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Hiring High-Skilled Labor Through Mergers and Acquisitions

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Abstract

Using random H-1B visa lotteries as a natural experiment, we find that firms respond to shortages of high-skilled workers by acquiring firms that employ such workers. The effect is stronger among firms with high human capital and more senior workforces, firms facing tight labor markets and legal barriers to poaching workers, and firms lacking foreign affiliates. The acquired workers are highly educated, sharing skills and occupations similar to those of the acquirer's existing workers. Our findings suggest skilled labor is an important driver of acquisitions and acquiring is an effective means of obtaining skilled labor.

I. Introduction

Hiring skilled workers is difficult when they are in short supply and constrained by noncompete agreements. To overcome this difficulty, many firms have resorted to "acquires," the practice of hiring talent through mergers and acquisitions (M&As). For example, the *Wall Street Journal* reported that talent shortage has become a primary driver of M&As since the COVID-19 outbreak, which tightened the labor market (Loten (2022)). The *New York Times* similarly reported that, "Companies like Facebook, Google and Zynga are so hungry for the best talent

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that they are buying startups to get their founders and engineers" (Helft (2011)). In fact, many firms have openly admitted that they acquire other firms primarily for their talent. Mark Zuckerberg, the founder and CEO of Facebook, acknowledged: "Facebook has not once bought a company for the company itself. We buy companies to get excellent people" (Hindman (2010)).[1] Evan Spiegel, the founder and CEO of Snap, similarly stated: "Typically if you buy a business, it comes with a really talented team and I think for us the team is everything" (Murphy and Kruppa (2020)). Tim Cook, the CEO of Apple, disclosed that Apple buys a firm every 2–3 weeks on average, primarily to acquire talent (Feiner (2019)). In short, acquires have become common among high-tech firms and in every sector (Coyle and Polsky (2013), Needleman (2012)).

Despite the prevalence of acquires in practice, causal evidence on acquiring is rare in the academic literature for two reasons. First, exogenous shocks to the supply of skilled labor are scarce, as are shocks to firms' demand for talent. Second, detailed data on employee skills are difficult to collect, and thus, direct evidence that skilled workers are acquired through M&As is difficult to demonstrate. In this study, we overcome these obstacles by leveraging exogenous shocks to the skilled labor supply along with detailed information on employee skills and occupations obtained from LinkedIn profiles and H-1B visa microdata.

Our natural experiment exploits the random lottery employed by the United States Citizenship and Immigration Service (USCIS) office to allocate H-1B visas. H-1B is the primary work visa for U.S. employers seeking high-skilled foreign workers. The supply of H-1B visas is capped by an annual quota, and this quota drastically dropped from 195,000 in 2003 to 65,000 in 2004 and has been binding ever since. When the quota is binding, the USCIS uses a lottery to allocate H-1B visas and, in doing so, creates random variation in the likelihood that firms receive H-1B visas. When firms lose H-1B visa lotteries, they face a shortage of high-skilled foreign workers.

Firms can replace skilled foreign workers who lost the H-1B visa lottery by hiring similar workers from the labor market, poaching workers from competitors, or acquiring. Although acquiring may appear costly because it involves M&As, its net benefit can outweigh that of poaching and direct recruiting. Acquiring enables a firm to obtain a team of skilled workers all at once while circumventing noncompete covenants and trade-secret laws. Since the acquired team members are already familiar with each other and their products, they can help the firm develop new products quickly. Acquiring can also provide a better way to recruit talented founders and key employees from startups backed by venture capital (VC). Such talents are hard to poach given their incentive to maintain healthy long-term relationships with VC firms and continue creating new startups. Whether these benefits are large enough to induce firms to acquire is ultimately an empirical question. We hypothesize that some firms will acquire after losing random H-1B visa lotteries.

Consistent with our hypothesis, as well as with anecdotal evidence, we find that firms that lose more H-1B visa lotteries undertake more acquisitions and

[1]For example, in July 2012, Facebook acquired Spool, a startup providing a mobile-bookmarking service, for its five employees but not for its products or other assets: https://www.cnet.com/news/facebook-acquires-mobile-bookmarking-service-spool/.

acquire more skilled workers. Each 1-standard-deviation reduction in the firm's H-1B visa lottery win rate raises the number of acquisitions by 4.4%, the number of acquired Science–Technology–Engineering–Math (STEM) workers by 4.9%, and the number of acquired H-1B workers by 6.6%. The results are robust to alternative model specifications, measures of M&A activity that restrict deals to either disclosed or undisclosed transaction values, and factors that might undermine the validity of our natural experiment, including visa over-petitioning, the educational degrees of H-1B petitioners, the existence of student visa work permits (i.e., Optional Practical Training [OPT]), and the existence of foreign affiliates.

The effects of H-1B visa lotteries on acquiring activity are stronger when a firm faces a tight labor market. The effects concentrate in target firms located in states with strong noncompete laws but are insignificant for targets in states with weak noncompete laws, indicating that acquiring is more appealing when poaching talent is more costly. In addition, the effects are weaker for firms with offices in Canada, consistent with anecdotal evidence that some firms relocate H-1B workers to Canada after they lose the H-1B visa lottery. A tight labor market, legal barriers to poaching talent, and the lack of foreign offices appear to be important economic mechanisms behind acquiring in our setting.

The effects are stronger among firms with high human capital, firms with more tech workers, firms with more senior workers (for which junior skilled workers are likely more important), and firms with more M&A experience (which are likely better at retaining acquired talent). The effects also concentrate in acquisitions of target firms with skilled workers and become insignificant for targets without skilled workers. In addition, the effects are significant regardless of whether the target firm owns patents, suggesting the acquirers on average are not solely buying patents. Furthermore, after losing H-1B visa lotteries, firms grant more employee stock options to attract and retain skilled workers. On balance, skilled labor seems to be an important driver of the M&As undertaken by the firms that lose H-1B visa lotteries.

Using employee LinkedIn profiles and H-1B visa microdata, we show that target firms possess the skilled workers that acquirers need and that firms recover a meaningful fraction of the deficit in skilled workers through acquiring. After losing an average of 25.6 H-1B visa lotteries per year, the sample firms acquire an average of 6.6 STEM workers (25.8% of the 25.6 visas lost) identifiable from LinkedIn. The results suggest acquiring is a useful means of obtaining skilled labor. In addition, the high-skilled workers they acquire share skills and occupations similar to their existing workers, suggesting that the fit between the acquirer's and the target's employee skills and occupations matters for their acquiring decisions.

Recent studies suggest that labor plays a role in M&As. For example, several studies have shown that acquisitions are more likely to occur between firms with related human capital (Tate and Yang (2016), Lee, Mauer, and Xu (2018), and Lagaras (2021)).[2] Ouimet and Zarutskie (2020) parse target firms' 10-K filings for

[2]John, Knyazeva, and Knyazeva (2015) and Dessaint, Golubov, and Volpin (2017) show that enhanced employee protection and labor rights lead to lower M&A announcement returns to the acquirer and the acquirer-target combined. Although not directly related to acquihiring, these findings suggest labor plays an important role in M&As.

keywords such as "skill" and "skilled" and find a positive relation between these keywords and the post-merger employment outcomes of target firm employees. However, without exploiting exogenous shocks to the supply of skilled workers or shocks to firms' demand for skilled workers, these studies are unable to provide causal evidence of acquiring; that is, the retainment of some workers from a target firm could be incidental to the actual motivating purpose of an acquisition (e.g., financial synergies). Chen, Gao, and Ma (2021) appear to offer the first causal evidence related to acquiring. They show that firms headquartered in states with trade secret laws, which impede worker mobility between firms, are more likely to be acquired. This finding implies that firms acquire when poaching workers is more costly.

We add to these studies with a novel natural experiment, new evidence, and new insights. First, our natural experiment exploits exogenous shocks to the supply of high-skilled labor at the firm level, which allows us to conduct more powerful tests and better understand the economic mechanisms behind acquiring. Consider California, where trade secret laws are not enforceable and acquiring is probably most prevalent. California not only employs 1.4 million tech workers out of a nationwide total of 8.7 million, but also hosts the highest concentration of tech firms in the world (i.e., potential acquiring acquirers and targets).[3] Cross-firm analysis can shed light on whether firms within California respond to exogenous shortages of skilled labor by acquiring, insight that state-level analysis cannot provide. Second, we examine various economic mechanisms behind acquiring other than the cost of poaching workers. Specifically, we show that a tight labor market and the unavailability of foreign affiliates can induce firms to acquire after losing H-1B visa lotteries. Third, unlike prior studies, we provide direct evidence that skilled workers are indeed hired through acquisitions. And finally, we add to the literature with new evidence that a firm's acquiring decision is also affected by its levels of human capital, team structure, employee seniority, and acquisition experience, as well as the fit between the occupations and skills of the acquirer's and the target's workers.

Although our findings are based on skilled foreign workers, they have meaningful implications for acquiring skilled domestic labor since the channels behind acquiring are likely similar for foreign and domestic skilled workers. Thus, we expect the causal effects of H-1B visa shortages on acquisition activity to extend to shortages in skilled domestic labor. The literature still lacks causal evidence that firms acquire after being exposed to exogenous shortages of skilled domestic labor at the firm level, which calls for future studies.

We also add to the broader M&A literature that explores why firms undertake M&As, offering skilled labor as an additional factor in M&A decisions. Extant studies show that firms pursue M&As for various reasons, including synergy gains, technological or regulatory changes, buying assets using overvalued equity, obtaining intellectual property, managerial overconfidence, empire building, and killing target firms' disruptive innovation.[4]

[3]See https://www.wsj.com/articles/florida-texas-lead-nation-in-tech-job-gains-11648674042.

[4]See, among others, Rhodes-Kropf and Viswanathan (2004), Harford (2005), Harford and Li (2007), Levi, Li, and Zhang ((2010), (2014)), Duchin and Schmidt (2013), Bena and Li (2014), and Cunningham, Ederer, and Ma (2020). See Betton, Eckbo, and Thorburn (2008) for a review of this literature.

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Xu (2023) has found that firms more reliant on H-1B workers lowered their investment after the drastic reduction in the annual H-1B visa quota in 2004, which suggests that skilled foreign workers and capital investment are complementary. We supplement Xu's (2023) finding by showing that firms acquire when facing shortages of skilled foreign labor, likely as a means of maintaining investment.

Lastly, our findings suggest that acquiring could be a viable solution to the fundamental matching problem between workers and firms (Oyer and Schaefer (2011)); thus, we also add to the vast labor economics literature. More and more firms have begun acquiring (see above), suggesting that acquired workers may provide better matches than workers recruited from the labor market.

II. Hypothesis Development

After losing H-1B visa lotteries, firms have a variety of options, which include cutting investment projects that require H-1B workers (Xu (2023)), outsourcing projects, recruiting skilled workers from the labor market, poaching from competitors, or acquiring.[5] If a firm opts to replace the H-1B workers who lost the H-1B visa lottery, it must do so through acquiring, poaching, or direct hiring from the labor market. Why would firms buy the target firms just to access their skilled workers? Could they not simply poach the workers from the target or other firms or hire comparable workers from the labor market? Below, we address these questions by first discussing the advantages and disadvantages of acquiring and then developing our hypotheses.

Acquiring has disadvantages compared to poaching and direct hiring. The target firm may resist acquiring because its founders and current shareholders will lose control of the firm. Acquired employees may also have to terminate current projects and products to which they are personally attached. Furthermore, the acquirer often must offer bonus payments and sizeable stock options to the target's key employees to incentivize them to stay, and despite these measures, acquired workers may still leave the firm shortly after the acquire (Kim (2018)). In addition, the acquiring firm must negotiate with the target firm and its key employees on the acquiring terms, which might take more time and effort than direct hiring and poaching, especially when the acquire involves a large, complex target firm. Thus, acquiring may be the more costly option, particularly for firms with little M&A experience.

Despite these disadvantages, acquiring may be an attractive option for several notable reasons. As a fundamental problem in labor economics, hiring is widely regarded as a matching process with costly search and bilateral information asymmetry (Oyer and Schaefer (2011)). Workers have varying levels of skill and motivation, and firms have varying preferences for these attributes. An efficient labor market should identify the best match between workers and firms. Acquiring can be

[5]It would be interesting to examine which firm chooses which option, but given the limitations of our data, we are unable to do so here. Instead, we focus on whether some firms will acquihire after losing H-1B visa lotteries. We also do not aim to quantify the fraction of firms that resort to acquihiring rather than alternative strategies, to categorically identify which M&As are pure acquihires, or to quantify the fraction of acquihires among all M&A deals. Given the nature of our data, these objectives are beyond the scope of our study.

a viable solution to this matching problem. For one, acquiring may lower information asymmetries because the acquirer can observe the attributes of the target workers based on their existing projects and products.

Acquiring also enables the firm to recruit entire teams whose members already possess the team-specific capital that is crucial for innovation and product development (Jaravel, Petkova, and Bell (2018)). By recruiting an entire team, acquiring increases the probability that the hired workers can successfully collaborate with the acquirer's existing employees. In contrast to teams built from the ground up with employees that have little experience working together, the acquired team can continue working on its existing projects and products, thus speeding up the launch of new products. In fact, firms often acquire a team of talent rather than recruit individual workers when they need to develop a new product or enter a new industry. For example, rather than assembling a team from scratch, Apple acquired a team of skilled workers from Lala; this team had extensive experience in streaming music online, and they helped Apple develop and quickly launch its cloud-based music service. Such expedient delivery of new products may be especially useful in high-tech sectors, where the pace of technological innovations makes timely product launch crucial for success.

Although poaching may be less costly than acquiring, poaching is difficult when skilled workers are subject to noncompete covenants and protected by trade-secret laws. In addition, many high-skilled workers are averse to being poached away, especially those who are founders and key employees of VC-backed startups. These high-skilled workers usually aspire to found startups in the future, and VCs who have previously funded them are often the most important sources of financing and advice. Thus, these high-skilled workers have incentives to maintain good relationships with their current and former VCs and build good reputations within the VC community. Being poached away by another firm while working for a VC-backed startup may damage start-up workers' reputations and incur social sanctions from the VC community (Coyle and Polsky (2013)).

Since founders and key employees of VC-backed startups are often unwilling to abandon their startup through poaching, acquiring may be more preferable. Selling the startup to another firm is usually deemed a successful entrepreneurial venture, while liquidating the startup (and joining another firm) is not. Additionally, VCs that back startups prefer acquiring to liquidation for reputational and financial reasons (Coyle and Polsky (2013)).

In sum, although acquiring may create additional costs above and beyond poaching and direct hiring, it has various advantages to consider. Through acquiring, the firm may obtain a team of skilled workers that can help the firm quickly introduce new products and enter new markets. An acquire can also circumvent noncompete covenants, trade-secret laws, and social sanctions from VCs when recruiting start-up founders and key employees. These high-skilled workers and their investors (i.e., VCs) also prefer acquiring to poaching because of the associated reputational benefits.

Considering the costs and benefits described previously, the question we address here is whether firms acquire to resolve skilled labor shortages caused by H-1B visa lottery losses. Thus, our null hypothesis is that firms do not respond to exogenous shortages of H-1B workers by acquiring other firms. Under the null

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hypothesis, the firm's fraction of H-1B demand met is not significantly associated with its future merger and acquisition activity. The alternative hypothesis is that some firms will acquire after losing H-1B visa lotteries given the advantages of acquiring. Under the alternative hypothesis, the firm's fraction of H-1B demand met is negatively associated with its future merger and acquisition activity, and the target firm has high-skilled workers the acquirer needs.

The previous discussions indicate that firms' likelihood of acquiring varies depending on the cost of acquiring and how difficult it is to obtain skilled workers through other means. We thus hypothesize that firms are more likely to acquire after losing H-1B visa lotteries i) when the market for high-skilled labor is tight, ii) when it is more difficult to poach high-skilled workers from other firms, iii) when the firm does not have foreign branches, iv) when the firm is more experienced in consummating acquisitions and retaining acquired employees, and v) when human capital is more important for the firm.

III. Empirical Strategy

A. Background on the H-1B Visa Lottery Program

The Immigration Act of 1990 created the H-1B visa program with an initial annual quota of 65,000 visas that lasted until 1999. The cap was raised to 115,000 in 1999 and further to 195,000 in 2001, but it was sharply reverted to 65,000 in 2004. In 2006, 20,000 H-1B visas were added for foreign workers with a master's degree or higher accredited by a U.S. institution. The annual cap has not been adjusted since then. Although the annual cap was never reached before 2004, it has been binding since 2004.

To hire a skilled immigrant under the H-1B visa program, an employer must first file a Labor Conditions Application (LCA) to the U. S. Department of Labor (DOL). The employer can file one LCA for multiple foreign workers in the same job category or position. Once the LCA is certified, the employer can submit an I-129 petition separately for each foreign worker specified in the LCA to the USCIS office. A granted H-1B work visa is valid for 3 years and may be extended once for another 3 years.

On the first business day in April, the USCIS starts accepting I-129 petitions for the coming fiscal year that starts in October. The USCIS must keep petitions open for at least 5 business days. If the annual quota is not reached within the first 5 days, the USCIS processes all petitions submitted before the date when the annual quota is reached and conducts lotteries to allocate the remaining H-1B visas to the petitions submitted on that date. If the volume of submitted I-129 petitions reaches the annual quota within the first 5 days, the USCIS will stop accepting I-129 petitions after a specific cutoff day that is unknown to petitioners in advance. The USCIS determines the cutoff day ad hoc once it thinks it already has or will have enough petitions by the cutoff day. The USCIS then uses lotteries to allocate the cap-subject H-1B visas to petitions submitted before the cutoff date. In fiscal years 2008 and 2009 and 2014–2017, the quota was reached within 5 days and all cap-subject H-1B visas were allocated using computer-based random algorithms. This lottery algorithm results in random variations in the fraction of a firm's demand for skilled foreign workers that is met. Therefore, our analysis focuses on fiscal years 2008 and 2009 and 2014–2017 because the lottery win rate is random across firms in these years.

Lucky firms have more of their demand for high-skilled foreign labor satisfied in H-1B visa lotteries, while unlucky firms have less (or none) of their demand met. Unlucky firms may opt to acquire firms with the high-skilled workers they need, as discussed previously. We thus hypothesize that the higher the fraction of H-1B visa petitions a company fails to get approved, the more likely it will be to acquire talent through M&As.

B. Model Specification

We identify the effect of the H-1B visa lottery win rate on a firm's acquisition activity and the number of workers acquired by estimating the following model:

$$y_{i,t+1} = \beta \times \text{H1B\_WIN\_RATE}_{it} + \gamma X_{it} + \alpha_i + I_j \times \alpha_t + \varepsilon_{it}, \tag{1}$$

where $y_{i,t+1}$ is firm i's acquisition activity or the number of high-skilled workers acquired in year $t+1$. We focus on acquisition activity 1 year ahead because identifying and negotiating with target firms often takes time. Additional analysis below shows that the firm's acquiring activity concentrates in the first year after the H-1B lottery likely because it is costly to leave the vacancy of skilled workers unfilled for long. H1B_WIN_RATE_{it} is the fraction of firm i's demand for cap-subject H-1B visas that is met in year t. To enter our sample, H1B_WIN_RATE_{it} must be available for the firm in at least one of the 6 lottery years. $\boldsymbol{X_{it}}$ is a vector of firm characteristics and α_i and $I_j \times \alpha_t$ are firm and industry × year fixed effects, respectively.

In the baseline regressions, we apply the inverse hyperbolic sine (IHS) transformation to the count of acquisitions and the count of acquired workers. The IHS transformation approximates the natural logarithm function and retains zero-valued observations without any further manipulations. The baseline results are robust to logarithm transformation of the dependent variables and to Poisson regressions, as shown below. To conserve space in tables for regression results, the default dependent variable is the IHS transformation of the count of acquisitions (or the count of acquired workers) unless labeled otherwise.

IV. Data

A. Data Sources and Sample Construction

We build a sample of U.S. public firms from CRSP and Compustat. Following the literature (e.g., Xu (2023)), we exclude from the sample utility firms (SIC codes 4900–4999), financial firms (SIC codes 6000–6999), and public sector firms (SIC codes over 9000). We measure each firm's demand for H-1B visas using LCA microdata downloaded from the DOL. We also identify the number of H-1B visas granted to a firm using I-129 petitions microdata up to 2017, which we obtain from the USCIS through a Freedom of Information Act request. LCAs are records of H-1B visa applications, whereas I-129 petitions are records of H-1B visa grants. We use Thomson Reuters SDC data to identify M&As undertaken by the firms in our sample and use the PatentsView database to gauge firm patenting activity.

We measure a firm's demand for cap-subject H-1B visas using its LCA filings and measure the number of cap-subject H-1B visas granted to the firm using the I-129 petitions data, following Kerr and Lincoln (2010), Chen, Hshieh, and Zhang (2021), and Xu (2023). See Appendix B of the Supplementary Material for details on the measures. A firm's fraction of demand for cap-subject H-1B visas that is met (i.e., H1B_WIN_RATE) is the ratio of the number of cap-subject visas received to the number requested by the firm. To enter our sample, the firm must have requested at least one cap-subject H-1B visa in one of the 6 lottery years (2008, 2009, and 2014–2017). There are 3,877 firm-years that satisfy this requirement. Our measures of H-1B visa demand and supply turn out to be accurate. The demand measure is positively associated with the supply measure, and the fraction of demand that is met is not correlated with firm characteristics or past firm performance. The lottery win rate based on our measures is also very close to the likelihood of winning an H-1B lottery disclosed by the USCIS.

From the SDC database, we retrieve M&As announced between 2008 and 2018 by the firms in the H-1B visa lottery sample. Following prior studies, we require that the deal be in the form of a merger, an acquisition of majority interest, or an acquisition of assets.[6] The deal must also be a control bid in which the acquirer owns less than half of the target firm's outstanding shares before the deal and aims to own more than half after the deal.

For each firm in our H-1B lottery experiment and each of their target firms, we retrieve LinkedIn profiles of its current and former employees visible in 2020 from the database assembled by Bright Data, which contains public profiles of LinkedIn users. The data items we retrieve include the employee's country of residence, first and last name, employment history (dates, employer names, and job titles), educational history (degree dates, field of study, and level), and skillset keywords. The dates of each employee's employment history enable us to identify the firm's employees at different times.

We match CRSP/Compustat firms with firms in SDC using CUSIP and pair them to companies in LCAs, I-129 petitions, LinkedIn, and PatentsView using a fuzzy string-matching algorithm based on standardized firm name (e.g., removing business entity identifiers, local office addresses, etc.) following Chen et al. (2021).[7] To further safeguard the integrity of our matching procedure, we manually inspect the final set of matched firm names. This procedure results in a panel of 3,869 firm-years in which the firm demanded at least one cap-subject H-1B visa in 2008, 2009, and 2014–2017. Since the H-1B visa program follows the governmental fiscal year, which starts on Oct. 1, we construct our variables by the governmental fiscal year rather than the calendar year; henceforth, "year" refers to governmental fiscal year. Panel A of Table 1 reports the frequency of firms and their H-1B visa demand and supply each year. The number of LCA-filing

[6]See, among others, Betton et al. (2008) and Bessembinder, Cooper, and Zhang (2019).

[7]If the parent company name is not listed alongside the subsidiary name on a LinkedIn profile, then the subsidiary is treated as a separate company.

TABLE 1

The Fraction of a Company's Demand for High-Skilled Foreign Labor That Is Met

Panel A of Table 1 reports the number of public companies filing cap-subject Labor Condition Applications (LCAs), the average number of cap-subject foreign workers each LCA filer demanded (CAP_H1B_DEMAND), the average number of cap-subject H-1B visas granted to the company (CAP_H1B_GRANT), and the fraction of demand for high-skilled foreign labor that is met (H1B_WIN_RATE), by year. The sample period is years 2008–2009 and 2014–2017 in which lotteries are held to allocate all cap-subject H-1B visas. We estimate a company's demand for cap-subject foreign workers using its LCA filings and the number of cap-subject H-1B visas granted to the company using its processed I-129 petitions (detailed in Appendix B of the Supplementary Material). Panel B presents the OLS regression results of company–year panel regressions using the sample of public companies that demand at least one cap-subject H-1B visa in the year. The dependent variable (H1B_WIN_RATE) is the fraction of the company's demand for cap-subject H-1B visa that is met by supply in year *t*. The explanatory variables are company characteristics related to size, leverage, ROA, Tobin's *Q*, cash, employment, and the fraction of the firm's employees on LinkedIn with a master's degree or higher, measured at the end of year *t*. See the Appendix for variable definitions. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Standard errors in parentheses are clustered at the firm level.

Panel A. Demand for and Supply of High-Skilled Foreign Workers Subject to H-1B Visa Cap, by Year

Year	# Companies Filing Cap-Subject LCA	CAP_H1B_DEMAND	CAP_H1B_GRANT	H1B_WIN_RATE
2008	739	17.34	7.71	0.52
2009	734	22.42	10.09	0.54
2014	590	44.48	13.20	0.62
2015	614	51.89	11.53	0.46
2016	621	42.84	11.56	0.42
2017	571	48.05	12.54	0.36

Panel B. Company Characteristics and the Fraction of Demand for Cap-Subject H-1B Visa That Is Met

	H1B_WIN_RATE	
	1	2
SIZE	0.036	0.032
	(0.035)	(0.020)
LEVERAGE	−0.030	0.046
	(0.077)	(0.068)
ROA	0.176	−0.097
	(0.151)	(0.082)
TOBINS_Q	0.015	−0.001
	(0.020)	(0.008)
CASH	0.106	−0.042
	(0.234)	(0.086)
EMPLOYMENT	8.060	−3.951
	(6.155)	(4.500)
FRAC_ADV_DEG	0.229	−0.143
	(0.148)	(0.165)
No. of obs.	3,869	3,869
Adj. R^2	0.012	0.193
Company FE	No	Yes
Year FE	Yes	Yes

firms decreased from 739 in 2008 to 590 in 2014 and then stabilized around 600 between 2015 and 2017.

We employ the I-129 microdata and the LinkedIn data to shed new light on the skills, occupations, seniority, and educational background of the acquired workers. The I-129 microdata provide information on H-1B workers, while the LinkedIn data cover both domestic and foreign workers. A substantial fraction of U.S. firms' high-skilled workers has LinkedIn profiles. A Pew Research Center study in 2021 found that 51% of adults with bachelor's or advanced degrees use LinkedIn, compared to 10% of those with a high school diploma or less. Consistent with Jeffers (2022), we find LinkedIn has broad coverage of our sample of firms. We can identify at least one employee LinkedIn profile for 3,869 of the 3,877 firm-years in the H-1B visa lottery experiment and for 77% of their target firms. The wide coverage of LinkedIn makes it a more suitable data source for our study compared to alternative data sources, such as the census Longitudinal Employer-Household Dynamics (LEHD) microdata. Researchers must go through a lengthy application procedure for access to the LEHD microdata for each state, and each state can reject the researcher's application. For example, Ouimet and Zarutskie's (2020) application was approved by only 25 states, excluding states like California, Massachusetts, New York, which host many firms.[8] The limited coverage of the LEHD data results in a drastic reduction in Ouimet and Zarutskie's (2020) sample size: they can match only 300 (17%) of the 1,800 target firms in their sample to LEHD (see their Table 1). In addition, LinkedIn offers more nuanced data on employee skills and occupations, which enable us to shed new light on acquired workers and the fit between the acquirer's and the target's employees. Because of these features, the LinkedIn microdata have been used in recent academic studies (e.g., Jiang, Wang, and Wang (2018), Jeffers (2022)).

B. Verifying the Randomness of the H-1B Visa Lottery

Panel A of Table 1 reports summary statistics of H1B_WIN_RATE in each of the 6 lottery years for the sample firms. The firms demand more and more H-1B visas over time: the average demand has more than doubled from 17.34 visas in 2008 to 48.05 in 2017. The average number of cap-subject H-1B visas granted to each firm per annum has also risen from 7.71 in 2008 to 12.54 in 2017. Because the rate of growth is smaller than that of demand, the fraction of demand met by supply (H1B_WIN_RATE) fell from 52% in 2008 to 36% in 2017.

In Panel B of Table 1, we test whether H1B_WIN_RATE is random across observable firm characteristics. We regress H1B_WIN_RATE on firm size, leverage ratio, ROA, Tobin's Q, cash holding, labor intensity (employee count in Compustat divided by book assets), and the fraction of employees with advanced educational degrees (e.g., a master's degree or higher) identifiable from LinkedIn. Coefficients on these characteristics are all insignificant, suggesting H1B_WIN_RATE varies randomly across firms and is not tilted toward any of the firm characteristics. The coefficients on these characteristics remain insignificant when we separately estimate the regression for each of the 6 lottery years rather than for the pooled sample (Table A1 in the Supplementary Material). The results are consistent with prior studies (Chen et al. (2021)).

C. H-1B Visa Lottery and Labor Shortage

We next examine whether the sample firms are more likely to disclose or publicly discuss labor shortages after losing H-1B visa lotteries by studying their SEC filings, earnings conference calls, and shareholder/analyst calls. We search each firm's 10-K/10-Q forms filed in each year and its call transcripts in each year for a list of keywords related to labor shortages. We then count the number of unique keywords for each firm-year. Panel A of Table A2 in the Supplementary Material lists the keywords we use, which are akin to those used by Qiu and Wang (2021). We regress the IHS transformation of the number of unique keywords in 10-K/10-Q

[8] Similarly, the LEHD data used in Tate and Yang (2015) cover plants in 23 states.

forms filed in year $t+1$ on H1B_WIN_RATE and the control variables in column 1 in Panel C of Table A2 in the Supplementary Material. In column 2, we replace the dependent variable with an indicator for the existence of any keywords in 10-K/10-Q filings in year $t+1$. The coefficient on H1B_WIN_RATE is negative and statistically significant at the 10% and 5% levels, respectively, in the two columns. The regressions in columns 3 and 4 are the same as in columns 1 and 2 except that the dependent variables now concern the keywords in the firm's call transcripts rather than their 10-K/10-Q filings. In columns 5 and 6, we replace the dependent variable with the IHS transformation of the number of keywords in both 10-K/10-Q filings and transcripts and an indicator for the existence of such keywords. We observe that the coefficient on H1B_WIN_RATE remains negative and is statistically significant at the 5% level in columns 3–6. These results suggest that firms face shortages of skilled labor after losing H-1B visa lotteries.

V. H-1B Visa Lottery Outcome and Acquiring Activity

A. Baseline Results

Panel A of Table 2 presents summary statistics of the variables used to estimate equation (1). The average firm has a market capitalization of $12.4 billion, an annual ROA of 0.7%, Tobin's Q of 2.2, a leverage ratio of 22.1%, a cash-to-asset ratio of 0.25, and an employee count of 19,350. The pooled average fraction of H-1B demand met is 49.0% with a standard deviation of 37.9%. The average firm demands 36.5 H-1B visas and receives 10.9 H-1B visas in a year, leaving an annual deficit of 25.6 H-1B workers.

The annual deficit of 25.6 H-1B workers may seem small compared to the average firm employment of 19,350. However, given that STEM workers, who are widely regarded as high skilled, make up only about 7% of the U.S. workforce according to the U.S. Census Bureau's 2019 estimates, the deficits, if accumulated over years, are not trivial (Martinez and Christnacht (2021)). About 79.6% of the H-1B workers in the I-129 database are STEM workers, and these workers have at least a bachelor's degree, suggesting an annual deficit of 20.4 (= 25.6 × 79.6%) high-skilled STEM workers per firm. The annual deficit of 20.4 H-1B STEM workers represents over 1.5% of the estimated average number of 1,354.5 (= 19,350 × 7%) high-skilled STEM workers in these firms. The annual deficit in high-skilled H-1B workers will cumulate into a material shortage of talent if it is not expeditiously addressed. Talent deficits are especially harmful when firms compete fiercely on innovation. Thus, firms have incentives to fill talent deficits through poaching and direct hiring from the labor market or through acquiring. The average sample firm initiates 0.40 acquisitions in the year following the H-1B visa lottery, and the likelihood that a firm initiates acquisitions in a year is 24.6%. Through these acquisitions, they obtain an average of 56.2 workers and 20.6 STEM workers (identified from LinkedIn) per year.[9] Note that the 20.6 acquired STEM workers are close in number to the deficit of 25.6 H-1B workers.

[9]We designate a LinkedIn profile as a STEM worker at a certain point in time if the individual reported a job title that contains STEM keywords (e.g., "software," "engineer," "scientist," etc.), which we derive from a list of STEM occupations provided by the U.S. Bureau of Labor Statistics (see https://www.bls.gov/oes/stem_list.xlsx).

TABLE 2

H-1B Visa Lottery Outcome and Acquiring Activity

Panel A of Table 2 presents summary statistics of the variables relevant to equation (1). Panel B presents OLS estimation results of company–year panel regressions in equation (1) over the lottery years 2008–2009 and 2014–2017. The dependent variable is the IHS transformation of the number of acquisitions (column 1), an indicator of whether the firm has an acquisition (column 2), the IHS transformation of the number of acquired workers identifiable from LinkedIn (column 3), and the IHS transformation of the number of acquired STEM workers identifiable from LinkedIn (column 4) in year $t + 1$. The main independent variable is the fraction of the company's demand for H-1B visas that is met (H1B_WIN_RATE). We estimate a company's demand for cap-subject foreign workers using its Labor Condition Application (LCA) filings and the number of cap-subject H-1B visas granted to the company using its processed I-129 petitions (detailed in Appendix B of the Supplementary Material). Other explanatory variables are a set of firm characteristics measured in year t, the firm fixed effects, and the industry × year fixed effects (2-digit NAICS). See the Appendix for variable definitions. The last row for columns 1, 3, and 4 reports the percentage change in the dependent variable for each 1-standard-deviation increase in H1B_WIN_RATE, while the last row for column 2 reports the percentage point change in the probability of acquisitions for each 1-standard-deviation increase in H1B_WIN_RATE. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Standard errors in parentheses are clustered at the firm level.

Panel A. Summary Statistics

	N	Mean	Std. Dev.	5 Percentile	25 Percentile	50 Percentile	75 Percentile	95 Percentile
CAP_H1B_GRANT	3,869	10.937	58.396	0.000	0.000	1.000	4.000	30.000
CAP_H1B_DEMAND	3,869	36.549	268.075	1.000	1.000	3.000	8.000	71.000
H1B_WIN_RATE	3,869	0.490	0.379	0.000	0.000	0.500	0.900	1.000
NUM_ACQ	3,869	0.400	0.931	0.000	0.000	0.000	0.000	2.000
IND_ACQ	3,869	0.246	0.431	0.000	0.000	0.000	0.000	1.000
NUM_ACQUIRED	3,869	56.221	545.997	0.000	0.000	0.000	0.000	73.000
NUM_ACQUIRED_STEM	3,869	20.641	199.153	0.000	0.000	0.000	0.000	25.000
SIZE ($B)	3,869	12.393	46.086	0.045	0.400	1.683	6.999	52.260
LEVERAGE	3,869	0.221	0.238	0.000	0.013	0.184	0.338	0.607
ROA	3,869	0.007	0.237	−0.409	−0.024	0.061	0.116	0.221
TOBINS_Q	3,869	2.248	1.700	0.861	1.222	1.714	2.637	5.450
CASH	3,869	0.249	0.227	0.014	0.070	0.174	0.373	0.735
EMPLOYMENT (thousands)	3,869	19.350	51.850	0.097	0.783	3.600	14.109	83.756
FRAC_ADV_DEG	3,869	0.174	0.110	0.034	0.098	0.157	0.228	0.374

Panel B. Regression Results

	NUM_ACQ	IND_ACQ	NUM_ACQUIRED	NUM_ACQUIRED_STEM
	1	2	3	4
H1B_WIN_RATE	−0.043***	−0.040***	−0.117***	−0.129***
	(0.011)	(0.010)	(0.031)	(0.035)
SIZE	0.041**	0.043***	0.115***	0.112**
	(0.019)	(0.017)	(0.043)	(0.053)
LEVERAGE	−0.168**	−0.092	−0.259	−0.129
	(0.075)	(0.062)	(0.167)	(0.221)
ROA	−0.033	−0.005	−0.066	−0.052
	(0.060)	(0.051)	(0.138)	(0.159)
TOBINS_Q	0.001	−0.002	−0.016	−0.010
	(0.008)	(0.008)	(0.019)	(0.023)
CASH	0.145	0.070	0.313	0.572*
	(0.104)	(0.092)	(0.233)	(0.300)
EMPLOYMENT	−0.444	−0.508	−0.260	3.808
	(0.991)	(1.014)	(2.420)	(2.605)
FRAC_ADV_DEG	0.038	−0.032	−0.011	0.852
	(0.328)	(0.313)	(0.729)	(0.905)
No. of obs.	3,869	3,869	3,869	3,869
Adj. R^2	0.344	0.266	0.249	0.171
Company FE	Yes	Yes	Yes	Yes
Industry × year FE	Yes	Yes	Yes	Yes
Economic magnitude	−4.39%	−1.52%	−4.44%	−4.89%

Panel B of Table 2 presents the regression results for equation (1). The dependent variable in column 1 is the IHS transformation of the count of acquisitions (NUM_ACQ). In column 2, we replace the dependent variable with an indicator for acquisitions (IND_ACQ) in the year. The coefficient on the fraction of H-1B demand met (H1B_WIN_RATE) is negative and statistically significant at

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the 1% level in both columns. The economic magnitudes of the effects are not trivial. Each 1-standard-deviation (37.9%) reduction in the lottery win rate raises the number of acquisitions by 4.4% per year and raises the probability of initiating acquisition by 1.5 percentage points (or 6.1% of the unconditional probability of acquisition of 24.6% shown in Panel A of Table 2).[10] The effects (4.4% and 6.1%) are economically meaningful and will cumulate into even larger effects over multiple years.

In columns 3 and 4 in Panel B of Table 2, we examine whether H-1B visa lottery outcomes affect the number of skilled workers the firm acquires through M&As. Specifically, we replace the dependent variable with the IHS transformation of the number of acquired workers identifiable on LinkedIn (NUM_ACQUIRED) in column 3 and with the IHS transformation of the number of acquired STEM workers (NUM_ACQUIRED_STEM) in column 4. Examining the count of acquired STEM workers is interesting because, as discussed previously, STEM workers are widely regarded as high-skilled labor. The coefficient on H1B_WIN_RATE is negative and statistically significant at the 1% level in both columns. In terms of the economic magnitude, each 1-standard-deviation reduction in H1B_WIN_RATE raises the number of acquired workers by 4.4% or about 2.5 (=4.4% × 56.2) workers per year based on the average number of acquired workers of 56.2 (Panel A of Table 2). Each 1-standard-deviation reduction in H1B_WIN_RATE raises the number of acquired STEM workers by 4.9% or about 1.0 acquired STEM workers per year based on the average number of acquired STEM workers of 20.6. These effects (2.5 acquired workers and 1.0 acquired STEM workers per year) are economically meaningful relative to the annual deficit of 25.6 H-1B visas.

The results indicate that, after losing H-1B visa lotteries, firms acquire targets that have skilled workers. The results are consistent with the acquiring hypothesis.

B. Robustness Checks

1. Acquisitions with Undisclosed/Disclosed Transaction Value

As mentioned previously, the average firm faces an approximate 1.5% deficit in high-skilled STEM workers from losing H-1B visa lotteries. The deficit may not warrant a large acquisition that involves billions of dollars; a young startup with few high-skilled employees and a negligible amount of tangible assets may be a better acquiring target. Such a small acquire usually does not require the approval of the board of directors or shareholders, a lengthy due diligence process, lengthy negotiations, or the help of M&A advisors.[11] Therefore, the time and cost required to buy a small target is significantly lower than for a large target.[12]

[10]With the IHS transformation of the dependent variable, our regression has this form: $ln(Y+\sqrt{Y^2+1}) = a + bX + u$. For each unit of change in X, the percentage change in Y is approximated by its semi-elasticity with respect to X: $\frac{\partial Y}{\partial X} \times \frac{1}{Y} = b \times \sqrt{1+\frac{1}{Y^2}}$ (Bellemare and Wichman (2020)).

[11]See discussions about acquihires by law firms: https://www.linkedin.com/pulse/acqui-hire-transactions-place-ma-universe-pat-linden/; https://www.walkercorporatelaw.com/startup-issues/acquihires-101-tips-for-founders/.

[12]Due to the lack of details on acquihire transactions, specific summary statistics are lacking on how long it takes to complete an acquihire. But the process is believed to be much shorter given the small amount of tangible assets involved.

We thus separately count M&As with undisclosed transaction values, which usually involve small targets with a negligible amount of assets, and M&As with disclosed transaction values.[13] About half of the M&As undertaken by our sample of firms have an undisclosed transaction value (Panel A of Table A3 in the Supplementary Material). The coefficient on H1B_WIN_RATE remains negative and statistically significant at the 1% or 5% levels when the dependent variable in equation (1) is replaced with i) the IHS transformation of the count of M&As with undisclosed size or with disclosed size and ii) the indicator for M&As with undisclosed size or with disclosed size (Panel B of Table A3 in the Supplementary Material). In short, the baseline results are robust to M&As with or without disclosure of their transaction values.

2. Alternative Model Specifications

In the first alternative specification, we exclude the control variables from the regressions in Panel B of Table 2, keeping only H1B_WIN_RATE and the firm and industry × year fixed effects. The regression results (untabulated for brevity) reveal that the coefficient on H1B_WIN_RATE remains negative and statistically significant at the 1% level, suggesting that the baseline results are not driven by other firm characteristics.

The dependent variable in the baseline model is the firm's M&A activity and acquired workers in year $t+1$ (i.e., 1 year after the H-1B visa lottery). As mentioned previously, acquiring large targets takes longer to consummate, making it possible that firms may pursue more M&As in years $t+1$ and beyond. To examine this possibility, we replace the dependent variable with the IHS transformation of the count of acquisitions or the count of acquired workers in years $t+2$ and $t+3$ and present the regression results in Panels A and B of Table A4, respectively, in the Supplementary Material. The results show insignificant coefficients on H1B_WIN_RATE, suggesting the effects of lottery outcomes on acquiring activity concentrate in the year immediately after the lottery. In addition, we estimate an event study model to examine the dynamic effects of H-1B lottery outcomes on acquiring activity in year $t+0$ up to year $t+3$, following Deryugina (2017) and Dobkin, Finkelstein, Kluender, and Notowidigdo (2018). The estimation results, reported in Panel C of Table A4 in the Supplementary Material, also show that the effects concentrate in year $t+1$. These results are consistent with the view that shortages of high-skilled foreign workers are costly, which pressures the firm to fill the shortage early through M&As or other means (e.g., poaching or hiring from the labor market). Delaying and addressing talent shortages through M&As beyond year $t+1$ seems too costly.

In the baseline regressions, we normalize the count of acquisitions or acquired workers using the IHS transformation. Here, we test whether the results are robust to alternative normalizing methods (N'guessan, Featherstone, Odeh, and Upendram (2017), Bellemare and Wichman (2020)). First, rather than the IHS transformation,

[13]The SEC requires the acquirer to disclose the transaction size if the target firm is large relative to the acquiring firm, which can be measured relative to investment, asset, or income. Therefore, an undisclosed transaction size does not necessarily mean that the target firm has no tangible assets. Still, an undisclosed transaction size likely indicates that the target firm has relatively fewer tangible assets, ceteris paribus.

we transform the count of acquisitions or acquired workers with the natural logarithm of one plus the count. The estimation results, presented in the first three columns of Table A5 in the Supplementary Material, show that the coefficient on H1B_WIN_RATE remains negative and statistically significant at the 1% level in all three columns. Second, we follow Cohn, Liu, and Wardlaw (2022) and estimate Poisson regressions, in which the dependent variable is the raw count of acquisitions, acquired workers, or acquired STEM workers. The Poisson regression results show that the coefficient on H1B_WIN_RATE remains negative and statistically significant at the 1% level (the last three columns of Table A5 in the Supplementary Material). Thus, the baseline results are robust to Poisson regression and log transformation of the count of acquisitions and acquired skilled workers.

3. Firms with Large Unmet H-1B Demand

The baseline analysis includes all firms participating in H-1B visa lotteries. Here, we examine whether the baseline results remain robust when we consider only firm-years in which the firm loses at least 5, 6, 7, 8, 9, or 10 lotteries. The idea is that the firm may be more likely to respond to large deficits of skilled workers with acquiring. When we restrict the firm-years to those with a deficit of at least five H-1B visas, the coefficient on H1B_WIN_RATE remains negative and statistically significant at better than the 5% level, while the economic magnitude of the coefficient amplifies by about 10 times (Table A6 in the Supplementary Material). The coefficient remains economically and statistically similar when we increase the cutoff deficit from 5 to 6 visas but becomes economically smaller and less statistically significant when the cutoff deficit is further increased up to 10 visas. The weaker results for cutoff visa deficits above 7 are likely because of the resulting small sample size (and thus low test power). For example, the sample size drops from the original sample size of 3,869 firm-years to only 512 firm-years when the cutoff deficit is set to 10 visas. On balance, firms seem to be more likely to acquire when facing larger H-1B visa deficits.

4. Over-Petitioning

Firms may apply for more visas than needed to secure enough H-1B visas (i.e., over-petitioning). Suppose N homogeneous firms compete for S visas. A cooperative outcome is that each firm applies for S/N visas when visas are rationed. But a firm will benefit if it defects (i.e., requests more than S/N visas) while other firms do not defect.[14] However, an over-petitioning firm will necessarily incur the petition costs (e.g., filing fees, attorney fees, etc.) as well as possible overstaffing costs (i.e., due to a redundancy in H-1B workers if the firm wins more visas than it needs). These costs are likely to discourage firms from over-petitioning in the first place. In fact, small firms have avoided hiring foreign workers because of the hassle and expenses associated with the H-1B system according to media reports and survey evidence.[15] Among the more than 600 VC-backed startups surveyed by the

[14]Osborne and Rubinstein (1994) show that "in any finite repetition of this [prisoner's dilemma] game the only Nash equilibrium outcome is that in which the players choose (D, D) [defect, defect] in every period."

[15]See, for example, https://www.forbes.com/sites/realspin/2012/06/17/h1-b-visa-quotas-greatly-restrain-small-business-expansion/?sh=240ba4c1718c.

National Venture Capital Association in 2013, the majority indicated that "projects had been delayed because of the lack of H-1B visas," about three-quarters indicating that "U.S. immigration laws for skilled [foreign] professionals harm American competitiveness" and 43% deciding to "place or hire more personnel in facilities located outside the United States" because of the hassle and expenses of the H-1B system (Anderson (2013)). One reason that VC-backed startups have avoided hiring H-1B workers lies in the lengthy, inefficient application procedure: the startups "can't plan [their] hiring needs more than 6 months in advance" (Anderson (2013)).

Even if over-petitioning were present, it would unlikely drive the baseline results for several reasons. First, the lottery win rate is random and does not depend on over-petitioning. Thus, the lottery win rate cannot affect firm acquisition activity through over-petitioning. Second, over-petitioning is a zero-sum game because of the H-1B visa quota: some, but certainly not all, firms can successfully implement this strategy. As such, over-petitioning would at most only add noise to the observed fraction of H-1B demand met, reducing the likelihood that we observe significant effects of H1B_WIN_RATE on acquiring. Still, the data reveal that H1B_WIN_RATE has significant effects on acquiring activity, which suggests the baseline results are so robust that any noise in the key explanatory variable created by over-petitioning cannot mask these effects. Third, over-petitioning would have little impact on our estimates if all firms over-petitioned to similar degrees. Fourth, to show that our results are not driven by over-petitioning, we additionally control for H-1B visa demand in equation (1) and find that the coefficient on H1B_WIN_RATE remains qualitatively unchanged and the coefficient on H-1B demand is insignificant (Table A7 in the Supplementary Material).

Growth firms might have stronger incentives to over-petition to secure skilled foreign workers for growth. These firms may also grow through M&As. Thus, we examine whether the H-1B lottery win rate has stronger effects on growth firms' acquiring activity by adding to equation (1) the interaction between H1B_WIN_RATE and the firm's BM ratio. The regression results show that the effect of H1B_WIN_RATE on acquisition activity is not different for growth versus value firms (Panel A of Table A9 in the Supplementary Material). Viewed together, these results suggest that over-petitioning does not drive the baseline results.

5. H-1B Worker Education

The USCIS conducts two sequential lotteries if all cap-subject H-1B visas are allocated through lottery in the year. In the first lottery, the USCIS allocates the 20,000 advanced degree H-1B visas to applicants with master's degrees or higher. After losing the first lottery, the applicants with advanced degrees are still eligible for the second lottery in which the USCIS assigns the 65,000 regular H-1B visas to all applicants remaining in the lottery pool. As such, advanced degree H-1B petitioners have a higher lottery win rate than petitioners with bachelor's degrees. H1B_WIN_RATE is not completely random if H-1B worker education is not random across firms. It is thus desirable to control for H-1B worker education in equation (1). Unfortunately, it is omitted from the regression because this information is unavailable in the LCA and I-129 data. This omitted variable might bias the coefficient estimate. If firms are more likely to acquire after losing advanced degree

H-1B visas, H-1B worker education will be positively correlated with both the fraction of demand met and acquisition activity. Hence, the coefficient estimate might be upwardly biased (Roberts and Whited (2013)).

This potential bias can be significantly mitigated by controlling for variables that explain most of the variation in H-1B worker education across firms. To this end, we have controlled for the firm's fraction of employees with advanced degrees (identifiable from LinkedIn) in the regressions. We also find that our baseline control variables, including firm characteristics and firm and industry × year fixed effects, explain about three-quarters of the variation in the fraction of H-1B workers with advanced degrees using a subsample of LCA applicants whose educational level can be inferred through another data source.[16] Using the same data source, Chen et al. (2021) and Dimmock, Huang, and Weisbenner (2022) both find that firm characteristics and firm and year fixed effects can explain the majority of the variation in the educational degrees of H-1B visa applicants. As such, H-1B worker education is unlikely to bias our estimates since the control variables absorb most of its variation.

Other evidence also suggests that the coefficient estimates are not biased. First, the coefficients are similar to those in the baseline regressions after adjusting for the omitted variable bias using the method of Oster (2019), as shown in Table A8 in the Supplementary Material. The bias-adjusted coefficients for the four columns in Panel B of Table 2 are −0.0389, −0.0362, −0.162, and −0.116, respectively, when we set $R_{max} = 1.3\ R^2$ following Oster's (2019) suggestion. The bias-adjusted coefficients are close to those in Panel B of Table 2 and are qualitatively similar when we set $R_{max} = R^2$. Second, H1B_WIN_RATE is insignificantly associated with the firm characteristics in Panel B of Table 1, including the fraction of employees with advanced degrees. If H1B_WIN_RATE were nonrandom and systematically tilted toward certain firms, some coefficients on the firm characteristics would likely be statistically significant. In contrast, the coefficients are all insignificant.

Third, the potential bias will be small if only a small fraction of H-1B visa petitioners have advanced degrees. The bias shrinks to 0 when this fraction drops to 0. This fraction, while increasing over time, is relatively low (about 20%) during our sample period. This relatively low fraction is unlikely to cause notable upward biases in the coefficients after controlling for variables that absorb most of the variation in H-1B worker education. Last, in an additional natural experiment based on the sharp reduction in the H-1B visa cap in 2004, we find that exogenous

[16]The DOL requires that the wage offered to an H-1B worker must be the prevailing wage paid to similarly employed workers in the same occupation in the area of intended employment. The employer can satisfy this requirement in LCAs using prevailing wage rates from multiple sources including the National Prevailing Wage and Center (NPWC), the Occupational Employment Statistics program, and surveys conducted by the employer or its consultants. The NPWC prevailing wages (available since 2010) are based on job codes. For about half of these job codes, the NPWC also provides a typical worker's educational degree. This allows us to infer the applicant's educational degree if the employer chooses to use the NPWC data and if the job code has an associated educational degree. We can infer the educational degree of about 20% of the applicants in the cap-subject LCAs filed by our sample of firms from 2014 to 2017.

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shortages of H-1B workers also lead to increased acquisition activity (see Appendix C of the Supplementary Material). This experiment is unaffected by the higher lottery win rate of H-1B visa applicants with more advanced degrees and thus is not subject to concern over upward bias for the coefficient on H1B_WIN_RATE.

In sum, H-1B worker education seems unlikely to result in considerable upward bias in the coefficient estimates.

6. Optional Practical Training Work Permits and Foreign Affiliates

In contrast to the potential upward bias in the baseline coefficient estimates due to not observing H-1B visa applicants' academic degrees, the coefficient estimates might understate the true effect of skilled labor shortages on acquiring for two reasons. First, after losing an H-1B lottery, foreign workers can continue to work for the firm if they are still in the OPT period.[17] Second, some firms may be able to temporarily transfer workers to a foreign affiliate (e.g., an office in Toronto, Canada) after they lose the H-1B visa lottery. OPT and the availability of foreign offices can dampen the effects of losing H-1B visa lotteries on acquiring, making it more difficult to observe such effects. Still, we observe material effects of H-1B visa lottery losses on the firm's acquiring activity.

The availability of foreign affiliates mitigates a firm's need to acquire because the firm can reapply for H-1B visas for foreign workers in the future. To test whether the baseline results are stronger or weaker for firms with foreign affiliates, we employ the following proxy for the existence of affiliates in Canada. U.S. firms are increasingly opening Canadian offices to host high-skilled foreign workers who can easily obtain a Canadian work visa through the Canadian Global Talent Stream program.[18] For each sample firm, we identify its employees on LinkedIn and construct an indicator that takes the value of 1 if the firm has any employees working in Canada. We then interact the indicator with H1B_WIN_RATE in equation (1) to understand its cross-sectional effects. To conserve space, we report the full estimation results in Panel B of Table A9 in the Supplementary Material and present the coefficient on the interaction variable of interest in Panel A of Table 3. The coefficient on the interaction between H1B_WIN_RATE and the indicator is positive and statistically significant at the 5% or 10% level in the four columns. The results indicate that the availability of foreign affiliates lowers the firm's tendency to acquire when facing shortages of skilled foreign workers.

In sum, the baseline results are robust to alternative model specifications and factors that might affect the design of our natural experiment. These factors include visa over-petitioning, H-1B visa applicants' academic degree level, OPT work permits, and the existence of foreign affiliates.

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[17] OPT allows foreign undergraduate and graduate students with F-1 visas who have completed or have been pursuing their degrees for 1 academic year to work for 1 year on a student visa toward obtaining practical training to complement their education. For STEM students, the OPT period was extended from 12 months to 27 months in 2008 and further to 36 months in 2016. An H-1B visa applicant can continue to work for his or her employer and reapply for an H-1B visa after losing the H-1B visa lottery if the applicant continues to be in F-1 student visa status while on OPT. The I-129 microdata do not allow us to identify which applicants are on OPT.

[18] See https://insights.dice.com/2019/03/25/h-1b-hiring-moving-jobs-canada/ and https://syndesus.com/how-canadas-immigration-alternative-helped-a-u-s-opt-visa-holder-discover-home-in-vancouver/.

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VI. Cross-Sectional Tests of the Acquiring Hypothesis

In this section, we conduct more tests of the acquiring hypotheses developed in Section II. In line with the hypotheses, we find the baseline results are stronger among firms facing a tight labor market, firms with high human capital and more senior workforces, and firms that are experienced acquirers (i.e., likely better at retaining acquired workers). The baseline results are also stronger when the target firm has skilled workers and more junior workforces and when the target firm is

TABLE 3

H-1B Visa Lottery Outcome and Firm Acquisition Activity: Cross-Sectional Tests

In Table 3, we augment equation (1) by including each of the 12 moderating variables mentioned in Sections V.B.6 and VI.A–VI.D (relating to the existence of Canadian affiliates, labor market tightness, the level of the firm's human capital, the firm's team structure, seniority of the firm's workers measured by their work experience, and the firm's acquisition experience) and each variable's interaction with the fraction of the company's demand for H-1B visas that is met (H1B_WIN_RATE). See Sections V.B.6 and VI.A–VI.D for definitions of the moderating variables. Panel A presents the coefficients on the interaction variables in the OLS regressions in which the dependent variables are the IHS transformation of the number of acquisitions (column 1), an indicator of whether the firm has an acquisition (column 2), the IHS transformation of the number of acquired workers identifiable from LinkedIn (column 3), and the IHS transformation of the number of acquired STEM workers identifiable from LinkedIn (column 4) in year $t+1$. The full estimation results for these regressions are presented in Panels B–M of Table A9 in the Supplementary Material. Panel B presents summary statistics of acquisitions of different types of targets undertaken by the sample firms. Columns 1–8 of Panel C present the estimation results of equation (1), where the dependent variables are the IHS transformations of the number of acquisitions of different types of targets in year $t+1$. The last three columns of Panel C present the difference in the coefficient on H1B_WIN_RATE across different columns and the associated standard errors of the difference. The last row of Panel C reports the percentage change in the dependent variable for each 1-standard-deviation increase in H1B_WIN_RATE. The main independent variable in the regressions in Panels A and C is H1B_WIN_RATE. We estimate a company's demand for cap-subject foreign workers using its Labor Condition Application (LCA) filings and the number of cap-subject H-1B visas granted to the company using its processed I-129 petitions (detailed in Appendix B of the Supplementary Material). Other explanatory variables are a set of firm characteristics measured in year t, the firm fixed effects, and the industry × year fixed effects (2-digit NAICS). See the Appendix for variable definitions. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Standard errors in parentheses are clustered at the firm level.

Panel A. Impacts of Canadian Affiliates, Labor Market Condition, and Acquirer Characteristics

	NUM_ACQ	IND_ACQ	NUM_ACQUIRED	NUM_ACQUIRED_STEM
	1	2	3	4
Panel A1. Has Employees in Canada				
H1B_WIN_RATE × has employee in Canada	0.037* (0.021)	0.041** (0.017)	0.162** (0.078)	0.114* (0.061)
Panel A2. Labor Market Tightness				
H1B_WIN_RATE × low occupational unemployment	−0.047*** (0.017)	−0.040*** (0.015)	−0.128* (0.069)	−0.081 (0.051)
H1B_WIN_RATE × low occupational hire rate	−0.093* (0.049)	−0.093** (0.043)	−0.496*** (0.182)	−0.455*** (0.147)
Panel A3. The Firm's Human Capital and Team Structure				
H1B_WIN_RATE × high wage	−0.107** (0.046)	−0.099** (0.041)	−0.327* (0.179)	−0.218 (0.143)
H1B_WIN_RATE × high frac. STEM workers	−0.109** (0.050)	−0.111** (0.044)	−0.255** (0.119)	−0.270* (0.145)
H1B_WIN_RATE × high frac. tech workers	−0.139*** (0.047)	−0.116*** (0.042)	−0.239** (0.116)	−0.104 (0.075)
H1B_WIN_RATE × high frac. creative workers	−0.068*** (0.026)	−0.057** (0.024)	−0.160** (0.071)	−0.101** (0.044)
H1B_WIN_RATE × high frac. bachelor's degree or higher	−0.102** (0.050)	−0.094** (0.043)	−0.399** (0.181)	−0.309** (0.141)
H1B_WIN_RATE × high frac. master's degree or higher	−0.100* (0.055)	−0.090* (0.051)	−0.574*** (0.212)	−0.459*** (0.151)
H1B_WIN_RATE × high frac. doctoral degree	−0.120** (0.054)	−0.094** (0.047)	−0.346* (0.194)	−0.279* (0.151)
Panel A4. Seniority of the Firm's Employees				
H1B_WIN_RATE × firm with senior workers	−0.078 (0.062)	−0.053 (0.054)	−0.521** (0.231)	−0.443** (0.189)
Panel A5. Experienced Acquirers				
H1B_WIN_RATE × experienced acquirer	−0.041** (0.018)	−0.036** (0.016)	−0.222*** (0.074)	−0.167*** (0.058)

(continued on next page)

TABLE 3 (continued)

H-1B Visa Lottery Outcome and Firm Acquisition Activity: Cross-Sectional Tests

Panel B. Summary Statistics of Acquisitions of Different Types of Target Firms

	N	Mean	Std. Dev.	5 Percentile	25 Percentile	50 Percentile	75 Percentile	95 Percentile
NUM_ACQ, targets with junior workforce	3,869	0.269	0.725	0.000	0.000	0.000	0.000	1.000
NUM_ACQ, targets with senior workforce	3,869	0.130	0.427	0.000	0.000	0.000	0.000	1.000
NUM_ACQ, targets with STEM workers	3,869	0.249	0.637	0.000	0.000	0.000	0.000	1.000
NUM_ACQ, targets w/o STEM workers	3,869	0.151	0.530	0.000	0.000	0.000	0.000	1.000
NUM_ACQ, targets w/o patent	3,869	0.307	0.810	0.000	0.000	0.000	0.000	2.000
NUM_ACQ, targets with patent	3,869	0.093	0.344	0.000	0.000	0.000	0.000	1.000
NUM_ACQ, targets in states with strong non-compete laws	3,869	0.169	0.507	0.000	0.000	0.000	0.000	1.000
NUM_ACQ, targets in states with weak non-compete laws	3,869	0.229	0.616	0.000	0.000	0.000	0.000	1.000

Panel C. H-1B Lottery Outcome and Acquisitions of Different Types of Target Firms

	NUM_ACQ											
	Targets with Junior Workers	Targets with Senior Workers	Targets with STEM Workers	Targets w/o STEM Workers	Targets w/o Patent	Targets with Patent	Targets in Strong NC	Targets in Weak NC				
	1	2	3	4	5	6	7	8	1–2	3–4	5–6	7–8
H1B_WIN_RATE	−0.036***	−0.009	−0.038***	−0.006	−0.031**	−0.014*	−0.067***	−0.011	−0.027**	−0.032***	−0.017	−0.057*
	(0.010)	(0.007)	(0.010)	(0.006)	(0.012)	(0.008)	(0.024)	(0.021)	(0.011)	(0.011)	(0.015)	(0.030)
SIZE	0.020	0.021*	0.037**	−0.002	0.041*	0.002	0.039*	0.011				
	(0.016)	(0.011)	(0.018)	(0.013)	(0.023)	(0.013)	(0.020)	(0.017)				
LEVERAGE	−0.118**	−0.082*	−0.111*	−0.081*	−0.052	−0.025	−0.057	−0.101*				
	(0.059)	(0.047)	(0.067)	(0.045)	(0.077)	(0.053)	(0.063)	(0.058)				
ROA	−0.032	−0.013	0.004	−0.017	0.024	0.012	0.011	−0.004				
	(0.045)	(0.036)	(0.045)	(0.030)	(0.059)	(0.032)	(0.051)	(0.035)				
TOBINS_Q	0.009	−0.008	−0.003	0.006	0.001	0.006	−0.002	0.002				
	(0.007)	(0.005)	(0.007)	(0.005)	(0.009)	(0.006)	(0.008)	(0.008)				
CASH	0.094	0.087	0.100	0.043	0.118	0.003	0.132	0.009				
	(0.084)	(0.069)	(0.091)	(0.065)	(0.118)	(0.071)	(0.091)	(0.080)				
EMPLOYMENT	−1.761**	1.357**	0.053	−0.260	−2.228	0.206	1.640	0.510				
	(0.735)	(0.528)	(0.735)	(0.536)	(1.600)	(0.189)	(1.091)	(0.943)				
FRAC_ADV_DEG	−0.002	0.091	−0.054	0.092	−0.411	0.096	−0.119	0.073				
	(0.297)	(0.161)	(0.308)	(0.179)	(0.286)	(0.224)	(0.210)	(0.253)				
No. of obs.	3,869	3,869	3,869	3,869	3,869	3,869	3,869	3,869				
Adj. R^2	0.282	0.177	0.234	0.208	0.254	0.134	0.247	0.220				
Company FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes				
Industry × year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes				
Economic magnitude	−5.25%	−2.65%	−5.96%	−1.52%	−4.00%	−5.73%	−15.24%	−1.87%				

located in states with stronger enforcement of noncompete laws, which makes acquiring more appealing compared to poaching. In addition, the baseline results remain robust among target firms with or without patents, consistent with the view that the acquirer wants the target's skilled workers rather than its intellectual property. Furthermore, after losing H-1B visa lotteries, firms grant employees more stock options to attract and retain skilled workers.

A. Tightness of the Labor Market

Acquires are more appealing than direct hiring and poaching when the labor market is tight. We thus construct two proxies for the tightness of the labor market: an indicator for low occupational unemployment rate and an indicator for low occupational hire rate. In the same spirit as Lee, Mauer, and Xu (2018), we construct a measure of unemployment rate faced by firms by weighting the median occupational unemployment rate at the 2-digit OCC code by the proportion of employees at the 4-digit NAICS level using data from the Occupational Employment and Wage Statistics (OEWS) provided by the U.S. Bureau of Labor Statistics (BLS). We then assign the weighted values to the sample firms in each year based on their 4-digit NAICS. We follow Xu (2023) in the construction of commuting the zone level hiring rate using the Quarterly Workforce Indictors data from the U.S. Census Bureau. A firm is classified as having a low occupational unemployment (hiring) rate if its weighted average median occupational unemployment (hiring) rate is below the sample median for a given year.

We add each indicator for the tightness of the labor market and the interaction between the indicator and H1B_WIN_RATE to the right-hand-side of equation (1). The full regression results are presented in Panels C and D of Table A9 in the Supplementary Material, while the coefficients on the two interaction variables of interest are reported in Panel A of Table 3. The coefficient on the interaction between H1B_WIN_RATE and the indicator for low unemployment rate is negative through the four columns; it is statistically significant at the 1% or 10% level in the first three columns and is insignificant in the last column, where the dependent variable is the IHS transformation of the count of acquired STEM workers. The coefficient on the interaction between H1B_WIN_RATE and the indicator for low hire rate is negative and statistically significant through the four columns. Viewed together, the results suggest shortages of skilled foreign labor have stronger effects on the firm's acquiring activity when the firm faces a tight labor market.

B. Level of Human Capital and Team Structure

Firms with high human capital are expected to be more likely to acquire because human capital is more important for these firms. To test this prediction, we create seven indicators for high human capital firms based on their employees' wage, skill, and education. The indicators are: i) high employee wage, which takes the value of 1 if the firm's weighted average median occupational wages (6-digit OCC code) by the proportion of employees at the 4-digit NAICS level is above the sample median;[19] ii) a high fraction of STEM employees, which takes the value of 1 if the firm's fraction of STEM employees on LinkedIn is above the sample median, and 0 otherwise; iii) a high fraction of employees with technological skills; iv) a high fraction of employees with creative skills; v) a high fraction of employees with bachelor's degrees or higher; vi) a high fraction of employees with master's degrees or higher; and vii) a high fraction of employees with doctoral degrees. The last five indicators are defined using LinkedIn data, similar to the second indicator. Note that the last six indicators also relate to the firm's employee team structure. For instance, a high fraction of STEM, technically skilled, or creatively skilled workers indicates a more technical and innovative employee team.

We add each of the seven indicators and its interaction with H1B_WIN_RATE as explanatory variables to equation (1) and present the estimation results in Panels

[19]We follow similar methodology as Lee, Mauer, and Xu (2018) using OEWS data from BLS as explained previously.

E–K of Table A9 in the Supplementary Material. The coefficients on the interaction variables of interest are also displayed in Panel A of Table 3. The coefficients on the interaction variables are negative throughout the 28 model specifications (7 indicators × 4 model specifications) and are statistically significant in 26 of the 28 regressions. The results suggest stronger effects of labor shortage on acquiring activity among firms with high human capital and among firms with more technological and innovative employee teams.

C. Seniority of Firm Employees

A large fraction of H-1B workers are young foreigners who just finished their education in the U.S. Younger workers may be more up-to-date with certain technologies (e.g., Ouimet and Zarutskie (2014)). Therefore, it is conceivable that firms hire H-1B workers to bring in new, junior blood to their workforce. After losing H-1B visa lotteries, the firms could acquire junior skilled workers from other firms. In line with this conjecture, the employees of the sample firms that apply for H-1B visas are more senior than the workers of their target firms. The employees of H-1B visa-applying firms have an average work experience of 13.3 years, compared to the average 5.7 years of work experience for the target firms' employees (see Section VII). The desire for junior skilled workers could be stronger for firms with a more senior workforce. We test this conjecture by constructing an indicator that takes the value of 1 if the firm's employees' average work experience is above the sample median, and 0 otherwise. We add this indicator and its interaction with H1B_WIN_RATE to equation (1) and present the regression results in Panel L of Table A9 in the Supplementary Material. The coefficient on the interaction variable, which is also displayed in Panel A of Table 3, is negative and statistically insignificant when the dependent variable is the number of M&As and the indicator for M&As (columns 1 and 2) and is negative and statistically significant at the 5% level when the dependent variable is the number of acquired workers (columns 3 and 4). On balance, when facing shortages of foreign skilled workers, firms with a more senior workforce tend to acquire more skilled workers than firms with a more junior workforce.

We also test whether the firms' acquiring activity concentrates in targets firms with junior workers. To do so, we classify the target firms into senior (junior) depending on whether the target firm's employees' average work experience is above (below) the median of the average employee work experience of all target firms identifiable from LinkedIn. In column 1 in Panel C of Table 3, we replace the dependent variable of equation (1) with the IHS transformation of the number of acquisitions targeting firms with a junior workforce. The coefficient on H1B_WIN_RATE is −0.036 and statistically significant at the 1% level. In column 2 in Panel C of Table 3, where the dependent variable is the IHS transformation of the count of acquisitions that target firms with a senior workforce, the coefficient on H1B_WIN_RATE is −0.009 and statistically insignificant. The difference in the coefficient across the two columns is statistically significant at the 5% level. The results suggest the firms' acquiring activity concentrates in target firms with a junior workforce.

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D. Experienced Acquirers

Prior studies show that experienced acquirers are better at retaining acquired workers (Puranam and Srikanth (2007), Kim (2018)). Thus, we expect experienced acquirers to find it more appealing to acquire. We classify a firm as an experienced acquirer if its cumulative number of completed M&As up to the lottery year exceeds the sample median. We then interact the experienced acquirer indicator with H1B_WIN_RATE in equation (1) to understand its cross-sectional effects. The coefficient on this interaction variable is negative and statistically significant throughout the four columns in Panel A of Table 3 (see Panel M of Table A9 in Supplementary Material for the full regression results). The results suggest experienced acquirers are more likely to acquire than inexperienced acquirers when they face shortages of skilled workers.

E. Acquisitions of Firms With Versus Without STEM Workers

If firms acquire when short on skilled labor, they are more likely to buy targets that have high-skilled workers (e.g., STEM workers). We thus re-estimate equation (1), replacing the dependent variable with the IHS transformation of the number of acquisitions targeting firms with and without STEM workers on LinkedIn. The results, presented in columns 3 and 4 in Panel C of Table 3, show that firms buy more targets with STEM workers but not targets without STEM workers. The coefficient on H1B_WIN_RATE is −0.038 and statistically significant at the 1% level when the dependent variable concerns acquisition targets with STEM workers (column 3). The coefficient shrinks to −0.006 and becomes statistically insignificant when the dependent variable concerns acquisition targets without STEM workers (column 4). The difference in the coefficient across the two columns is statistically significant at the 1% level. Taken together, shortfalls in high-skilled labor result in more acquisitions of targets with STEM workers but not more acquisitions of targets without STEM workers. The results suggest that buying high-skilled workers is a primary driver of the M&As undertaken after losing H-1B visa lotteries.

F. Acquisitions of Targets With Versus Without Patents

Skilled workers often create intellectual property, notably patents. Shortages of skilled labor curtail patent production in-house, which may force firms to buy patents through M&As. Skilled labor shortages could thus turn a firm's innovation strategy from internal development to external acquisition. If so, patents rather than talent could drive the acquisitions studied previously.

We test this possibility by distinguishing acquisitions of targets with patents from those without patents. About 77% of the target firms do not have patents (Panel B of Table 3). Column 5 in Panel C of Table 3, in which the dependent variable is the IHS transformation of the count of acquisitions of targets without patents, shows that the coefficient on H1B_WIN_RATE is −0.031 and statistically significant at the 5% level. In column 6, where the dependent variable is the IHS transformation of the count of acquisitions of targets with patents, the coefficient on H1B_WIN_RATE is −0.014 and statistically significant at the 10% level.

The difference in the coefficient across the two columns is statistically insignificant. The results indicate that deficits in skilled labor result in more acquisitions regardless of whether the target firm has patents. It appears that acquiring firms are not solely buying patents from the target firms. Rather, they are likely buying talent.

G. Noncompete State Laws

It is more difficult to poach talent from a firm headquartered in states with strong enforcement of noncompete laws. Thus, an acquisition is more likely to be an acquire if the target firm is in a state with strong noncompete laws (Chen et al. (2021)). We thus re-estimate equation (1) and replace the dependent variable with the IHS transformation of the count of acquisitions in which the target is headquartered in a state with strong (weak) enforceability of noncompete labor laws. We regard the target firm's headquarter state as having strong (weak) enforceability of noncompete labor laws if its enforceability index (Garmaise (2011), Ertimur, Rawson, Rogers, and Zechman (2018)) is above (below) the median within our sample of target firms. Columns 7 and 8 in Panel C of Table 3 report the estimation results for states with strong and weak enforceability of noncompete labor laws, respectively. The coefficient on H1B_WIN_RATE is −0.067 and statistically significant at the 1% level in column 7 and is −0.011 and statistically insignificant in column 8. The difference in the coefficient across the two columns is statistically significant at the 10% level. Shortages of skilled labor seem to induce firms to acquire targets located in states with strong enforcement of noncompete laws, but the effect is weaker for targets located in states with weaker enforcement of noncompete laws. Firms seem to be more likely to acquire when poaching is more difficult in the presence of strong noncompete laws, which is consistent with the acquiring hypothesis.

H. Employee Stock Options

Firms often attract and retain talented employees by granting them stock options. We thus expect an increase in the acquirer's outstanding employee stock options and new option grants if the acquirer is truly recruiting talent through acquisitions.[20] To test this hypothesis, we estimate equation (1) using several measures of employee stock option grants as dependent variables. Table 4 reports the estimation results using four outcome variables related to employee stock options: i) the ratio of employee stock option grants to outstanding employee stock options, averaged over years t and $t + 1$; ii) the average new stock option grants per employee in years t and $t + 1$; iii) the average percentage change in employee stock options in years t and $t + 1$; and iv) the average change in outstanding stock options per employee in years t and $t + 1$. We observe that the coefficient on H1B_WIN_RATE is negative and statistically significant across the four columns.

In sum, the results so far suggest that the effects of H-1B lottery outcomes on the firm's acquiring activity are stronger when the labor market is tight, when

[20]Carter and Lynch (2004) and Babenko (2009), for example, measure employee turnover using the number of forfeited options deflated by the number of outstanding options.

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TABLE 4

H-1B Lottery Outcome and Employee Stock Options

Table 4 presents OLS estimation results of company–year panel regressions in equation (1) over the years 2008–2009 and 2014–2017. The dependent variables in the four columns are: i) the ratio of new employee option grants to outstanding employee options, averaged over years t and $t+1$, ii) the average new option grants per employee in years t and $t+1$, iii) the average percentage change in employee options in years t and $t+1$, and iv) the average change in outstanding options per employee in years t and $t+1$. The main independent variable is the fraction of the company's demand for H-1B visas that is met (H1B_WIN_RATE). We estimate a company's demand for cap-subject foreign workers using its Labor Condition Application (LCA) filings and the number of cap-subject H-1B visas granted to the company using its processed I-129 petitions (detailed in Appendix B of the Supplementary Material). Other explanatory variables are a set of firm characteristics measured in year t, the firm fixed effects, and the industry × year fixed effects (2-digit NAICS). See the Appendix for variable definitions. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Standard errors in parentheses are clustered at the firm level.

	FRAC_NEW_ OPTIONS	NEW_OPTIONS_ PER_EMP	PCT_CHG_ OPTIONS_OUT	CHG_OPTIONS_ PER_EMP
	1	2	3	4
H1B_WIN_RATE	−0.029**	−0.777*	−0.020**	−0.329**
	(0.013)	(0.409)	(0.010)	(0.143)
SIZE	−0.007	−0.266	−0.006	−0.069
	(0.011)	(0.427)	(0.008)	(0.174)
LEVERAGE	0.053	1.934	0.011	1.419*
	(0.040)	(1.799)	(0.026)	(0.807)
ROA	−0.127***	−5.243	−0.062**	−1.953
	(0.037)	(3.241)	(0.029)	(1.282)
TOBINS_Q	0.001	−0.070	−0.001	−0.108
	(0.004)	(0.181)	(0.003)	(0.085)
CASH	−0.121**	−1.494	−0.081*	−0.220
	(0.059)	(2.278)	(0.047)	(1.140)
EMPLOYMENT	−0.040	−23.923	−0.066	−7.835
	(0.465)	(26.609)	(0.395)	(10.226)
FRAC_ADV_DEG	−0.179	−11.611	−0.123	−4.724
	(0.143)	(9.220)	(0.109)	(3.688)
No. of obs.	3,869	3,869	3,869	3,869
Adj. R^2	0.422	0.637	0.365	0.611
Company FE	Yes	Yes	Yes	Yes
Industry × year FE	Yes	Yes	Yes	Yes

poaching is more difficult due to noncompete laws, when the firm has no foreign affiliates, and among firms with high human capital and with more acquisition experience. The effects concentrate in the acquisition of targets that have skilled workers and junior workers. In addition, the acquirers short on skilled workers are not solely buying the target firms' intellectual property (i.e., patents). Lastly, firms short on skilled workers are more likely to increase employee stock option grants to attract and retain skilled workers. Overall, these results support the acquiring hypothesis.

VII. Additional Direct Evidence on Acquired High-Skilled Workers

Section V shows that firms obtain high-skilled workers through M&As after losing H-1B visa lotteries. In this section, we examine the different types of high-skilled workers acquired. We focus on two groups of high-skilled workers whose information we can access: H-1B workers in the I-129 microdata and skilled workers who voluntarily disclose their information on LinkedIn, the world's largest professional network.

A. Direct Evidence on Acquired High-Skilled Foreign Workers

We identify acquired H-1B workers using the I-129 microdata, whose coverage starts in 1999.[21] The sample firms in our natural experiment have hired a pooled average of 360.3 H-1B workers up to the lottery year (Panel A of Table 5), which accounts for about 1.9% of the average employment reported in Compustat (Panel A of Table 2). Although H-1B workers comprise a small fraction of the U.S. workforce, they represent a large fraction of the high-skilled workforce. Consider STEM workers, who are widely regarded as highly skilled and are prime candidates to be acquired. STEM workers comprised only 7% of the U.S. workforce in 2019 according to U.S. Census Bureau's estimates (Martinez and Christnacht (2021)). Among STEM workers, one-fifth to one-quarter are foreign born according to the estimates of the American Immigration Council.[22] The share of foreign-born skilled labor is even higher for professions that require more advanced skills. For instance, the fraction of foreign-born workers is almost 40% for software engineers and is above 40% for physical and medical scientists. The substantive fraction of foreign-born, high-skilled workers suggests that our findings on acquiring H-1B workers can facilitate understanding of acquiring high-skilled workers in general.

As mentioned, STEM workers make up only 7% of the U.S. workforce. Assuming 7% of all workers are highly skilled, H-1B workers would represent 27.1% (= 1.9%/7%) of the sample firms' high-skilled workers. These firms undertake an average of 0.4 acquisitions per year (Panel A of Table 2). Among these acquisitions, 45.0% involve target firms that have hired H-1B workers before the acquisition (Panel A of Table 5). These firms acquire an average of 19.5 H-1B workers per year, which represents 5.4% (= 19.5/360.3) of the H-1B workers in the acquiring firm or 76.1% of the annual H-1B visa lotteries lost (= 19.5/(36.5–10.9)). These fractions suggest that sample firms recover a significant fraction of the lost H-1B visa lotteries through acquires.

In column 1 in Panel B of Table 5, we replace the dependent variable with the IHS transformation of the number of H-1B workers acquired from the targets. The coefficient on H1B_WIN_RATE is negative and statistically significant at the 1% level. In terms of the economic magnitude, each 1-standard-deviation reduction in the lottery win rate raises the annual number of acquired H-1B workers by 6.6% or about 1.3 (= 6.6% × 19.5) H-1B workers given the average number of acquired H-1B workers of 19.5 (Panel A of Table 5). The 1.3 acquired

[21]For acquisitions in which the acquirer is considered a "successor-in-interest," employers do not have to file amended H-1B petitions or new LCAs so long as the acquired H-1B worker's job function, duties, and work location are expected to remain unchanged. The acquirer is only required to place a "notice" in each impacted H-1B worker's "Public Access File" (subject to review by the DOL) before the effective date of employment post-acquisition. This notice must indicate that the acquirer accepts the obligations and liabilities of the H-1B workers' LCAs filed by the target firm. Otherwise, the acquirer must file amended H-1B petitions or change of employer applications with the USCIS before the employee begins employment with the acquirer. Note that these new filings with the USCIS, which have a median processing time of 13 days in our sample, are not subject to the H-1B visa cap.

[22]The research report is available at https://www.americanimmigrationcouncil.org/research/foreign-born-stem-workers-united-states.

TABLE 5

Acquired H-1B Workers

Panel A of Table 5 presents summary statistics of acquired H-1B workers and acquisitions of different types of targets undertaken by the sample firms. Panel B presents OLS estimation results of equation (1) over the years 2008–2009 and 2014–2017. In column 1, the dependent variable is the IHS transformation of the number of acquired H-1B workers in year $t+1$. In the last four columns, the dependent variable is the IHS transformation of the number of acquisitions in year $t+1$ in which the target or the deal has one of the following characteristics: the target has H-1B workers or not (columns 2 and 3) and the target has H-1B workers with positive job function similarity scores as the acquirer's workers or not (columns 4 and 5). We identify the firm's H-1B workers from the I-129 data set starting from 1999. The last two columns present the difference in the coefficient on the fraction of the company's demand for H-1B visas that is met (H1B_WIN_RATE) across different columns and the associated standard error of the difference. The last row reports the percentage change in the dependent variable for each 1-standard-deviation increase in H1B_WIN_RATE, the main independent variable. We estimate a company's demand for cap-subject foreign workers using its Labor Condition Application (LCA) filings and the number of cap-subject H-1B visas granted to the company using its processed I-129 petitions (detailed in Appendix B of the Supplementary Material). Other explanatory variables are a set of firm characteristics measured in year t, the firm fixed effects, and the industry × year fixed effects (2-digit NAICS). See the Appendix for variable definitions. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Standard errors in parentheses are clustered at the firm level.

Panel A. Summary Statistics of Acquisitions With and Without H-1B Workers in the Target Firm

	N	Mean	Std. Dev.	5 Percentile	25 Percentile	50 Percentile	75 Percentile	95 Percentile
NUM_ACQ, with H-1B workers	3,869	0.180	0.500	0.000	0.000	0.000	0.000	1.000
NUM_ACQ, w/o H-1B workers	3,869	0.220	0.667	0.000	0.000	0.000	0.000	1.000
NUM_ACQ, with H-1B workers of similar skills/occupations	3,869	0.163	0.481	0.000	0.000	0.000	0.000	1.000
NUM_ACQ, w/o H-1B workers of similar skills/occupations	3,869	0.237	0.691	0.000	0.000	0.000	0.000	1.000
NUM_ACQUIRED H-1B workers	3,869	19.488	346.456	0.000	0.000	0.000	0.000	19.000
No. of existing H-1B workers	3,869	360.334	1,535.188	0.000	16.000	55.000	186.000	1,209.000
CAP_H1B_GRANT	3,869	10.937	58.396	0.000	0.000	1.000	4.000	30.000
CAP_H1B_DEMAND	3,869	36.549	268.075	1.000	1.000	3.000	8.000	71.000

Panel B. H-1B Visa Lottery Outcome and Acquisitions of H-1B Workers from the Target Firm

	NUM_ACQUIRED	NUM_ACQ					
	H-1B Workers	With H-1B Workers	W/o H-1B Workers	With H-1B Workers of Similar Skills	W/o H-1B Workers of Similar Skills		
	1	2	3	4	5	2–3	4–5
H1B_WIN_RATE	−0.174**	−0.071***	−0.003	−0.069***	−0.028	−0.067**	−0.041**
	(0.074)	(0.020)	(0.026)	(0.019)	(0.017)	(0.032)	(0.019)
SIZE	−0.083	−0.011	0.028	−0.004	0.002		
	(0.059)	(0.018)	(0.025)	(0.017)	(0.012)		
LEVERAGE	−0.189	−0.183***	0.035	−0.153***	−0.113**		
	(0.221)	(0.058)	(0.068)	(0.055)	(0.054)		
ROA	0.099	0.012	0.003	0.023	−0.019		
	(0.124)	(0.035)	(0.055)	(0.034)	(0.031)		
TOBINS_Q	0.061***	0.004	0.004	0.005	0.003		
	(0.023)	(0.007)	(0.010)	(0.006)	(0.005)		
CASH	0.581*	0.127	−0.035	0.127	0.018		
	(0.343)	(0.095)	(0.092)	(0.092)	(0.061)		
EMPLOYMENT	−2.030	−0.860	−0.779	0.189	−0.710		
	(1.692)	(0.934)	(1.541)	(0.260)	(0.970)		
FRAC_ADV_DEG	1.983*	0.298	−0.610**	0.286	0.059		
	(1.166)	(0.255)	(0.265)	(0.233)	(0.166)		
No. of obs.	3,869	3,869	3,869	3,869	3,869		
Adj. R^2	0.097	0.171	0.239	0.202	0.125		
Company FE	Yes	Yes	Yes	Yes	Yes		
Industry × year FE	Yes	Yes	Yes	Yes	Yes		
Economic magnitude	−6.60%	−15.19%	−0.53%	−16.26%	−4.60%		

H-1B workers per year are economically meaningful relative to the annual deficit of 25.6 H-1B visas.

The count of H-1B workers in the firms could be noisy for two reasons, however. First, the I-129 data start in 1999 and thus exclude H-1B workers hired before 1999. Second, H-1B workers may switch employers. Measurement error in the dependent variable makes it harder to observe significant effects (Angrist and Pischke (2009)). Still, we find strong and consistent effects that, after losing H-1B visa lotteries, firms acquire other firms that have hired H-1B workers.

If recruiting talent is a primary driver of the acquisitions we study, the baseline results should be stronger for acquisitions of targets that also employ H-1B workers (the high-skilled workers that the acquirer needs). To test this prediction, we re-estimate equation (1) and replace the dependent variable with the IHS transformation of the number of acquisitions in which the target has hired H-1B workers before the lottery year. The regression results, presented in column 2 in Panel B of Table 5, show that the coefficient on H1B_WIN_RATE is −0.071 and statistically significant at the 1% level. In column 3 in Panel B of Table 5, we replace the dependent variable with the IHS transformation of the number of acquisitions in which the target has not hired H-1B workers before the lottery year. The coefficient on H1B_WIN_RATE is now −0.003 and becomes statistically insignificant. The difference in the coefficient across the two columns is statistically significant at the 5% level. These findings are consistent with the results in Panel C of Table 3 based on STEM workers. Both tables suggest that hiring talent is a primary driver of the acquisitions undertaken after losing H-1B visa lotteries.

We also estimate the fit of the acquirer's and the target's H-1B workers before the acquisition. For each firm, we construct a vector of H-1B worker counts. Each element of the vector corresponds to a unique job category specified in I-129 petitions. The similarity score for an acquisition equals the cosine similarity of the acquirer's and the target's job function count vectors.[23] The similarity score is 0 if the acquirer/target has not hired H-1B workers before the acquisition. A higher similarity score means that the target's H-1B workers possess skills and occupations more like the acquirer's H-1B workers, suggesting that the acquirer's and the target's H-1B workers are a better fit.

Skill complementarity with the existing workforce is also important in hiring decisions (Beaumont, Hebert, and Lyonnet (2022)). After losing H-1B visa lotteries, the acquirer likely needs workers with similar skills to replace the H-1B workers who fail to secure an H-1B visa. Thus, we re-estimate equation (1) with the dependent variable replaced with the IHS transformation of the number of acquisitions in which the acquirer's and the target's H-1B workers have positive job function similarity scores. The coefficient on H1B_WIN_RATE is −0.069 and statistically significant at the 1% level (column 4 in Panel B of Table 5). We repeat the analysis by replacing the dependent variable with the IHS transformation of the number of acquisitions in which the target has no H-1B workers or the acquirer's and the target's H-1B workers do not have positive job function similarity scores. The coefficient on H1B_WIN_RATE becomes −0.028 and statistically insignificant (column 5 in Panel B of Table 5). The difference in the coefficient across the two columns is statistically significant at the 5% level.

Taken together, the results indicate that high-skilled H-1B workers with similar occupations and skills as the firm's existing workers are indeed obtained through these acquisitions.

[23]This measure is similar to the product similarity measure developed by Hoberg and Philips (2010).

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B. Acquired Skilled Workers Identifiable from LinkedIn

Besides the acquired skilled workers identifiable from the I-129 microdata, we also study the types of acquired workers with a LinkedIn profile. The LinkedIn data enable us to observe direct evidence that skilled workers in general are acquired because a large fraction of firms' high-skilled workers likely have LinkedIn profiles, as mentioned previously.

Panel A of Table 6 summarizes the LinkedIn employees for the 3,869 firm-years. The average firm has 2,375 employees on LinkedIn, which is 12.3% of the average number of 19,350 employees reported in Compustat (Panel A of Table 2). The median firm has 622 employees on LinkedIn, which is 17.3% of the median

TABLE 6

Acquired Skilled Workers Identified from LinkedIn

From LinkedIn, we retrieve information on the employees of the sample firms and the target firms they acquire. The analysis in Table 6 only includes the sample firms and the target firms that have at least one employee identified on LinkedIn. Panel A1 presents summary statistics of the employees of the sample firms and their acquired workers identifiable on LinkedIn; Panel A2 presents summary statistics of the employees on LinkedIn at the target firms. Panels B and C present the OLS estimation results of equation (1) over the years 2008–2009 and 2014–2017. In Panel B, the dependent variables are the IHS transformations of the count of acquired workers on LinkedIn in year $t+1$ with technology skills (column 1), with creative skills (column 2), with bachelor's degrees or higher (column 3), with master's degrees or higher (column 4), or with doctoral degrees (column 5). For each acquirer-target pair, we compute the similarity score between their workers based on their educational majors or technology skills. The dependent variables in Panel C are the IHS transformations of the count of acquisitions in year $t+1$ in which the similarity scores based on employee educational majors (column 1) and employee skills (column 3) are positive, or 0 (columns 2 and 4). The last two columns in Panel C present the difference in the coefficient on the fraction of the company's demand for H-1B visas that is met (H1B_WIN_RATE) across different columns and the associated standard errors. The last row of Panels B and C reports the percentage change in the dependent variable for each 1-standard-deviation increase in H1B_WIN_RATE, the main independent variable. We estimate a firm's demand for cap-subject foreign workers using its Labor Condition Application (LCA) filings and the number of cap-subject H-1B visas granted to the company using its processed I-129 petitions (detailed in Appendix B of the Supplementary Material). Other explanatory variables are a set of firm characteristics measured in year t, the firm fixed effects, and the industry × year fixed effects (2-digit NAICS). See the Appendix for variable definitions. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Standard errors in parentheses are clustered at the firm level.

Panel A. Summary Statistics of Sample Firms' and Their Target Firms' Employees on LinkedIn

	N	Mean	Std. Dev.	5 Percentile	25 Percentile	50 Percentile	75 Percentile	95 Percentile
Panel A1. Summary Statistics of Workers on LinkedIn for Firms in the H-1B Lottery Sample								
No. of all workers ('000)	3,869	2.375	5.590	0.010	0.162	0.622	1.969	9.944
Avg. employee work experience (years)	3,869	13.274	3.313	8.087	11.163	13.296	15.324	18.128
No. of STEM workers ('000)	3,869	0.698	2.001	0.003	0.050	0.175	0.535	2.743
No. workers with tech skills ('000)	3,869	0.886	2.428	0.003	0.050	0.219	0.730	3.280
No. workers with creative skills ('000)	3,869	0.888	2.120	0.003	0.063	0.257	0.800	3.454
No. workers with bachelor's degree ('000)	3,869	0.768	1.724	0.003	0.051	0.208	0.674	3.216
No. workers with master's degree ('000)	3,869	0.388	1.030	0.002	0.027	0.098	0.317	1.643
No. workers with doctoral degree ('000)	3,869	0.080	0.283	0.000	0.004	0.015	0.047	0.278
NUM_ACQUIRED	3,869	56.221	545.997	0.000	0.000	0.000	0.000	73.000
NUM_ACQUIRED_STEM	3,869	20.641	199.153	0.000	0.000	0.000	0.000	25.000
NUM_ACQUIRED, with tech skills	3,869	34.377	226.863	0.000	0.000	0.000	0.000	67.000
NUM_ACQUIRED, with creative skills	3,869	41.159	299.233	0.000	0.000	0.000	0.000	67.000
NUM_ACQUIRED, with bachelor's degree	3,869	32.529	218.931	0.000	0.000	0.000	0.000	61.000
NUM_ACQUIRED, with master's degree	3,869	19.138	136.015	0.000	0.000	0.000	0.000	29.000
NUM_ACQUIRED, with doctoral degree	3,869	4.436	35.599	0.000	0.000	0.000	0.000	6.000
NUM_ACQ, with similar educational majors	3,869	0.294	0.723	0.000	0.000	0.000	0.000	2.000
NUM_ACQ, w/o similar educational majors	3,869	0.105	0.419	0.000	0.000	0.000	0.000	1.000
NUM_ACQ, with similar tech skills	3,869	0.297	0.730	0.000	0.000	0.000	0.000	2.000
NUM_ACQ, w/o similar tech skills	3,869	0.103	0.421	0.000	0.000	0.000	0.000	1.000
Panel A2. Summary Statistics of Workers on LinkedIn for the Target Firms of the Acquisitions								
No. of all workers	1,174	20.601	21.016	1.000	3.000	11.000	36.000	57.000
Avg. employee work experience (years)	1,174	5.739	3.064	1.429	3.200	5.301	8.063	11.000
No. of STEM workers	1,174	6.609	6.900	0.000	1.000	3.500	13.000	18.000
No. workers with tech skills	1,174	15.121	13.666	0.000	3.000	10.000	35.000	35.000
No. workers with creative skills	1,174	14.560	12.342	0.000	3.000	10.000	32.000	32.000
No. workers with bachelor's degree	1,174	13.593	12.573	0.000	2.000	8.000	32.000	32.000
No. workers with master's degree	1,174	6.517	5.870	0.000	1.000	4.000	15.000	15.000
No. workers with doctoral degree	1,174	1.195	1.291	0.000	0.000	1.000	3.000	3.000

(continued on next page)

TABLE 6 (continued)

Acquired Skilled Workers Identified from LinkedIn

Panel B. H-1B Visa Lottery and Acquired Skilled Workers Identified on LinkedIn

	NUM_ACQUIRED				
	With Tech Skills	With Creative Skills	With Bachelor Degree or Higher	With Master's Degree or Higher	With Doctoral Degree
	1	2	3	4	5
H1B_WIN_RATE	−0.173***	−0.181***	−0.141***	−0.147***	−0.069***
	(0.048)	(0.048)	(0.038)	(0.042)	(0.024)
SIZE	0.129**	0.147**	0.133**	0.085	0.024
	(0.064)	(0.065)	(0.053)	(0.056)	(0.035)
LEVERAGE	−0.251	−0.321	−0.317	−0.238	−0.066
	(0.264)	(0.270)	(0.202)	(0.231)	(0.152)
ROA	−0.045	−0.078	−0.074	−0.039	−0.027
	(0.195)	(0.207)	(0.169)	(0.179)	(0.109)
TOBINS_Q	−0.012	−0.012	−0.015	−0.004	0.003
	(0.028)	(0.027)	(0.022)	(0.024)	(0.016)
CASH	0.624*	0.568	0.360	0.484	0.343*
	(0.354)	(0.353)	(0.276)	(0.311)	(0.204)
EMPLOYMENT	1.089	−1.008	−0.922	−1.038	−1.144
	(4.209)	(4.057)	(3.386)	(3.388)	(1.619)
FRAC_ADV_DEG	0.450	0.471	0.148	0.973	1.160
	(1.168)	(1.149)	(0.948)	(1.058)	(0.722)
No. of obs.	3,869	3,869	3,869	3,869	3,869
Adj. R^2	0.207	0.193	0.247	0.188	0.139
Company FE	Yes	Yes	Yes	Yes	Yes
Industry × year FE	Yes	Yes	Yes	Yes	Yes
Economic magnitude	−6.56%	−6.86%	−5.35%	−5.58%	−2.68%

Panel C. H-1B Visa Lottery and Acquisitions of Targets with Employees of Similar Skills/Occupations

	NUM_ACQ					
	With Similar Skills	W/o Similar Skills	With Similar Education Majors	W/o Similar Education Majors		
	1	2	3	4	1–2	3–4
H1B_WIN_RATE	−0.042***	−0.002	−0.040***	−0.004	−0.041***	−0.036***
	(0.010)	(0.004)	(0.010)	(0.005)	(0.010)	(0.010)
SIZE	0.040**	0.001	0.049***	−0.009		
	(0.016)	(0.010)	(0.017)	(0.010)		
LEVERAGE	−0.155**	−0.027	−0.157**	−0.027		
	(0.066)	(0.034)	(0.066)	(0.035)		
ROA	−0.045	0.010	−0.062	0.026		
	(0.054)	(0.024)	(0.054)	(0.026)		
TOBINS_Q	−0.004	0.007*	−0.006	0.009**		
	(0.007)	(0.004)	(0.007)	(0.004)		
CASH	0.158*	0.001	0.125	0.045		
	(0.090)	(0.055)	(0.092)	(0.054)		
EMPLOYMENT	−0.066	−0.383	0.055	−0.515		
	(0.688)	(0.493)	(0.674)	(0.563)		
FRAC_ADV_DEG	0.045	−0.041	0.008	−0.000		
	(0.283)	(0.168)	(0.286)	(0.164)		
No. of obs.	3,869	3,869	3,869	3,869		
Adj. R^2	0.306	0.191	0.300	0.183		
Company FE	Yes	Yes	Yes	Yes		
Industry × year FE	Yes	Yes	Yes	Yes		
Economic magnitude	−5.64%	−0.73%	−5.32%	−1.48%		

number of employees of 3,600 in Compustat. The employees have an average of 13.3 years of work experience. The average firm has 698 STEM workers on LinkedIn, which account for 29.4% of the average number of 2,375 workers on LinkedIn. Assuming 7% of all workers in these firms are STEM workers, 51.6% (= 12.3% × 29.4%/7%) of these firms' STEM workers have LinkedIn accounts.

This fraction matches well with the aforementioned Pew Research Center study in 2021 that 51% of adults with bachelor's or advanced degrees use LinkedIn.

Besides STEM workers, Panel A of Table 6 also presents the count of workers on LinkedIn with technology skills (e.g., software programing) and creative skills (e.g., 3D modeling) for the sample firms. LinkedIn provides a list of keywords for both technology and creative skill classifications that LinkedIn users are encouraged to include on their profiles.[24] The average firm has 886 workers with at least one technology skill and 888 workers with at least one creative skill. The LinkedIn data also contain the worker's educational background. The average firm has 768 employees with bachelor's degrees as their highest degree, 388 with master's degrees, and 80 with doctoral degrees. Thus, employees with at least a bachelor's degree represent 52.0% (= (768 + 388 + 80)/2,375) of these firm's employees on LinkedIn. In short, the LinkedIn data contain a large fraction of workers with technology/creative skills and with college degrees.

The sample firms acquire an average of 56.2 LinkedIn workers per year; among those acquired, 20.6 are STEM workers, 34.4 are workers with technology skills, 41.2 are workers with creative skills, 32.5 have bachelor's degrees, 19.1 have master's degrees, and 4.4 have doctoral degrees. The acquired high-skilled workers meaningfully contribute to the acquiring firm. For example, the 56.2 acquired workers represent 2.4% of the average number of 2,375 LinkedIn workers in the acquiring firms; the 20.6 acquired STEM workers represent 3.0% of the average number of 698 STEM workers in the acquiring firms; and the 19.1 acquired workers with master's degrees are 4.9% of the average number of 388 workers with master's degrees in the acquiring firms. Acquired skilled workers appear to be a meaningful source of the acquiring firms' skilled workforce.

Turning to the target firms matched to LinkedIn, Panel A2 of Table 6 shows that these target firms have an average of 20.6 workers and a median of 11.0 workers on LinkedIn. The workers have an average of 5.7 years of work experience. The target firms employ an average of 6.6 STEM workers, 15.1 workers with technology skills, and 14.6 workers with creative skills. In terms of educational degrees, the average target firm has 13.6 workers with bachelor's degrees, 6.5 workers with master's degrees, and 1.2 workers with doctoral degrees. Note that high-skilled workers represent a substantial fraction of the target firms' workforces. STEM, technologically skilled, and creatively skilled workers account for 32.1%, 73.3%, and 70.7% of the target firms' workforces, respectively. Employees with master's and doctoral degrees represent 31.6% and 5.8% of the target firms' workforces, respectively. In short, these targets indeed have high-skilled, highly educated workers.

The baseline results have shown that firms acquire STEM workers after losing H-1B visa lotteries. In Panel B of Table 6, we examine whether the firms also acquire other high-skilled workers (technologically-trained workers, creative workers, workers with bachelor's degrees or higher, workers with master's degrees or higher, or workers with doctoral degrees) by replacing the dependent variable

[24]For example, technology skills include cloud computing, software development, data science, and so forth. The detailed lists of technology and creative skills provided by LinkedIn can be found here: https://www.linkedin.com/learning/browse/technology.

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with the IHS transformation of the number of such workers acquired through M&As. The regression results for each of the five types of skilled workers are presented in the five columns in Panel B of Table 6, respectively. We observe that the coefficient on H1B_WIN_RATE is negative and statistically significant at the 1% level throughout the five columns. In terms of the economic magnitude, each 1-standard-deviation reduction in H1B_WIN_RATE raises the number of acquired skilled workers by 6.6%, 6.9%, 5.4%, 5.6%, and 2.7%, respectively, for each of the five types of skilled workers. The five numbers translate into 2.3, 2.8, 3.0, 1.3, and 0.1 acquired technologically-trained workers, creative workers, workers with bachelor's degrees or higher, workers with master's degrees or higher, or workers with doctoral degrees, respectively. These effects are economically meaningful relative to the annual deficit of 25.6 H-1B visas.

Firms tend to acquire workers with skills and occupations they want, as mentioned previously. Thus, we examine the similarity between the skills and occupations of the acquirer's and the target's workers using two measures: the similarity score based on employees' educational majors (i.e., fields of study) and the similarity score based on employees' technology skills classified by LinkedIn. For each firm and similarity type, we construct a vector of worker counts. Each element of the vector corresponds to a unique educational major (or a unique employee technology skill). The similarity score for an acquisition equals the cosine similarity of the acquirer's and the target's educational major (or technology skill) count vectors. A higher similarity score means that the target firm's workers possess skills and occupations more aligned with the acquirer's workers.

In Panel C of Table 6, we test whether firms are more likely to acquire targets with workers that share skills and occupations similar to their existing workers. In column 1, the dependent variable is the IHS transformation of the count of acquisitions in which the acquirer's and the target's workers have positive similarity scores based on educational majors. The coefficient on H1B_WIN_RATE is -0.042 and statistically significant at the 1% level. In column 2, the dependent variable is replaced with the IHS transformation of the count of acquisitions in which the acquirer's and the target's workers have a similarity score of 0 based on educational majors. The coefficient on H1B_WIN_RATE is -0.002 and becomes statistically insignificant. The difference in the coefficient is statistically significant at the 1% level. Columns 3 and 4 are the same as columns 1 and 2 except that the worker similarity score is now based on worker technology skills. The coefficient on H1B_WIN_RATE in column 3, where the dependent variable is the IHS transformation of the count of acquisitions with similar worker technology skills between the acquirer and the target, is -0.040 and statistically significant at the 1% level. The coefficient on H1B_WIN_RATE in column 4, where the dependent variable is the IHS transformation of the count of acquisitions without similar worker technology skills between the acquirer and the target, is -0.004 and becomes statistically insignificant. The difference in the coefficient across columns 3 and 4 is statistically significant at the 1% level. On balance, the results suggest firms are more likely to acquire targets whose employees share skills and occupations similar to their existing employees; they are not more likely to acquire targets with little or no overlap in employee skillsets.

To summarize, after losing random H-1B visa lotteries, firms acquire target firms with both domestic and foreign high-skilled workers. The high-skilled workers they acquire share skills and occupations similar to their existing workers, suggesting that the fit between the acquirer's and the target's employee skills matters for the firm's acquiring decision.

VIII. Conclusions

More and more firms have been hiring skilled workers through M&As rather than hiring them directly from the labor market. As competition for skilled workers intensifies, acquiring has become commonplace in Silicon Valley and has also been widely adopted in virtually every industry. Nevertheless, academic research on acquiring is rare. The literature lacks both causal evidence on acquiring and direct evidence that high-skilled workers are indeed acquired through M&As.

In a natural experiment based on random H-1B visa lotteries, we document that, when exposed to exogenous negative shocks to the supply of skilled workers, firms pursue more acquisitions, especially more acquisitions targeting firms that possess the skilled workers they need. We also find that acquires are an effective means of obtaining high-skilled workers. Using employee profiles retrieved from LinkedIn and H-1B microdata, we provide direct evidence that firms acquire high-skilled workers from target firms. To the best of our knowledge, this is the first direct evidence that skilled workers are acquired through M&As due to unmet skilled labor demand. We conclude that skilled labor is an important driver of acquisitions, and acquires are an effective means of obtaining skilled workers.

This study advances our understanding of acquiring but leaves some questions unanswered. For example, although the natural experiment allows us to show that shortages in skilled labor drive firms' M&A activities, this study and previous studies cannot categorically identify which acquisitions are pure acquires and which are not. To meet this challenge, future studies will need detailed information on the acquirers' needs for skilled workers and more complete information on employees in the target firms. Additionally, our direct evidence of high-skilled workers based on the targets' H-1B workers and workers on LinkedIn does not paint a complete picture of acquiring. Future studies can continue to fill in this picture with the help of detailed information on *all* employees in both acquiring and target firms.

Appendix. Variable Definition

Main Dependent Variables

NUM_ACQ: The number of acquisitions in year $t+1$.

IND_ACQ: An indicator of whether the firm (acquirer) has an acquisition in year $t+1$.

NUM_ACQUIRED: The number of acquired workers identifiable on LinkedIn in year $t+1$.

NUM_ACQUIRED_STEM: The number of acquired STEM workers identifiable on LinkedIn in year $t+1$.

FRAC_NEW_OPTIONS: The ratio of new employee options grants to outstanding employee options, averaged over years t and $t + 1$.

NEW_OPTIONS_PER_EMP: The average new options grants per employee in years t and $t + 1$.

PCT_CHG_OPTIONS_OUT: The average percentage change in employee options in years t and $t + 1$.

CHG_OPTIONS_PER_EMP: The average change in outstanding options per employee in years t and $t + 1$.

Firm Characteristics

CAP_H1B_GRANT: The number of cap-subject H-1B visas granted to the firm in year t, which is estimated from the I-129 data set. See Appendix B of the Supplementary Material for details.

CAP_H1B_DEMAND: The number of cap-subject H-1B visas the firm demands in year t, which is estimated from the LCA data set. See Appendix B of the Supplementary Material for details.

H1B_WIN_RATE: The fraction of the firm's demand for cap-subject H-1B visas in year t that is met. This is also referred to as the firm's win rate in the H-1B visa lotteries.

SIZE: The natural logarithm of total market capitalization in year t.

LEVERAGE: Long-term debt plus debt in current liabilities divided by book assets in year t.

ROA: Net income divided by book assets in year t.

TOBINS_Q: Firm market value (book assets plus market capitalization minus book equity) divided by replacement cost of assets (book assets) in year t.

CASH: Cash holdings divided by book assets in year t.

EMPLOYMENT: Employee count divided by book assets in year t.

FRAC_ADV_DEG: Fraction of the firm's LinkedIn employees with a master's or higher degree in year t.

Supplementary Material

To view supplementary material for this article, please visit http://doi.org/10.1017/S0022109023000856.

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