of target closure, in the same format as Table 3 does for the general workforce. Here, the term "managers" refers to middle management and is defined from the occupational codes using the Blossfeld (1987) classification. Table OA5 in the Online Appendix provides the results for managers in a more detailed format, in parallel to Table 2 for the general workforce. Table OA6 in the Online Appendix repeats the same analysis for highly-qualified employees. Highly-qualified employees are also defined from the occupational codes using the Blossfeld (1987) classification and include managers. We do not discuss the results for highly-qualified employees in detail, since they are qualitatively similar, but quantitatively weaker, and usually lie somewhere between those for managers and those for the general workforce; thus, they do not provide additional insights. Note that all these tables include transitions between categories, e.g., transitions between managerial and non-managerial positions, in addition to the flows analyzed before. We refer to transitions of employees in non-management positions to managerial positions as promotions, and to flows in the opposite direction as demotions. These flows are mostly statistically insignificant and do not play a major role in our discussion.

Two observations apply to both subsamples, that with surviving targets and that with closed targets. First, the net employment growth of management is slightly higher than that for the general workforce, which shifts the proportions in the overall workforce slightly toward management. Second, turnover for managers is much higher than for the general workforce: It is 10.8% for surviving targets (general workforce: 5.2%) and 27.4% for closed targets (general workforce: 12.3%). Hence, we can safely conclude that restructuring is happening mostly at the top of the organization, consistent with the notion that restructuring is largely about changing the organization of the firm and its management processes. For the remaining discussion, we analyze transactions with surviving targets and those with closed

targets separately.

Surviving targets. In transactions in which the target survives, the *Total outflow* and the *External outflow* of managers are very high (7.3% and 6.5%, respectively), hence, incumbent target managers are replaced at a much higher rate compared to the general workforce of the target, for which the *External outflow* is not even statistically significant. These losses are more than compensated by inflows, which amount 15.4% (total *Inflow*) and 12.5% (*External inflow*), respectively. However, about 70% of these abnormal inflows are at the acquirer, and only 30% are at the target. This observation suggests that, in many cases, surviving targets retain their general workforce, but they are now managed by the acquirer, and by managers located in the plants of the acquirer. The transfer of managers from the acquirer to the target, as suggested by the theory of embedded managerial processes, is statistically highly significant *(Internal inflow* from the acquirer to the target is 0.8%), but still relatively less important when compared to the external hiring of managers at the target (*External inflow* of managers to the target: 3.7%). Hence, the results support the notion that acquirers restructure targets by completely redefining management processes, but the dominant model seems to be to direct targets from establishments of the acquirer, and externally hire and train new managers; by contrast, transfers of the acquirer's managers to the target are less important. Note also that *Net employment growth* of managers is much less (4.7%) than the difference between total inflows and total outflows (8.1% = 15.4% - 7.3%), because the balance between promotions and demotions is also reduced. Put differently, M&As reduce the net transitions of employees from non-managerial to managerial positions. This suggests that the internal career paths of some employees will be closed, as new managers are hired from outside the merging firms. Finally, note that only very few managers move from the target to the acquirer (0.6% compared to the *External inflow* of 8.8% at the acquirer and the *External outflow* of 6.5% at the target). Hence, there is no evidence for the acqui-hiring of middle managers.

Closed targets. The most remarkable observation on the transactions in which the target is closed is the loss of managers at the acquirer, which is 24.3% (*External outflow*), compared to

10.9% or the general workforce of the acquirer. Hence, when targets are closed, the abnormal loss of managers is more than twice as high as the loss of rank-and-file employees at the acquirer. By contrast, the loss of managers of the target is only 12.9%, which is unusually small, since targets lose 22.7% of their general workforce. Hence, when acquirers close target establishments, they retain the targets' managers at a much higher rate than they retain rank-and-file employees, and many retained managers (5.6%) are transferred from the target to the acquirer; the opposite conclusion holds for managers at the acquirer, who leave at a higher rate than other employees. Our interpretation of these observations is that acquirers continue the operations of the target, but transfer them to their own establishments. For this purpose, they need a critical number of the managers, and potentially also of other highly-skilled employees, of the target, and more than they need the target's other employees, presumably in order to retain targets' firm-specific human capital. However, the managers that are transferred from the target's to the acquirer's establishment displace some of the acquirer's incumbent managers, or potentially close their career paths for future promotions, so that many of the acquirer's managers leave. This displacement argument appears more plausible than the acqui-hiring argument in this case, because for every target manager who is transferred to the acquirer, there are more than two target managers who leave for the external labor market (*External outflow* = 12.9%, *Internal outflow* = 5.6%), and more than four managers who are hired from the outside at the acquirer (where *External inflow* is 26.2%). Hence, simply acqui-hiring managers from the target without continuing the target's operations would be costly and satisfy only a small portion of acquirers' demand for managers. Table OA5 in the Online Appendix shows that acquirer managers leave mostly for new jobs with a higher wage, which supports the notion that they leave voluntarily rather than being laid off after the firm acqui-hired more suitable managers from the target.[25]

Restructuring management.   Synthesizing the closed-target and the surviving-target cases suggests that integrating the target's operations requires both, the knowledge and skills of some of the incumbent target managers, probably because they understand the target's

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[25]Table OA5 shows that, for the entire group of transactions, the abnormal outflow of managers to other firms is 5.17%, of which 4.53% is with a wage increase and 0.64% (insignificant) is with a wage decrease.

technology and clients; and the knowledge and skills of the acquirers' management, probably because they are steeped in the acquirers' management practices. Hence, the knowledge and skills of acquirers' and targets' managers complement each other, and no group and can completely substitute the contribution of the other group. Hence, when targets are closed, acquirers still need to retain some of the target's managers, and when targets survive, then acquirers still need to replace some of the target's management. However, the argument that managerial processes are embodied can explain only the internal transfers, whereas the dominant restructuring model involves mostly new hiring. Hence, we infer that management practices are only partially embodied in incumbent managers, and can also be transferred by training newly-hired managers in the practices of the acquirer.

5.2 Organization and hierarchies

In this section, we investigate how M&As affect the organizational structures of the firm. We capture the organizational structure by the number of layers of management. We construct these layers from occupational codes, following Caliendo, Monte, and Rossi-Hansberg (2015) and Gumpert, Steimer, and Antoni (2019).[26] The bottom layer is layer 1 (production workers) and the highest potential layer is layer 4 (CEOs and managing directors). Layers 2 and 3 include different ranks of middle managers; see Appendix A.2 for further details on the construction of layers. Table OA3 in the Online Appendix provides descriptive information on the number of layers, employment, and wages in each firm, separately for targets and acquirers (in the pre-acquisition year) and for the merged firms. Only two-thirds of the acquirers (704 firms) and two-fifths of the targets (452 firms) have four layers, and layers are not always consecutive; for example, a firm may have employees in layers 1, 2, and 4, but none in layer 3.

We are interested in whether M&As affect the layer structure of the firm. Again, we draw on the theory of knowledge-based hierarchies and hypothesize that merging firms achieve

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[26]This methodology for assigning employees to hierarchies based on occupational codes is the one most widely-used method in the literature, since it can be applied to large-scale data sets (see Tåg, 2013, 2016; Bastos, Monteiro, and Straume, 2018; Gumpert, Steimer, and Antoni, 2019; Friedrich, 2022). Other methods classify employees based on job titles, or job titles combined with transitions between jobs (Baker, Gibbs, and Holmstrom, 1994a; Grund, 2005; Huitfeldt et al., 2022), which are usually only applied to small data sets with data on job titles or reporting relationships.

economies of scale by reorganizing the layer structure of the firm. We introduced this theory in Section 4.3 above to argue how a "shadow of the superstars" can explain the patterns of labor inflows and outflows, and the way in which turnover affects the composition of the labor force. In particular, creating higher levels of management can be thought of as an investment, which pays off by reducing the skill requirements in the middle of the organization. We now test two implications of this argument for the way in which M&As affect the layer-structure of the firm.

Changes in scale and the number of layers. First, we should see a strong positive relationship between an increase (decrease) in scale and an increase (decrease) in the number of layers: Expanding firms should increase the number of layers, since they would otherwise have to increase their control spans, and larger control spans require that employees work more independently, i.e., they require the firm to hire higher-skilled and more expensive employees. Similarly, contracting firms reduce the number of layers, since maintaining additional layers of management is associated with fixed costs. Testing this hypothesis requires a measure of scale, and we use the growth of the wage bill, denoted by g^{WB}, which compares the wage bill of the merged firm in period $t + 2$ with the wage bill of the acquirer in period $t - 1$. Since we follow the blueprint of their analysis, we construct this variable as the closest possible approximation to the variable "Value added" used in Caliendo, Monte, and Rossi-Hansberg (2015).[27] Our dependent variable is the change in the number of layers, $\Delta Layers$, which we measure as the difference between the number of layers of the merged firm in period $t + 2$ and the number of layers of the acquirer in period $t - 1$.

To begin, we run a simple OLS regression of $\Delta Layers$ on g^{WB} and report the results in line 1 of Table 8. Next, we define dummy variables to separate increases in the number of layers from decreases in the number of layers, respectively, to separate expanding firms from consolidating firms, since we want to test both parts of the hypothesis. Hence, $D(\Delta Layers > 0) = 1$ for an increase in the number of layers, and $D(\Delta Layers < 0) = 1$ for a reduction in the number of layers; both variables are zero otherwise. We report the results for OLS regressions

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[27]IAB does not report profits at the plant level, so we approximate value added by using the sum of all wages of all employees of the firm as reported by IAB.

with $\Delta Layers$ as the dependent variable in line 1, and those with the dummy variables $D(\Delta Layers > 0)$ and $D(\Delta Layers < 0)$ as dependent variables in line 2 and 3. All coefficients have the expected signs. There is a strong association between the change in scale of operations and the change in the number of hierarchical layers.

Industrial relatedness and the number of layers. Second, we hypothesize that more complex firms with more diversified operations require more layers of management, since the general managers at the top can only direct operations in which they are not experts with the help of intermediate layers of expert managers. To test this hypothesis, we define a new variable g^{Num}, which is the growth of the number of industries in which the acquirer operates between $t-1$ and $t+2$, and run multivariate regressions of $\Delta Layers$, respectively $D(\Delta Layers > 0)$ and $D(\Delta Layers < 0)$, on g^{WB} and on g^{Num}. Lines 4 to 6 of Table 8 report the results. We find some evidence for a positive impact of increases in the number of industries on the number of layers in the linear probability model (line 5, coefficient of 0.08, significant at the 10% level). Overall, these results support the conclusion that unrelated acquisitions that increase the number of product lines require more layers of middle management.

5.3 Organization and industrial relatedness

In this section, we relate labor restructuring and the organization of the firm to different merger types, which we distinguish by their industrial relatedness. In particular, we define an acquisition as *horizontal* if acquirer and target both operate in the same NACE 2-digit industry; an acquisition is *vertical* if acquirer and target are vertically related, where vertical relations are inferred from industry-level input-output tables for Germany; finally, acquisitions are diversifying if they are neither horizontal nor vertical (see Appendix A.4 for further details). We observe 450 (43.1%) horizontal acquisitions, 296 (28.4%) vertical acquisitions, and 297 (28.5%) diversifying acquisitions in our sample. Table 9 reports key variables to describe each of these subsamples. Panel A of Table 9 reports the abnormal employee flows, which have all been defined and discussed above; Panel B reports descriptive statistics, in particular the means and medians of pre-merger size (defined as total employment in the year before the

merger), pre-merger 3-year employment growth, *Target closure*, and the *Hierarchy index.* The *Hierarchy index* is defined as an employee-weighted average of the layers of the firm, e.g., if all employees are in layer 1 (layer 4), then *Hierarchy index* equals one (four). Finally, Panel C of Table 9 shows the distribution of mergers by type and by the change in the hierarchical structure, i.e., whether firms increase, reduce, or do not change the number of layers after acquisitions. The data in Table 9 allow us to develop a simply typology of mergers:

Horizontal mergers.   Horizontal mergers have the lowest pre-merger employment growth, the largest acquirers, and the largest targets. We would classify these mergers as *consolidation* mergers of mature companies in mature markets. Acquirers and targets in horizontal mergers also have the flattest hierarchical structure as indicated by low values of the *Hierarchy index*, and the *Hierarchy index* of acquirers and targets is almost identical. Both facts are surprising, given that we establish in the previous section that the hierarchization of firms increases with size. Relatedly, horizontal mergers rarely lead to a change in the number of layers compared to other merger types. Hence, firms that undertake horizontal mergers seem to find it easier to change control spans, which is in line with our argument above that hierarchical structures become more important for firms that increase the number of industries in which they are active.

Diversifying mergers.   Diversifying mergers are different from the other two types because they have the lowest fraction of transactions in which targets are closed, and the lowest decline in employment. In fact, this is the only category of mergers for which the decline in employment is statistically insignificant. They also have the lowest employee turnover, consistent with our earlier discussion, which led us to conclude that both, employment decline and turnover, are associated with target closures. Finally, the targets of diversifying mergers are smaller and have a higher pre-merger growth compared to other types of mergers. Overall, we classify these mergers as transactions in which firms *acquire growth opportunities.* The merging partners are faster-growing and less mature firms. Acquirers presumably have a lower competence to manage to the target's operations, so it is less likely that the target is closed

and absorbed into the operations of the acquirer. Acquirers are more hierarchical before the acquisition, even though they are on average smaller, consistent with our discussion above that diversified firms have smaller control spans and need to be more hierarchical. Interestingly, the hierarchization of targets does not differ across merger types. Diversifying mergers also have the highest proportion of mergers in which layers are added, and the lowest proportion in which layers are removed after the acquisition, which reinforces the same point.

Vertical mergers. Vertical mergers are unusual in a number of ways. They have the highest incidence of closing the target, and, accordingly, also the largest decline in net employment, and they are undertaken by the smallest acquirers. We would label these mergers as *integration* mergers, which reflects the high frequency of integrating the target. This interpretation is also consistent with the notion that such mergers are undertaken to facilitate a smoother operation of a supply chain, or with the internalization of externalities in buyer-supplier relationships; both will arguably require more complete control of the target's operations. Interestingly, vertical mergers have by far the highest turnover of the labor force (10.5%, compared to 7.5% for horizontal and 6.4% for diversifying mergers), and, relatedly, the most active internal labor markets. In particular, they are the only category of mergers for which *Internal flow within*, i.e., the flows of employees within the acquirer, respectively, within the target, is statistically, and also economically, significant. Hence, it appears that in vertical mergers, the restructuring of the labor force sets in motion a sequence of job rotations, in which employees do not only move between acquirers, targets, and the external labor markets - in all dimensions vertical mergers dominate the other two types - but also within acquirers and within targets. This observation is puzzling, and we cannot offer a complete explanation here. However, it is consistent with the observation of Atalay, Hortacsu, and Syverson (2014), who argue that the movement of intangible resources, in particular of management practices, is particularly pertinent in vertical mergers, and far more important than the movement of goods along the supply chain.

Overall evaluation of merger types. The three categories of mergers are similar when we compare the average employment growth of acquirers, which ranges from 7.0% (vertical and horizontal mergers) to 7.5% (diversifying mergers), which is remarkable, given that they differ along many other dimensions. Our interpretation is that merger types differ mainly in the degree and frequency with which the target is closed and absorbed into the acquirer, which is consistently associated with more turnover and employment reduction. We hypothesize that a greater similarity of operations, which is probably lowest for diversifying mergers, tends to facilitate the absorption of the target, whereas a larger size of the target makes complete integration probably more difficult. However, given that all these determinants are correlated, these hypotheses require a multivariate analysis, which we undertake in the next section.

6 Determinants of employee flows

The analysis above relies mainly on bivariate comparisons and correlations to explore the multifaceted nature of the post-merger restructuring of the labor force. In this section we analyze the determinants of employee flows using multivariate regressions. To this end, we extend our methodology (Section 6.1) and then ask what drives employment growth (Section 6.2), turnover (Section 6.3), the activity levels in internal labor markets (6.4), and the incidence of target closure.

6.1 Methodology

We expand Equation (2) by including additional variables that describe the labor force of the merging partners, their hierarchical structure, their size and pre-acquisition growth, as well as their relatedness. We measure all these variables in the pre-acquisition year $t-1$ and interact them with the *Treated* indicator. Hence, we run:

$$
\begin{aligned}
y_{j,t-1,t+2} =& \alpha_t + \theta \times Treated_j + \beta X_{j,t-1} + \gamma \times Treated_j \times X_{j,t-1} \\
& + \lambda g_{j,t-3,t-1} + \sum_c D_{cj}\delta_c + \varepsilon_j,
\end{aligned}
\tag{3}
$$

where $y_{j,t-1,t+2}$ measure the outcome, $Treated_j$ is the treatment indicator, and $X_{j,t-1}$ is a vector of control variables. Our selected outcome variables are net employment growth $g_{j,t-1,t+2}$, key employee flows, *Turnover*, and *Target closure.*

In the vector $X_{j,t-1}$ we include the following variables (precise definitions of all variables can be found in Table A2 and the Appendix):

Relatedness (4 variables). We use three variables that characterize the industrial relatedness of target and acquirer: *Horizontal* and *Vertical* are indicator variables, which are equal to one if acquirer and target serve the same horizontal market, respectively, if they are vertically related, and zero otherwise. Hence, diversifying mergers form the reference group; *HCR*, or human-capital relatedness, is a measure of the pairwise human-capital relatedness of acquirers and targets as defined in Lee, Mauer, and Xu (2018).[28]

Growth and size (4 variables). We include the pre-acquisition growth of employment of the acquirer, *Acquirer growth*, and of the target, *Target growth*, as in the baseline regressions based on equation (2) discussed in the previous section. We also include the logarithm of total employment of acquirer and target as a proxy for size (*Acquirer size, Target size*).

Control variables (8 variables). We control for the pre-merger organization of acquirers and targets, for the composition of their workforce, and for geographical distance. We control for the organization by using the *Hierarchy index* introduced above, which is defined as an employee-weighted average of the index of hierarchical layers, to characterize the degree of hierarchization of the acquirer and the target. We control for the characteristics of the workforce by including the average daily wage, the average employee age, and the percentages of employees with high education, respectively, high qualification. In each case, we include the value for the target and a second variable that measures the difference of this measure (age, wage, etc.) between the acquirer and the target. Finally, we also control for geographical distance, defined as the driving distance between the headquarters of the acquirer and the

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[28]We also ran all key regressions using the measure of human capital transferability of Tate and Yang (2016) and obtain similar results.

headquarters of the target.

Since the number of variables and regressions is rather large, we only report estimates for the coefficients θ on $Treated_j$ and the coefficients γ on $Treated_j \times X_{j,t-1}$, and we perform the analysis only at the level of the merged firm. Table 10 shows the results for the general workforce in Panel A and for management in Panel B). The coefficients for the control variables are only reported in Table OA6 in the Online Appendix.

6.2 What drives growth and employment losses?

We first ask which variables drive net employment growth, which is shown in column 1 of Table 10. Observe that the treatment indicator is never significant. Hence, the interactions of the explanatory variables with *Treated* fully absorb the influence of treatment.

Acquirer size has a highly significant positive impact and *Target size* has an equally significant negative impact. To evaluate economic significance, we multiply the coefficients from Table 10 by the standard deviations of the explanatory variables (see Table 1), which gives an impact of about 12 pp for both variables (acquirer: +6.4x1.8; target: -8.6x1.4). The signs and size of these effects is surprising. First, we would have expected larger targets to carry more business opportunities, which permit the merged firm to growth faster, but this does not appear to be the case. Rather, it seems that larger targets have already matured and grown these business opportunities themselves, and require more adaptations to fit the purposes of the acquirer. Acquirers restructure these larger targets more radically, which is reflected in larger external outflows from the merged firm (Panel A, column 5).

We would have expected larger acquirers to grow more slowly, simply because an acquisition of a given size has relatively less impact on a larger acquirer, and because larger firms generally grow more slowly (Sutton, 1997). We can offer two mutually non-exclusive explanations. First, it is plausible that larger acquires are more constrained by the lack of business opportunities, whereas they have all other resources already in place, in particular management and management processes. Then an acquisition spurs faster post-acquisition growth, because it relaxes a more stringent constraint. Second, it could be that larger acquirers simply possess more capacities

to integrate and absorb targets into their organization.

Panel B of Table 10 shows the regression results from estimating equation (3) for managers. Many results for managers are similar to those for the general workforce. However, acquirer size is not significant anymore. While larger acquirers grow the general workforce more, they do not grow management more, most likely because larger acquirers already have the requisite managerial capacity for managing the target in place.

6.3   What drives the increase in turnover?

Next, we discuss the increase in employee turnover. Employee turnover, defined in equation (1) and measured at the level of the merged firm, increases by 7.83% for the general workforce and by 16.18% for managers (see Tables 2 and OA5 and Section 4.2). Three variables consistently explain the cross-sectional variation in turnover (see column 10 in Table 10): A one-standard deviation increase in HCR (0.50) increases turnover by 2.25 pp (=0.50x5.65); a one-standard deviation increase in the acquirer's pre-acquisition growth (0.29) increases turnover by 2.77 pp (=0.29x9.40); and a one-standard deviation increase in the target's pre-acquisition growth (0.23) increases turnover by 1.85 pp (=0.23x8.20).

Our interpretation is that growth is a process in which tasks and the labor force need to be continuously reconfigured; hence, growth drives turnover. Interestingly, the growth of the acquirer carries a quantitatively larger weight compared to the growth of the target. Hence, it is more the pre-acquisition growth of the acquirer that requires a more significant adaptation of the workforce than that of the target. These adaptations are more significant if the workforce of the acquirer and of the target are more similar, i.e., if HCR is higher, and this effect has economically about the same size as that of pre-acquisition growth. Note that, unlike industrial relatedness measured by *Horizontal* and *Vertical*, human-capital relatedness does not predict net employment growth (see column 1).[29] We hypothesize that a more similar target workforce has less complementarity with the skill set of the acquirer and induces more replacements.

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[29]This finding differs from that of Lee, Mauer, and Xu (2018) for M&As in the U.S., who find that HCR is related to net employment growth.

The variables that influence the turnover of managers are the same as those for the general workforce, but the effects are about twice as high as for the general workforce (compare Panels A and Panels B of Table 10). They also show that post-acquisition restructuring is predominantly a restructuring of the managerial functions of the firm.

6.4   What drives the activity levels in internal labor markets?

Next, we ask which factors affect whether firms increase the activity of their internal labor markets. Factors that affect the activity level of the internal labor markets are the pre-acquisition growth of the acquirer (coefficient: +3.46) and HCR (coefficient: +1.88); a one-standard deviation increase in either of these variables increases internal labor market activity at the merged firm by one percentage point. Both variables are also associated with external inflows to the acquirer, and their impact is more than twice as large for external inflows compared to internal inflows. Hence, this observation corroborates our earlier observation from simple bivariate correlations that external inflows and internal inflows are complementary in serving the staffing requirements of the firm.

The results for the internal flows of managers are again broadly similar to those of the general workforce, with the point estimates for acquirers' pre-acquisition growth being slightly larger. The most notable difference is that for managers, the industrial relatedness of the merging partners appears more relevant (the coefficients on these variables are statistically and economically more significant), whereas human-capital relatedness does not, exactly the opposite of what we see for the general workforce. This is plausible, because the transferability of managers' skills depends more likely on the similarity of the markets they operate in than on the similarity of the occupational characteristics of the workforce.

6.5   What drives target closure?

Finally, we analyze the potential causes of target closure in column 7, where we run a regression of the indicator *Target closure* against the same explanatory variables. We observe that, apart from the treatment indicator and the driving distance between acquirers' and targets'

headquarters, the only other variables that reliably predict *Target closure* are the size of acquirer and target, which both have a highly significant negative impact.

7   Conclusion

The post-merger restructuring of the labor force has many facets, but we attempt a summary of the overarching insights here to bring together the most important aspects. To begin, we argue that post-merger labor restructuring is best understood as an attempt to change the way the workforce is managed and organized. Other explanations related to labor markets, such as acqui-hiring, or the notion that internal labor markets improve efficiency, cannot explain the main stylized facts we document. The most important of these is the dramatic increase in employee turnover, which reduces the age, experience, and compensation of the workforce, without much of an effect on indicators of skill levels, such as education or qualification. We argue that this observation is best understood as a consequence of changes in the organization, which makes organizations more hierarchical and "top heavy," and we draw on theories that associate such reorganizations with a "shadow of the superstars," in which high-skilled employees at the top of the hierarchy release the skill requirements on those in the middle. By contrast, we find no indication that turnover increases because firms attempt to boost the overall quality of their workforce.

Turnover is predominantly through the external labor market, while internal labor markets are mostly small. Moreover, turnover shifts jobs, but not necessarily employees, from targets to acquirers, as separations are concentrated in targets while hiring is concentrated in acquirers. This process affects managers differently from other employees: target managers are retained at a lower rate than other employees when targets survive, but at a higher rate when targets close. With surviving targets, many new managers are hired, but at the acquirer, whereas with closing targets, managers transferred from the target displace managers at the acquirer, who then leave the firm. Hence, in both cases some managers from the target are retained and some new managers are hired, and we argue that the skills of both groups probably complement each other.

Our analysis suggests significant gaps in the theoretical literature. We observe that post-merger restructuring changes the organization and management of the firm, and we interpret these findings by drawing on overlapping paradigms in organizational economics. Yet, no integrated theory of how mergers affect firm organization and the composition of firms' labor force exists. The theory of the firm has often interpreted mergers as redrawing the boundaries of the firm, and as replacing markets with hierarchies. Hence, it is natural ask how firms should design hierarchies, and adapt the composition of their workforce after mergers. We conclude that developing a theory of M&As that provides detailed predictions on how replacing markets with hierarchies affects organizational design, management, and the composition of the labor force remains on the research agenda.

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A Appendix

This appendix provides more detailed information about the computation of growth rates, hiring rates, and separation rates (Section A.1).

A.1 Growth rates, separation rates, and hiring rates

We use the following definitions:

Symbol	Definition
E_{jt}	Number of all employees employed in firm j at the end of year t.
H_{jt}	Number of employees who enter firm j in period t, i.e. between the end of year $t-1$ and the end of year t.
S_{jt}	Number of employees who are separated from firm j in period t, i.e. between the end of year $t-1$ and the end of year t.

We then define employment growth between period $t-1$ and period t as

$$g_{j,t-1,t} \equiv \frac{E_{jt} - E_{j,t-1}}{0.5\left(E_{jt} + E_{j,t-1}\right)} \tag{4}$$

and observe that

$$E_{jt} - E_{j,t-1} = H_{jt} - S_{jt}. \tag{5}$$

We define one-year hiring rates and separation rates as

$$h_{jt} = \frac{H_{jt}}{0.5\left(E_{jt} + E_{j,t-1}\right)}, \quad s_{jt} = \frac{S_{jt}}{0.5\left(E_{jt} + E_{j,t-1}\right)}. \tag{6}$$

From (4), (5), and ((6)), we have

$$g_{j,t-1,t} = h_{jt} - s_{jt}. \tag{7}$$

We also compute multi-period employment flows as

$$E_{j,t+k} - E_{j,t-1} = \sum_{\tau=0}^{\tau=k}\left(E_{j,t+\tau} - E_{j,t+\tau-1}\right) = \sum_{\tau=0}^{\tau=k}\left(H_{j,t+\tau} - S_{j,t+\tau}\right) = H_{j,t-1,t+\tau} - S_{j,t-1,t+\tau}. \tag{8}$$

Multi-period rates. Multi-period growth rates between periods $t-1$ and $t+k$ are defined as

$$g_{j,t,t+k} \equiv \frac{E_{j,t+k} - E_{j,t-1}}{0.5\left(E_{j,t+k} + E_{j,t-1}\right)}. \tag{9}$$

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Multi-period hiring rates and separation rates are defined analogously to (9). Note that, generally, $g_{j,t-1,t+k} \neq \sum_{\tau=0}^{\tau=k} g_{j,t+\tau-1,t+\tau}$ and analogously for separation and hiring rates.

Percentage growth rates. We use γ to refer to conventional one-year percentage growth rates, which can be defined as

$$\gamma_{j,t-1,t} \equiv \frac{E_{jt} - E_{j,t-1}}{E_{j,t-1}}. \tag{10}$$

It is easy to show that

$$g_{j,t-1,t} = \frac{2\gamma_{j,t-1,t}}{2 + \gamma_{j,t-1,t}} \Leftrightarrow \gamma_{j,t-1,t} = \frac{2g_{j,t-1,t}}{2 - g_{j,t-1,t}}$$

and that $g_{j,t-1,t}$ and $\gamma_{j,t-1,t}$ are monotonically increasing functions of each other. However, their ranges are different, $\gamma_{j,t-1,t} \in [-1, \infty)$ whereas $g_{j,t-1,t} \in [-2, 2]$.

Growth rates and employment fractions. For this discussion, suppress the firm index j and the time indices $t - 1$ and t, and index employees in group h by the superscript h. Let $\phi_t^h \equiv \frac{E_t^h}{E_t}$ be the fraction of employees in group h, given by E_t^h, relative to the total number of employees $E_t \equiv \sum_h E_t^h$. Define the percentage growth rate of group h by $\gamma^h \equiv \frac{E_t^h - E_{t-1}^h}{E_{t-1}^h}$. The growth of the whole workforce, $\gamma \equiv E_t/E_{t-1} - 1$, is a weighted average of the percentage growth rates of the different groups, i.e.

$$\gamma = \frac{\sum_h E_{t-1}^h \left(1 + \gamma^h\right)}{E_{t-1}} - E_{t-1} = \sum_h f_{t-1}^h \gamma^h.$$

Note that the growth rates g defined in (4) and (9) do not have this property. Observe also that

$$\phi_t^h = \frac{E_{t-1}^h \left(1 + \gamma^h\right)}{E_{t-1} \left(1 + \gamma\right)} = \phi_{t-1}^h \frac{\gamma^h - \gamma}{1 + \gamma}.$$

Hence, $\phi_t^h > \phi_{t-1}^h \Longleftrightarrow \gamma^h > \gamma$. Since the previous observation implies that $\gamma^h > \gamma \Longleftrightarrow g^h > g$, we have that fractions ϕ^h increase exactly for those groups whose employment growth is higher than the overall growth rate, independently of whether the growth rate is defined as a percentage growth rate or as in (4) and (9).

Turnover. To relate our definition of *Turnover* in equation (1) to other definitions in the literature, which regard turnover as an average of inflows and outflows (e.g., Davis and Haltiwanger, 1999; Cahuc, Carcillo, and Zylberberg, 2014), observe the following (suppress

subscripts for time and firm for simplicity):

$$
\begin{aligned}
TO = Min\,(s, h) \\
&= \frac{s + h}{2} + \frac{1}{2} Min\,(h - s, s - h) \\
&= \frac{s + h}{2} - \frac{1}{2} Max\,(h - s, s - h) \\
&= \frac{s + h}{2} - \frac{1}{2} |g|,
\end{aligned}
\tag{11}
$$

where the last line uses ((7)). Hence, defining turnover as $\frac{s+h}{2}$ also captures the absolute value of net employment growth, $|g|$.

A.2 Variables derived from the Integrated Employment Biographies

Most variables in our analyses are derived from the Integrated Employment Biographies (IEB) database. The IEB contains every dependent employee in Germany, i.e. all regular employees since 1975 in West Germany and since 1992 in East Germany as well as all marginally employed workers since 1999.[30] The data are structured in terms of spells, i.e. employment relationships, and the data source reports starting and ending dates of these spells on a daily basis. If employment relationships continue into the following calendar year, a notification is given by the employer at the end of each year. The continued employment relationship is represented by a new spell in the following calendar year. For categorical variables such as education, qualification, and establishment affiliation, we use the information from the latest spell in a calendar year. An employee's daily wage is based on the individual's earnings in the firm over the calendar year divided by the number of days in employment. The employee's earnings are top-coded, because earnings above a threshold ranging from 51,000 in 1998 to 70,000 in 2013 Euros are exempt from certain social-security contributions. *Age* is determined on the last day of the calendar year.

A.2.1 Occupation-related variables based on Blossfeld (1987): *Qualification* and *Manager*

All qualification-related variables and *Manager* are derived from Blossfeld (1987), who classifies jobs into 12 distinct major occupations based on the German Classification of Occupations 1988 (KldB 1988). Table 1 on page 99 in Blossfeld (1987) provides a detailed overview on those 12 occupations and related ISCO codes. We sort the occupational groups presented in Blossfeld

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[30]The IEB does not cover civil servants and the self-employed. These groups are irrelevant for the companies in our sample. For more details on the sources and structure of IAB's administrative data, see Antoni, Ganzer, and Vom Berge (2016).

(1987) into three groups according to the level of their qualification. Low qualification: Simple manual occupations, simple services, simple commercial and administrative occupations. Medium qualification: Skilled manual occupations, qualified services, semi-professions, qualified commercial and administrative occupations. High qualification: technicians, engineers, professions, managers. The *Qualification index* reports the average employee qualification level of an entity at the end of the calendar year. We assign a value of one for each low qualification, two for each medium qualification, and three for each high qualification employee.

A.2.2 Layers

We construct a four layer management hierarchy following Caliendo, Monte, and Rossi-Hansberg (2015). Based on five-digit occupational codes from the German (IAB) data we assign each employee (at the end of the calendar year) to one layer, the lowest layer being layer 1 (production workers) and the highest potential layer being layer 4 (CEOs and managing directors). Layers 2 and 3 include different ranks of middle managers. We use the exact same layer assignment from occupational codes as Gumpert, Steimer, and Antoni (2019), who adapt the layer definitions Caliendo, Monte, and Rossi-Hansberg use for France to German (IAB) data. See Gumpert, Steimer, and Antoni (2019), especially their Appendix A.3 ("Assignment of occupations to layers") for further details.

A.2.3 Education index

Education index is based on a categorical variable in the IEB database, which records the following education milestones: no school leaving certificate or intermediate school leaving certificate (ISLC), ISLC with vocational training, upper secondary school leaving certificate (USSLC) with or without vocational training, college, university degree. The *Education index* reports the average employee education level of an entity at the end of the calendar year. We assign a value of one for each employee with only ISLC, two for each employee with ISLC and vocational training, three for each employee with USSLC with or without vocational training, four for each employee with college degree, and five for each employee with university degree at the end of the calendar year.

A.3 Human capital relatedness (*HCR*): Lee, Mauer, and Xu, 2018

Lee, Mauer, and Xu, 2018 propose HCR as a measure of the relatedness between the workforce of two companies. Their original measure is based on 4-digit NAICS Occupation profiles from Occupational Employment Statistics (OES) and 3-digit SIC codes from the Compustat Industry Segment Database (CIS). The measure therefore does not compute the human capital relatedness of two firms, but of the two industries in which these firms operate. We deviate

from this approach because our data allows us to compute the human capital relatedness of two firms. We start by computing firm-specific occupation shares based on a three-digit job classifier (142 values, according to the German Classification of Occupations 2010, KldB 2010). For each firm we compute the share of each occupation of those 142 occupations and compute HCR as $HCR = (H_A H_T') / \left(\sqrt{(H_A H_A')} \sqrt{(H_T H_T')} \right)$. H_A and H_T denote the human capital profile of the acquirer and the target firm (vector of occupations shares). HCR is thus a normalized measure between zero and one.

A.4   Industry relatedness (*Related*)

Related indicates whether the acquirer and the target operate in related industries. *Related* is equal to 1 if both target and acquirer operate in the same industry according to the 2-digit NACE-code or if target and acquirer operate in vertically integrated industries. To determine vertical integration, we use industry-level data on the input and output of goods provided by the OECD for Germany (in 2010). We expand the 36 industries in the OECD data to the 88 2-digit NACE industries in our sample and compute the relatedness of output and input between two industries. We define two industries to be vertically integrated, if the input-output relatedness is above the median input-output relatedness of all industries in our sample. We use the 2018 edition of the OECD input-output tables, which can be found here: `https://stats.oecd.org/Index.aspx?DataSetCode=IOTSI4_2018`.

A.5   Overview of the literature on M&As and labor

Table A1: Literature overview. This table provides a condensed overview of the Labor and M&A literature. The columns provide the following information. *Country:* ISO code of the country for domestic studies and INT for international (cross-country) samples. *Period:* Sample period. *#Obs:* Number of transactions investigated in the study. *Transaction:* Type of corporate control transaction investigated in the study. *Empl.:* Reports how employment is affected by corporate control transactions. *Wages:* Reports how employee wages are affected by corporate control transactions. Codes: A - ambiguous, P - significantly positive, N significantly negative, I - insignificant. *Topic:* Reports the direction of causality investigated in the study: M&A => Labor - the effect of M&As on labor outcome variables, Labor => M&A - the effect of labor variables on M&As.

Paper	Sample			Transaction	Labor outcome		Topic
	Country	Period	# Obs		Empl.	Wages	
Agrawal and Tambe (2019)	USA	n.a.	29,648	M&As			M&A => Labor
Ahmad and Lambert (2019)	INT	1992-2010	32,912	M&As			Labor => M&A
Almeida (2007)	PRT	1991-1998	1,381	M&As	I	I	M&A => Labor, Labor => M&A
Amess, Girma, and Wright (2014)	GBR	1996-2006	527	Takeovers, LBOs	N	I	M&A => Labor
Arnold (2019)	USA	1999-2009	7,100	M&As, OC of plants		A	M&A => Labor
Bandick and Görg (2010)	SWE	1993-2002	207	M&As	P		M&A => Labor
Bhagat, Shleifer, and Vishny (1990)	USA	1984-1986	62	Hostile takeovers	N		M&A => Labor
Brown and Medoff (1988)	USA	1978-1984	6,884	M&As	A	A	M&A => Labor
Carriquiry (2018)	DNK	2001-2010	3,489	M&As	N		M&A => Labor
Chen, Gao, and Ma (2020)	USA	1980-2013	10,911	M&As			Labor => M&A
Conyon et al. (2001)	GBR	1983-1996	240	Takeovers	N		M&A => Labor
Conyon et al. (2002)	GBR	1967-1996	442	M&As	N		M&A => Labor
Dessaint, Golubov, and Volpin (2017)	INT	1985-2007	45,696	M&As			Labor => M&A
Furlan (2015)	INT	2003-2010	ca. 1200	M&As	P		M&A => Labor
Geurts and Van Biesebroeck (2019)	BEL	2005-2012	2,601	M&As, Takeovers	N		M&A => Labor
Girma and Görg (2017)	GBR	1981-1994	303		A	A	M&A => Labor
Gokhale, Groshen, and Neumark (1995)	USA	1980-1991	133	Takeovers		P	M&A => Labor
Gugler and Yurtoglu (2004)	INT	1981-1998	646	M&As	A		M&A => Labor
He and le Maire (2020)	DNK	1995-2011	ca. 3700	M&As		N	M&A => Labor
Huttunen (2007)	FIN	1988-2001	284	Foreign M&As	N	P	M&A => Labor

Table A1: Literature overview (continued).

Paper	Sample		# Obs	Transaction	Labor outcome		Topic
	Country	Period			Empl.	Wages	
?	USA	1990-2011	3,700	M&As of startups	N		M&A => Labor
Krishnan, Hitt, and Park (2007)	USA	1992-1998	174	M&As	N		M&A => Labor
Lagaras (2020a)	BRA	2004-2012	2,096	M&As	N	P	M&A => Labor
Lagaras (2020b)	BRA	2004-2012	2,096	M&As	N	N	M&A => Labor
Lee, Mauer, and Xu (2018)	USA	1997-2012	1,322		N		M&A => Labor, Labor => M&A
Lehto and Böckerman (2008)	FIN	1989-2003	7,923	M&As	N		M&A => Labor
Levine, Lin, and Shen (2015)	INT	1991-2012	11,485	M&As			Labor => M&A
Li and Wang (2020)	USA	1981-2012	942	M&As	N		M&A => Labor
Li (2013)	USA	1981-2002	1,430	M&As	N	N	M&A => Labor
Lichtenberg and Siegel (1990)	USA	1972-1981	2,027	OC of plants	N	I	M&A => Labor
Lie and Que (2019)	USA	1987-2009	10,835	Asset sales, takeovers		I	M&A => Labor
Ma, Ouimet, and Simintzi (2021)	USA	1980-2010	396	M&As		P	M&A => Labor
McGuckin and Nguyen (1995)	USA	1977-1987	4,495	M&As	A	A	M&A => Labor
McGuckin and Nguyen (2001)	USA	1977-1987	20,383	OC of plants	P	P	M&A => Labor
McGuckin, Nguyen, and Reznek (1998)	USA	1977-1987	2,111	OC of plants	P	P	M&A => Labor
Neffke and Henning (2013)	SWE	2004-2007	17,504	Organic growth			Labor => M&A
Oldford and Otchere (2016)	CAN	1980-2008	804	M&As	N	N	M&A => Labor
Ouimet and Zarutskie (2020)	USA	1995-2005	1,800	M&As		P	M&A => Labor
Prager and Schmitt (2021)	USA	2000-2010	85	M&As		A	M&A => Labor
Ranft and Lord (2000)	USA	1994-1995	89	M&As	N		M&A => Labor
Rosett (1990)	USA	1976-1987	258	Takeovers		I	M&A => Labor
Shleifer and Summers (1988)	USA	1970-1985	4	Takeovers	N	N	M&A => Labor
Siegel and Simons (2010)	SWE	1985-1998	ca. 11000	M&As		N	M&A => Labor
Tate and Yang (2016)	USA	1995-2007	3,900	M&As			M&A => Labor, Labor => M&A
?	USA	1978-2008	1,814	Union elections			Labor => M&A
Younge, Tong, and Fleming (2015)	USA	1979-1998	ca. 500	M&As			Labor => M&A

A.6   Variable definitions

Table A2: Description of variables. The table defines the main numerical variables used in the paper. All other variables are defined in the respective captions of the tables using them.

Variable name	Definition	Values
$\text{Age}_{A\text{-}T}$	Age_A - Age_T	$[0:\infty]$
Age_k	Average age of all full-time employees in entity k	$[0:\infty]$
Distance	Driving distance between target HQ and acquirer HQ in minutes	$[0:\infty]$
$\text{Education}_{A\text{-}T}$	Education_A - Education_T	$[-100:100]$
Education_k	Share of employees with college or university degree in entity k	$[0:100]$
External inflow_k	Inflow_k from the external labor market, i.e., inflow from an establishment which is not part of the merged firm	$[0:\infty]$
$\text{External outflow}_k$	Outflow_k into the external labor market, i.e., outflow to an establishment which is not part of the merged firm	$[0:\infty]$
Growth_k	Employment growth rate g from t=-2 to t=-1 as defined in Section 3.3 and Appendix A.1	$[-2:2]$
HCR	Human capital relatedness index based on Lee et al. (2018), details see Appendix A.3	$[0:100]$
Hierarchy_k	Employee-weighted average of the number of hierarchical layers in entity k	$[0:4]$
Inflow_k	Employment inflow h into an establishment of entity k between event year t=-1 and t=2 as defined in Section 3.3 and Appendix A.1	$[0:\infty]$
Internal inflow_k	Inflow_k from the internal labor market, i.e., inflow from another establishment of the merged firm	$[0:\infty]$
$\text{Internal outflow}_k$	Outflow_k into the internal labor market, i.e., outflow to another establishment of the merged firm	$[0:\infty]$
Manager	One if occupation is equal to "Manager', details see Appendix A.2	$[0,1]$
Net Emp. Growth_k	Employment growth rate g of entity k from event year t=-1 to t=2 as defined in Section 3.3 and Appendix A.1	$[-2:2]$
Outflow_k	Employment outflow s from an establishment of entity k between event year t=-1 and t=2 as defined in Section 3.3 and Appendix A.1	$[0:\infty]$
$\text{Qualification}_{A\text{-}T}$	Qualification_A - Qualification_T	$[-100:100]$
Qualification_k	Share of employees identified as Technicians, Engineers, Profession-Members, or Managers in entity k, details see Appendix A.2	$[0:100]$
Related	One if target and acquirer are in the same industry or display above median relatedness, details see Appendix A.4	$[0,1]$
Size_k	Number of employees employed in entity k	$[0:\infty]$
Target closure	One if employment in target is zero at the end of t=2	$[0,1]$
$\text{Wage}_{A\text{-}T}$	Wage_A - Wage_T	$[0:\infty]$
Wage_k	Average daily wage of all full-time employees in entity k	$[0:\infty]$

B   Figures
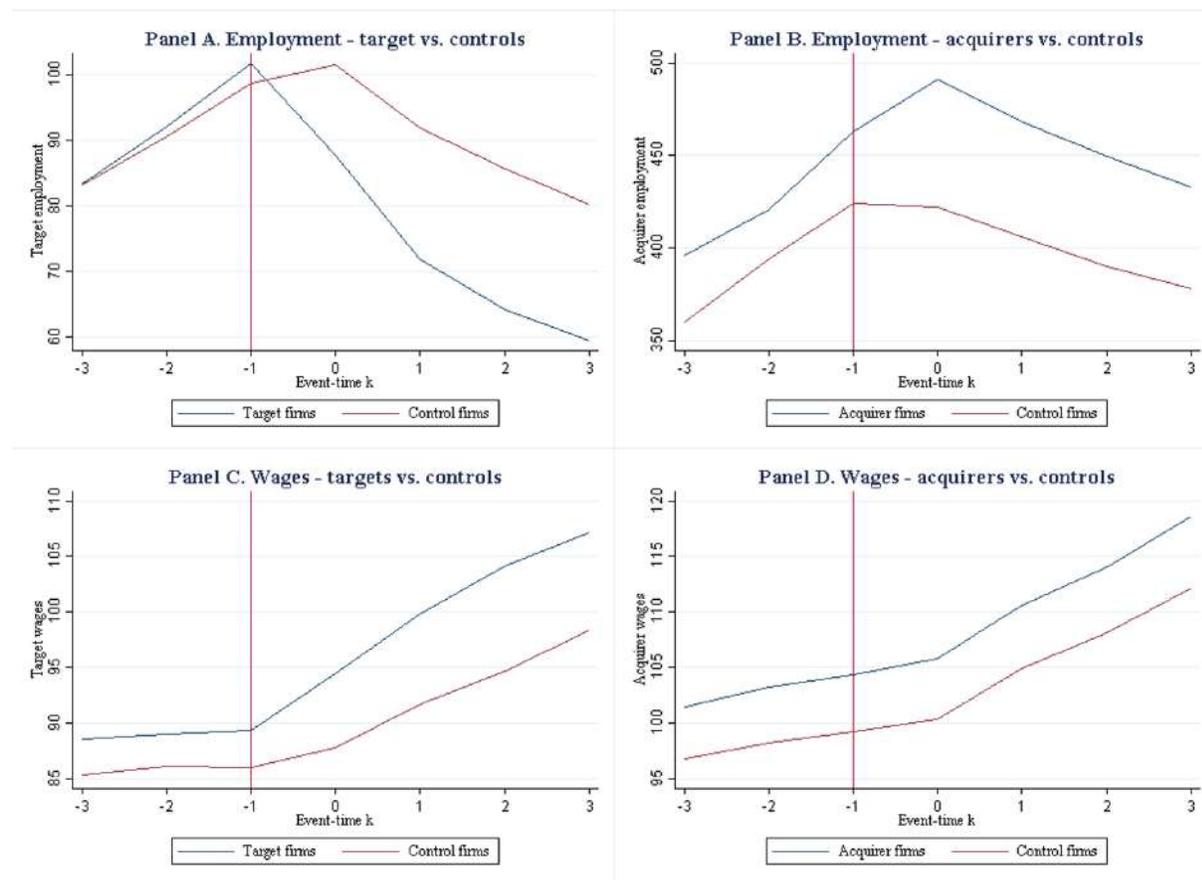
Figure 1: Firm-level employment and wages. Panel A (Panel B) shows the average total employment at the target (acquirer). Panel C (Panel D) shows the average *Wage* paid at the at the target (acquirer). *Wage* is defined in Table A2.
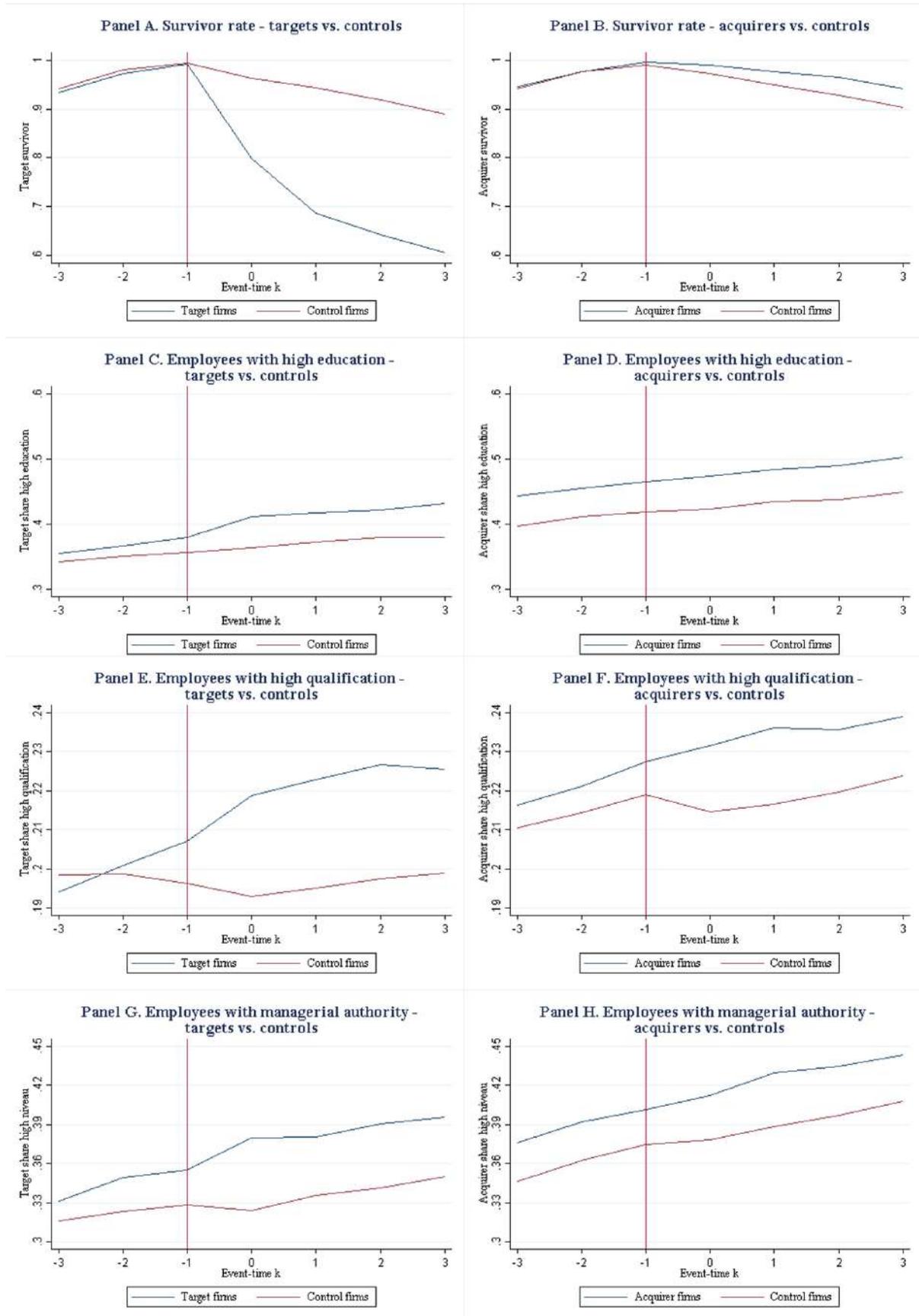
Figure 2: Firm-level development of labor force characteristics. Panel A (Panel B) plots the survival rate of target (acquirer) firms relative to control firms.

C Tables

Table 1: Summary statistics. This table provides descriptive statistics for all numerical variables. The firm level data set consists of 1,043 target, acquirer, and consequently merged firms. Each of these firm pairs has exactly one matched control firm pair. Panel A (Panel B) provides summary statistics for the treated (control) firms. Panel C provides correlations for some of our key flow variables. All growth variables are measured from t=-1 to t=+2, all other variables are measured at t=-1. All variables are defined in Table A2.

Panel A: Treated firms

	N	Mean	SD	Min	P25	P50	P75	Max
$\text{Age}_{\text{A-T}}$	1,043	-0.16	6.38	-27.42	-3.71	-0.03	3.67	26.43
Age_{T}	1,043	40.02	5.98	20.00	36.19	40.27	43.56	66.50
Distance	1,043	173.23	150.17	0.00	37.97	140.15	284.77	642.68
$\text{Education}_{\text{A-T}}$	1,030	7.95	25.65	-82.22	-4.07	5.02	20.45	100.00
$\text{Education}_{\text{T}}$	1,035	23.75	23.95	0.00	4.88	15.38	34.38	100.00
Growth_{A} (%)	1,039	30.45	53.88	-200.00	5.50	16.29	37.50	200.00
Growth_{M} (%)	1,043	25.15	38.40	-171.23	7.16	15.95	32.80	200.00
Growth_{T} (%)	1,041	31.65	59.52	-200.00	5.50	18.04	41.86	200.00
HCR	1,027	49.49	32.11	0.00	18.97	49.24	80.34	99.99
$\text{Hierarchy}_{\text{A}}$	1,038	2.58	0.52	1.00	2.15	2.46	2.93	4.00
$\text{Hierarchy}_{\text{T}}$	1,035	2.50	0.54	1.00	2.08	2.33	2.83	4.00
Inflow_{A} (%)	1,043	64.95	140.47	0.00	24.82	41.44	70.82	2,880
Inflow_{M} (%)	1,043	47.89	41.23	0.00	23.71	37.93	57.01	531
Inflow_{T} (%)	1,037	37.51	60.87	0.00	0.00	22.50	47.06	1,000
Net emp. growth_{A} (%)	1,043	-10.21	61.98	-200.00	-19.83	-4.30	11.97	200.00
Net emp. growth_{M} (%)	1,043	-26.94	53.66	-200.00	-41.38	-13.00	2.02	152.54
Net emp. growth_{T} (%)	1,037	-84.57	95.37	-200.00	-200.00	-44.44	-7.23	200.00
$\text{Outflow}_{\text{A}}$ (%)	1,043	75.16	153.13	0.00	30.07	45.83	72.34	2,920
$\text{Outflow}_{\text{M}}$ (%)	1,043	74.83	61.45	10.38	36.89	54.97	90.59	665
$\text{Outflow}_{\text{T}}$ (%)	1,037	122.08	98.02	0.00	40.00	93.62	200.00	1,200
$\text{Qualification}_{\text{A-T}}$	1,030	2.05	26.20	-100.00	-8.33	1.82	13.17	100.00
$\text{Qualification}_{\text{T}}$	1,035	20.70	22.61	0.00	3.70	13.64	31.12	100.00
Related	1,043	0.72	0.45	0.00	0.00	1.00	1.00	1.00
Size_{A}	1,043	463.03	1,343.45	0.00	31.00	117.00	375.00	18,177
Size_{A} (ln)	1,043	4.66	1.80	0.00	3.47	4.77	5.93	9.81
Size_{M}	1,043	564.84	1,401.79	2.00	79.00	203.00	495.00	18,439
Size_{T}	1,043	101.81	273.33	0.00	14.00	40.00	103.00	6,242
Size_{T} (ln)	1,043	3.68	1.39	0.00	2.71	3.71	4.64	8.74
$\text{Wage}_{\text{A-T}}$	1,030	15.12	33.54	-143.29	-5.15	12.54	34.01	123.73
Wage_{T}	1,035	89.33	29.12	2.67	69.06	88.19	107.55	190.68

Panel B: Control firms

	N	Mean	SD	Min	P25	P50	P75	Max
Age$_{A-T}$	1,043	0.02	6.25	-26.19	-3.40	0.04	3.72	31.86
Age$_T$	1,043	40.06	5.57	20.00	36.71	40.13	43.37	67.50
Distance	1,043	206.31	136.80	0.00	96.63	180.62	295.45	622.23
Education$_{A-T}$	1,024	6.23	26.80	-96.77	-5.89	3.42	18.44	100.00
Education$_T$	1,035	22.72	23.95	0.00	4.55	13.46	33.33	100.00
Growth$_A$ (%)	1,039	27.58	56.59	-200.00	3.03	14.67	34.41	200.00
Growth$_M$ (%)	1,043	22.93	35.71	-170.52	5.97	15.20	29.63	200.00
Growth$_T$ (%)	1,041	30.01	54.55	-200.00	5.65	17.54	37.66	200.00
HCR	1,021	34.71	30.58	0.00	7.85	25.53	57.28	100.00
Hierarchy$_A$	1,032	2.52	0.54	1.00	2.11	2.37	2.88	4.00
Hierarchy$_T$	1,035	2.45	0.56	1.00	2.04	2.27	2.78	4.00
Inflow$_A$ (%)	1,034	39.15	42.49	0.00	17.15	28.57	47.41	600
Inflow$_M$ (%)	1,043	37.86	29.64	0.00	20.66	30.63	44.64	320
Inflow$_T$ (%)	1,036	39.80	40.70	0.00	16.75	29.28	50.00	633
Net emp. growth$_A$ (%)	1,034	-26.34	59.15	-200.00	-30.12	-10.81	0.00	200.00
Net emp. growth$_M$ (%)	1,043	-20.59	41.02	-200.00	-27.34	-11.35	0.00	111.89
Net emp. growth$_T$ (%)	1,036	-29.51	61.35	-200.00	-34.31	-12.58	0.00	200.00
Outflow$_A$ (%)	1,034	65.49	64.85	0.00	27.08	41.28	76.58	800
Outflow$_M$ (%)	1,043	58.45	45.50	9.09	30.10	43.19	68.42	400
Outflow$_T$ (%)	1,036	69.31	67.00	0.00	28.57	45.19	83.05	589
Qualification$_{A-T}$	1,024	2.11	28.45	-100.00	-10.36	1.11	13.37	100.00
Qualification$_T$	1,035	19.79	23.69	0.00	2.18	10.62	29.38	100.00
Related	1,043	0.72	0.45	0.00	0.00	1.00	1.00	1.00
Size$_A$	1,043	423.98	1,256.14	0.00	29.00	109.00	340.00	15,814
Size$_A$ (ln)	1,043	4.56	1.81	0.00	3.40	4.70	5.83	9.67
Size$_M$	1,043	522.91	1,309.91	3.00	73.00	192.00	437.00	16,018
Size$_T$	1,043	98.93	262.52	0.00	14.00	39.00	100.00	5,266
Size$_T$ (ln)	1,043	3.64	1.40	0.00	2.71	3.69	4.62	8.57
Wage$_{A-T}$	1,024	13.28	36.71	-124.56	-8.11	10.97	35.13	139.76
Wage$_T$	1,035	86.11	31.10	0.00	65.52	85.11	106.48	190.04

Panel C: Correlations

	External inflow	External outflow	Internal inflow	Internal outflow
External inflow		0.661***	0.219***	0.765***
External outflow	0.379***		0.692***	0.324***
Internal inflow	0.031	0.011		0.031
Internal outflow	0.006	-0.045	0.183***	

Table 2: Firm-level aggregate employee flows for the general workforce. The table reports the estimated differences in growth rates from $t = -1$ to $t = +2$ between the treated firms (Merged, Target, Acquirer) and their control firms. Estimates are obtained as estimates of θ from equation (2) for the dependent variables presented in the first column. *Merged* refers to the combined flows of target and acquirer, respectively, their matched pairs. All rates are either scaled by the combined employment of target and acquirer (i.e., the merged firm denoted as *Merged*; columns 1, 3, 5) or the employment of the respective entity (columns 2 and 4). In column 6, the dependent variable is *Turnover* as defined in equation 1). In all our regressions, we control for driving distance, the pre-acquisition growth rate, and fixed effects for cells from the full product of the calendar year, region, and firm size category, where size categories are defined based on the number of firms' establishments: 1, 2, 3-5, 6-10, and more than 10. All variables are defined in Table A2 in the Online Appendix. Standard errors are clustered at the firm-level and t-statistics are presented in parentheses below the coefficients. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 2: Firm-level aggregate employee flows for the general workforce (continued).

Entity	Merged	Target		Acquirer		Turnover
Scaled by	Merged (1)	Target (2)	Merged (3)	Acquirer (4)	Merged (5)	Merged (6)
Net employment growth	-7.22***	-55.36***	-14.01***	14.54***	6.97***	
	(-3.50)	(-15.75)	(-10.07)	(5.55)	(4.61)	
Inflow	9.72***	-2.22	-2.90***	23.78***	12.52***	7.83***
	(6.66)	(-0.95)	(-3.71)	(5.45)	(9.41)	(6.11)
External inflow	6.21***	-4.04*	-3.27***	18.19***	9.39***	4.33***
	(4.95)	(-1.79)	(-4.39)	(4.75)	(8.46)	(4.07)
Inflow other firms	5.81***	-0.81	-1.40**	14.45***	7.17***	4.13***
	(5.91)	(-0.56)	(-2.51)	(4.71)	(8.44)	(5.82)
with wage increase	5.09***	0.06	-0.85**	12.43***	5.90***	3.48***
	(6.97)	(0.06)	(-2.49)	(4.86)	(8.79)	(6.03)
with wage decrease	0.72	-0.87	-0.55*	2.03***	1.27***	0.70***
	(1.61)	(-1.30)	(-1.68)	(2.93)	(4.11)	(3.40)
Inflow new entrant	0.40	-3.26***	-1.86***	3.72***	2.20***	0.25
	(0.80)	(-2.67)	(-5.64)	(3.53)	(5.23)	(0.57)
Internal inflow	3.50***	1.83***	0.37**	5.59***	3.14***	3.50***
	(7.36)	(3.63)	(2.05)	(3.56)	(7.09)	(7.36)
Inflow within	1.04***	0.54	0.10	1.09**	0.93**	1.04***
	(2.58)	(1.22)	(0.59)	(2.58)	(2.57)	(2.58)
Inflow between	2.47***	1.29***	0.27***	4.50***	2.20***	2.47***
	(9.57)	(5.27)	(4.12)	(2.96)	(8.82)	(9.57)
Outflow	16.93***	53.14***	11.11***	9.24*	5.56***	
	(7.37)	(14.09)	(8.22)	(1.84)	(3.06)	
External outflow	13.43***	34.50***	8.82***	5.99	4.34***	
	(6.26)	(9.76)	(6.67)	(1.48)	(2.62)	
Outflow other firms	11.71***	30.68***	8.28***	6.23**	3.26**	
	(6.69)	(11.23)	(7.64)	(1.97)	(2.44)	
with wage increase	7.85***	20.80***	5.26***	4.31*	2.49**	
	(6.00)	(9.86)	(7.01)	(1.78)	(2.39)	
with wage decrease	3.86***	9.88***	3.03***	1.92*	0.77*	
	(5.94)	(8.46)	(5.95)	(1.79)	(1.92)	
Outflow unemployment	1.73**	3.81**	0.54	-0.24	1.08*	
	(2.30)	(2.24)	(1.21)	(-0.17)	(1.89)	
Internal outflow	3.50***	18.65***	2.29***	3.25*	1.21***	
	(7.36)	(12.39)	(7.66)	(1.82)	(3.28)	
Outflow within	1.04***	0.54	0.10	1.09**	0.93**	
	(2.58)	(1.22)	(0.59)	(2.58)	(2.57)	
Outflow between	2.47***	18.11***	2.19***	2.15	0.28***	
	(9.57)	(12.50)	(8.82)	(1.24)	(3.99)	
N	2,086	2,071	2,086	2,072	2,086	2,086

Table 3: Firm-level aggregate employee flows for the general workforce by status of target closure. The table reports the estimated differences in growth rates from $t = -1$ to $t = +2$ between the treated firms (Merged, Target, Acquirer) and their control firms. The table distinguishes between transaction in which the target survives and transactions in which the target is shut down at the end of year 2. Estimates are obtained as estimates of θ from equation (2) for the dependent variables presented in the first column. *Merged* refers to the combined flows of target and acquirer, respectively, their matched pairs. All rates are either scaled by the combined employment of target and acquirer (i.e., the merged firm). *Turnover* is defined in equation 1). In all our regressions, we control for driving distance, the pre-acquisition growth rate, and fixed effects for cells from the full product of the calendar year, region, and firm size category, where size categories are defined based on the number of firms' establishments: 1, 2, 3-5, 6-10, and more than 10. All variables are defined in Table A2 in the Online Appendix. Standard errors are clustered at the firm-level and t-statistics are presented in parentheses below the coefficients. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Entity	Closed targets			Surviving targets		
	Merged (1)	Target (2)	Acquirer (3)	Merged (4)	Target (5)	Acquirer (6)
Net employment growth	-27.56***	-36.73***	9.20***	3.75*	-2.10*	5.95***
	(-6.84)	(-12.83)	(3.49)	(1.69)	(-1.76)	(3.24)
Inflow	13.23***	-8.85***	22.02***	7.53***	0.23	7.33***
	(4.87)	(-7.00)	-8.7	(5.03)	(0.25)	(5.74)
External inflow	6.07***	-8.69***	14.68***	6.05***	-0.44	6.51***
	(2.72)	(-7.17)	(7.37)	(4.35)	(-0.50)	(5.50)
Internal inflow within	1.79**	-0.16	1.94**	0.63	0.25	0.40
	(2.14)	(-0.52)	(2.52)	(1.61)	(1.40)	(1.17)
Internal inflow between	5.38***	0.00	5.40***	0.84***	0.41***	0.41***
	(8.53)	(1.06)	(8.52)	(6.23)	(4.35)	(6.27)
Outflow	40.80***	27.88***	12.81***	3.78*	2.33**	1.38
	(8.97)	(10.09)	(3.75)	(1.70)	(1.96)	(0.73)
External outflow	33.63***	22.66***	10.88***	2.31	1.67	0.53
	(7.96)	(8.12)	(3.65)	(1.07)	(1.44)	(0.29)
Internal outflow within	1.79**	-0.16	1.94**	0.63	0.25	0.40
	(2.14)	(-0.52)	(2.52)	(1.61)	(1.40)	(1.17)
Internal outflow between	5.38***	5.38***	0.00	0.84***	0.41***	0.44***
	(8.53)	(8.54)	(1.06)	(6.23)	(6.26)	(4.20)
Turnover	12.33***			5.17***		
	4.78			4.42		
N	746	746	746	1340	1340	1340

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Table 4: Composition of acquirers' and targets' workforce. This table shows the occupational groups and education of acquirer and target employees. Occupational groups are based on the classification from Blossfeld (1987). All statistics are based on the year prior to the transaction.

	Target		Acquirer	
	N	%	N	%
Occupational group (degree of Qualification)				
Simple tasks (low)	21,829	23.3	87,588	21.2
Skilled manual occupations (medium)	13,084	13.9	46,454	11.3
Technician/Engineers (high)	10,912	11.6	60,616	14.7
Qualified service (medium)	1,919	2.0	4,992	1.2
Semi-professions (medium)	4,961	5.3	11,596	2.8
Professions (high)	1,430	1.5	6,703	1.6
Simple commercial and admin. occupations (low)	11,915	12.7	31,543	7.6
Qualified commercial and admin. occupations (medium)	23,637	25.2	133,676	32.4
Managers (high)	4,143	4.4	29,460	7.1
Total	93,830	100.0	412,628	100.0
Education (level of Education)				
Intermediate school leaving certificate [ISLC] (low)	9,178	9.8	32,497	7.9
ISLC with vocational training (medium)	56,797	60.5	215,897	52.3
Upper secondary school leaving certificate [USSLC] (medium)	1,894	2.0	9,092	2.2
USSLC with vocational training (high)	9,513	10.1	42,815	10.4
College or university degree (high)	16,448	17.5	112,327	27.2
Total	93,830	100.0	412,628	100.0

Table 5: Characteristics of inflows and outflows. This table reports the mean and standard deviations of average employee education and qualification levels as well as average employee age and daily wage (at t=-1) for targets, acquirers, and merged firms. It also reports the average of these variables for the inflows (outflows) from (to) the external labor market (Panel A) and the internal labor market (Panel B) during the three year period from t=0 to t=+2 together with its difference (absolute and in %) and a paired t-test. *Education index* and *Qualification index* are defined in Appendix A.2, *Age* and *Wage* are defined in Table A2.

Panel A

		Education index (1)	Qualification index (2)	Age (3)	Wage (4)
Treated firms	Mean at t = -1	2.825	1.901	39.78	98.60
N = 1035	SD at t = -1	0.693	0.357	4.11	25.80
	External inflow	3.060	1.983	35.44	85.25
	External outflow	2.962	1.968	39.34	96.19
	Difference	0.091	0.013	-3.97	-11.02
	in % of t = -1	3.2	0.7	-10.0	-11.2
	t-stat	11.07	3.07	-33.36	-25.19
Control firms	Mean at t = -1	2.724	1.865	39.99	94.85
N = 1043	SD at t = -1	0.687	0.394	3.81	27.48
	External inflow	2.823	1.826	36.17	74.57
	External outflow	2.751	1.807	36.53	75.13
	Difference	0.072	0.019	-0.36	-0.57
	in % of t = -1	2.6	1.0	-0.9	-0.6
	t-stat	48.85	23.04	-18.24	-5.55

Panel B

		Education index (1)	Qualification index (2)	Age (3)	Wage (4)
Treated firms	Mean at t = -1	2.891	1.918	39.46	99.91
N = 266	SD at t = -1	0.699	0.344	4.02	26.48
	Internal inflow	3.523	2.164	39.18	122.82
	Internal outflow	3.444	2.157	38.41	114.99
	Difference	0.079	0.007	0.77	7.83
	in % of t = -1	2.7	0.4	2.0	7.8
	t-stat	2.79	0.27	3.81	6.90

Table 6: Sales growth and labor productivity. The table reports regression results with sales growth (Panel A), change in labor productivity (Panel B), and labor productivity growth (Panel C) from $t=-1$ to $t=2$ as the dependent variable. In columns 1 and 2 the sample includes all available observations and in columns 3 and 4 the sample includes only observations for which all dependent and independent variables are available for the merged and for the control firm. Sales is the sum of target and acquirer sales reported by BvD. Labor productivity is the ratio of sales to the total number of employees ($Size_M$). Change in labor productivity is the difference between labor productivity in $t=2$ and $t=-1$. Sales growth and labor productivity growth are defined following the definition of growth rates described in Section 3.3 and equation (4) for employment growth. Fixed effects are the full product of calendar year, region, and firm size category, where size categories are defined based on the number of the firms' establishments: 1, 2, 3-5, 6-10, and more than 10. Standard errors are clustered at the firm-level and t-statistics are presented in parentheses below the coefficients. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

	All Observations		Matched Observations	
	(1)	(2)	(3)	(4)
Panel A: Sales growth from t=-1 to t=+2				
Treatment	8.24**	5.14	5.84	5.84
	(2.45)	(0.89)	(1.20)	(1.21)
Fixed effects	No	Yes	No	Yes
Observations	835	835	352	352
adj. R^2	0.006	0.658	0.004	0.475
Panel B: Change in labor productivity from t=-1 to t=+2				
Treatment	489.64***	330.97***	332.27***	332.27***
	(6.75)	(2.69)	(3.03)	(3.18)
Fixed effects	No	Yes	No	Yes
Observations	835	835	352	352
adj. R^2	0.035	0.690	0.026	0.667
Panel C: Labor productivity growth from t=-1 to t=+2				
Treatment	13.27***	6.64	9.18*	9.18*
	(3.69)	(1.07)	(1.79)	(1.79)
Fixed effects	No	Yes	No	Yes
Observations	835	835	352	352
adj. R^2	0.013	0.666	0.009	0.470
Panel D: Average employee earnings growth from t=-1 to t=+2				
Treatment	3.63***	3.63***	3.54***	3.54***
	(3.81)	(4.08)	(3.77)	(4.06)
Fixed effects	No	Yes	No	Yes
Observations	2066	2066	2044	2044
adj. R^2	0.007	0.129	0.006	0.144
Panel E: Average stayer earnings growth from t=-1 to t=+2				
Treatment	0.74**	0.79***	0.76**	0.76**
	(2.21)	(2.62)	(2.27)	(2.54)
Fixed effects	No	Yes	No	Yes
Observations	2034	2034	1996	1996
adj. R^2	0.002	0.206	0.002	0.202

Table 7: Firm-level aggregate employee flows for managers by status of target closure. The table reports the estimated differences in growth rates from $t = -1$ to $t = +2$ between the treated firms (Merged, Target, Acquirer) and their control firms. The table distinguishes between transaction in which the target survives and transactions in which the target is shut down at the end of year 2. Estimates are obtained as estimates of θ from equation (2) for the dependent variables presented in the first column. *Merged* refers to the combined flows of target and acquirer, respectively, their matched pairs. All rates are scaled by the combined employment of target and acquirer (i.e., the merged firm). *Turnover* is defined in equation 1). In all our regressions, we control for driving distance, the pre-acquisition growth rate, and fixed effects for cells from the full product of the calendar year, region, and firm size category, where size categories are defined based on the number of firms' establishments: 1, 2, 3-5, 6-10, and more than 10. All variables are defined in Table A2 in the Online Appendix. Standard errors are clustered at the firm-level and t-statistics are presented in parentheses below the coefficients. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

	Closed targets			Surviving targets		
Entity	Merged (1)	Target (2)	Acquirer (3)	Merged (4)	Target (5)	Acquirer (6)
Net employment growth	-21.17***	-29.95***	8.71	4.73	-3.44	8.11**
	(-3.03)	(-7.54)	(1.49)	(1.08)	(-1.25)	(2.35)
Inflow	27.09***	-7.27***	33.89***	15.37***	4.60***	10.71***
	(3.92)	(-3.60)	(5.17)	(5.40)	(2.67)	(4.25)
External inflow	19.82***	-6.94***	26.23***	12.49***	3.65**	8.81***
	(3.02)	(-3.52)	(4.23)	(4.52)	(2.19)	(3.60)
Internal inflow within	1.69	-0.33	2.01*	1.40***	0.12	1.30***
	(1.53)	(-0.88)	(1.96)	(2.64)	(0.40)	(2.82)
Internal inflow between	5.59***		5.65***	1.47***	0.83***	0.61***
	(4.88)		(4.91)	(5.49)	(3.77)	(4.47)
Outflow	44.93***	18.07***	26.35***	7.26*	7.31***	0.03
	(5.59)	(4.56)	(3.73)	(1.86)	(2.95)	(0.01)
External outflow	37.65***	12.91***	24.32***	4.48	6.51***	-1.93
	(4.81)	(3.38)	(3.53)	(1.17)	(2.71)	(-0.63)
Internal outflow within	1.61	-0.42	2.03**	1.33***	0.09	1.26***
	(1.47)	(-1.03)	(1.99)	(2.60)	(0.32)	(2.80)
Internal outflow between	5.60***	5.59***		1.38***	0.71***	0.70***
	(5.56)	(5.56)		(5.58)	(4.82)	(3.21)
Turnover	27.35***			10.82***		
	4.55			4.95		
N	667	667	667	1301	1301	1301

Table 8: Hierarchies and organization. This table reports results for six OLS regressions, in which the change in acquirers' hierarchy after the acquisition is measured with different dependent variables. In models (1) and (4), the dependent variable is $\Delta Layers$, which is the difference in the number of layers of the merged firm in t+2 and the number of layers of the acquirer in t-1. In models (2) and (5) (models (3) and (6)) the dependent variable is $D\left(\Delta Layers > 0\right)$ ($D\left(\Delta Layers < 0\right)$), a dummy variable that equals one if $\Delta Layers > 0$ ($\Delta Layers < 0$), and zero otherwise. Models (1) to (3) perform regressions, in which the independent variable is the growth in the wage bill (g^{WB}) from t-1 (acquirer) to t+2 (merged firm). Wage bill is the total amount of wages the respective entity pays in a calendar year. Models (4) to (6) perform regressions with an additional independent variable g^{NUM}, the growth in the number of industries. g^{NUM}, is defined as number of industries in which the merged firm is active in t+2, minus the number of industries the acquirer is active in t-1. All models include event year fixed effects.

	Dependent variable	Independent variables				N	adj. R^2
		g^{WB}		g^{NUM}			
		Coefficient	t-statistic	Coefficient	t-statistic		
(1)	$\Delta Layers$	0.49***	13.55			835	0.185
(2)	$D(\Delta Layers > 0)$	0.19***	9.38			835	0.096
(3)	$D(\Delta Layers < 0)$	-0.07***	-5.45			835	0.036
(4)	$\Delta Layers$	0.48***	13.35	0.02	0.22	835	0.184
(5)	$D(\Delta Layers > 0)$	0.18***	9.00	0.08*	1.88	835	0.099
(6)	$D(\Delta Layers < 0)$	-0.08***	-5.46	0.01	0.52	835	0.035

Table 9: Mergers and industrial relatedness. The table categorizes employee flows and hierarchical changes by the industrial relatedness of target and acquirer. We define a transaction as horizontal if both target and acquirer are in the same 2-digit industry. In vertical transactions, target and acquirer are from different industries, but have high input-output relatedness. All transactions that do not qualify as horizontal or vertical are defined as diversifying. In Panel A, we report firm firm-level aggregate employee flows for the general workforce for each type. The table reports the estimated differences in growth rates from $t = -1$ to $t = +2$ between the treated firms (Merged, Target, Acquirer) and their control firms. Estimates are obtained as estimates of θ from equation (2) for the dependent variables presented in the first column. *Merged* refers to the combined flows of target and acquirer, respectively, their matched pairs. All rates are scaled by the combined employment of target and acquirer. The dependent variable *Turnover* is defined in equation 1). In all our regressions, we control for driving distance, the pre-acquisition growth rate, and fixed effects for cells from the full product of the calendar year, region, and firm size category, where size categories are defined based on the number of firms' establishments: 1, 2, 3-5, 6-10, and more than 10. In Panel B, we provide descriptive statistics by industry relatedness. In Panel C, we describe hierarchical changes by industry relatedness. All variables are defined in Table A2 in the Online Appendix. Standard errors are clustered at the firm-level and t-statistics are presented in parentheses below the coefficients. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Panel A - Flows

	Horizontal		Vertical		Diversifying	
	Abn. flow	*t*-statistic	Abn. flow	*t*-statistic	Abn. flow	*t*-statistic
Net employment growth						
Merged	-7.63**	(-2.54)	-11.01***	(-2.70)	-2.50	(-0.66)
Target	-14.48***	(-7.42)	-17.91***	(-6.43)	-9.83***	(-3.59)
Acquirer	6.96***	(3.01)	7.00**	(2.51)	7.54***	(2.86)
Inflows (merged)						
Total	8.66***	(3.55)	12.96***	(5.26)	8.71***	(3.69)
External	5.57***	(2.75)	7.88***	(3.82)	6.24***	(2.79)
Between	2.33***	(6.82)	3.12***	(5.58)	2.05***	(4.39)
Within	0.76	(1.03)	1.96**	(2.41)	0.42	(0.91)
Outflows (merged)						
Total	16.29***	(4.29)	23.98***	(5.43)	11.21***	(3.19)
External	13.20***	(3.75)	18.89***	(4.65)	8.74**	(2.56)
Between	2.33***	(6.82)	3.12***	(5.58)	2.05***	(4.39)
Within	0.76	(1.03)	1.96**	(2.41)	0.42	(0.91)
Turnover (merged)	7.45***	(3.28)	10.46***	(4.91)	6.38***	(3.44)
N	452		296		295	

Table 9: **Mergers and industrial relatedness. (continued)**

Panel B - Summary statistics

	Horizontal		Vertical		Diversifying	
	Mean	Median	Mean	Median	Mean	Median
Pre-merger size						
Merged	610.03	232.00	432.01	163.00	481.50	166.00
Target	107.84	43.50	98.66	32.00	85.70	39.00
Acquirer	502.20	147.00	333.35	89.50	395.80	77.00
Pre-merger growth (3 years)						
Merged	21.83	14.86	25.71	17.20	21.83	12.50
Target	25.71	16.53	29.47	18.49	37.10	17.62
Acquirer	23.90	14.29	32.69	16.62	28.09	13.33
Target closure	0.38	0.00	0.39	0.00	0.30	0.00
Hierarchy index						
Target	1.54	1.37	1.56	1.36	1.54	1.37
Acquirer	1.56	1.39	1.67	1.53	1.66	1.53
N	297		296		450	

Panel C - Hierarchy changes

		Merger type:			
		Horizontal	Vertical	Diversifying	All
	N	452	296	295	1,043
Layer change:	Up	14.8%	21.6%	25.1%	19.7%
	Same	75.9%	66.9%	70.2%	71.7%
	Down	9.3%	11.5%	4.7%	8.6%

Table 10: Flow regressions: all employees and managers. The table regresses the estimated differences in growth rates from *t=-1* to *t=2* on a set of independent variables. *Merged firm* refers to the combined employment (flows) of target and acquirer, respectively, their matched pairs. All rates are scaled by the combined employment of target and acquirer (i.e., the merged firm). The table reports estimates of θ (*Treatment*) and γ (*Treatment* $\times$ variable of interest) of equation (3) for the dependent variables *Net employment growth* (column 1), *Internal flow* (column 2), *External inflow* (column 3), *External outflow* (column 6), *and Tur*nover as defined in equation (1) (column 8). In column (6), the dependant variable is Target closure which is 1 if the target has zero employees in *t=2*. In all our regressions, we include additional control variables accounting for average employee age (*Age*), employee wage (*Wage*), employee qualification (*Qualification*), and employee education (*Education*) in the target, and the difference between the acquirer and the target. In Panel A, we analyze the flows of the whole labor force and in Panel B we focus on flows of managers. We report the estimates of γ for these variables in Table OA8. All variables are defined in Table A2. Standard errors are clustered at the firm-level and t-statistics are presented in parentheses below the coefficients. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 10: Flow regressions: all employees and managers. (continued)

Panel A

	Net emp. growth (1)	Internal flow (2)	External inflow (3)	External outflow (4)	Turnover (5)	Target closure (6)
Treatment	-6.2034	2.5798	-16.8678	-10.6643	-7.9541	0.0518
	((-0.20))	((0.35))	((-0.87))	((-0.33))	((-0.40))	(0.26)
$\times$ Age$_T$	0.0024	0.0583	0.4153	0.4129	0.3310	0.0011
	((0.00))	((0.43))	((1.07))	((0.66))	((0.90))	(0.28)
$\times$ Age$_{A-T}$	0.6602	0.1241	0.5655*	-0.0947	0.3374	0.0020
	((1.07))	((0.94))	((1.69))	((-0.17))	((1.11))	(0.53)
$\times$ Wage$_T$	-0.0531	-0.0178	0.0275	0.0806	-0.0187	-0.0008
	((-0.40))	((-0.60))	((0.36))	((0.60))	((-0.25))	(-0.83)
$\times$ Wage$_{A-T}$	-0.0566	-0.0371	0.0622	0.1188	-0.0077	-0.0006
	((-0.44))	((-1.31))	((0.89))	((0.97))	((-0.12))	(-0.74)
$\times$ Qualification$_T$	0.0889	-0.0418	-0.0040	-0.0928	-0.1275	-0.0015
	((0.51))	((-1.02))	((-0.04))	((-0.47))	((-1.02))	(-1.17)
$\times$ Qualification$_{A-T}$	0.0802	-0.0246	-0.0368	-0.1170	-0.1241	-0.0004
	((0.47))	((-0.69))	((-0.40))	((-0.69))	((-1.27))	(-0.35)
$\times$ Education$_T$	0.0407	-0.0494	-0.0490	-0.0897	-0.0255	0.0013
	((0.19))	((-1.02))	((-0.33))	((-0.38))	((-0.15))	(1.06)
$\times$ Education$_{A-T}$	0.1644	-0.0326	-0.0524	-0.2168	-0.0438	0.0001
	((0.92))	((-1.03))	((-0.58))	((-1.30))	((-0.51))	(0.09)
$\times$ Distance	-0.0148	-0.0044	-0.0043	0.0105	-0.0070	-0.0001
	((-0.95))	((-1.11))	((-0.39))	((0.62))	((-0.60))	(-0.66)
$\times$ Related	0.4497	-2.1994*	-1.3947	-1.8444	-2.9776	-0.0036
	((0.09))	((-1.67))	((-0.49))	((-0.37))	((-0.98))	(-0.11)
$\times$ Related	8.3544	-2.0766*	-2.5776	-10.9320**	-4.1453	0.0000
	((1.49))	((-1.68))	((-0.82))	((-2.08))	((-1.42))	(0.00)
$\times$ HCR	3.4493	2.3353**	4.5441*	1.0948	5.2222**	0.0029
	((0.80))	((2.35))	((1.75))	((0.26))	((2.12))	(0.10)
$\times$ Hierarchy$_T$	2.5570	-0.4450	1.6427	-0.9143	-0.7966	-0.0632
	((0.35))	((-0.26))	((0.40))	((-0.12))	((-0.18))	(-1.28)
$\times$ Hierarchy$_A$	-2.9900	4.1765*	3.5017	6.4917	7.3972	0.0848*
	((-0.42))	((1.94))	((0.74))	((0.80))	((1.32))	(1.65)
$\times$ Growth$_T$	-0.0011	0.0136	0.0873*	0.0884	0.0859*	-0.0008*
	((-0.02))	((0.91))	((1.94))	((1.33))	((1.72))	(-1.79)
$\times$ Growth$_A$	-0.0208	0.0313**	0.0898**	0.1105	0.0898**	0.0000
	((-0.32))	((2.47))	((2.00))	((1.61))	((2.12))	(0.05)
$\times$ Size$_T$	-8.6427***	-0.2815	-1.8602*	6.7826***	-0.8809	-0.0115
	((-5.31))	((-0.69))	((-1.69))	((4.03))	((-0.79))	(-1.03)
$\times$ Size$_A$	6.6317***	-0.4511	-0.4512	-7.0829***	-0.7534	0.0031
	((4.29))	((-1.37))	((-0.52))	((-4.53))	((-0.87))	(0.33)
N	2036	2036	2036	2036	2036	2036
adj. R^2	0.1596	0.0779	0.3357	0.2879	0.3105	0.5950

Table 10: Flow regressions: all employees and managers. (continued)

Panel B

	Net emp. growth (1)	Internal flow (2)	External inflow (3)	External outflow (4)	Turnover (5)
Treatment	73.3884	13.8913	55.4789	33.2510	-42.2258
	((1.19))	((1.43))	((1.13))	((0.50))	(-0.82)
× Age_T	0.2723	-0.0749	0.3360	-0.6745	0.2734
	((0.21))	((-0.37))	((0.32))	((-0.45))	(0.22)
× Age_{A-T}	2.1291*	-0.1167	0.8883	-1.2513	0.2764
	((1.76))	((-0.62))	((0.85))	((-0.87))	(0.30)
× $Wage_T$	-0.4551*	-0.0117	-0.2576	0.1546	0.2475
	((-1.79))	((-0.30))	((-1.31))	((0.64))	(1.31)
× $Wage_{A-T}$	-0.2019	-0.0415	-0.2030	-0.0391	0.0659
	((-0.91))	((-0.90))	((-1.11))	((-0.17))	(0.37)
× $Qualification_T$	0.7159**	-0.0497	0.3182	-0.4150	0.2229
	((2.13))	((-0.92))	((1.22))	((-1.30))	(0.84)
× $Qualification_{A-T}$	0.5598*	-0.0654	0.1991	-0.4147	0.3560
	((1.89))	((-1.13))	((0.80))	((-1.38))	(1.09)
× $Education_T$	0.0674	0.0092	0.1189	-0.0679	-0.2654
	((0.18))	((0.17))	((0.36))	((-0.16))	(-1.03)
× $Education_{A-T}$	0.2544	-0.0117	0.0767	-0.0287	-0.1054
	((0.80))	((-0.25))	((0.35))	((-0.10))	(-0.52)
× Distance	-0.0193	-0.0067	0.0024	0.0133	0.0184
	((-0.65))	((-1.21))	((0.09))	((0.41))	(0.71)
× Related	0.4669	-4.7381**	-0.4883	-4.2537	-2.6331
	((0.05))	((-2.48))	((-0.07))	((-0.52))	(-0.30)
× Related	15.9782	-5.2448***	4.8170	2.5637	-7.4751
	((1.61))	((-2.66))	((0.57))	((0.24))	(-0.77)
× HCR	-0.9048	-0.1709	15.8218**	14.1914*	-7.8120
	((-0.11))	((-0.11))	((2.37))	((1.69))	(-1.06)
× $Hierarchy_T$	-1.9036	-2.2391	2.6502	6.1227	7.0338
	((-0.15))	((-0.95))	((0.27))	((0.50))	(0.51)
× $Hierarchy_A$	-11.7528	3.4185	-13.6014	-6.8496	-4.3820
	((-0.84))	((1.27))	((-0.99))	((-0.41))	(-0.43)
× $Growth_T$	-0.1179	0.0076	0.1527	0.2396*	-0.0723
	((-1.12))	((0.42))	((1.50))	((1.88))	(-0.82)
× $Growth_A$	-0.0861	0.0504**	0.1355	0.2021	-0.0141
	((-0.74))	((2.26))	((1.30))	((1.53))	(-0.20)
× $Size_T$	-10.1142***	-0.6822	-3.4387	5.4704*	0.6732
	((-3.29))	((-1.32))	((-1.44))	((1.87))	(0.24)
× $Size_A$	0.1307	-0.0477	-4.8690**	-6.3145*	3.3405
	((0.04))	((-0.10))	((-1.98))	((-1.95))	(1.25)
N	1925	1925	1925	1925	1434
adj. R^2	0.1016	0.2002	0.0773	0.1426	0.1838