An Empirical Analysis of Post-Merger Organizational Integration*

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Abstract

We study post-merger organizational integration using linked employer–employee data. Integration is implemented by reassigning a small number of high-skilled workers, especially in R&D and management. Workforce mixing is concentrated to establishments set up after merger, rather than to previously existing establishments. Worker turnover is high after merger, but new hiring yields stable total employment. Target employees have higher turnover and reassignment, particularly if the target firm is small relative to the acquiring firm. These findings might suggest that integration is costly, but can be achieved by focusing on key employees. Alternatively, the reassignment of a few key employees is sufficient for achieving integration.

I. Introduction

A merger is a dramatic event for firms and employees, requiring integration of two organizations. There is a large body of literature on mergers, but it offers little evidence on how integration is accomplished.[1] In this paper, we

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[1] The importance of integration to merger success is often mentioned in the business press and management literature. For example, the Pricewaterhouse Cooper (2010) annual survey

present such evidence, using Danish matched employer–employee data. The data are particularly well suited to study integration, because they identify the physical location where each employee works. Thus, is it possible to observe when workers are reassigned following a merger, under what circumstances employees of both firms mix in the workplace, and what the consequences are.

Our results are as follows. First, there is surprisingly little overall integration, defined as reassignment of employees to work with colleagues from the other firm. Three years after merger, only about 8 percent of surviving employees from the acquiring firm, and 15 percent from the target firm, had moved to a workplace that was in the other firm before merger, or set up after merger. The rest remain in workplaces existing in their firm prior to merger, where most colleagues are from their firm. Second, the merged firm chooses certain types of employees to mix with employees from the other firm – those who are highly skilled, managers, or those in R&D, presumably to share knowledge and coordinate between organizations. Third, there is relatively high turnover in the acquiring firm and even more in the target firm, but the average size of the combined firm remains stable due to new hiring. Fourth, integration depends on the relative size of the merging workforces. The larger the target workforce is relative to the acquiring workforce, the more target workers are shielded from turnover or reassignment to the acquiring firm's establishments.

One interpretation of our results is that, consistent with practitioner observations, organizational integration is difficult, and mergers are implemented in ways that mitigate the costs. An alternative interpretation is that integration can be achieved without large-scale integration of the workforces; instead, it is achieved by reconciling policies and coordinating across groups without much need to disturb day-to-day operations.

This paper contributes to the literature by highlighting the question of integration costs in mergers, providing new evidence on how firms integrate after mergers, and suggesting an approach for further research on these questions. The findings also have broader relevance for the literature on the economics of organization because post-merger integration is one interesting example of the issue of coordination within firms.

II. Economics of Organizational Integration

In this section, we present a brief literature review, followed by a discussion of the costs and benefits of post-merger integration. We do not distinguish

of post-merger integration argues that emphasis on careful integration improves the odds of success in a merger. They find that "the key integration challenges [. . .] are motivation of employees, alignment of cultures, organization and processes as well as IT systems."

between mergers and acquisitions. The former sometimes refers to a combination of two firms that are relatively equal (in size, market share, or value). The latter term is used more when a larger firm buys a smaller firm. We use the terms "acquiring" and "target" to refer to the merging firms, because our data provide a natural definition of which buys the other. We are largely agnostic about the relative power of the two firms, though we use a measure for this ("dominance") below. Usually the acquiring firm is larger, though this is not always the case. Denmark had almost no hostile takeovers during our sample period (Solomon, 2010), so we do not distinguish friendly and hostile transactions.

Prior Literature

A large body of literature on mergers studies topics such as returns to shareholders of both firms, and the effects of mergers on profit, quality, R&D, market share, productivity, and employment (Andrade *et al.*, 2001; Pautler, 2003). Many merger motives have been proposed, but evidence is inconclusive on which are most common or create more value. Mergers tend to occur in waves and cluster within industries, suggesting they are often driven by exogenous shocks such as technological or regulatory change. Target workers tend to fare worse than acquiring workers in wages and employment (Brown and Medoff, 1988; Margolis, 2006), though Ouimet and Zarutskie (2010) find that target employees have higher wage growth than acquiring employees when they are more skilled than acquiring employees.

Recent research exploits matched employer–employee datasets similar to ours. Benedetto (2006) finds increased turnover after merger. Pesola (2011) and Lehto and Böckerman (2008) find high turnover of manufacturing workers acquired by a foreign company. Kwon and Meyersson-Milgrom (2009) find higher turnover for workers losing occupational status after a merger. Davis *et al.* (2008) study private-equity transactions, and find that target firms had declining growth both before and after acquisition, but after a few years employment grew more rapidly than firms in a control group. Maksimovic *et al.* (2011) find substantial restructuring after mergers of manufacturing firms, including selling and closing establishments. Target establishments increase productivity, especially when the acquiring firm has higher productivity itself. These last two papers suggest the importance of key human capital and knowledge sharing in mergers. However, they do not identify whether benefits arise through extensive integration, or by using a few key employees to share knowledge between workforces.

There is almost no evidence on post-merger integration. An exception is the case study by Kole and Lehn (2000) of USAir's acquisition of Piedmont Aviation. USAir extended its higher pay and less strict work rules to Piedmont in order to "buy labor peace". Kole and Lehn conclude that desire

for internal equity to reduce conflict between merging workforces might be a substantial integration cost. The only survey on integration we are aware of is Pautler (2003), which primarily discusses reports by consulting firms. Notably, the economics literature focuses almost exclusively on the benefits of mergers, whereas Pautler finds that practitioners emphasize the costs, particularly of integration. Thus, the following subsection focuses primarily on costs of mergers.

Benefits and Costs of Integration

Only some benefits of mergers require integration. First, there might be economies of scale, which generate efficiencies, some of which might reduce headcount or wages. To the extent that such efficiencies are the motive, a merger might be a negative experience for many employees. This would not have many implications for the workforces, beyond possibly reducing headcount.

Second, the acquiring firm might have purchased the target in order to improve operations. In this case, we would expect the merged firm to be led mostly by the acquiring firm's management. We would also expect those with key knowledge – high-skill workers, such as those in R&D – to be likely to stay after merger, and mix and share knowledge and methods across firms. Improving target operations would tend to disproportionately cause turnover among target workers.

Third, there might be gains from knowledge sharing between the firms. These can arise in several ways, including economies of scope in product design, synergies in production, cross-selling to customers from the other firm, sharing technology, and improving production methods. If knowledge sharing is important, certain employees from both firms might benefit by playing a key role in a merger (e.g., possessing knowledge the merged firm wants to share, working in a position that can benefit from new knowledge, or facilitating the exchange of ideas). Therefore, we expect that when merging for synergies, high-skill workers will benefit more from merger than low-skill workers. This implies that workers with less firm-specific human capital, education, and tenure might be more likely to leave the merged firm. We would also expect that managers will be disproportionately from the acquiring firm.

We turn now to integration costs. Integration is likely to create several types of costs: the difficulty of changing formal and informal policies; the negative effects of those changes on productivity; and the possibility of factions and favoritism between the two workforces.

First, it is likely to be costly to change explicit structures and policies, for at least one firm and possibly for both. Business units, geographical locations, hierarchies, functions, reporting relationships, and job titles must

be reconciled. Compensation systems and human resources policies must be made consistent. This process might favor the acquiring firm, assuming they tend to retain their policies. Turnover arising from dissatisfaction would then tend to be larger for target workers.

Second, implicit policies and intangible assets must also be reconciled. The two firms will differ in hiring criteria and corporate culture. Crémer *et al.* (2007) view culture as a specialized code (i.e., language or jargon) between employees that facilitates coordination. They argue that a firm's ability to broaden its scope (e.g., through unrelated merger) is limited by the need for a common code across the workforces. That code can be developed, but takes time and possibly turnover and training of a new workforce. Employees have implicit contracts with their original firm, on the basis of which they provide effort, invest in skills, and have expectations about career prospects. Productivity also arises in part from firm-specific human capital, including social networks with colleagues to aid problem solving and learning (Garicano, 2000; Ichniowski and Shaw, 2009). When a merger occurs, the value of these intangible worker assets might change, and turnover might increase if such capital becomes less valuable. This effect might differ by acquiring or target status; one can easily imagine that the firm-specific human capital of acquiring workers is relatively more valuable than that of target workers after merger. This analysis also suggests that merged firms might prefer new hires to integrating incumbent employees, despite losses in specific human capital.

Third, integration might generate conflict between the workforces. The merged firm must choose how much to weight each side's policies in the new organization. The side whose policies are favored loses less, as its human capital, authority, and networks are more intact. Each workforce has an incentive to use its power to implement its own policies, and to act with favoritism towards its own members (Prendergast and Topel, 1996).

Empirical Questions

Previous studies found that acquiring employees fare better than target employees in wages and employment. By definition, the acquiring firm takes control of the target. It seems likely that it will impose more of its policies on the target. Favoritism would only magnify any disadvantage for target workers. All of our analyses distinguish acquiring workers from target workers.

The benefits and costs of integration suggest four research questions: effects of merger on firm size and workforce composition; whether mergers of equal or unequal sized firms differ; extent and methods used for integration; and the role of employees with key human capital.

First, what are the effects of merger on firm size and workforce composition? Prior studies tend to find that mergers lead to a decline in total workforce, though evidence is mixed. The theoretical effect is ambiguous. If the firm merges for economies of scale, then it might be able to eliminate workers, but firm growth from being more efficient could cause the workforce to grow. The merged firm faces the choice of integrating existing workers, or replacing them with new hires who lack firm-specific human capital, productive social networks, etc. A potential advantage of new hires is that they might be easier to integrate into the firm than target workers. The merged firm can choose its recruitment criteria and training, and new hires do not belong to an existing workforce and so are less likely to affiliate with one side or the other, or engage in favoritism. The literature has focused on turnover much more than new hiring. We analyze the composition of the merged workforce in terms of acquiring workers, target workers, and new hires.

Second, is merger of equally sized firms more difficult, as practitioners argue (O'Reilly, 1998; Pautler, 2003)? A potential reason is suggested by the literature on ethnic conflict and assimilation (e.g., Montalvo and Reynal-Querol, 2005; Caselli and Coleman, 2010). Conflict is more likely when two groups are of similar size. When one group is relatively small, resisting integration with the larger group is less likely to succeed, and the smaller group is more likely to assimilate. Similar logic can apply inside a merging firm. The smaller firm might resist integration, but is less likely to win political battles than the larger firm. The smaller workforce might be more cooperative, or its workers might exit. To study these questions, we define the variable dominance: the fraction of the workforce that worked in the employee's firm at the time of merger. This is calculated for both workforces; dominance of the target workforce equals 1 minus dominance of the acquiring workforce. Dominance values closer to 0.5 (i.e., mergers of equals) might indicate greater potential for conflict. Dominance that is larger for one firm than the other might indicate that the larger firm has more managerial power and will implement its own policies.

Third, to what extent does the merged firm mix workforces by reassigning them to locations with employees from the other firm? If integration is costly, then the firm might try to realize the benefits of merger through methods that avoid integration. A large amount of mixing implies substantial integration. By contrast, a small amount suggests two possibilities. One is that merging firms use low levels of integration to avoid integration costs. An alternative is that integration does not require collocation, but can be reasonably achieved by common policies, communication, and mixing a few key employees. We provide the first empirical evidence on this issue.

We define two types of mixing: hard mixing refers to reassignment to an establishment that was in the other firm before merger, and soft

mixing refers to reassignment to a new establishment created after merger. These are designed to reflect the presumption that soft mixing might be less difficult than hard mixing. All colleagues in a new establishment will also be soft mixing, whereas an employee who hard mixes is a minority in an existing establishment consisting of employees from the other firm who already work together. Relatively more hard than soft mixing would be consistent with one firm imposing its organization on the other, and focusing on the integration of employees from the other firm who possess key human capital. Soft mixing might result if the merged firm grows and moves into new locations.[2] An alternative use of soft mixing is to "reboot" the organization, starting a new establishment from scratch with employees from both firms. This might reduce conflict, make it easier to change policies, and lower integration costs.

Fourth, does workplace mixing vary by occupation and level of human capital? A motive for many mergers is to share knowledge. A small body of literature analyzes social networks inside firms (Jackson, 2008). Ichniowski and Shaw (2009) view a firm as a collection of "experts developing connective capital". They emphasize a case where skills are dispersed throughout the workforce, so many employees develop networks. This view would suggest that high rates of mixing are needed to obtain the benefits of integration. An alternative view comes from organizational sociology (Burt, 2005) and models of knowledge hierarchies (Garicano, 2000): a small number of workers become brokers or experts at solving problems and sharing knowledge. In this view, integration might be possible by mixing a small number of workers who possess knowledge to share, or are good at communication or coordination. What kinds of skills or knowledge are most valuable for integration? Pautler (2003) concludes that high-skilled employees, managers, and those in R&D or Sales, are key to integration (especially in technology or human capital intensive industries). Managers have experience coordinating functions and business units. R&D engineers possess knowledge about product design necessary to achieve economies of scope or share improvements in production methods. Salespeople have relationships (a form of intangible capital) with important customers. High-skilled employees might act as brokers or experts, as they are likely to possess intangible knowledge that can benefit the other firm.

III. Data and Summary Statistics

We employ a dataset of mergers in Denmark. Beginning in the late 1980s, the rate of mergers increased, which has been attributed to restructuring as a

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[2] Denmark is a small country, with most of the economy in the area around Copenhagen, so this is less likely in our data.

result of European economic integration, and increasing international trade (Rasmussen, 2004). This is similar to merger waves seen in Europe and the US during this period (Gugler *et al.*, 2012). Despite this, our sample is relatively even over time. This is probably because we only study within-country mergers, due to the inability to observe establishments outside Denmark.

The Danish regulatory environment for mergers is similar to the US, with no significant unusual provisions (Jensen and Reinholt, 2011). Governance has evolved over time towards the Anglo-Saxon model used in the US and UK, but some features of Danish governance during this time (and still today) reflect Nordic or German approaches (Gomard, 1990; Solomon, 2010). Shareholders rights are weaker than in the US and UK. Dual classes of shares with different voting rights are common, which tends to reduce the ability of institutional investors to implement change. Some companies are run by foundations, ostensibly run as non-profits intended to serve social purposes, though research suggests they perform similarly to for-profit firms. Danish firms have a supervisory board similar to the German model. Employees have the legal right to elect one-third of the board. For these reasons, hostile takeovers have been very rare in Denmark.

We constructed the sample using matched employer–employee data from the Danish government statistical agency Statistics Denmark, covering all individuals and firms from the period 1980–2001.[3] We know each worker's employer in November, so the data are annual snapshots at that date. The data have several useful features. They allow accurate identification of mergers and physical workplaces. Workers can be followed as they stay, exit, or transfer within the firm after merger. Gender, age, education, and compensation are included; labor-market experience and firm tenure are easily calculated. Occupations are coded using International Standard Classification of Occupation (ISCO) codes that are standard in several European datasets of this kind. However, occupation data are only available from 1993 onward, and are most complete from 1995, so occupation analyses use a more limited sample. Unlike many datasets of this type, establishments are unique physical work locations, such as an office, store, or factory. Thus, they provide a good measure of which employees work in close proximity. Statistics Denmark provides the primary industry of each establishment. We define firm industry as the modal industry measured by total employment across establishments.

Our initial sample consists of firms with five or more employees involved in a merger from 1980 to 2001. We are able to identify 2,631 mergers using establishment and firm identification numbers (see the

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[3] Many papers use these data, for example, Bennedsen *et al.* (2007) and Lentz and Mortensen (2008).

Online Appendix for details). Our sample includes three types of mergers: single acquisitions where firm A acquires firm B; multiple acquisitions where firm A acquires firms B, C, D, etc.; and joint mergers where firms A and B merge to create a new firm C. We keep only mergers for which acquiring and target firms were clearly identified. This was obvious for single and multiple mergers. However, identifying acquiring firms was impossible for joint mergers, which we therefore exclude. Second, we exclude multiple mergers because the dynamics of integration are likely to be substantially different.[4] Third, to study workforce dynamics pre- and post-merger, we require data from at least two years before to three years after merger. This limits the sample to firms involved in mergers from 1982 to 1998, and active in a six-year window. Fourth, to ensure mergers do not overlap in time, we exclude cases where a firm went through more than one merger during that time window. Finally, we keep only mergers between private firms in private industries, as state-owned firms and firms in public industries might exhibit different behavior. The final sample consists of 595 mergers, 30 percent of single merger cases.[5]

We do not study merger motives as there are few proxies, but control for several merger characteristics. One is whether the merger is related (same primary four-digit industry) or unrelated. A related merger is more likely to be motivated by economies of scope. Both types of merger can benefit from knowledge sharing, but it is of interest to see if there are differences in integration. We control for partial mergers, in which a firm merges with part of another firm but the rest is spun off. These might involve cherry-picking to maximize benefits or minimize costs of merger. Finally, we control for workforce size in case integration costs are non-linear with respect to size.

Merger characteristics are summarized in Table 1. Nearly half are in retail, hotels, or restaurants. Manufacturing comprises a third of the sample. About 10 percent are partial mergers (typically all of the acquiring firm merged with only some target establishments), 81 percent are related mergers, and 19 percent unrelated. Acquiring firms average four to five times as many establishments as target firms. Acquiring workforces are about six times larger than target workforces. Our measure of relative workforce size is dominance, the fraction of the merged workforce that came from that employee's firm. Average acquiring firm dominance is about 70 percent, implying that average target dominance is about 30 percent. Not surprisingly, acquiring firms tend to dominate targets, but there is substantial

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[4] In previous versions, we assumed that the larger firm was the acquirer in joint mergers, and included those in the sample. We also included multiple mergers. Our results were robust to including or excluding all of these types of observations.

[5] Private industries are agriculture, manufacturing, retail, hotels/restaurants, construction, transport, finance, real estate, and R&D.

Table 1. *Merger characteristics*

	Percent		Mean	Std dev.
Modal one-digit industry at merger		No. of establishments	6.7	(22.3)
Retail, hotels, and restaurants	45.0	Acquiring	5.5	(22.3)
Manufacturing	32.3	Target	1.2	(0.7)
Construction and transport	11.6	No. of employees	221.5	(642.9)
Finance, real estate, and R&D	9.9	Acquiring	189.7	(630.5)
Agriculture	1.2	Target	31.8	(61.7)
		% dominance of	70.6	(22.1)
Partial merger	10.4	acquiring workforce		
		Pre-merger turnover:	acquiring	
Related merger		$t = -1$ to $t = 0$	27.5	(15.5)
One-digit	90.4	$t = -2$ to $t = -1$	24.0	(18.5)
Two-digit	85.0	Pre-merger turnover:	target	
Three-digit	81.7	$t = -1$ to $t = 0$	37.9	(17.9)
Four-digit	81.2	$t = -2$ to $t = -1$	29.3	(20.5)
		N		595

variation. The data include a few mergers with more target workers than acquiring workers.

Table 1 shows turnover in the two years before merger. Turnover is generally high in Denmark due to "flexicurity" labor-market institutions that reduce turnover costs for both workers and firms (Westergaard-Nielsen, 2002). Turnover is higher in target firms.[6] Both have higher turnover in the year before we define the merger. This reflects that mergers occur throughout the calendar year, but our data are fiscal-year-end snapshots. Thus, mergers actually occurred sometime in the twelve months preceding what we call merger date $t = 0$, so our data understate organizational change to that extent. This is a limitation of most merger studies, which typically use annual data. Turnover two years before merger is not very different from that of non-merging firms.

Table 2 examines worker characteristics one year before merger, compared to employees in control groups for each type. Control groups were created using the universe of Danish firms as the potential comparison group for our acquiring and target firms. Control firms were identified as the closest match in firm size, active in the same year and industry (three-digit) as acquiring and target firms, and privately owned.[7] In the top panel, we see that acquiring workers are better paid than target workers by a small

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[6] In our sample, 25.5 percent of acquiring workers and 31.4 percent of target workers leave during the first year after merger. By contrast, firms similar to acquiring and target firms in terms of size and industry but not involved in a merger have lower turnovers of 24.3 and 26.5 percent, respectively.

[7] The advantage of this approach is that it allows matching as closely as possible on observables, without assumptions. An alternative is propensity score matching. We also tried that technique and it did not affect our results. Details of the matching procedures, and

Table 2. *Workforce characteristics of acquiring and target firms pre-merger*

	Mean				
	Acquiring firms	Target firms	Control group for acquiring	Control group for target	All firms
Hourly wage (DK kroner)	159.2	149.5*	155.1	154.2	142.5
	(43.9)	(39.5)	(40.4)	(87.1)	(55.9)
% female	35.5	35.1	34.3	35.4	34.9
	(24.4)	(27.3)	(24.2)	(26.2)	(29.6)
Age	35.0	34.7	35.0	34.5	32.9
	(5.7)	(6.6)	(5.6)	(6.7)	(7.0)
Experience	11.2	11.0	11.0	10.5	9.4
	(4.3)	(4.0)	(4.1)	(4.5)	(4.6)
Tenure	4.3	4.1	4.2	4.1	3.3
	(2.6)	(2.8)	(2.5)	(2.8)	(2.7)
Years of schooling	11.1	11.1	11.0	10.9	10.9
	(1.0)	(1.0)	(0.9)	(1.0)	(1.0)
N	595	595	595	595	644,425
Managers	6.1	5.1*	4.6	5.3	4.1
	(6.0)	(7.1)	(4.4)	(7.1)	(7.2)
R&D workers	7.0	7.9	6.4	6.1	4.1
	(14.0)	(17.5)	(12.3)	(13.0)	(11.6)
Sales workers	13.8	13.1	12.0	8.2	7.7
	(16.6)	(19.0)	(15.2)	(12.3)	(13.8)
Support workers	23.5	22.1	19.5	20.3	20.4
	(18.9)	(20.0)	(14.3)	(17.8)	(20.8)
Production workers	31.3	33.5	36.5	37.8	34.3
	(27.9)	(30.2)	(27.7)	(29.2)	(30.9)
Other workers	2.4	2.1	1.8	2.0	3.2
	(5.3)	(4.2)	(3.4)	(4.3)	(7.6)
Missing occupation	15.7	16.2	19.2	20.3	26.2
	(20.5)	(21.7)	(21.8)	(22.7)	(25.2)
N	195	195	195	195	186,786

Notes: Means and standard deviations. Columns 3 and 4 report summary statistics for control group firms. We use the universe of Danish firms as the potential comparison group for our acquiring and target firms. This allows us to match on observables, as closely as possible, without making any assumptions. The control firms were identified as the closest match in term of firm size and number of plants, active in the same year and the same industry (at the three-digit level) than the acquiring and target firms, and privately owned. We also used the propensity score matching technique to identify the control group firms. The results were not affected. For more details, see the Online Appendix. Column 5 reports the summary statistics for all firms privately owned in the private sector having a minimum of five workers and being active in the same years as the firms in our merger sample. Note that no control group (Columns 3–5) includes firms that have been involved in any type of merger during the period 1980–2001. *denotes statistically different at the 5 percent level between acquiring and target firms.

amount (about US$1.5 per hour). Both target and acquiring employees are about 35 percent female, have an average age of 35, average schooling of 11 years, and tenure of slightly more than four years. There are few

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summary statistics of control groups computed using propensity score matching, are given in the Online Appendix.

differences between our sample and control groups. There are some small differences between the sample and Column 5, which shows characteristics of employees of all non-merging firms of five or more employees for the period 1980–2001. The differences in Column 5 – slightly lower pay, age, tenure, and experience – seem attributable to the larger percentage of small firms in the non-merging data.

The second half of Table 2 is occupational distributions.[8] We lack occupation information for the entire period, so the sample is smaller with 195 mergers. Occupations are classified into manager, R&D, sales, support, production, and other. Only one occupation is significantly different between target and acquiring firms, but patterns are suggestive. Acquiring firms have more managers, 6.1 percent compared to 5 percent, and the difference is statistically significant. There are also more managers in acquiring firms than in control groups. There are more R&D workers in target than acquiring firms, 8 percent to 7 percent (though the difference is insignificant), and both have more R&D workers than control groups. Sales and support are also found more in acquiring and target firms than in non-merging firms, but differences between target and acquiring firms are smaller.

IV. Results

Firm Size and Workforce Composition

We now turn to an analysis of post-merger job moves. If the merger is to enjoy economies of scale, we expect turnover, unless the merged firm subsequently grows. Whether it grows or not, we would expect the firm to prefer its current workforce over new hires, to retain firm-specific human capital, and to avoid turnover and hiring costs. For these reasons, overall employment, rates of exit, and new hiring are of interest. Figure 1(a) plots the average number of establishments, while Figures 1(b)–(d) plot the average number of employees, as well as the 25th and 75th percentiles, for the combined firm from two years before to three years after the merger. Figure 1(b) shows all mergers, while Figure 1(c) and (d) divide the sample into large and small mergers (defined as above or below 73 employees, which is the median at merger). In all plots, the horizontal axis is the time period relative to the year of merger ($t = 0$). Shaded bars represent acquiring firms, white bars target firms, and cross-hatched bars new hires or establishments opened after the merger. In Figures 1(b)–(d), the upper and lower lines represent the 75th and 25th percentiles of the distribution of firm size. These are divided into those from acquiring and target firms,

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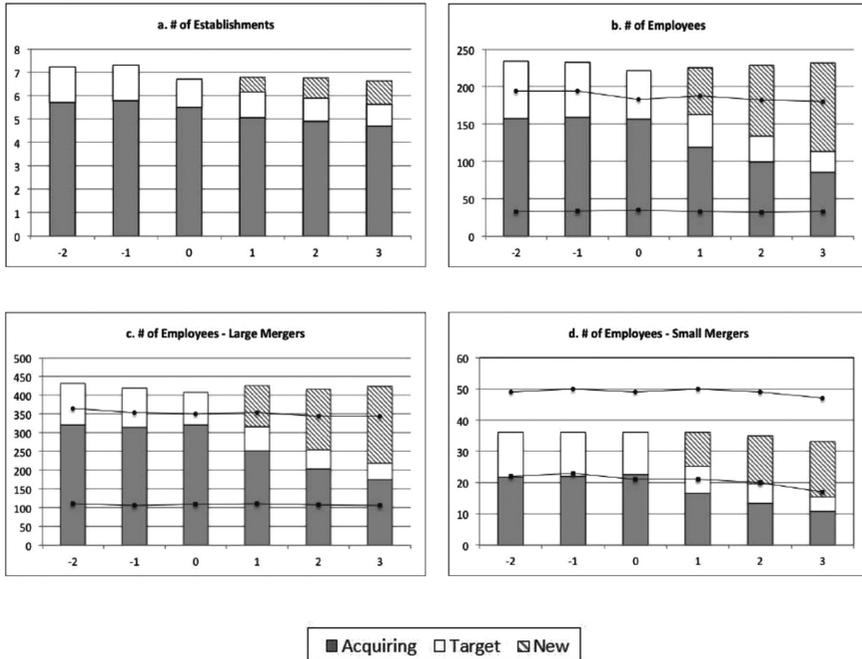[8] The definition of occupational groups is given in the Online Appendix.

Fig. 1. Size of merged firm over time

plus establishments or employees added after the merger. Firm size stayed roughly constant over the six-year merger window: the average number of establishments declined slightly while the average number of employees remained at about 230. The first and third quartiles of the distribution of firm size do not seem to exhibit much change over time either. Mergers are often motivated by downsizing, but the sample period was not a period of dramatic restructuring in Denmark. The fact that the size of the merged firm's workforce does not decline will be of interest for interpretation below.

While the number of establishments remained roughly constant, there was some shutting down of both acquiring and target establishments. These were replaced by the creation of one new establishment in the average merger. A similar story holds for employment, but the creative destruction is more pronounced. We see high turnover: roughly 45 percent of acquiring and 55 percent of target workers are gone after three years. However, these were replaced with new hires, so that half of the workforce was new by the end of the third year. This reflects the high turnover in Denmark's labor market, but also indicates restructuring during implementation of the merger.

These patterns might obscure heterogeneity in merger types. As a quick check, Figures 1(c) and (d) provide plots similar to Figure 1(b) for large and small mergers.[9] The basic story remains. Both large and small mergers have approximately constant total employment over time (although firms at the extreme of the distribution are shrinking slightly more), high turnover of acquiring and target workers, and new hires comprising roughly half the workforce after three years. Similar conclusions apply to the number of establishments, and if we divide the sample into related and unrelated mergers (neither comparison is shown). It is remarkable that few differences in post-merger restructuring are evident in any of these comparisons.

Worker Transitions and Reallocations

If the purpose of the merger is to share knowledge, then firms need some method of organizational integration. As discussed above, there are two issues to consider. The first is the method used – the choice between mixing employees by reassignment to an establishment in the other firm (hard mixing) or by reassigning workers from both to a new establishment (soft mixing). The second issue is the extent of collaboration between the workforces after merger. If integration is difficult or costly, then the firm might choose less dramatic ways to achieve knowledge sharing, by avoiding mixing and strategically reassigning a small fraction of workers to achieve integration.

Table 3 sheds light on these issues by summarizing job moves after the merger. Employees who do not exit are classified into not mixing (remain employed in an establishment that was in their firm at the time of merger) or mixing (hard or soft). The majority of day-to-day colleagues of non-mixers are from their original firm, so disruption to those employees is likely to be relatively slight. Mixers have a high fraction of colleagues who are not from their original firm, especially if they hard mix.

Because acquiring and target firms have different structures (acquiring firms are larger and have more establishments), we also report predicted values. These assume that, conditional on switching establishment, employees are reassigned to other establishments randomly, with odds equal to the fraction of employees in those other establishments. For example, if workers are more likely to be reassigned to larger rather than smaller establishments, target workers will mix more on average. This is a purely mechanical effect and, by comparing actual and predicted transitions, we are able to assess whether or not this is what we are capturing. We calculate these predicted values over all possible establishment changes: hard and

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[9] We use median employment size at merger (73 workers) as the cut-off point.

Table 3. *Cumulative post-merger transitions*

	Acquiring		Target	
	Actual	Predicted	Actual	Predicted
From t = 0 to t = 1				
Among those who do not exit				
Not mixing				
% staying in same estab.	91.3		89.9	
% changing estab. w/in pre-merger firm	6.2	6.0*	0.8	0.6*
Mixing				
% hard mixing – to estab. in other firm	0.8	2.0*	6.8	8.7*
% soft mixing – to estab. created post-merger	1.7	0.7*	2.5	0.6*
% who exit	20.8		26.7	
From t = 0 to t = 3				
Among those who do not exit				
Not mixing				
% staying in same estab.	80.3		83.1	
% changing estab. w/in pre-merger firm	12.0	13.0*	1.5	1.2*
Mixing				
% hard mixing – to estab. in other firm	1.2	3.3*	12.0	14.0*
% soft mixing – to estab. created post-merger	6.5	2.6*	3.4	1.3*
% who exit	40.4		52.0	
N		112,877		18,918
Equal-size mergers: from t = 0 to t = 3				
Among those who do not exit				
Not mixing				
% staying in same estab.	92.1		89.0	
% changing estab. w/in pre-merger firm	2.0	1.3*	1.7	1.1*
Mixing				
% Hard mixing – to estab. in other firm	3.5	4.8*	7.5	8.9*
% Soft mixing – to estab. created post-merger	2.5	0.8*	2.0	0.8*
% who exit	48.1		50.6	
N		17,145		12,768
Unequal-size mergers: from t = 0 to t = 3				
Among those who do not exit				
Not mixing				
% staying in same estab.	78.5		69.9	
% changing estab. w/in pre-merger firm	13.6	15.8*	1.1	0.3*
Mixing				
% Hard mixing – to estab. in other firm	0.8	2.2*	22.2	26.8*
% Soft mixing – to estab. created post-merger	7.1	3.0*	6.7	3.0*
% who exit	39.0		54.7	
N		95,732		6,150

Notes: *denotes that actual and predicted transitions are different with 5 percent significance. Predicted values assume that, conditional on switching establishment, employees are reassigned to other establishments randomly, with odds equal to the fraction of employees in those other establishments. Equal-size and unequal-size mergers are defined according to the median of dominance of acquiring workers, which is 75 percent.

soft mixing, plus changing establishments within the employee's original firm.[10]

The most striking observation in Table 3 is that mixing rates are low. Of those who remain after three years, roughly 92 percent (80.3 + 12.0 percent) of acquiring workers and 85 percent (83.1 +1.5 percent) of target workers have not mixed. This implies that gains from integration are achieved not by creating one seamless organization out of the two workforces, but instead by reassigning some few employees to work with colleagues from the other firm.[11] In this sense, the merger might have little day-to-day effect on the jobs of most workers. Below, we examine what types of workers are given those reassignments.

We see some differences between the workforces when we examine those who change establishments. First, target workers are more likely to mix than are acquiring workers. Total mixing after three years is over 15 percent for target workers, compared to about 8 percent for acquiring workers. Much of this appears to be driven by the fact that target firms have fewer and smaller establishments, as predicted values suggest that acquiring workers were expected to hard mix less than target workers. Second, there is less hard mixing, and more soft mixing, than expected for both groups. For example, acquiring workers have 6.5 percent odds of soft mixing after three years, compared to 2.6 percent expected. They have 1.2 percent odds of hard mixing, compared to 3.3 percent expected. Similar results occur for target workers – there is less hard mixing, and more soft mixing, for both acquiring and target workers than would be expected if reassignments were random.

This tells us something about how merging firms implement integration. It seems that setting up new organizational units, instead of combining existing ones, increases the gains or decreases the costs of integration. Hard mixing sends an employee across firms into an existing group that might resist change. This mixing employee will probably have to adopt most of the policies and procedures of the existing group, and might face pressure to fit in rather than push for changes. The firm might find it easier to make changes by soft mixing, as it starts the organizational unit from

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[10] Details of the procedure used to compute predicted values are given in the Online Appendix.

[11] Alternatively, this finding could imply that integration is largely possible via communication and coordination without collocation. Certainly there must be some truth to this. However, most organizations go to some lengths to locate employees together, unless there is a compelling business reason for different locations, suggesting that physical proximity improves collaboration and coordination. Urban economics finds a similar effect, in which more densely populated cities tend to have higher rates of innovation, suggesting that even collaboration across firms is enhanced by physical proximity (Carlino, 2001).

scratch. In a new establishment, no employees are incumbents or minorities trying to assimilate into an existing group.

The bottom panel presents worker transitions for equal-size and unequal-size mergers, defined according to the median of acquiring workers' dominance (75 percent). Because our focus is on integration, we concentrate on the numbers for mixing. The patterns are similar to what was found above. Acquiring workers do not mix much, and when they do, the firm relies on soft mixing. Target workers mix much more often, and are especially likely to hard mix. There is, however, a different pattern between equal-size and unequal-size mergers. Unequal-size mergers have mixing rates for target workers twice as high as in the entire sample, indicating that unequal-size mergers have stronger effects for mixing target workers. Acquiring workers very rarely experience hard mixing in unequal-size mergers. By contrast, equal-size mergers show much lower mixing rates for target workers but higher mixing rates for acquiring workers. As observed before, in all cases, hard mixing is less than predicted and soft mixing is more than predicted.[12]

Characteristics of Mixers, Non-Mixers, Exits, and New Hires

Table 4 describes the characteristics of employees by their status three years after merger. Compared to non-mixers, hard mixers are more likely to be male, have less tenure, similar ages, more education, and a higher wage percentile (especially target workers). Soft mixers look similar to hard mixers but exhibit smaller differences in term of tenure, gender, and education with respect to non-mixers. Workers who exit are younger, less educated, have less experience and tenure, and lower pay. Firms appear to retain skilled workers, mixing the most skilled of that group, and replace those less skilled with new hires (who are even younger, less experienced, and paid less). These findings are consistent with the view that one motive for mergers is to share knowledge within the new firm, and that high human capital workers most embody that knowledge.

In the lower half of Table 4, we examine occupation distributions and mixing status three years after merger. Among acquiring workers, 12.6 percent of hard mixers, 4.1 percent of non-mixers, and 3.4 percent of soft mixers are managers. For target workers, we find the opposite: 4.6 percent of hard mixers, 4.1 percent of non-mixers, and 9.8 percent of soft mixers are managers. Acquiring managers are redeployed to target workplaces, suggesting that some supervision from the acquiring company might be

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[12] In a previous version of the paper, we split the sample between related and unrelated mergers, defined at the four-digit level. Our findings were not affected. Interestingly, target workers have a higher rate of mixing in unrelated mergers than in related mergers.

Table 4. *Employee demographics by type of transition: three years post-merger*

| | Acquiring | | | | Target | | | | |
| | Not mixing | Mixing | | Exit | Not mixing | Mixing | | Exit | New hires |
		Hard	Soft			Hard	Soft		
Female	36.3	29.6	40.0	36.4	31.3	20.0	28.6	33.9	35.7
	(48.1)	(45.7)	(49.1)	(48.1)	(46.4)	(39.7)	(45.2)	(47.4)	(47.9)
Age	38.6	38.8	38.5	34.6	38.7	38.4	38.0	33.8	31.7
	(10.6)	(11.4)	(10.3)	(13.6)	(10.7)	(10.6)	(11.0)	(13.3)	(11.3)
Years of schooling	11.7	12.0	12.1	11.3	11.2	12.0	12.2	10.9	11.5
	(2.0)	(2.3)	(2.4)	(2.1)	(1.9)	(2.2)	(2.3)	(2.0)	(2.2)
Experience	15.1	13.4	14.5	10.4	15.1	15.6	14.0	10.4	9.0
	(8.0)	(7.9)	(7.5)	(8.6)	(8.0)	(8.6)	(8.3)	(8.7)	(8.0)
Tenure	7.7	4.6	6.3	4.1	6.0	4.6	4.8	3.3	0.9
	(7.1)	(5.7)	(6.5)	(5.8)	(6.5)	(5.4)	(6.0)	(5.2)	(1.7)
Wage percentile	53.2	54.5	52.1	45.6	51.6	56.4	57.1	43.4	42.3
	(27.8)	(29.0)	(27.7)	(30.0)	(27.2)	(28.0)	(28.0)	(28.9)	(29.6)
N	62,140	788	4,384	45,565	7,690	1,089	311	9,828	61,448
Occupation									
Manager	4.1	12.6	3.4	3.5	4.1	4.6	9.8	3.7	2.6
	(19.8)	(33.2)	(18.1)	(18.3)	(19.7)	(21.0)	(29.9)	(18.9)	(15.9)
R&D	10.7	21.7	7.3	8.6	8.2	31.3	4.9	9.2	11.7
	(30.9)	(41.3)	(26.1)	(28.1)	(27.5)	(46.4)	(21.7)	(28.9)	(32.2)
Sales	13.5	10.2	10.5	14.1	6.7	10.8	15.7	7.5	11.8
	(34.2)	(30.5)	(30.7)	(34.8)	(25.0)	(31.0)	(36.5)	(26.4)	(32.2)
Support	38.6	22.3	25.3	29.4	15.0	17.2	15.7	17.4	22.6
	(48.7)	(41.7)	(43.5)	(45.6)	(35.7)	(37.8)	(36.5)	(37.9)	(41.8)
Other	26.8	26.3	42.5	29.3	56.7	26.8	37.3	44.7	35.1
	(44.3)	(44.1)	(49.5)	(45.5)	(49.6)	(44.3)	(48.6)	(49.7)	(47.7)
Missing	6.3	4.0	11.0	15.1	9.4	9.3	16.7	17.4	16.2
	(24.2)	(19.7)	(31.2)	(35.8)	(29.2)	(29.0)	(37.5)	(37.9)	(36.8)
N	21,352	175	683	14,400	3,975	604	102	4,136	35,295

Notes: Means and standard deviations. Columns in the bottom half sum to 100 percent.

required there. In contrast, the firm tends to send target managers to newly created establishments, possibly to share specific capital or knowledge, or to redeploy more talented target managers.

A large fraction of R&D workers hard mix. For acquiring workers, 21.7 percent of hard mixers are from R&D, while they are only 10.7 percent of non-mixers. The effect is even stronger for target workers, where R&D accounts for 31.3 percent of hard mixers. This might indicate that physical integration is particularly important for R&D workers to create synergies and share knowledge.

For other occupation groups, fewer patterns emerge. Acquiring workers in sales and support have a lower share of mixers than non-mixers. Target sales workers are subject to more reallocation than acquiring sales workers. It is interesting that support and production occupations comprise the highest share of exits. High exit and mixing rates for support workers could

mean that those workers are more likely to be redundant post-merger, or most easily replaced by new hires.

Competing Risks

In Tables 5 and 6, we use competing risk models to estimate the effect of worker and firm characteristics on the probability that a worker experiences hard mixing, soft mixing, or exit.[13] The baseline in estimations is remaining in an establishment from one's pre-merger firm. Multinomial probits are used for the competing risk models.[14] To allow the time workers are at risk to play a role, we use a non-parametric baseline by creating duration-interval-specific dummy variables, one for each spell at risk. All specifications include industry and year fixed effects. Tables 5 and 6 report marginal effects instead of coefficients for ease of interpretation.

The first result in Table 5 is the protective effect of dominance on the probability of transition, particularly for target workers. A more dominant (i.e., relatively larger) target workforce at merger implies less mixing to acquiring or new establishments and fewer exits for target workers. This effect is found after controlling for firm size and the number of establishments each pre-merger firm owns. The marginal effect on hard mixing for target workers is 8.1 percent (-0.081 in the first row, Column 1). The standard deviation of dominance is 0.241, so a one standard deviation increase in dominance for target workers decreases the probability of hard mixing by $0.081 \times 0.241 = 0.0195$, which is almost 2 percent. The predicted rate of hard mixing for target workers is 3.7 percent, so a 2 percent fall in probability amounts to a 54 percent relative decline in the rate of hard mixing, a very large relative effect. Similarly, a one standard deviation increase in target dominance yields a 0.87 percentage point, or 67 percent decrease, in predicted soft mixing, and a 2.2 percentage point or 9.8 percent reduction in predicted exits. Because we expect that post-merger transitions might be risky and difficult from the worker's point of view, and probably from the point of view of the firm as well, it is notable that dominance reduces the probability of these events for target workers.

Dominance is not as strongly related to post-merger transitions for acquiring workers. There is a significant reduction in hard mixing, but no

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[13] We only estimate competing risks for the first worker transition. For example, a worker might mix in year 2, then move back in year 3. Including multiple moves would create too many competing risks for feasible estimation or meaningful interpretation. Fortunately, only a small fraction of workers make multiple moves: 2.1 percent during a three-year period and 12.0 percent over a ten-year period.

[14] We also estimated multinomial logits for the competing risk models; these assume independence of irrelevant alternatives. We use multinomial probits because our data do not satisfy the IIA assumption. Our results were similar to multinomial logits.

Table 5. *Multinomial probit estimation of post-merger movements – up to three years post-merger (baseline: stay in the same pre-merger firm)*

	Target workers			Acquiring workers		
	Mixing			Mixing		
	Hard dy/dx	Soft dy/dx	Exit dy/dx	Hard dy/dx	Soft dy/dx	Exit dy/dx
Dominance, employee's workforce	−0.081*** (0.015)	−0.036*** (0.010)	−0.091*** (0.031)	−0.013*** (0.003)	0.018 (0.013)	0.026 (0.040)
Related merger	0.009 (0.008)	−0.008 (0.005)	−0.024 (0.017)	0.000 (0.001)	0.007 (0.005)	−0.002 (0.013)
Partial merger	0.001 (0.010)	0.011 (0.009)	−0.023 (0.025)	0.001 (0.002)	0.015*** (0.006)	−0.019 (0.018)
Pre-merger turnover	−0.020 (0.019)	0.031*** (0.009)	0.086* (0.047)	0.008 (0.007)	0.077*** (0.019)	0.206*** (0.038)
No. establishments, employee's firm	0.004 (0.003)	0.003*** (0.001)	−0.011* (0.006)	−0.000 (0.000)	−0.000*** (0.000)	0.001** (0.000)
Merger size/100	0.000 (0.001)	−0.000 (0.001)	−0.002 (0.002)	−0.000 (0.001)	0.001*** (0.000)	−0.002** (0.001)
Age	−0.000 (0.001)	−0.000 (0.001)	−0.017*** (0.002)	−0.000 (0.001)	0.000 (0.001)	−0.019*** (0.002)
Age^2	−0.000 (0.001)	0.000 (0.001)	0.000*** (0.000)	0.000 (0.001)	−0.000 (0.001)	0.000*** (0.000)
Experience	0.000 (0.001)	0.000 (0.001)	−0.012*** (0.002)	0.000 (0.001)	0.001* (0.000)	−0.004*** (0.001)
Experience^2	0.000 (0.001)	0.000 (0.001)	0.000*** (0.000)	−0.000 (0.001)	−0.000 (0.001)	0.000 (0.001)
Tenure	−0.001 (0.001)	−0.001*** (0.000)	−0.018*** (0.002)	−0.000 (0.001)	−0.001** (0.000)	−0.015*** (0.001)
Tenure^2	0.000 (0.001)	0.000* (0.000)	0.001*** (0.000)	0.000 (0.001)	0.000 (0.000)	0.000 (0.001)
Years of schooling	−0.005 (0.005)	−0.005 (0.005)	−0.005 (0.014)	0.001 (0.001)	0.006** (0.003)	−0.029*** (0.009)
Years of schooling^2	0.000** (0.000)	0.000 (0.001)	0.000 (0.001)	−0.000 (0.001)	−0.000** (0.000)	0.001*** (0.000)
Female	−0.012*** (0.004)	0.004** (0.002)	−0.001 (0.008)	−0.000 (0.001)	0.000 (0.001)	−0.006 (0.006)
Wage residual	0.190*** (0.040)	0.004 (0.030)	0.394*** (0.111)	0.002 (0.004)	−0.003 (0.017)	0.278*** (0.054)
Predicted probability	0.037	0.013	0.225	0.004	0.020	0.162
Log pseudo likelihood		−26,582			−129,849	
N		40,076			267,825	

Notes: Standard deviations given in parentheses. All specifications include industry and year fixed effects. We use a non-parametric baseline by creating duration-interval-specific dummy variables, one for each spell year at risk. Data are truncated 3 years after the merger. Related mergers are defined at the 4-digit level. Wage residuals were computed from OLS estimation of individual wages using quadratics for age, experience and firm tenure; female, years of education, merger size, and year and industry fixed effects as covariates. We report marginal effects of multinomial probit estimations. Standard errors are clustered by merger. ***, **, and *denote significance at the 1, 5, and 10 percent levels, respectively.

Table 6. *Multinomial probit regression of post-merger movements – up to three years post-merger, including occupation codes (baseline: stay in the same pre-merger firm)*

	Target workers			Acquiring workers		
	Mixing			Mixing		
	Hard dy/dx	Soft dy/dx	Exit dy/dx	Hard dy/dx	Soft dy/dx	Exit dy/dx
Dominance, employee's workforce	−0.066*** (0.023)	−0.030** (0.012)	−0.021 (0.030)	−0.013*** (0.005)	−0.003 (0.009)	−0.017 (0.037)
Related merger	−0.007 (0.011)	−0.008 (0.007)	0.011 (0.014)	−0.001 (0.002)	0.012 (0.011)	−0.029* (0.015)
Partial merger	0.019 (0.015)	−0.008 (0.006)	0.013 (0.019)	0.000 (0.002)	0.008 (0.006)	−0.003 (0.015)
Pre-merger turnover	0.019 (0.023)	0.039** (0.016)	0.095** (0.039)	−0.003 (0.005)	0.008 (0.013)	0.112*** (0.044)
No. establishments, employee's firm	−0.000 (0.003)	0.004* (0.002)	−0.001 (0.004)	−0.000 (0.001)	−0.000 (0.001)	0.000 (0.001)
Merger size/100	0.001 (0.001)	−0.001 (0.001)	−0.001*** (0.005)	−0.001 (0.001)	0.000 (0.001)	−0.001 (0.001)
Age	0.001 (0.001)	−0.000 (0.001)	−0.020*** (0.004)	−0.000 (0.001)	0.000 (0.001)	−0.021*** (0.003)
Age^2	−0.000 (0.001)	0.000 (0.001)	0.000*** (0.000)	0.000 (0.001)	−0.000 (0.001)	0.000*** (0.000)
Experience	0.001 (0.001)	0.000 (0.001)	−0.006** (0.002)	0.000 (0.001)	0.000* (0.000)	−0.003* (0.002)
Experience^2	0.000 (0.001)	−0.000 (0.001)	0.000 (0.001)	−0.000 (0.001)	−0.000 (0.001)	−0.000 (0.001)
Tenure	−0.002** (0.001)	−0.000 (0.001)	−0.016*** (0.002)	−0.000 (0.001)	−0.001** (0.000)	−0.011*** (0.002)
Tenure^2	0.000** (0.000)	−0.000 (0.001)	0.000*** (0.000)	0.000 (0.000)	0.000 (0.001)	0.000*** (0.000)
Years of schooling	0.010 (0.007)	−0.003 (0.003)	0.004 (0.018)	0.002* (0.001)	0.008** (0.003)	−0.008 (0.008)
Years of schooling^2	0.000* (0.000)	0.000 (0.001)	−0.000 (0.001)	−0.000 (0.001)	−0.000** (0.000)	0.000 (0.001)
Female	−0.015** (0.006)	0.001 (0.003)	0.009 (0.010)	−0.002** (0.001)	−0.003** (0.002)	0.014* (0.008)
Wage residual	0.158*** (0.052)	−0.014 (0.034)	0.431*** (0.144)	−0.009 (0.006)	0.009 (0.020)	0.206*** (0.050)
Managers	0.034*** (0.011)	0.002 (0.006)	0.032** (0.014)	0.004** (0.002)	−0.001 (0.002)	0.018 (0.014)
R&D	0.037*** (0.008)	−0.002 (0.005)	0.020 (0.020)	0.006*** (0.002)	−0.003 (0.003)	−0.012 (0.009)
Sales	0.024*** (0.007)	−0.001 (0.006)	0.010 (0.015)	0.003* (0.002)	0.000 (0.002)	−0.004 (0.009)
Support	0.024*** (0.006)	−0.002 (0.004)	0.011 (0.013)	0.003** (0.001)	−0.001 (0.002)	−0.013 (0.008)
Predicted probability	0.038	0.011	0.183	0.009	0.004	0.147

(*Continued*)

Table 6. *Continued*

	Target workers			Acquiring workers		
	Mixing			Mixing		
	Hard dy/dx	Soft dy/dx	Exit dy/dx	Hard dy/dx	Soft dy/dx	Exit dy/dx
Log pseudo likelihood		$-10,170$			$-37,317$	
N		17,027			83,026	

Notes: All specifications include industry and year fixed effects. We use a non-parametric baseline by creating duration-interval-specific dummy variables, one for each spell year at risk. Data are truncated three years after the merger. Related mergers are defined at the four-digit level. Wage residuals were computed from OLS estimation of individual wages using quadratics on age, experience, and firm tenure; female, years of education, occupational groups, merger size, and year and industry fixed effects as covariates. Only workers with non-missing occupation code are used; baseline is production and other occupations. We report marginal effects of multinomial probit estimations. Standard errors (in parentheses) are clustered by merger. ***, **, and *denote significance at the 1, 5, and 10 percent levels, respectively.

effect on soft mixing or exits. Because dominance of the acquiring firm is, on average, about 70 percent, we might not expect large marginal effects of dominance for acquiring workers. The fact that we see strong effects for target workers, in contrast, suggests that small increases in power from a relatively small base translate into large effects in outcomes for those workers.

Looking at other firm characteristics, there are few significant variables. Related merger is a dummy variable indicating whether the firms are in the same four-digit industry.[15] Our expectation was that post-merger transitions might vary, as firms in the same industry might experience economies of scale by merging. However, there are no significant differences between related and unrelated mergers in transitions. Both types of mergers seem to require similar levels of mixing and turnover. Similarly, the dummy variable for partial mergers (which might indicate that the acquiring firm cherry-picked establishments of particular value or ease of integration) is positive and significant for acquiring workers who soft mix, but insignificant in all other cases.

Pre-merger turnover, which can proxy for firm turbulence before merger, has positive and significant effects on soft mixing and exit rates, but not on hard mixing.[16] Having more pre-merger establishments decreases the

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[15] We use modal industry for each pre-merger firm, defined with respect to the number of workers. We experimented with using two- and three-digit industries. We also computed the share of workers active in the same major industry to capture related mergers in a continuous way. Our results were not affected by the type of variable chosen.

[16] As noted, annual data create measurement error in job transitions. For example, pre-merger turnover might be understated. Similarly, if employees mix and exit soon thereafter, then the extent of mixing is understated.

probability of exit and increases the probability of soft mixing for target workers. Because a small change in the number of establishments is more significant in proportional terms for target firms, it seems reasonable that the effect is larger than for acquiring workers. Merger size (number of employees) only affects acquiring workers; the effect is small.

The effects of worker characteristics are estimated in the lower part of Table 5. Older, more experienced, and more tenured workers are less likely to exit the firm, with all exhibiting statistical significance. This is consistent with the common finding in labor economics that as workers age, their rate of turnover slows down. Women in target firms are less likely to hard mix, consistent with Table 4. We saw in Table 4 that mixing workers, particularly from the target firm, tend to be in higher wage percentiles and are slightly more educated. However, wages are correlated with educational attainment. For this reason, in Table 5, we use wage residuals as an estimate of unobserved ability, computed from OLS estimation of individual wages controlling for years of education, gender, merger size, industry fixed effects, years, and quadratics for age, experience, and tenure. In these results, workers with high wage residuals are more likely to exit the firm. Additionally, target workers with high wage residuals are more likely to engage in hard mixing. It appears that the effect of unmeasured ability on transition probabilities is bimodal – some workers, particularly target workers, with high unmeasured ability will be more likely to experience transitions in the newly merged firm, while others will end up leaving the firm.[17]

The results in Table 5 suggest that firm structure and merger characteristic variables do not matter much for post-merger transitions. The exceptions are dominance, which reduces the number of workplace transitions for target workers, and pre-merger turnover, which indicates that firms experiencing pre-merger volatility see it continue after merger.[18] As far as worker characteristics, the interesting result is that turnover is lower for workers with more observable ability (education, tenure, and experience), but higher for those with more unobservable ability (wage residual). These findings provide mixed evidence on the role of high human capital workers in implementing a merger. We ran the same estimation up to ten years post-merger to see whether long-term effects differ from three-year

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[17] Exits might reflect either that some target workers will have better outside options and leave the firm to pursue them, or that some target workers were overpaid before the merger and therefore fired afterwards.

[18] An issue with the dominance variable is that the effect could be due to a mechanical relationship between size and mixing. To address this, we reran Table 5, adding the predicted value of mixing from Table 3. The results were not affected (see the Online Appendix).

effects.[19] Overall, the effects are durable and persist up to ten years. The persistent impact of these variables on transitions argues that these are not fleeting effects that appear at merger and dissipate quickly. Rather, they fundamentally influence the long-term fate of workers in merged firms. Moreover, the fact that the effects are similar in magnitude at three and ten years suggests that most restructuring occurs quickly.

In Table 6, we add dummy variables for various occupational groups to see if occupational effects on mixing exist. We chose occupations especially relevant for mergers (e.g., Pautler, 2003), either because they play a role in coordination (managers, R&D), possess knowledge and skills that are important for the merged firm (R&D, sales), or are a source of efficiencies by eliminating redundancies (support). We combine production and other occupations as the base case.

Recall that occupation data are only available from 1993, and are most complete from 1995. As the panel is shorter and the sample size smaller, it is striking that marginal effects are quite comparable between Tables 5 and 6. For example, the effect of dominance on hard and soft mixing is approximately the same. Although the marginal effect on hard mixing for targets is slightly smaller, a one standard deviation increase is $-0.066 \times 0.242 = -0.016$, or a reduction of 42 percent of the predicted value, nearly the same as the effect in Table 5. The other marginal effects of dominance are about the same as in Table 5, save target exits. Other marginal effects on firm variables are not significant, except pre-merger turnover increasing exits for both acquiring and target workers. Similar observations apply to effects of worker characteristics, compared to Table 5. We regard the stability of marginal effects in the face of occupational controls and smaller sample sizes as evidence that employee characteristics play an important role in post-merger integration.

Now consider the effects of occupational classifications. The occupations denoted by dummy variables turn out to have significantly higher hard mixing rates than the omitted occupations. The marginal effect for target employees of hard mixing is almost ten times larger than the effects for acquiring employees. In addition, the effects for high-human capital occupations – managers and R&D – are substantially larger than those for support or sales. High human capital occupations are more likely to be involved in integration (hard mix), and the effect is more pronounced for target workers than acquiring workers. In fact, if a target worker is a manager or in R&D, the marginal effect of occupation – ignoring the impact of the

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[19] Results are available in the Online Appendix. We also performed the following robustness checks (also reported in the Online Appendix): split the sample into firms with sizes above and below median, and split the sample into related and unrelated mergers. In all cases, the results were similar, with no important substantive differences.

other variables – is large enough that the predicted probability of hard mix-
ing is nearly fully accounted for. Similarly, for acquiring workers, the effect
of occupation accounts for half to two-thirds of the predicted probability.

These large occupation effects suggest that post-merger transitions are
deliberate, consequential for careers, and explainable by the structures of
merging firms and types of workers management inherits. Many papers
have documented that target workforces are disadvantaged when mergers
take place; we link the target's population outcomes to dominance and its
protective effect on shielding workers from post-merger transitions. Simi-
larly, some studies have examined the role of human capital in mergers;
we find that this is concentrated in certain occupations.

Wages and Exit Rates by Type of Transitions

As mentioned above, mixing (especially hard mixing) can lead to high vari-
ance in outcomes, but potentially high rewards if the employee is successful
in the new role. To investigate this further, Table 7 presents the mean and
variance of wage level, wage growth, and exit for three job trajectories: not
mixing, hard mixing, and soft mixing.[20] Three years post-merger, mixing
is associated with higher wage levels than not mixing. In most cases, the
variance of wages is also higher for mixing, for both acquiring and target
workers. Of course, wage data are only available for employees who re-
main with the firm. If mixing is a difficult position for an employee, then
turnover might increase. For this reason, Table 7 also includes exit rates,
measured one year, two years, and three years after the merger occurred.

Turning to wage growth, the mean and variance are also higher for
mixers. Acquiring and target groups exhibit some different patterns. For
acquiring workers, hard mixing leads to higher mean and variance growth
than does soft mixing or not mixing. Moreover, acquiring workers who
will hard mix earn slightly higher wages at the time of the merger and
have previously experienced higher wage growth. This might indicate that
acquiring firms send employees with high management human capital or
skills to target establishments in order to foster integration, and that this
corresponds to pay increases.

Target firms display different patterns. Hard mixing leads to slightly
higher wage growth, with higher variance. Soft mixing leads to the highest

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[20] To control for the fact that individuals in each group (non-mixers, hard-mixers, and soft-
mixers) are different along observed as well as unobserved dimensions, we also replicate
Table 7 using standardized mean wages and wage growth with respect to individual char-
acteristics. Standardized wages (wage growth) are the residuals of an OLS estimation of
individual wage (wage growth) using quadratics on age, experience and firm tenure, fe-
male, years of education, merger size, years and industry fixed effects as covariates. Using
standardized means did not affect our findings. Results are provided in the Online Appendix.

Table 7. *Wage, wage growth, and exit rates by type of mixing*

	Year after merger			
	0	1	2	3
Acquiring				
Not mixing				
Hourly wage	175.2 (91.8)	178.8 (99.2)	186.4 (96.6)	189.3 (94.2)
Wage growth (%)	3.4 (17.7)	3.8 (29.2)	8.4 (34.1)	10.9 (36.4)
Exit (%)	−	14.0	12.5	11.6
N	87,183	87,183	72,176	57,393
Hard mixing				
Hourly wage	183.5 (80.1)	203.3 (356.2)	188.0 (81.9)	205.9 (106.1)
Wage growth (%)	4.6 (26.4)	9.7 (88.7)	12.9 (59.8)	14.2 (42.2)
Exit (%)	−	16.7	16.6	13.1
N	738	738	579	718
Soft mixing				
Hourly wage	174.7 (66.3)	179.2 (67.4)	205.9 (119.8)	209.9 (94.2)
Wage growth (%)	2.7 (15.2)	4.3 (21.7)	8.3 (44.0)	11.4 (29.2)
Exit (%)	−	18.5	9.3	9.4
N	1,510	1,510	4,051	4,049
Target				
Not mixing				
Hourly wage	163.3 (67.9)	165.1 (77.5)	170.3 (67.4)	175.3 (66.3)
Wage growth (%)	3.7 (22.9)	3.1 (29.5)	6.5 (28.2)	8.9 (34.6)
Exit (%)	−	19.9	18.1	14.0
N	12,582	12,582	9,649	6,896
Hard mixing				
Hourly wage	206.4 (124.2)	200.8 (94.8)	225.4 (96.8)	205.4 (163.4)
Wage growth (%)	5.2 (30.3)	1.7 (22.2)	8.3 (25.8)	11.3 (72.7)
Exit (%)	−	23.4	15.6	18.8
N	936	936	1,163	738
Soft mixing				
Hourly wage	191.4 (76.3)	195.7 (73.4)	199.9 (86.4)	204.5 (127.5)
Wage growth (%)	1.1 (18.8)	6.8 (54.8)	14.7 (77.5)	17.0 (34.4)
Exit (%)	−	21.6	18.4	19.4
N	347	347	256	237

Notes: Statistics are for all employees who were at the firm at the time of merger, and who remain with the merged firm through period t. Wages are real wages in 2001 prices. Wage growth is cumulative real wage growth, $[w(t) − w(t0)]/w(t0)$ for $t = 1, 2, 3$. For $t = 0$, wage growth is defined as $[w(t0) − w(t − 1)]/w(t − 1)$. Exit rates at period t are rates of exit from t to $t + 1$, computed only for workers in surviving firms. "Not mixing" includes employees who did not change establishments, or changed to an establishment that was in their pre-merger firm at the merger.

wage growth, with high variance as well. Target mixers also earn higher wages before they mix, although only hard mixers seem to enjoy higher wage growth prior mixing. One interpretation is that the firm tries to learn about target workers' ability by mixing, and allocates the best to highly paid positions. It might also be that selection is made with respect to how easily target workers can integrate. Target workers who successfully mix might end up in management and see higher wages, as we saw in Table 4. This could be because the firm finds it easier to integrate target workers into newly created establishments.

Finally, exit patterns in Table 7 are consistent with the view that mixing is risky for target workers. Exit rates are not very different for non-mixers and mixers from the acquiring firm. By contrast, for target workers, exit rates are substantially higher for mixers than for non-mixers.

It is not surprising that acquiring and target employees have different outcomes due to hard and soft mixing. It seems reasonable that acquiring firms reward those who can spread their culture and methods, and that repositioned target workers have to prove themselves (in skills, integration, or both) in order to be given more responsibility. Finally, new establishments might especially benefit from receiving target managers as changing the culture and expectations is not necessary in a new plant.

V. Conclusion

A merger is an interesting topic for study because two organizations suddenly become one. The methods, timing, and extent of integration provide important clues to broader questions about organizational design, as they reflect trade-offs between benefits from merger and costs of integration, which currently are not well understood. We provide the first systematic evidence on integration, which we hope will stimulate others to analyze the topic theoretically and empirically.

We find no evidence that post-merger workforce dynamics vary across industry or size of merging firms. Post-merger restructuring is substantial. Most occurs in the first three years, and effects on workers persist for at least ten years.

As in prior research, turnover rises as a result of merger. A large fraction of employees leave the merged firm, from both sides. The increase in turnover is significantly larger for target workers. Despite high turnover from both workforces, average total employment remains stable. Therefore, firms are replacing employees who possessed firm-specific capital with new hires.

This paper provides some of the first evidence on integration of the merging workforces. We measure integration by physical collocation (mixing) of employees from both firms in the same workplace. An interesting finding is that merging firms do not mix their workforces extensively. We observe significantly more soft mixing than hard mixing. Target workers are more likely to mix than are acquiring workers, and particularly more likely to hard mix.

Workers who mix, and presumably play important roles in post-merger integration, tend to come from certain occupations. Those employed in R&D and management have a higher propensity to hard mix, and target employees more than acquiring employees. Target workers who are highly skilled (measured by wage residuals) are also more likely to hard mix.

We have also analyzed the effect of dominance – workforce size, relative to the other firm – on outcomes. Dominance is negatively correlated with both turnover and mixing: the larger (more dominant) a firm is at the time of merger, the lower are turnover and mixing for its employees. This finding holds for both acquiring and target employees, but is especially marked for targets.

Finally, soft and hard mixing appear to be high risk/reward assignments. Mixers have higher average wage growth, but also higher variance in wage growth and higher exit rates, compared to those who do not mix. These patterns are similar across acquiring and target firms, suggesting that mixing is inherently difficult, regardless of which firm the employee is from.

Putting these findings together, post-merger integration of workforces is limited, and focused on certain types of employees. Some of those mixing employees have key knowledge or relationships that will be valuable to the newly-merged firm (R&D, salespeople, and those with high levels of human capital). Other mixing employees appear to be those who are able to implement change and coordinate well (managers). Target employees have much higher mixing rates than do acquiring workers, but the higher the dominance of their firm, the less they mix.

One interpretation of these results is that extensive integration of workforces is not necessary to reap the benefits of a merger. Synergies might arise from a small set of employees. Changes that affect the bulk of the workforce might be small, or involve changes in policies that can be coordinated by managers. To the extent that this is correct, this interpretation also provides interesting evidence for network/broker views of organizations.

A second interpretation is that integration is costly and difficult, so merging firms do not implement widespread mixing. Instead, they focus on employees where integration benefits are highest. They then allow or encourage turnover of many employees (especially from the target firm). Those workers are replaced by new hires who do not have firm-specific human capital, but who might find it easier to integrate. Indeed, the findings of high turnover and replacement of incumbent employees, and the fact that dominance affects employee outcomes, are difficult to explain with the first interpretation. Dominance could also explain the common observation that a high fraction of mergers do not seem to perform well. The evidence that mixing is a high risk/high reward assignment is consistent with the second view, but might also be consistent with the first.

It is impossible to choose between these two interpretations using our evidence. In fact, both are likely to have some validity. Further research with more direct evidence on integration costs, methods, and the extent of conflict between merging workforces would be welcome.

Regardless of interpretation, the differential effects of the merger on the target workforce compared to the acquiring workforce, and the role

of dominance in reducing those effects for target workers, suggest that acquiring firms are more likely to implement their own policies, systems, and culture than those of target firms. If that is so, it is certainly not surprising. Acquiring firms tend to be larger. By definition, they are usually the firm that initiated the merger, and they also tend to have a stronger role in executive management and governance after the merger. These are likely to put workers from the target firm at some disadvantage, as their firm-specific human capital and understanding of the culture lose value as a result of the merger.

While we tentatively conclude that integration is costly, we recognize that there are other factors that we cannot address here. Are mergers of equals less likely to succeed, and if so, is that because integration is more difficult due to the parity in numerical power? Do merging firms replace incumbent workers with new hires to avoid conflict, or to clear out low-productivity employees? Further research might illuminate these questions.

Our method might be fruitful for studying integration in other datasets. We go beyond distinguishing acquiring and target workers, to considering the relative workforce sizes. We analyze new types of job moves beyond turnover that proxy for the worker's role in integration: soft and hard mixing. Finally, we consider the effect of the worker's occupation on their role in integration.

Future work on mergers remains full of promise. In these days of information technology, integration must also be occurring with email, networks, and other technologies. As communication technologies advance, the need for integration might alter substantially. It would also be interesting to see how formal policies, systems, and practices change as a result of merger. Finally, we would like to be able to examine mergers with pre- and post-merger financial and accounting measures that would enable a link between merger conditions and subsequent profitability.

Supporting Information

The following supporting information can be found in the online version of this article at the publisher's web site.

Online Appendix

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