Inventor Commingling and Innovation in Technology Startup Acquisitions [*]

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Abstract: How does inventor team "commingling" (integrating human capital from the target and acquiring firm for R&D collaboration) impact innovation outcomes in technology acquisitions? Commingling is an alternative to potentially disruptive structural integration, and is a means of recombining organizational and human know-how. We study technology firms experiencing an acquisition, some of which also had prior R&D alliances with the acquirer. Innovation outcomes increase post-acquisition for firms with more intensive inventor commingling, and the commingling effect is stronger when structural integration is weaker. Commingling significantly increases individual's post-acquisition innovation output more than commingling under pre-acquisition alliance. These effects are distinct from team knowledge diversity. We instrument direct flights between the M&A party locations to address endogenous commingling, and find consistent results, supporting a causal interpretation.

Keywords: technology acquisitions; inventor commingling; innovation; patents; structural integration.

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1. INTRODUCTION

Established industry incumbents increasingly rely on acquiring innovative emerging enterprises to develop new lines of business or to advance established ones (e.g., Puranam, et al., 2006). Acquisitions have also long been the dominant mode in which venture capital-backed enterprises achieve liquidity in the US (Aggarwal & Hsu, 2014). Despite these aligned motivations, a long-standing literature suggests disappointing post-acquisition innovation outcomes (e.g., Hitt, et al. 1990; Kapoor & Lim, 2007; Cloodt, et al., 2006). One explanation is grounded in the dilemma of post-acquisition integration (Ranft & Lord, 2002). While organizational structural integration is sometimes necessary to achieve coordination and leverage acquired knowledge (Puranam & Srikanth, 2007; Puranam, et al., 2009), it brings considerable disruption to the target companies (Haspeslagh & Jemison, 1991; Paruchuri, et al., 2006).

We suggest that team commingling, defined as integrating inventive human capital from the target and the acquiring firm in the form of R&D collaboration, may serve as an effective alternative means of leveraging acquired technology capability outside of structurally integrating formerly distinct organizational units. Unlike organizational structural integration, team commingling involves individual-level integration, which may be less disruptive, yet also facilitate innovation in target firms.[1] Starting from individual-level origins, we conceptualize and align our empirical measurement of inventor commingling to address a multi-level conceptualization and dynamic treatment of this organizational investment in human capital integration. We pose the following research question: what are the innovation implications of inventor commingling on the innovation output of the acquired firm?

Our empirical analysis uses a broad-based sample of technology venture acquisitions (not conditioned on receiving venture capital), which also contains approximately 30% non-US acquisitions. We find that the degree of post-acquisition firm-level inventor commingling is positively related to innovation output (as measured by granted patents and forward citation weighted patents) and exploration (patents with new-to-the-firm technology classes), especially in

[1] We recognize that commingling may be eased by structural integration, but note that the constructs are distinct in that firms can employ one practice without necessarily engaging in the other (as the former takes place at the team level of analysis, while the latter takes place at the organization level). Furthermore, inventor commingling can take place even in the absence of an M&A, whereas structural integration cannot.

the absence of post-M&A structural integration. These relationships hold after accounting for inventor team technical experience diversity, which the literature has identified as an important contributor to innovation. We address the issue that unobserved and unmeasured managerial choices likely shape the degree of inventor commingling. We investigate whether our results hold once we adjust the estimates by exploiting the exogenous introduction of direct flights between acquirer and acquired entity locations. Such flights exogenously shift the cost of commingling, allowing us to construct an instrumental variable for commingling (note that the acquisition event itself is still exogenous to our analysis, as we aim to contribute to the post-M&A integration rather than the M&A selection literature). Our original results hold. A further analysis exploits the fact that commingling and inter-organizational R&D collaboration occurs in our sample prior to some acquisitions. This allows us to examine innovation outcomes of (the same) inventors under different inter-organizational cooperation structures. We find that inventor level innovation outcomes are higher when commingling under the acquisition structure (after accounting for inventor team diversity, structural integration, and inventor selection effects).

This work advances the literature in two ways. First, while most post-acquisition integration studies discuss top-down organizational design, such as structural integration, we study an alternative micro-foundational mechanism through which knowledge embedded in individual and organizational context can be unstuck and recombined for innovation. This follows the knowledge-based-view tradition (e.g., von Hippel, 1994; Grant, 1996). Second, the effectiveness of inventor commingling may depend on the organization of collaboration (alliance compared to M&A structures) between entities, and so studying inventor output under these alternatives represents a window into how the form of collaboration may impact innovative outcomes. Both themes have received scant attention in the post-M&A integration literature. We end with a discussion of implications and future directions.

2. BACKGROUND & HYPOTHESES

2.1 Post-M&A integration for innovation. Accessing knowledge outside of an organization's boundaries can be instrumental to its competitiveness (e.g., Cohen & Levinthal, 1990), especially when the requisite knowledge for innovation is not entirely resident in the focal firm. As Rosenkopf

& Almeida (2003: 762) succinctly note: inter-firm knowledge transfer can effectively fill in holes in [the focal firm's] knowledge landscapes." Technology acquisition is frequently taken as an effective vehicle to expand firms' knowledge landscapes (e.g., Leonard-Barton, 1995; Kale & Puranam, 2004; Puranam & Srikanth, 2007), though we still have limited understanding of the micro-mechanisms through which individual inventors integrate their experience and knowledge following acquisition.

Prior research has documented inventor team knowledge diversity's positive relation to R&D outcomes (e.g., Hoisl et al., 2017). However, following Aggarwal et al. (2020), we suggest that even with a given set of individuals with an associated span of (technical) experience, the way invention production teams are organized is a significant organizational design choice, likely with innovation consequences. This is because such design impacts organizational (not just individual) knowledge recombination. "Knowledge" in this context refers to both technical knowledge and routines at the individual level as well as know-how at the organizational level. As the knowledge-based view of the firm has highlighted (Kogut & Zander, 1992; Grant, 1996), firm-level knowledge is more than the simple addition of their individuals' knowledge. Organizational know-how is tacit but essential for knowledge transfer (Teece, 1977). Because both the task and solution environments are ill-defined in R&D, tacit knowledge is particularly important in innovation. Therefore, unsticking tacit knowledge is an essential first step to initiating innovation (von Hippel, 1994; Szulanski, 1996). Inventors in commingled teams are from originally separate organizational entities holding distinct tacit knowledge about managing innovation (via policies, procedures, and norms about approaching the innovation task). By forming a commingled team and collaborating on specific projects, tacit knowledge from the two entities can be unstuck and recombined through interaction and integration (Hoisl, et al., 2017). Team commingling provides an opportunity to recombine individuals' technical knowledge domains within the context of diverse higher-order organizational knowledge routines; we therefore expect an independent effect from individual knowledge diversity:

- **H1:** *Acquired firms which commingle their inventors more intensively are causally related to more favorable innovation outcomes, holding constant team knowledge diversity*

2.2 Team commingling and structural integration. The recent post-M&A integration literature examines the efficacy of organizational design, such as structural integration (Puranam, et al., 2006; Puranam, et al., 2009). Structural integration has been found to be extremely disruptive however, as Puranam et al. (2009: 313) note: "acquirers who buy small technology-based firms for their technological capabilities often discover that post-merger integration can destroy the very innovative capabilities that made the acquired organization attractive in the first place." This can occur due to individual-level disruptions upon acquisition, especially in knowledge-oriented contexts (Ernst & Vitt, 2000). The operative mechanisms behind individual inventor disruption stem from the loss of social status on the part of inventors in the acquired firm (Paruchuri, et al., 2006) as well as information asymmetries (Kapoor & Lim, 2007).

Unlike structural integration, team commingling does not require dramatic organizational structural change but instead can involve a progressive, human capital integration process. It therefore brings fewer disruptions to the acquired inventive teams than structural integration does because the acquired entities can maintain autonomy while the R&D teams of the two entities commingle with each other. The incentive structure to motivate innovation and the social status of acquired inventors can remain aligned and preserved in the commingling process, which can promote innovation.

At the same time, team commingling, as an informal integration vehicle, may preserve some of the benefits of structural integration by forming common ground (shared knowledge) through collaboration. Puranam et al. (2009) investigate the necessary conditions for structural integration. The authors point out how structural integration enables coordination between acquiring and acquired organizations. Coordination is the alignment of actions, which means interacting individuals and firms can adequately anticipate each other's actions and adjust their own accordingly (e.g., Grant 1996; Puranam et al. 2009; Gulati et al. 2005). If coordination and alignment between the target and the acquirer exists, the need for structural integration may decline because people who possess similar stocks of knowledge can also coordinate without formal arrangement, and vice-versa. By collaborating on joint projects, shared knowledge is created. For example, blueprints, documentation, or artifacts may be developed in the commingling process, serving as a guide for future interdependent R&D activities. Therefore, team commingling may partially substitute for structural integration and may be an efficient integration path especially in cases where structural integration is too costly or not possible. We propose:

- **H2:** *The positive impact of team commingling on target firms' post-acquisition innovation outcomes increases when formal structural integration is low*.

2.3 Organizational form of commingling. Inventor commingling may occur under two organizational forms: within the context of R&D alliance before an acquisition and intra-firm collaboration afterwards. Given that prior alliances between counterparties are common in technology acquisition (Zaheer, et al., 2010), commingling before acquisitions may not be rare. One major difference between the two forms of R&D collaboration is ownership and control: under an alliance, the future target and acquirer are still separate entities with their own control over strategic resources. Therefore, the counterparties must contractually specify the boundaries of the joint development (Ryall & Sampson, 2009). Since the task environment is ill-defined in the R&D context, it is not unusual for alliance contracts to contain unverifiable and unenforceable covenants (such as number of man-hours required, but with no mechanisms to monitor or verify this). These unverifiable covenants increase the governance and oversight costs of managing commingled teams, and may diminish knowledge-transfer and recombination efficacy (Robinson & Stuart, 2007). Additionally, since alliance-based commingling is typically *project*-level collaboration, commingling teams may compete with internal teams for resources. As a result, the lack of common ownership can lead to resource misappropriation. Without proper support and necessary resources under the alliance structure, commingling teams may bring only limited enhancement to innovation productivity.

Acquisitions reduce these governance issues. Common ownership enables flexible decision-making in directing the commingled team (without the need for ex-ante contracting, which would be the case under an alliance), a particularly important benefit in R&D contexts which are marked by solution environment uncertainty. When the parent company has the legal ownership of the target firm, issues of misaligned incentives and uncertainty in control no longer exist (Ranft & Lord, 2002). Control and authority of technical human capital therefore enables the overriding benefits for realizing synergies through closer knowledge sharing (Dyer, et al., 2004). We therefore propose:

- **H3:** *The same inventors will be more innovative when commingling in an acquisition as compared to a pre-M&A R&D alliance*.

3. DATA, VARIABLES AND EMPIRICAL STRATEGY

To test these predictions about innovation and inventor commingling, we first describe our data construction. We then discuss our main variables, which are at both the firm-year and inventor-year levels of analysis, and end the section with a short discussion of our empirical strategy.

3.1 Data construction. We start with the set of firms listed in Crunchbase, a platform concentrating on emerging ventures, which were listed as acquired between the years 1970 and 2014 (since our measure of innovation quality is based on forward patent citations in the 4 years post grant, we stop the analysis window before the data end in 2018). This yields a list of 44,834 acquired companies. Since a Crunchbase listing is not dependent on receiving venture capital funding nor conditional on being US-based, we believe that this database allows us to cover a broader sample of startup firm acquisitions.[2]

We then use the set of acquired firms to build a longitudinal database at both the acquired firm and inventor levels. To do so, we make use of the PatentsView dataset provided by the United States Patent & Trademark Office (UPSTO). We drop acquired firms not granted any patents between 1976-2014 as listed in PatentsView to help us focus on acquisitions that are likely driven by technology-centric motivations (while acknowledging that we might miss non-patented knowledge, such as that protected by trade secrecy). There is also a pragmatic reason in that our key empirical variables are derived from patent information, as we discuss below. We fuzzy match (using the Stata 15 built-in "reclink2" software package) acquired firm names from Crunchbase with patent firm assignees listed in PatentsView. We find an overlap of 7,404 firms in both databases.

[2] We compare the Crunchbase data to two datasets to assess coverage quality. First, we examine the overlap between Crunchbase listings of ventures acquired from Israel to an Israeli data source of venture capital-backed startups in Israel, known as the IVC Research Center database. Since Israel is well-represented in technology acquisitions of technology-centric startups, we believe that this comparison is worthwhile. We find that the Crunchbase data is quite comprehensive in its coverage (by comparison, established venture capital data sources such as Thomson One do not systematically cover international transactions). Second, we compare Crunchbase coverage of technology acquisitions to SDC Platinum, a standard dataset used for acquisition data. We find that the SDC coverage skews toward larger firms and misses many smaller firm acquisitions, which is of particular relevance to us. To further compare the quality of these two databases, we examine the listed acquisition data in each database as compared to that contained in the IVC data for the set of Israeli acquisitions (with the assumption that the local data provider, IVC, is most likely to be a "gold standard" on data quality). We find that the Crunchbase dataset dramatically outperforms the SDC database.

Finally, we exclude multiple acquisition situations of the same firm to ease interpretation. This leaves a final sample of 6,478 acquired firms in our analysis.[3]

We then gather a list of all the inventors whose patents were assigned to the focal acquired companies using the unique inventor identifiers contained in the PatentsView database. This allows us to build a history of patenting of each inventor over her/his career, both before and after patenting in the focal firm, if applicable. These inventor- and patent-level data are crucial for measuring the key constructs, such as inventor commingling (as we explain in the next section). Of course, patent assignment records can only indicate inventors' employers in years where patent applications are observed. In the absence of other intervening assignees, we assume that an inventor continued his or her employment with the same employer during the period spanning consecutive patent applications. An inventor is considered to have switched employers in the year s/he is associated with a patent application assigned to a different employer. Integrating the inventor-employer affiliations with the acquired-firms patent records identifies 717 firms that engaged in commingling, of which 557 created commingled patents after the acquisition date.

For our instrument construction we identify the R&D locations of the focal firms. We take advantage of inventor residential address information to examine the geographic location of their firm's R&D activities. For each focal firm we cluster these addresses at the patent level, aggregating to a circle with a radius of 50 kilometers (km). We then group these clusters based on their centers so that all circles for which the center can be placed within a circle with a radius of 50km will be considered part of the same R&D location. We define the center of each of these resulting clusters as an R&D location of the focal firm.[4] Through this process, we identify 7,499 R&D locations associated with the 717 focal acquired companies, spread across 69 countries as well as 20,231 R&D locations of 521 acquiring firms located in 114 countries. We use the Air Carrier Statistics database, also known as the T-100 data bank, from the US Bureau of Transportation Statistics to identify

[3] In the interest of space, we do not provide a "thick" description of the overall data, but consider the following facts: (1) acquisition events become much more prevalent as we approach the present; (2) the top three industries of the acquired firms are: communications (23%), health and medical-related (19%), and motor vehicle-related (7%); (3) the top four nations of the acquired firms are: US (71%), UK (6%), Germany (3.6%), and Canada (3.4%); (4) within the US, the top three states of venture location are: California (31%), Massachusetts (8.5%), and Texas (6.1%); and (5) the top three acquiring firms in our sample are: Microsoft (0.58%), IBM (0.57%), and Cisco (0.41%).

[4] The median number of acquired firm R&D locations is one, however some acquired firms are large and distributed, resulting in an average of 10.4 R&D locations per acquired firm. Since some acquirers are very large, we keep the top 100 R&D locations for this group

direct flights.[5] For the 6,519,684 dyads of acquired-acquiring R&D locations, we identify all airports within 100 km to the center of each focal R&D location (which rests on an assumption of household commuting distance to the relevant airport). We aggregate the monthly data to the annual level and classify a location dyad as connected in a given year if there is at least one direct flight operating throughout the given year between the airports serving the focal R&D locations.

3.2 Variables and measures

3.2.1 Outcome variables. *Firm patent stock* is defined as the cumulative number of patent applications which are ultimately successful up to a given year, aggregated to the firm-year or inventor-year level of analysis (*inventor patents stock*). These are measures of innovation quantity commonly used in the literature. To measure innovation quality, we follow the convention in the innovation literature by weighting the patent grants by the number of forward patent citations over the following four years post patent grant (and calculating the stock), resulting in the variable, *firm forward citations stock*.[6] We aggregate this variable to the firm-year level of analysis, and examine the variable at the inventor-year level as well (*inventor forward citations stock*). Finally, to measure innovative activity broadening, we construct the variable, *firm cumulative patent classes*, which is a cumulative count of the number of main (3-digit) patent classes up to a given year (for analysis at the firm level), or at the inventor level (*inventor cumulative patent classes*). Variable definitions and summary statistics are in Table 1, while correlations are available on request (we do not detect concerns about multicollinearity).

---TABLE 1 ABOUT HERE---

3.2.2 Explanatory variables. We define a commingled patent as one which is produced by inventors coming together from the acquired and acquiring firms. *Firm commingling intensity* is the share of the acquired entity's cumulative patent stock invented by commingled teams (*inventor commingling intensity* is similarly constructed).[7] *Post-acquisition* is a dummy variable for years

[5] The database contains monthly reports from 1980 to 2018 for all flight routes of certified US air carriers which have at least one point of service in the US or its territories and has been used in the literature to construct direct flight instruments which address the endogenous choice of geographic location.
[6] Our data analysis spans M&A transactions through 2014 and the associated patent data up to 2018, given the time lapse between patent filing and grant, and the four-year moving window used for forward citation tracking.
[7] To construct the measure of commingling, we take the pool of patents assigned to the acquired firm (329,504 patents) and compile the associated inventors (a total of 233,011 inventors). We then construct for this total inventor group the history of inventor-employers (using a similarity score of 0.8 as a threshold for matching and uniquely identifying employers). A commingled patent is

after the acquisition. These variables and their interaction are used for testing H1, the commingling effect on innovation.

To test H2, the efficacy of commingling under varying degrees of structural integration, we follow Arora et al. (2014) in constructing the variable *structural integration proxy* as the portion of new created patents invented by the acquired or the commingling team but assigned to the acquiring company. As Arora et al. (2014) note in their paper, this proxy is imperfect, yet it is a scalable proxy for the delegation of authority or autonomy in R&D management.

To test H3, that inventor commingling is more productive under M&A as compared to alliances, we narrow our sample to the set of 493 companies where we have evidence of pre-M&A commingling via alliance. We select all of the inventors employed by these firms before the acquisition who stayed with the focal acquired firm at least 5 years after the acquisition. These criteria are guided by the comparison we wish to make, which is inventor innovation in a more integrated regime (post-acquisition) as compared to less integrated pre-M&A cooperative modes (such as alliances). The *inventor commingling intensity* variable is defined as the share of patents in inventor *j*'s patent stock which were invented by a commingled team. The unit of analysis is an inventor-year. Note that the pre-M&A commingling criteria is applied at the firm level, thus this analysis includes variation in inventor-level commingling pre-M&A.

3.2.3 Control variables. At the firm-year level, we construct a number of variables that control for various aspects of the acquired firm's patent position and inventor experience. *Firm team knowledge diversity* is the within-team knowledge diversity across all inventor teams which have patented for the focal firm before the focal year.[8] *Firm technology concentration* is a Herfindahl index of 3-digit (main) patent classes in the firm's patent stock up to year *t* (higher values indicate more concentration of patent classes). The variable, *firm inventors*, is a count of the number of distinct inventors at the firm in year *t*. The final three control variables in this series give firm cumulative averages of inventor innovation activity (*firm inventor avg cumulative patent counts*,

one in which inventors come together from the acquired and acquiring entities (not necessarily after an acquisition). Using this definition, 7,932 patents are invented by a commingled team in our dataset. While most commingled patents are produced after an acquisition event (6.6% of patents post-acquisition are commingled), commingling can also occur before an acquisition (in our sample, 1.1% of pre-acquisition patents are commingled).

[8] Within-team knowledge diversity is defined following Jaffe (1986) and Aggarwal, Hsu & Wu (2020) as the average of the angular distance between the knowledge experience of each pair of inventors on a team where experience is measured by patent class experience vectors.

firm inventor average cumulative fcitation, and *firm inventor avg cumulative patent classes*), somewhat akin to lagged outcome variable controls. Finally, two variables control for the acquired firm's investor base and external funding activity: *firm cumulative funding rounds* and *firm cumulative VC investors*, in each case, up to the focal year.

At the inventor-year level of analysis, aside from acquiree-inventor fixed effects, we construct a measure of *inventor-team knowledge diversity* defined as the average angular distance between the knowledge experience of the focal inventor and that of other inventors who have co-invented with her. We further control for *inventor co-located*, an indicator for whether the inventor's most recent residential address (as listed in PatentsView) is located within a 100km distance from the acquirer's R&D center (see the next section for method), as it represents an alternative means of unsticking tacit knowledge.

3.2.4 Instrumental variable. We construct R&D location innovation outcome variables akin to our three main outcome variables: *location patents stock*, *location forward citations stock*, and *location cumulative patent classes*. The endogenous variable in this set up is *R&D location commingling intensity*, which is analogous to the other commingling intensity variables, though the unit here is an R&D location. We exploit the introduction of direct flights between R&D locations and construct the instrumental variable *location connectedness* (defined as the number of acquirer's R&D locations which have direct flights to location *l* in year *t*) in the *post acquired* period. Finally, *location knowledge relatedness* is a control variable for the share of knowledge base overlap between the acquirer and location *l*, following Ahuja & Katila (2001). We further construct our patent controls per R&D location, akin to the firm level controls discussed above but limited to the specific R&D location data (see Table 1).

3.3 Empirical specification. Our main empirical specifications use difference-in-differences (DiD) designs (graphical analysis, available on request, does not suggest evidence of pre-trends). To test our first prediction that post-acquisition integration involving a higher degree of commingling will be associated with improved innovation outcomes, we compare firm innovation profiles before and after the acquisition, as well as stratified by firms which have a higher versus lower level of commingled inventor teams. Our analysis is at the firm-year level of analysis. Given the count nature of our outcome variables, our main specifications are fixed effects conditional Poisson regressions (though the results are robust to OLS estimation as well).[9] We use a one-year lag term of team commingling intensity in the regressions to account for temporal lags in production (our results are robust to longer time lags). In addition to the main DiD variables of interest, we include a host of controls for firm and inventor composition variables, as well as acquirer and acquiree firm fixed effects. Since post-acquisition integration is not randomly determined, we interpret these results as correlational. Our controls also include a measure for inventor team diversity; this is intended to test whether commingling has an independent effect beyond increased team diversity. To assess the degree to which the results might be driven by selection (rather than treatment) effects, we exploit an exogenous shift of the costs of firm-level commingling. The introduction or removal of direct flights between the location of the acquiring and acquired firms is a decision outside of managerial control. In a two-stage least squares regression, we use direct flights between the location dyad, post-acquisition, to instrument for the potentially endogenous variable, *R&D location commingling intensity*.

To test H2, we examine a three-way interaction between *commingling intensity*, *post-acquisition*, and *structural integration proxy*. To conduct our inventor-level tests (H3), we switch to the inventor-year level of analysis. We examine the inventor-level analogs of the innovation-level outcomes, and use a similar DiD approach, again in a Poisson regression framework given the count nature of the outcomes.

We are concerned with the potentially confounding effect of post-M&A inventor selection, as inventors or inventor teams successfully commingling pre-M&A are potentially more valuable to the post M&A entities and would have a higher representation in the post-M&A cohort of inventors. We re-run the above specifications limiting our sample to inventors who did not commingle prior to the acquisition date (for the inventor-year analysis) and to acquired-firms that started commingling only after the acquisition date (for the firm-year analysis). This analysis also allows us to verify the effect of post-M&A commingling without the potential persistence effect of pre-M&A commingling intensity on post-M&A innovation.

[9] Overdispersion is a well-known issue with the Poisson model (the conditional mean in empirical data typically is smaller than the variance). To address concerns about overdispersion, we cluster and implement robust standard errors in the panel conditional Poisson model. We also re-estimate our models using a conditional fixed-effects negative binomial model instead, and we find consistent and statistically significant results to those reported where the negative binomial models converge.

4. RESULTS

Table 2 tests the relationship between firm-level inventor commingling and innovation outcomes. The unit of analysis is a firm-year. For each of our outcome variables, *firm patents stock*, *firm forward citations stock*, and *firm cumulative patent classes*, we present two specifications: one with just the key DiD variables (with fixed effects for year, acquiree and acquirer in all models); a second which adds to the specification the set of firm-level control variables listed in Table 1. The estimation method is a conditional Poisson regression, since the outcomes are all non-negative counts (integers). The reported estimates are expressed as incident-rate ratios (IRR), which exponentiates the estimated coefficient, and so can be interpreted relative to the number 1.0. Values above 1.0 which are statistically significant (t-statistics are included in parentheses in the tables) correspond to positive effects, while values below 1.0 correspond to negative effects. The IRR helps interpret the economic significance of the estimates: a unit increase in an independent variable multiplies the dependent variable by the estimated coefficient. Because our key variable, commingling intensity, is expressed as a ratio but does not (in our data) span the entire distribution from zero to one, we express the economic effects throughout as the innovation effect of a standard deviation change in commingling intensity from the mean of the variable's distribution. We only report the estimates of the key DiD variables throughout due to space constraints (all other coefficient estimates are available on request).

In Table 2, we note that the *post-acquisition* dummy is significantly negative (IRRs below 1.0), most robustly as related to *firm cumulative patent classes*, but also as related to *firm patents stock* when the set of firm level controls is omitted. Our results also indicate that *structural integration proxy* further reduces innovation output while increasing patent diversity consistent with the structural integration literature. There may be two sources of organizational disruption: (1) disrupted team standard operating procedures and routines, and (2) enhanced coordination costs. These often result in decreased post-M&A innovation output.[10]

[10] To the first domain, Kogut & Zander (1992) propose organizational capabilities in knowledge sharing and transfer which spans both information and know-how, and transcends the associated individual knowledge. A logical consequence of M&As is comprehensive disruption of these organizational processes and domains (Ranft & Lord, 2002). Kapoor & Lim (2007) find empirical evidence consistent with this notion of disrupted organizational routines at the inventor level following M&A, though this is

Across the specifications, *firm commingling intensity* is strongly positive, both in statistical and economic significance. The key variable of interest, however, in the DiD specification is *firm commingling intensity * post-acquisition*. This variable is also strongly positive in statistical significance (at least $p<0.01$ in all cases). To illustrate the economic significance, when all variables on the right-hand side are kept at their mean after the acquisition, the predicted patent stock = 27.4, forward citation stock = 109.8, and cumulative patent classes = 4.2. For a standard deviation increase in firm commingling intensity after the acquisition, the corresponding increases for each of these innovation outcome variables are: 23.2%, 20.4%, and 3.5%, respectively.

The effect of post-acquisition commingling is mitigated when the structural integration proxy is high, as evidenced by the coefficients of the interaction variable *Firm commingling (t-1) * structural integration proxy * post-acquisition* which are significantly negative (IRRs below 1.0) on all firm level specifications. When structural integration is lower, the effect of post-M&A commingling is higher, providing support for H2.

---TABLES 2 & 3 AROUND HERE---

We then move to Table 3, where we use an instrumental variables approach in recognition of the possible endogenous process of firm commingling associated with the results from Table 2. We focus on the introduction (or removal) of direct flight between the two firms as an exogenous shock (outside of managerial control) to the cost of R&D collaboration. Specifically, we use *location connectedness * post-acquisition* as an instrument for the endogenous commingling variable (*location commingling intensity*). In the first two columns, we show that there is a positive and significant relation between the instrumental and endogenous variables. This is the first stage of the two stage least squares (2SLS) regression. Over the following three pairs of columns, for each of the three firm-level innovation outcome variables, we compare the OLS (un-instrumented) estimates in the odd columns with the 2SLS estimates in the even ones. The robust positive coefficient of the *location commingling intensity* in the 2SLS estimates suggests that the prior commingling intensity result is not entirely driven by commingling selection effects, but instead

mitigated with time. The second cost, coordination costs, are due to unfamiliar shared norms (Haspeslagh & Jemison, 1991) and the lack of shared common ground.

points to a commingling treatment effect on innovation. Together the results in Table 2 and Table 3 support H1.

We move to testing H3, that inventor commingling intensity post-M&A is associated with higher innovation performance as compared to the effect of commingling under pre-M&A (alliance) organization. In Table 4, not only do we shift the analysis to the inventor-year level, we match our sampling strategy to test the hypothesis. Specifically, inventors in our sample are those who stayed at the merged firm at least 5 years after the M&A (following Kapoor & Lim, 2007) from firms which have coinvented patents with their acquirers before the acquisition (and so all of the inventors in the sample worked at firms with commingled patents). In this sample, we can compare inventor innovation profiles under an integrated regime (after the M&A) as compared to their own output under a pre-M&A regime (3,030 out of the 43,936 inventors in this sample commingled with the acquirer's inventors before acquisition).

---TABLES 4 & 5 AROUND HERE---

Due to the count nature of the innovation outcomes, we return to Poisson estimation with a variety of fixed effects. All estimates are again expressed as IRRs, with values above (below) 1.0 corresponding to positive (negative) effects. Each specification in Table 5 contains acquiree-inventor fixed effects as well as year fixed effects. The odd columns omit the control variables, while the even specifications contain those controls.

The key variable of interest in the DiD specification is *inventor commingling intensity * post -acquisition*. This variable is strongly positive and significantly different than zero statistically (at least $p<0.001$ in all cases). To illustrate the economic significance, when all variables on the right-hand side are kept at their mean after the acquisition, the predicted patent stock = 6.0, forward citation stock = 35.96, and cumulative patent classes =2.6. For a standard deviation increase in inventor commingling intensity post-acquisition, the corresponding increases for these variables are: 13.9%, 2.2%, and 5.5%, respectively, in innovation outcomes. These results confirm H3.

In Table 5, we address post-M&A inventor selection concerns, such as post-acquisition commingling effects only observed upon successful pre-acquisition inventor commingling. We show that our results hold even when we *exclude* acquired entities that had commingled innovation activities pre-M&A. The coefficients for commingling intensity indicate a strong positive commingling effect, and are statistically significant ($p<0.001$) across all innovation outcomes.

5. DISCUSSION & CONCLUSION

We introduce the concept of inventor commingling as a means of improving post-acquisition innovation outcomes. Unlike structural integration, which has been characterized as disruptive in the literature, we show that team commingling increases patent output and scope, supporting enhanced innovation for both the target firm and the acquired inventors. Using direct flights between the M&A parties to instrument for endogenous commingling, we find support for causality from commingling to innovation.

We contribute to the post-acquisition integration literature by identifying a new mechanism to leverage acquired knowledge and human capital. While the prior literature has focused on centralized organizational design, such as structural integration, our focus is at the individual level, emphasizing the importance of the human capital integration process. We believe this focus on literal knowledge recombination at the inventor and production team level is novel to the post-acquisition integration literature (and is a separate construct from the typical R&D team composition one, e.g., Aggarwal, et al. (2020)). Broader corporate policies such as structural integration as well as the mode or form of R&D cooperation certainly influence the degree of team-commingling. However, we find evidence that the effect of post-acquisition commingling is stronger when formal structural integration is weaker. Future studies could further investigate other potential contingent innovation effects of team commingling.

By defining the commingling construct and evaluating its effects under a change in the integration and control regime we find that post-acquisition commingling significantly increases both firm level and individual inventor's innovation output more than commingling under pre-acquisition alliance and that these effects are distinct from knowledge diversity. We hope this has laid the groundwork for extensions and new avenues for research on inter-organizational collaboration modes.

We would also like to call attention to a number of limitations and interpretational issues with the study. While our instrument analysis provides support for causation from commingling to innovation outputs, we do not address the endogenous nature of acquisition selection. To understand possible selection effects or boundary conditions, future research would ideally draw from a broader sample to better understand the role of commingling. Doing so may entail matching individuals and firms on observables to build counterfactual samples for comparison. Another inherent limitation stems from the fact that we take as given inventor stayers and leavers post-acquisition. However, the process governing this choice is likely intentional and selected (both from both the inventor- and acquirer-sides). Among the stayers, organizations may target certain individuals for commingling in ways which are unobserved and unmeasured (a concern which motivated our analysis in Table 5). More generally, commingled teams may result from serendipity or from managerially-placed organizational design choices (some of which have been discussed in the literature). Future research in this domain would ideally improve our understanding of the antecedents of inventor commingling. Doing so would also help build a bridge between the two main branches of the technology M&A literature: partner selection versus post M&A integration studies. Our hope is that the concepts developed and results reported here will open new avenues for subsequent work on post-acquisition technology integration, as well as more broadly on modes of R&D cooperation.

References

Aggarwal, VA, Hsu, DH. 2014. Entrepreneurial exits and innovation. *Management Science* **60**(4): 867-887.

Aggarwal, VA, Hsu, DH, Wu A. 2020. Organizing knowledge production teams within firms for innovation. *Strategy Science* **5**(1): 1-16.

Ahuja, G, Katila, R. 2001. Technological acquisitions and the innovation performance of acquiring firms: A longitudinal study. *Strategic Management Journal* **22**(3): 197-220.

Arora, A, Belenzon, S, Rios, L. 2014. Make, buy, organize: the interplay between research, external knowledge, and firm structure. *Strategic Management Journal* **35**: 317-337.

Cohen, W, Levinthal, D. 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly* **35**(1): 128-152.

Cloodt, M, Hagedoorn, J, Van Kranenburg, H. 2006. Mergers and acquisitions: Their effect on the innovative performance of companies in high-tech industries. *Research Policy* **35**(5): 642-654.

Cunningham, C, Ederer, F, Ma, S. (2021). Killer acquisitions. *Journal of Political Economy*, **129**(3): 649-702.

Dyer, JH. Kale, P. and Singh, H. 2004. When to ally & when to acquire. *Harvard Business Review* July-August.

Ernst, H, Vitt, J. 2000. The influence of corporate acquisitions on the behavior of key inventors. *R&D Management*, **30**(2): 105-119.

Grant, RM. 1996. Toward a knowledge-based theory of the firm. *Strategic Management Journal* **17**(S2): 109-122.

Gulati, R, Lawrence, PR. Adaptation in vertical relationships: beyond incentive conflict. *Strategic Management,* **26**(5): 415-440.

Haspeslagh, PC, Jemison, DB. 1991. *Managing acquisitions: Creating value through corporate renewal*. New York: Free Press.

Hitt, MA, Hoskisson, RE, Ireland, RD. 1990. Mergers and acquisitions and managerial commitment to innovation in M-form firms. *Strategic Management Journal* **11**(4): 29-47.
Hoisl, K, Gruber, M, Conti, A. 2017. R&D team diversity and performance in hypercompetitive environments. *Strategic Management Journal* **38**: 1455-77.
Kale, P., Puranam, P. 2004. Choosing equity stakes in technology-sourcing relationships: An integrative framework. *California Management Review*, 46(3), 77-99.
Kapoor, R, Lim, K. 2007. The impact of acquisitions on the productivity of inventors at semiconductor firms: A synthesis of knowledge-based and incentive-based perspectives. *Academy of Management Journal* **50**(5): 1133-1155.
Kogut, B, Zander, U. 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science* **3**(3): 383-397.
Leonard, D.1995. Wellsprings of knowledge (Vol. 16). Boston: Harvard Business School Press.
Paruchuri, S, Nerkar, A, Hambrick, D. 2006. Acquisition integration and productivity losses in the technical core:disruption of inventors in acquired companies,*Organization Science* **17**(5):545-562.
Puranam, P, Srikanth, K. 2007. What they know vs. what they do: How acquirers leverage technology acquisitions. *Strategic Management Journal* **28**(8): 805-825.
Puranam, P, Singh, H, Chaudhuri, S. 2009. Integrating acquired capabilities: When structural integration is (un) necessary. *Organization Science* **20**(2): 313-328.
Puranam, P, Singh, H, Zollo, M. 2006. Organizing for innovation: Managing the coordination-autonomy dilemma in technology acquisitions. *Academy of Management Journal* **49**(2): 263-280.
Ranft, AL, Lord, MD. 2002. Acquiring new technologies and capabilities: A grounded model of acquisition implementation. *Organization Science* **13**(4): 420-441.
Robinson DT, Stuart TE. 2007. Financial contracting in biotech strategic alliances. *Journal of Law and Economics* **50**(3): 559–596.
Rosenkopf, L., & Almeida, P. (2003). Overcoming local search through alliances and mobility. *Management Science*, **49**(6): 751-766.
Ryall, MD, Sampson, RC. 2009. Formal contracts in the presence of relational enforcement mechanisms:Evidence from technology development projects.*Management Science* **55**(6):906-25.
Szulanski G. 1996. Exploring internal stickiness: impediments to the transfer of best practice within the firm. *Strategic Management Journal* **17**(S2): 27-43.
Teece, DJ. 1977. Technology transfer by multinational firms: The resource cost of transferring technological know-how. *The Economic Journal* **87**(346): 242-61.
von Hippel, E. 1994. 'Sticky information' and the locus of problem solving: Implications for innovation. *Management Science* **40**(4): 429-39.
Zaheer, A., Hernandez, E., Banerjee, S., 2010. Prior alliances with targets and acquisition performance in knowledge-intensive industry. *Organization Science* **21**(5): 1072-91.

TABLE 1. Focal variable definitions and summary statistics

Firm-year level of analysis			
Variable	***Definition***	***Mean***	***SD***
Firm patents stock	Stock of patents of acquired firm *i* in year *t*. A patent filed before year *t* will be included in firm *i*'s patent stock if (i) the patent was directly assigned to firm i, or (ii) the patent was filed after the acquisition, assigned to the acquirer, and had at least one inventor from firm *i*	32.44	393.10
Firm forward citations stock	Forward citations to firm *i*'s stock of patents within 4 years since patent grant	99.95	1315.10
Firm cumulative patent classes	Number of distinct 3-digit (main) technology classes for firm *i*'s patent stock	4.22	6.76
Firm commingling intensity	Share of patents which were invented by commingling teams in firm *i*'s patent stock $Firm\ commingling\ intensity = \frac{cumulative\ \#\ of\ patents\ invented\ by\ commingling\ teams\ by\ year\ t}{firm\ i's\ patent\ stock\ in\ year\ t}$	0.01	0.08
Post-acquisition	Dummy=1 if *t* >= acquired year	0.29	0.45
Firm team knowledge diversity	Average within-team knowledge diversity across all inventor teams which have patented for firm *i* before year *t*. Within-team knowledge diversity is defined following Jaffe's (1986) similarity measure and Aggarwal, Hsu, and Wu (2020).	0.18	0.17
Structural integration proxy	Portion of new created patents invented by acquired inventors but assigned to the acquirer. $Structural\ integration\ proxy = \frac{\#\ patents\ created\ by\ acquired\ inventors\ but\ assigned\ to\ the\ acquirer\ filed\ in\ year\ t}{\#\ of\ patents\ created\ by\ acquired\ inventors\ filed\ in\ year\ t}$	0.09	0.27
Firm cumulative funding rounds	Cumulative # of funding rounds the firm has received up to year *t*	0.44	1.15
Firm cumulative VC investors	Cumulative # of venture capitalists who have invested in the firm up to year *t*	0.44	1.30
Firm technology concentration	Herfindahl index of firm *i*'s patent distribution among 3-digit (main) patent technology classes $Firm\ technology\ concentration_{it} = \sum_{s=1}^{N}(\%\ of\ patents\ in\ tech.\ class\ s\ in\ firm\ i's\ current\ patent\ stock)^2$	0.45	0.34
Firm inventors	Number of inventors working for firm *i* in year *t*	17.54	129.80
Firm inventor avg cumulative patent counts	Average patenting experience (cumulative patent counts) among firm *i*'s inventors	5.37	6.26
Firm inventor avg cumulative fcitation	Average patenting experience (cumulative patent counts weighted by forward citation) among firm *i*'s inventors	33.53	69.15
Firm inventor avg cumulative patent classes	Average patenting experience (cumulative patent class counts) among firm *i*'s inventors	2.76	1.71
Inventor-year level of analysis			
Inventor patents stock	Inventor *j*'s patent stock in year *t*	5.74	12.22
Inventor forward citations stock	Forward citations to inventor *j*'s patents stock within 4 years since patent grant(s)	30.04	112.10
Inventor cumulative patent classes	Number of distinct 3-digit (main) technology classes to inventor *j*'s patent stock	2.63	2.23
Inventor commingling intensity	Share of patents in inventor *j*'s patent stock which were invented by a commingling team	0.02	0.13
Inventor avg patent complexity	Average complexity measure over the inventors' current patent pool. Patent complexity is defined following Fleming & Sorenson (2001).	515.80	408.00
Inventor team knowledge diversity	The average angular distance between the knowledge experience of the focal inventor and that of other inventors who have co-invented with her	0.22	0.20
Inventor co-located	Dummy=1 if the inventor's current address (registered on the most recent patent document) is located within 100km of the acquirer's R&D center	0.24	0.42
R&D location-year level of analysis			
Location patents stock	An R&D location is defined as a 100km-radius cluster of inventors (addresses) who worked for firm *i* before the deal. Inventor *j* works in location *l* if her residential address locates in this 100km-radius cluster. Location *l*'s patent stock is the pool of patents which are invented by inventors working in location *l* and filed before year *t*.	17.25	111.30
Location forward citations stock	Forward citations to location *l*'s patent stock within 4 years since patent grant(s)	56.72	458.40
Location cumulative patent classes	Number of distinct 3-digit (main) technology classes for location *l*'s patent stock	3.94	4.70
Location commingling intensity	Share of patents in location *l*'s patent stock which were co-invented by inventors of firm *i* working in location *l* and inventors from the acquirer	0.04	0.16
Location team knowledge diversity	Average within-team knowledge diversity across all teams associated with the location *l*'s current patent stock	0.23	0.17
Location connectedness	Number of acquirer's R&D locations which have direct flights to location *l* in year *t*.	18.99	19.96
Location knowledge relatedness	*Relatedness = overlapped-knowledge-base / total knowledge-base of acquired R&D location* Knowledge base is defined following Ahuja & Katila (2001).	0.13	0.29

TABLE 2. Incident rate ratios of commingling on firm innovation (firm-year level of analysis)

	(1)	(2)	(3)	(4)	(5)	(6)
	Firm patent stock		Firm forward citations stock		Firm cumulative patent classes	
*Firm commingling intensity (t-1) * post-acquisition*	2.173	3.523	1.809	3.034	1.301	1.415
	(7.44)	(6.16)	(3.68)	(2.98)	(5.13)	(5.90)
Post-acquisition	0.966	1.016	0.970	1.017	0.990	0.992
	(-1.94)	(1.11)	(-1.35)	(0.79)	(-2.90)	(-2.73)
Firm commingling intensity (t-1)	4.061	3.544	3.820	3.181	1.294	1.314
	(10.61)	(9.97)	(5.95)	(5.95)	(3.76)	(5.42)
Structural integration proxy		0.926		0.915		1.034
		(-3.91)		(-3.45)		(6.17)
*Firm commingling (t-1) * structural integration proxy * post-acquisition*		0.551		0.454		0.837
		(-2.85)		(-2.17)		(-2.77)
Firm team knowledge diversity		2.543		1.382		1.479
		(6.42)		(1.60)		(13.67)
Firm level controls	N	Y	N	Y	N	Y
Acquiree/Acquirer/Year FE	Y	Y	Y	Y	Y	Y
Observations	94,796	84,441	86,134	77,596	94,796	84,441

Notes: This table reports exponentiated coefficients (incidence-rate ratios) from conditional Poisson regressions. Values greater (less) than 1.0 represent positive (negative) effects. Standard errors are robust & t-statistics are in parentheses. Firms in the firm-year panel are target companies in the Crunchbase M&A database which are also listed in the PatentsView database and were acquired before 2014. The control variables are listed in Table 1.

TABLE 3. Instrumental variable regressions of team commingling on innovation (R&D location level of analysis)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1st stage regression		OLS versus 2SLS IV regressions					
	Location commingling intensity*100		Log (location patents stock+1)		Log (location forward citations stock+1)		Log (location cumulative patent classes+1)	
			OLS	IV	OLS	IV	OLS	IV
*Location connectedness * post-acquisition*	0.0194	0.0151						
	(3.85)	(3.01)						
Location connectedness	-0.00634	-0.0148						
	(-0.48)	(-1.09)						
Post-acquisition	0.209	-0.249	0.00683	-0.0132	-0.00398	-0.0256	-0.00238	-0.0186
	(1.77)	(-2.06)	(0.97)	(-1.29)	(-0.42)	(-1.28)	(-.062)	(-3.40)
*Location commingling intensity * post acquisition (t-1)*			0.333	1.167	0.363	0.847	0.0938	0.771
			(8.60)	(3.11)	(6.43)	(1.93)	(4.86)	(3.82)
Team knowledge diversity (R&D location level)		8.73	0.0121	-0.0118	-0.155	-0.169	0.216	0.197
		(4.89)	(0.10)	(-0.10)	(-0.84)	(-0.92)	(3.10)	(2.84)
Structural integration proxy		0.735	-0.0826	-0.0843	-0.102	-0.103	-0.0378	-0.0392
		(4.39)	(-6.76)	(-6.86)	(-6.45)	(-6.50)	(-5.76)	(-5.82)
Controls	N	Y	Y	Y	Y	Y	Y	Y
Location & Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Observations	102,864	80,176	80,176	80,209	80,176	80,209	80,176	80,209

Notes: Reported coefficients and t-statistics (in parentheses) are from OLS/2SLS regressions. Standard errors are robust. A firm's R&D location is defined as a 100km-radius cluster of the residential addresses of inventors who patented for the firm before the acquisition. Control variables are listed in Table 1.

TABLE 4. Incident rate ratios of commingling on inventor innovation (inventor-year level of analysis)

	(1)	(2)	(3)	(4)	(5)	(6)
	Inventor patent stock		Inventor forward citations stock		Inventor cumulative patent classes	
*Inventor commingling intensity (t-1) * post-acquisition*	1.459	1.193	1.383	1.566	1.165	1.094
	(12.12)	(4.39)	(8.55)	(7.59)	(8.21)	(3.87)
Post-acquisition	1.051	1.052	0.952	0.952	1.020	1.020
	(20.66)	(21.06)	(-6.35)	(-6.42)	(22.58)	(22.90)
Inventor commingling intensity (t-1)	3.164	3.021	2.136	2.189	1.572	1.550
	(25.03)	(23.50)	(12.96)	(13.33)	(17.52)	(16.62)
Structural integration proxy	0.971	0.969	1.036	1.037	0.997	0.997
	(-6.61)	(-7.11)	(4.38)	(4.55)	(-1.88)	(-2.32)
*Inventor commingling (t-1) * structural integration proxy * post-acquisition*		1.406		0.819		1.113
		(6.52)		(-2.90)		(3.70)
Inventor team knowledge diversity	0.850	0.848	0.346	0.346	2.103	2.103
	(-4.11)	(-4.17)	(-13.20)	(-13.20)	(39.88)	(39.87)
Inventor level controls	N	Y	N	Y	N	Y
Firm-Inventor/Year FE	Y	Y	Y	Y	Y	Y
Observations	588,867	588,867	528,912	528,912	582,704	582,704

Notes: This table reports exponentiated coefficients (incidence-rate ratios) from conditional Poisson regressions. Values greater (less) than 1.0 represent positive (negative) effects. Standard errors are robust & t-statistics are in parentheses. Inventors are from 493 acquired companies which collaborated with the acquirer in R&D on at least one patent prior to the acquisition. Total number of inventors working for these acquired entities (based on patent filings) is 54,559, of which 7,118 joined after the transaction and 3,515 started to patent for another company within 5 years after the M&A. Full sample includes 43,936 inventors observed as working for the acquired pre-and post-deal. The control variables are listed in Table 1.

TABLE 5. Robustness check excluding firms/inventors who started commingled before the acquisition

	Firm level regression			Inventor level regression		
	(1)	(2)	(3)	(4)	(5)	(6)
	Firm patent stock	Firm forward citation stock	Firm cumulative patent classes	Inventor patent stock	Inventor forward citations stock	Inventor cumulative patent classes
Post-acquisition	1.023	1.05	1.001	1.054	0.974	1.022
	(1.07)	(2.24)	(0.29)	(21.61)	(-2.77)	(25.53)
Firm/inventor commingling intensity (t-1)	7.124	4.516	1.980	9.091	4.228	2.539
	(14.75)	(9.69)	(12.96)	(43.36)	(19.28)	(28.23)
Firm/inventor team knowledge diversity	3.036	2.102	1.545	0.885	0.384	2.173
	(12.14)	(6.09)	(15.25)	(-2.90)	(-11.41)	(39.76)
Structural integration proxy	0.979	0.993	1.052	0.962	1.016	0.993
	(-0.99)	(-0.28)	(9.38)	(-8.49)	(1.78)	(-5.23)
Firm/Inventor level controls	Y	Y	Y	Y	Y	Y
Target/Acquirer/Year FE	Y	Y	Y	Y	Y	Y
Inventor FE	N	N	N	Y	Y	Y
Observations	76,553	69,755	76,553	514,599	568,312	568,312

Notes: This table reports exponentiated coefficients in incidence-rate ratios from conditional Poisson regressions. Values greater (less) than 1.0 represent positive (negative) effects). Standard errors are robust & t-statistics are in parentheses. Samples used in the regressions are the subsets of samples used in Table 3 and Table 5, excluding firms/inventors who started commingling before the acquisition. Control variables are listed in Table 1.