

# Customer Concentration and M&A Performance\*

Yizhe Dong<sup>†</sup>, Chang Li<sup>‡</sup>, Haoyu Li<sup>§</sup>

Journal of Corporate Finance (forthcoming)

June 2021

## Abstract

This paper examines how the target's customer concentration affects merger performance. We find that the acquirer purchasing a customer-concentrated firm experiences significantly lower stock market returns and worse long-run operating performance. The effect is more pronounced when customers face lower switching costs or the target undertakes a higher level of relationship-specific investments, exhibits higher cash volatility, or is acquired by a less well-known company. Further analysis shows that the negative association is mainly driven by corporate customers, while relatively safe government customers moderate the effect. We also find that shared major customers, overconfident CEOs, and poor corporate governance are more likely to increase the likelihood of customer-concentrated acquisitions. Overall, our findings suggest that higher customer concentration leads to lower value creation in mergers.

**Keywords:** customer concentration; mergers and acquisitions; announcement return; major government customer

**JEL classification:** G30; G34; M41

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\* We thank helpful comments from three anonymous, Leonidas Barbopoulos, Thorsten Beck, Jonathan Crook, Douglas Cumming, Michael Guo, Iftexhar Hasan, Wenxuan Hou, Lucy Liu, Shu Lin, Bohui Zhang and Jeffrey Zhang.

<sup>†</sup> Yizhe Dong: University of Edinburgh Business School, 29 Buccleuch Place, Edinburgh, EH8 9JS, UK. Email: [yizhe.dong@ed.ac.uk](mailto:yizhe.dong@ed.ac.uk)

<sup>‡</sup> Chang Li: School of Economics, East China Normal University, Shanghai, China. Email: [cli@fem.ecnu.edu.cn](mailto:cli@fem.ecnu.edu.cn)

<sup>§</sup> Haoyu Li: University of Edinburgh Business School, 29 Buccleuch Place, Edinburgh, EH8 9JS, UK. Email: [H.Li-79@sms.ed.ac.uk](mailto:H.Li-79@sms.ed.ac.uk)

## 1. Introduction

The Pareto principle (also known as the 80/20 rule) seems to apply well to supply chain management, where, for many firms, a small set of large customers contributes a sizeable portion to a supplier's sales (Ellis et al. (2012) and Perry (2013)).<sup>1</sup> That a firm's total revenue is distributed across this small set of customers (or customer base) undergirds the concept of customer concentration. Supplier firms often make huge efforts to develop deep relationships with principal customers, which nevertheless can significantly influence firms' operational and financial performance from different aspects. The economic implications of customer concentration have drawn increasing attention from academics and practitioners in recent years (see, e.g., Patatoukas (2012), Irvine et al. (2014), Dhaliwal et al. (2016), Campello and Gao (2017), Chiu et al. (2019), Hui et al. (2019), and Working (2019)).

However, that existing studies yield mixed results on the economic consequences of customer concentration suggests that winning the business of big customers is a double-edged sword. On the one hand, a strong relationship between major customers and suppliers can reduce a firm's transaction costs and discretionary expenses and foster information sharing and collaboration along the supply chain, which in turn improve firm efficiency and performance (Kalwani and Narayandas (1995), Patatoukas (2012), Irvine et al. (2014), Ak and Patatoukas (2016), Chu et al. (2018)). In the context of M&As, productive efficiency improvement, as the result of a reduction in operating costs and information sharing, is commonly considered to be a source of gains to the acquisition of a target with major customers (Fee and Thomas (2004)). On the other hand, heavily relying on a few major customers is also likely to translate into higher expenses and increased business risks, which shareholders and stakeholders shoulder (e.g., Cohen and Freazzini (2008), Itzkowitz (2013), and Campello and Gao (2017)). A small operational change can have a significant negative impact on the customer relationship (Cen et al. (2016a)). In particular, a merger and acquisition (M&A) may expose the customer relationship to vulnerabilities. Anecdotal evidence suggests that buyers and investors view deep relationships with key customers as a source of risk, rather than a strength, in M&As (e.g., Kastner (2018)).<sup>2</sup> Once a deal closes, the seller may lose control of the customer relationship, and major customers are likely to either exit or make demands for price concessions with the new combined entity. In this context, acquirer returns are disastrous, and the road to rebuilding revenues is painful. The 2016 merger of American

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<sup>1</sup> The 80 and 20 are anecdotal, of course, probably has a different distribution. For example, Campello and Gao (2017) point out that one-third of the sales of U.S. manufactures flow to a few large customers.

<sup>2</sup> See Kastner (2018), who is President of GP Venture.

Axle & Manufacturing Holdings' (AXL) and Metaldyne Performance Group (MPG) exemplifies this dilemma. Among many factors that led AXL to experience five-day abnormal returns of -23.7%, it is widely believed that MPG's concentrated customer base (i.e., the top-three customers account for over 60% of the sales) was a key risk factor. However, studies on customer concentration in the context of mergers are still scant. In this study, we attempt to fill this important gap by systematically studying the effects of a target's customer concentration on merger performance.

This paper examines how the target's customer concentration affects several aspects of merger performance, that is, the announcement returns of the acquirer and the combined entity, as well as the long-run market and operating performance. To perform our tests, we gather M&A data from the Securities Data Company (SDC) Premium database and customer information from the Compustat Segments Customer database. The matching procedure produces a sample of 1,446 M&As by publicly traded U.S. companies from 2000 to 2017. Following the Statement of Financial Accounting Standards (SFAS) No. 131, we define major customers as those accounting for 10% or more of the supplier's total sales. We construct three main measures that capture various dimensions of the target's customer concentration. To sharpen the inference, we control for firm- and deal-level characteristics, as well as year and industry fixed effects in our empirical tests.

Our baseline results suggest that, across all measures of customer concentration, acquirers purchasing targets with major customers experience lower announcement returns associated with mergers. The effect is statistically and economically significant. The presence of the target's major customer is associated with a decrease of 1.7 percentage points in the acquirer's five-day cumulative abnormal returns (CARs) around the deal announcement. Moreover, a one-standard-deviation increase in the percentage of sales to all major customers and the sales-based Herfindahl-Hirschman index (HHI) leads to an approximately 76% and 51% reduction in the acquirer's five-day CARs, respectively. The trivial effect on target announcement returns implies that an unfavorable market reaction toward the acquirer is not attributed to an overpay issue. Furthermore, we find that the combined acquirer and target firm announcement returns (i.e., merger synergy) and the acquirer's long-term performance, measured by one- and two-year post-acquisition buy-and-hold abnormal returns (BHAR), are negatively associated with the target's customer concentration. These findings support the view that the target's customer concentration is an important risk factor in M&A transactions, one that may be underestimated by acquirers.

The relation between M&A performance and the customer concentration of targets in the above analysis is potentially subject to concerns of omitted variables, unobserved heterogeneity, and self-selection problems. To

alleviate these concerns, we further perform an instrumental variable (IV) method, the Durbin-Wu-Hausman test, and the propensity score matching (PSM) technique to validate our findings. We construct two IVs: (1) the number of potential major customers for a target and (2) the industry average of the number of major customers and a PSM matched sample. The IV and PSM estimations all suggest that the target's customer concentrations remain negatively associated with the acquirer's announcement returns and support the proposition that the results in our initial analysis are not the outcome of a spurious relationship. Our results are also robust to a set of sensitivity tests.

To provide more evidence that additional costs and uncertainties stemming from the target's customer concentration underpin poor M&A outcomes, we conduct several tests to examine the cross-sectional variation in the relation between an acquirer's announcement returns and a target's customer concentration.<sup>3</sup> Some previous studies have documented that government customers and corporate customers impose different levels of operational uncertainty on suppliers (see, e.g., Dhaliwal et al. (2016), Huang et al. (2016a), and Cohen and Li (2020)). Unlike corporate entities, government customers are usually reliable and stable business partners, as they are much less likely to default or go bankrupt and tend to sign long-term procurement contracts with their suppliers. As such, we expect that contracting with major government customers and with major corporate customers impose different levels of risk to the target and have differential impacts on M&A performance. To test this conjecture, we reconstruct the measures of customer concentration and base them on major corporate and government customers separately. We find that corporate customer concentration is significantly and negatively associated with the acquirer announcement returns, suggesting that the effect is mainly driven by major corporate customers. In addition, we capture a moderating effect associated with having a major government customer, as the negative impact of the overall customer concentration on the acquirer's returns is less pronounced when the target has a major government customer.

Customer switching costs play an important role in the supplier-customer relationship. Substantial switching costs deter major customers from switching to alternative suppliers. Thus, we expect that the merged entity has a higher risk of losing future major customer revenue when the barrier to switching is lowered. Using a target's industry market share to measure its customer switching costs, we find that higher switching costs (i.e., above-median switching costs) could impede the major customer concentration from exerting a negative effect on the acquirer's returns. Moreover, suppliers are often required to undertake relationship-specific

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<sup>3</sup> These heterogeneity tests further alleviate the endogeneity concern, since it is unlikely that factors other than customer concentration would simultaneously fit into these settings.

investments and customize their operations and products to suit their major customers' needs. Relationship-specific investments generally have little value to other customers. Thus, the acquirer is expected to suffer more from the loss of a target's major customer when the target invested a significant amount of relationship-specific assets. The results are consistent with our prediction: the negative association between the target's customer concentration and M&A performance is more pronounced when the target has made more relationship-specific investments.

Higher cash flow volatility implies that a firm is more likely to cycle through periods of internal cash flow shortfalls and suffer from liquidity problems (Minton and Schrand (1999)). Thus, cash flow risk stemming from a target's customer concentration tends to be higher for those deals that involve targets with unstable cash flows before an M&A. We find evidence consistent with this argument and show that the negative impact of a target's customer concentration on the acquirer's shareholder value is more striking when the target has a higher level of cash volatility before the merger. We also examine whether larger and more reputable acquirers purchasing targets with a concentrated customer base experience better M&A outcomes. Our results show that relative to non-S&P acquirers (i.e., relatively small acquirers), S&P buyers acquiring targets with a major customer exhibit 2.40 percentage points higher five-day CARs, suggesting that larger and more reputable acquirers are more capable of navigating the intricacies associated with major customers.

The above-mentioned analysis supports our hypothesis that acquiring targets with high customer concentration can destroy the shareholder value of the acquirers. If the mergers do not create value for the acquiring firm, then why do they initiate such deals? What do they intend to achieve with the merger activity? To answer these questions, we further investigate the potential motives behind the acquisition of customer-concentrated targets from the perspectives of strategic considerations, hubris, and agency motivation. We find that the presence of common major customers, CEO overconfidence, and weak corporate governance are positively associated with the firm's probability of acquiring a customer-concentrated target.

Our study contributes to several research streams. Our work extends the literature investigating the determinants of M&As by documenting how a target's business model (i.e., customer concentration) affects the performance of M&A transactions, an area relatively unexplored by prior studies. This large body of literature has documented various factors significantly affecting a firm's decisions about M&As and M&A performance, including firm size (Moeller et al. (2004), Alexandridis et al. (2013)), board connections (Cai and Sevilir (2012)), social networks (Ishii and Xuan (2014), El-Khatib et al. (2015)), CEO inside debt holdings (Phan (2014)), investment banker directors (Huang et al. (2014)), human capital (Lee et al. (2018), Chemmanur et al. (2019)),

employee compensation contracts of target firms (Babenko et al. (2020)), acquirer organization capital (Li et al. (2018)), cultural similarity (Bereskin et al. (2018)), corporate social responsibility (Deng et al. (2013)), the legal and regulatory environment (Rossi and Volpin (2004)), and policy uncertainty (Nguyen and Phan (2017)). Our findings suggest that a target's customer concentration is an important determinant in M&A transactions and destroys the shareholder value of acquiring firms. Our work is related to that of Krolkowski et al. (2017), but our focus is different. Krolkowski et al. (2017) find that targets can benefit from strong customer-supplier relationships by receiving higher premium from acquirers and experiencing better stock announcement returns.<sup>4</sup> However, we suggest that a target's customer concentration is an important risk factor in M&A transactions and bidding customer-concentrated firms harms the shareholder value of acquirers.

This paper also adds to existing literature that examines the factors motivating merger and acquisition activity. Some research documents that multiple motives may be involved in mergers, including an increase in market power and synergies creation (Healy et al. (1992), Berkovitch and Narayanan (1993), Lee et al. (2018)), hubris (Roll (1986), Malmendier and Tate (2008), Seth et al. (2000)), and agency or managerial motives (Shleifer and Vishny (1988), Jenter and Lewellen (2015)). Our paper highlights the importance of shared major customers, CEO overconfidence, and corporate governance in the likelihood of firms undertaking a merger.

Furthermore, our study adds to the ongoing debate about how major customer concentration can affect supplier performance, accounting and financial policies, investment decision and market outcomes (e.g., Banerjee et al. (2008), Patatoukas (2012), Irvine et al. (2014), Cen et al. (2016a), Cen et al. (2016b), Dhaliwa et al. (2016), Campello and Gao (2017) and Cao et al. (2021)). To our knowledge, however, the prior research has paid little attention to the effect of the supply chain relationship on strategic investment decisions and the performance of firms as related to suppliers. Our study provides new empirical evidence on the economic consequences of customer concentration in the context of M&As and supports the risk hypothesis that market participants perceive the risks associated with a target's major customers to outweigh potential benefits. This study is also related to existing work on exploring how the composition of a firm's customer base affects business risks (e.g., Dhaliwa et al. (2016), Huang et al. (2016a), and Cohen and Li (2020)). From the perspective of acquiring shareholders, we show that relying on different types of major customers has differential effects on the acquirer's shareholder value creation. That is, the presence of major government customers helps to mitigate

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<sup>4</sup> Based on a much bigger data set, we find the relation between the target's customer concentration and its announcement returns is negative but statistically insignificant, suggesting that the target's shareholders do not receive many gains from the merger if the target has a concentrated customer base.

risks associated with a target's customer concentration.

The remainder of this paper is organized as follows. In Section 2, we develop testable hypotheses. Section 3 introduces our sample, explain the construction of the key variables, and report descriptive statistics. Section 4 presents the main results for the relation between the target's customer concentration and M&A performance and our endogeneity analyses. Section 5 documents the results of additional heterogeneity tests. Section 6 discusses the potential motives for a firm to acquire a target with a concentrated customer base. Section 7 presents a set of robustness checks. Section 8 concludes.

## **2. Hypotheses Development**

Acquiring a target with a concentrated customer base can affect M&A outcomes in complex ways. Previous studies have documented that firms with high levels of customer concentration could improve firms' operational efficiency and profitability (e.g., Patatoukas (2012), Irvine et al. (2014), Krishnan et al. (2019), Crawford et al. (2020)). In the context of M&As, improving efficiency and promoting growth is a key consideration for the acquiring firm. Firms with a concentrated customer base can achieve better performance and higher productive efficiency because of decreased marketing, selling, general, and administrative expenses; improved asset utilization; increased recurring revenue from major customers; enhanced production distribution; and shortened cash conversion cycles (e.g., Kalwani and Narayandas (1995), Patatoukas (2012), Irvine et al. (2014), and Ak and Patatoukas (2016)). A close relationship between suppliers and major customers also fosters information sharing, coordination, and collaboration along the supply chain, thereby improving working capital and the management of production and encouraging innovation (Kumar (1996), Kinney and Wempe (2002), and Chu et al. (2018)). Anderson, Havila, and Samli (2001) suggest that efficiencies accrued to suppliers with concentrated customer bases are transferable through mergers. Thus, acquiring a target with major customers may provide the acquirer with access to these improved efficiencies and benefits, yielding a positive value to the acquirers' shareholders (hereafter, the efficiency effect). Moreover, having stable major customers provides a certification of the supplier's quality (Tirole (1988), Chevalier and Goolsbee (2009), Itzkowitz (2013)). The certification effect sends a positive signal to investors, resulting in a favorable market reaction to the merger transaction involving the target with a concentrated customer base.

A target's customer concentration also can be viewed as a source of risk to M&A transactions and post-merger integration for several reasons (hereafter, the risk effect). First, a heavy reliance on a few customers could pose significant business risks to suppliers. Financial distress and bankruptcy can permeate the supply

chain, thereby unleashing a contagion effect (e.g., Hertz et al. (2008), Jorion and Zhang (2009), Kolay et al. (2016)). If a major customer becomes financially distressed, declares bankruptcy, or switches to another supplier firm, the supplier will experience a sizable drop in its revenues and cash flows. In the M&As setting, the supplier-customer relationship becomes even more vulnerable. A strong customer-supplier relation often involves the supplier committing into relationship-specific investments and providing customized products to its major customers and a close personal connection between the top managers and major customers (Krug and Hegarty (2001), Banerjee et al. (2008), Campello and Gao (2017)). The change of control associated with an M&A may increase the likelihood of customers switching suppliers by disrupting the target's operations and the personal connection and reducing committed relationship-specific investments (Krug and Hegarty (1997)). Cen et al. (2016b) also suggest that threat of a takeover can impose costs on firms by adversely affecting relationships with major customers, resulting in deteriorating operating performance. Thus, the risk stemming from the target's major customer turnover will be absorbed by the acquirer and have a prolonged, negative effect on the combined entity.

Second, to ensure smooth integration and realize productivity gains and other synergies from acquiring a customer-concentrated target, the acquirer is required to make significant relationship-specific investments and long-term purchase commitments during post-acquisition integration so as to retain and maintain relationships with the target's major customers. Large customers tend to divert a disproportionate share of resources away from a larger number of smaller ones, as management could feel the need to cater to the top buyers. This diversion makes diversifying the customer base difficult and increases overdependence on too few customers in post-acquisition operations, which may increase the combined firm's cash flow risk. In addition, major customers enjoy stronger bargaining power not accessible to smaller customers (Piercy and Lane (2006) and Chiu et al. (2019)). They are more likely to engage in ex post renegotiation over contract terms, including low prices, and extended trade credits, with the acquirer. Doing so requires the use of a liquidity buffer to cope with long payment terms and late payment. Additional cash holdings may force the acquirer to reduce dividend payments and engage in tax avoidance and earnings management (Raman and Shahrur (2008), Wang (2012), and Huang et al. (2016a)), which, in turn, expose acquirers to unfavorable publicity and to the risk of litigation and penalties. These lead to an adverse effect on the outcome of acquisitions involving targets with major customers.

Third, suppliers with a concentrated customer base face higher costs of equity capital and bank loans, as prospective equity investors or debt holders view such firms as having a higher likelihood of default (Dhaliwal



et al. (2016) and Campello and Gao (2017)). The debt burden would be transferred to the acquirer purchasing a customer-concentrated supplier. The costs of financing either for the M&A transaction itself or for post-acquisition operation are expected to increase, which may deteriorate the market's reaction to the transaction and the synergy effect from integration. Taken together, we expect that the target's customer concentration is an important risk factor in M&A transactions and hypothesize that acquiring targets with concentrated customer bases reduces shareholder gains from mergers.

To summarize, both the efficiency improvement and risk effects of customer concentration have been discussed in the literature, and they can lead to contradictory implications for M&A transactions involving a target with a concentrated customer base. We, therefore, formalize the above discussions with the following competing hypotheses:

H1a: The target's customer concentration positively affects merger performance.

H1b: The target's customer concentration negatively affects merger performance.

### **3. Data and Empirical Methodology**

#### ***3.1. Sample selection***

We obtain M&A data from the Securities Data Company (SDC) Platinum database, customer concentration data from the Compustat Segments Customer database, stock return data from the Center for Research in Security Prices (CRSP), and financial statement information from the Compustat. Our initial sample encompasses all completed M&As valued at \$1 million or more over the period 2000–2017<sup>5</sup> for which both the acquirer and the target are U.S. publicly listed companies. Following Erel et al. (2012), we exclude spin-offs, recapitalizations, self-tender offers, exchange offers, repurchases, minority stake purchases, acquisitions of remaining interest, and privatizations. To ensure a transfer of corporate control, we further require that the acquirer should control less than 50% of the target's shares before the M&A and own 100% of the target's shares after the transaction. If more than one deal involving the same acquirer on the same day is recorded in the SDC database, we retain the one with the largest transaction value. We construct our final sample by requiring the deal to have available financial data for the acquirer and the target in Compustat and sufficient stock price data from CSRP to calculate abnormal returns. These restrictions leave us with 1,446 successful

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<sup>5</sup> Major customer disclosure requirements were initially introduced in 1976 by the Statement of Financial Accounting Standards (SFAS) No. 14, which was superseded by the SFAS 131 in 1997. SFAS 131 still requires firms to disclose the total amount of revenue from each customer that contributes more than 10% of total revenue, but no longer requires them to report the identity of such customers. Because of the change in regulations, several firms restated their customer segment information during 1998–1999 (Banerjee et al. (2008)). To avoid any potential bias caused by the change in regulation, we start our sample period in year 2000.

mergers with acquirer information available and 1,152 deals with acquirer and target firm information available.

Table 1 presents the distribution of our M&A sample by acquirer industry and announcement year. As reported in Panel A, considerable heterogeneity is evident in the deal frequency by year. Consistent with the pattern of the 5th and 6th merger waves, our sample shows a very active M&A market over 2000–2001 and 2004–2006. The number of deals diminishes to a relatively low level during the 2008 financial crisis and rebounds to a high level in the period 2014 to 2016. The patterns in the two subsamples (i.e., targets with and without major customers) across years follow a similar trend as in the full sample. Panel B shows the distribution of industries (Fama-French 12 industry) in the sample. Consistent with Cai and Sevilir (2012), the greatest number of M&As takes place in the Finance (34.16%) industry, followed by the Business Equipment and Healthcare industries with the proportions of 23.17% and 9.89%, respectively. Transactions involving targets with major customers are concentrated in some industries, including Business Equipment, Healthcare, Oil, Gas and Coal Extraction, and Products and Manufacturing.

[Table 1 is about here]

### 3.2. Customer concentration measures

We use the Compustat Segments Customer files to identify the major customers of each target firm. The Statement of Financial Accounting Standards No. 14 (SFAS 14) and SFAS 131 require a supplier to disclose external customers that individually account for 10% or more of its total sales. Some suppliers voluntarily report customers that contribute to less than 10% of their total sales; thus, the information is also recorded in the Compustat.<sup>6</sup> In this paper, to alleviate the concern of selection bias, we treat a customer that accounts for at least 10% of total sales as a major customer.<sup>7</sup>

We follow prior studies and construct three primary measures to capture the customer concentration of the target firm. Our first measure is an indicator variable, *Major Customer*<sub>it</sub>, that is equal to one if a target firm reports at least one major customer in a given year, and zero otherwise (e.g., Cen et al. (2016a), Dhaliwal et al. (2016)). In our sample, 30.98% of deals involve targets reporting that they have at least one major customer.

Our second customer concentration measure is defined as the sum of sales to all major customers scaled

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<sup>6</sup> After matching the targets in the SDC database to firms in the Compustat Segments Customer Database, we find that there are 592 deals for which customer records are available for the target.

<sup>7</sup> SFAS No. 14 and 131 require all public firms to disclose their customers that represent 10% or more of the firm's total sales. The Compustat Segments Customer Database collects information including the names of the customers and their assigned sales figures accordingly. The compulsory action allows us to count all major customers whose sales make up 10% or more of each target's total sales. However, if we use a cutoff below 10%, such as 5%, some firms report their customers that account for 5%–10% sales voluntarily, but others may not, which may lead to the concern of selection bias. Nevertheless, our results are qualitatively unchanged if we use the 5% of total sales as the threshold to define major customers.

by total sales (e.g., Banerjee et al. (2008), Huang et al. (2016a)). Specifically,  $MajorALL_{it}$  of target  $i$  at year  $t$  with  $J$  major customers is computed as

$$MajorALL_{it} = \sum_{j=1}^J \frac{Sales_{ijt}}{Sales_{it}}, \quad (1)$$

where  $Sales_{ijt}$  denotes the sales of target firm  $i$  to major customer  $j$  at year  $t$ , and  $Sales_{it}$  denotes the total sales of target firm  $i$  at year  $t$ . A higher value can be interpreted as higher customer concentration. If a target does not have a major customer or does not have customer information recorded in the Compustat Segments Customer Database in a given year, we set the value of  $MajorALL_{it}$  to zero.

As our third measure of customer concentration, we employ the HHI of sales, a common proxy for market concentration and competition (e.g., Patatoukas (2012), Crawford et al. (2020)). This measure could capture two elements of customer concentration: (a) the number of major customers and (b) the relative importance of each major customer in the firm's total sales. The measure is constructed as follows:

$$HHI_{it} = \sum_{j=1}^J \left( \frac{Sales_{ijt}}{Sales_{it}} \right)^2, \quad (2)$$

where  $Sales_{ijt}$  and  $Sales_{it}$  follow the same definitions used in Equation (1). HHI is bounded between 0 and 1, where higher values indicate more concentrated customer base.<sup>8</sup>

### 3.3. M&A performance measures

This subsection describes the construction of the merger performance measures used in the following tests. We use acquirer's five-day CARs centered on the deal announcement day, that is, CAR (-2, 2), as one of the main merger outcome measures.<sup>9</sup> The acquirer CAR captures the market's view of whether the acquirer's management is creating or destroying shareholder wealth through the proposed merger (John et al. (2015)). We obtain CARs for the acquirer from a market model estimated using the CRSP value-weighted index return as a proxy for market returns. The estimation period is from 241 trading days to 40 days before the announcement. Following Kaplan and Weisbach (1992) and El-Khatib et al. (2015), we calculate CARs for the combined firm as the market-value-weighted average of CARs of the acquirer and the target over five trading days around the announcement to proxy for total synergies generated by the merger. The weights are based on the market values of the acquirer and the target's equity eleven days prior to the merger announcement day. We also use long-run

<sup>8</sup> This measure equals zero for targets that do not disclose sales to any major customers and equals one for a target that completely relies on a single major customer for all annual sales.

<sup>9</sup> Our results remain robust when we use CARs over three-day event windows for the acquirer and the combined firm.

stock market reactions and operating performance, as proxied for by one-, two- and three-year BHARs, and changes in returns on assets (ROA), as alternative measures of merger performance.

### 3.4. Empirical methodology

To examine the relation between target customer concentration and merger outcomes at the deal level, we estimate the following specification:

$$\begin{aligned}
 &M\&A\ performance_{d,t} \\
 &= \alpha + \beta \times Customer\ concentration_{i,t-1} + \lambda \times Firm\_C_{d,t-1} + \mu \times Deal\_C_{d,t} + \gamma_{year} + \delta_{ind} \\
 &+ \varepsilon_{i,t} ,
 \end{aligned}$$

where  $d$ ,  $i$ , and  $t$  correspond to the deal, target firm, and the year of acquisition, respectively.  $M\&A\ performance_{d,t}$  is our merger performance measure. We mainly use the acquirer's five-day CARs around the announcement date of the acquisition, that is, CAR (-2, 2) to measure the merger outcome.  $Customer\ concentration$  represents one of three measures defined in Section 3.2, that is, *Major Customer*, *MajorAll*, or *HHI*.

$Firm\_C$  and  $Deal\_C$  are vectors of firm-level and deal-level control variables, respectively. Following the prior literature, we control for a set of acquirer-specific characteristics that substantially affects acquirer returns, including firm size, Tobin's Q, free cash flows, and leverage (e.g., Lang et al. (1991), Maloney et al. (1993), Moeller et al. (2005)). Considering that potential information leakage before the announcement might induce ex ante market reactions, we further include *Stock price run\_up*, measured by the BHAR of the acquirer over the period from 210 to 11 days before the deal announcement (John et al. (2015)). Prior studies show that payment method is related to the ex ante stock market performance of the acquirer (e.g., Moeller et al. (2004), Officer et al. (2009)), so we include two payment indicators: one is *Pure stock deal*, which takes the value of one if the deal is fully financed with stock and zero otherwise, and the other is *Mixed deal*, which indicates that the acquirer completes the transaction using a proportion of stock as payment. We also control for the relative size of the deal, which is calculated as the ratio of the transaction value to the acquirer's market value of equity, and an indicator (*High tech*) that equals one if the acquirer and target both belong to high-tech industries, and zero otherwise.

All firm-level control variables in the model are lagged one year relative to the announcement year. M&A performance and customer concentration should vary largely by industry, so we also control for the industry fixed effect,  $\delta_{ind}$ . We include year fixed effect ( $\gamma_{year}$ ) to control for time-varying macro factors that might affect M&A performance. Table A1 in the Appendix defines the variables in detail.

### 3.5. Descriptive statistics

Table 2 reports descriptive statistics for the key variables used in this study. Panel A provides the summary statistics for the customer concentration measures for both the full sample and the subset of targets with (without) a major customer. In our sample, 31% of acquisitions involve a target with at least one major customer accounting for 10% or more of sales. For the subset of targets that disclose at least one major customer, the mean sales to all major customers account for 42.3% of total sales.<sup>10</sup> Over the sample period, the mean values of *HHI* for the full sample and the major customer subsample are 0.045 and 0.146, respectively.

Panel B of Table 3 reports the summary statistics for the acquirer and the target as well as the deal characteristics. The first two columns of the table report the means and standard deviations for the full sample. Compared to the target, the acquiring firm tends to have a larger size, a larger Tobin's Q, free cash flow and stock price run-up, and smaller market leverage. Specifically, the means of *Firm size*, *Tobin's Q*, *Leverage*, *Free cash flow*, and *Stock price run-up* are 8.127, 1.591, 0.165, 0.020, and 0.063, respectively, for acquiring firms, and 6.267, 1.430, 0.179, 0.011, and 0.023, respectively, for target firms. As for deal characteristics, we notice that 29.1% of deals are completed with 100% stock payment and 41.3% of deals involve both stock and cash payments. The transaction value accounts for approximately 28.4% of the acquirer's market value on average, and high-tech companies actively engage in M&As, taking a proportion of 23.5% in our sample.

Columns (3)–(6) report summary statistics for the subsamples of targets with and without a major customer. Compared with acquirers bidding on targets without major customers, acquirers bidding on customer-concentrated targets have a smaller size, a higher Tobin's Q, and lower leverage. Similarly, targets with a major customer are smaller in size and have a higher Tobin's Q compared with their peers. However, we do not observe significant differences for either free cash flow or stock price run-up between subsamples with and without a major customer. For the payment method, deals involving targets with a major customer are less likely to be mixed paid. We also see that the acquisitions of customer-concentrated targets are more likely in high-tech industries. The comparisons reveal that deals with or without a major customer vary substantially along many dimensions, and they validate the controls we use in our multivariate analysis.

[Table 2 is about here]

## 4. Target Customer Concentration and M&A Returns

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<sup>10</sup> It is worthy of note that the biggest proportion of sales accounted for by major customers is 100%. This occurs in the case of Trubion Pharmaceuticals Inc., whose single major customer was Wyeth LLC in 2007 and 2008.

#### ***4.1. Univariate analysis***

Table 3 reports acquirer CARs and combined CARs, as well as acquirer BHARs for the full sample, followed by a comparison of the two subsamples based on whether or not the targets have a major customer. The mean (median) CARs for the full sample are negative for the acquirers. For example, the mean CAR (-2, 2) for the acquirer is -0.01%, confirming that M&A transactions overwhelmingly destroy the acquirer's short-term shareholder wealth in prior literature (e.g., Andrade et al. (2001), Cai and Sevilir (2012), and Ishii and Xuan (2014)). A comparison of the two subsamples uncovers that acquirers with a major customer experience a more unfavorable market reaction than those without a major customer. For example, the difference of approximately 0.8% over the five-day window is statistically significantly different from zero and also economically meaningful. In addition, a comparison of the combined announcement returns for the subsamples reveals that the value creation effect is larger in deals without a major customer. However, the difference in CARs is statistically, insignificantly different from zero.

The BHARs indicate the difference between the buy-and-hold returns of a sample firm and that of the market portfolio proxied for by the value-weighted CRSP index returns over the one-, two-, and three-year periods following an M&A deal. The mean values of acquirers' one-, two-, and three-year BHARs are 2.8%, 3.2%, and 3.8%, respectively, suggesting M&A transactions create positive long-term value to the acquirer shareholders. On closer examination of the subsamples, however, we discover that the value creation is almost entirely generated from deals in which the acquirer pursues a target without a major customer. On the other hand, if the acquirer pursues a target with a major customer, the acquirer suffers a substantial loss. Specifically, the means of one-year BHARs are -1.6% and 4.7% for deals with and without major customers, respectively; the figures correspond to -1.9% and 5.5% over a 2-year horizon. The equalities in mean one- and two-year BHARs between the two subsamples are rejected at least at the 5% level.

The univariate analysis delivers a consistent message: a target's higher customer concentration of is associated with a loss in value to the acquirer's shareholders in the short and long runs.

[Table 3 is about here]

#### ***4.2. Multivariate analysis***

In this subsection, we examine the association between a target firm's customer concentration and M&A performance in a multivariate setting, in which we can further control for acquirer, target, and deal characteristics that have been documented in the literature to influence merger outcomes.

##### ***4.2.1. Announcement returns***

We first examine the relation between the level of the target’s customer concentration and the acquirer’s announcement returns, which capture the market’s view of whether the acquirer’s management is creating or destroying shareholder wealth through the merger. Table 4 provides multivariate tests. The dependent variable is the five-day abnormal returns around the announcement dates. Columns (1)–(3) correspond to three measures of customer concentration, *Major Customer*, *MajorALL*, and *HHI*, respectively. The coefficients for all three measures of customer concentration are negative and statistically and economically significant, suggesting that the acquisition of a customer-concentrated target imposes a substantially negative wealth effect on acquirer shareholders.<sup>11</sup> For example, in Column (1), the presence of at least one major customer for the target is associated with a reduction of 1.7 percentage points in the acquirer CAR (-2, 2). Considering that the average market value is \$17.91 billion, the reduction could translate into a loss of \$304.47 million to acquiring firms’ shareholders. The economic magnitudes are also substantial for the other two measures. In Columns (2) and (3), a one-standard-deviation increase in *MajorALL* and *HHI* would decrease acquirer CARs by 76.48% and 50.74% on average, respectively. Unfavorable market reactions imply that a target with major customers imposes additional integration costs and reduces the intrinsic value of a merger. This corroborates the view that significant risks are embedded in a target’s concentrated customer base and support our hypothesis H1b.<sup>12</sup>

The coefficients for other control variables mainly produce predictable signs. Acquirers experience significantly lower returns among stock financing deals, consistent with Amihud et al. (1990). The higher stock price run-up prior to the announcement date destroys the acquirers’ shareholder value. This finding may capture a potential information leakage (e.g., Cai and Sevilir (2012), Masulis et al. (2007)). There is also a positive effect from leverage on acquirer returns (e.g., El-Khatib et al. (2015)).

[Table 4 is about here]

One of the criteria for a successful merger is total synergy gains. Hietala et al. (2003) suggest that the acquirer’s losses could be offset by the expectation of large synergy gains from the deal as a whole. To test the implications of the target’s customer concentration for the total takeover synergies, we estimate the regressions using the market-value-weighted average of the CARs for the acquirer and the target over a five-day event window around the announcement; that is, the combined CAR (-2, 2) is our dependent variable. The primary explanatory variables of interest are still the target’s customer concentration. We control for acquirer, target, and

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<sup>11</sup> If we use the a 5%, 15%, 20%, or 25% threshold of total sales to classify a customer as a major customer, the estimated coefficients for the three measures of customer concentration are consistently and negatively related to the acquirer CAR.

<sup>12</sup> Our main findings are robust to the inclusion of an industry-year fixed effect. For brevity, the results are not tabulated but are available on request.

deal characteristics that could affect the combined CARs. The results are reported in Appendix Table A2. Across all specifications, the extent of target's customer concentration is consistently and negatively related to the combined abnormal returns. The results confirm the notion that the target's customer concentration can interfere with post-merger integration and thereby stymie value creation for shareholders.

#### 4.2.2. Long-run buy-and-hold abnormal returns

The integration of two firms, including assets, organization, management, human resources, and corporate culture, requires a long length of time to be realized. Thus, the potential impact of acquiring a customer-concentrated firm on the post-acquisition operations is agnostic at the time of the merger announcement. Market participants might underestimate or overestimate the risks associated with the target's customer concentration base around the deal announcement and react differently after incorporating sufficient information. It is, therefore, necessary to examine whether the target's customer concentration persistently influences the acquirer's shareholders, specifically their wealth. We follow Rau and Vermaelen (1998) and measure long-term value creation using the post-merger stock returns of the acquirer over a three-period following the year of acquisition. BHARs indicate the difference between the buy-and-hold returns of a sample firm and that of the market portfolio proxied for by the value-weighted CRSP index returns over the one-, two-, and three-year periods following an M&A deal. Table 5 reports the results from the regression models.

Except for the coefficient for *Major Customer* in the two-year regression BHAR, all other coefficients on the post-merger abnormal stock returns over two-year horizon consistently exhibit significantly negative signs, suggesting that bidding a customer-concentrated firm not only affects the stock market assessment at the instant of the announcement but also destroys the shareholder value over a relatively long-term horizon. Taking *MajorALL* as an example, a one-standard-deviation increase in the proportion of sales to all major customers is associated with a decrease of 3.56% and 3.11% in abnormal returns for holding periods of one and two years, respectively. However, we find only one of three customer concentration measures (i.e. *HHI*) maintains its significance in three-year BHAR regressions, implying that the negative effect of target customer concentration become weakened.<sup>13</sup> Market investors may perceive that acquiring firms can learn how to deal with the issues brought by the major customers over a long horizon.

The unreported results for the control variables are similar to those in Table 4. Firms with a smaller size or a higher growth potential tend to perform worse in the long run, as these firms are not equipped to tackle the

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<sup>13</sup> Because of the concern for the noise in the long-run return variables, many studies only examine the BHAR performance over two-year horizons (e.g., Bouwman et al. (2009), Phan (2014), Oh (2018)).



problems associated with customer concentration, lack of bargaining power, for example. Likewise, a larger relative size of an acquirer to a target enhances the long-run stock market performance after the merger. Also, market reactions before the announcement and stock payments are negatively associated with the BHARs.

[Table 5 is about here]

In sum, Tables 4 and 5 consistently show a picture that acquiring targets with a concentrated customer base deteriorates acquirers' short- and long-term stock performance. These negative effects are significant, both statistically and economically, implies that acquirers may underestimate the risks associated with customer concentration.

#### 4.2.3 *Wealth transfer or performance effect*

CARs capture not only performance but also wealth transfer, and, thus, the deteriorating effect of target customer concentration on acquirer returns can be explained in two ways.<sup>14</sup> First, some prior studies show that mergers themselves do not create shareholder value but instead transfer wealth from acquirers to targets (e.g., Roll, (1986)). In our case, the acquirer may favor a target with major customers, as a strong and stable relationship between major customers and suppliers can generate many potential benefits, such as reducing transaction costs or shortening cash conversion cycles. The positive expectations may induce the acquirer to pay a premium for the target, further affecting the allocation of surplus created around the announcement dates between the acquirer and the target. Second, the acquisition of a customer-concentrated target is associated with substantial liquidity and business risks ex-post, which could deteriorate the long-run operating performance of the acquirer. To disentangle the two explanations of wealth transfer and performance effects from one another, we examine the relations between the target's customer concentration and, in turn, the takeover premium, the relative gain of the target, and the long-run operating performance of the acquirer.

The takeover premium is regarded as an important dimension along which to examine the source of gains or losses in a merger. We define the takeover premium as the difference between the price paid per share and the target share price 20 days prior to the announcement date, and we regress it on our customer concentration measures as well as on other firm- and deal-level controls.<sup>15</sup> The results are reported in the first three columns of Panel A of Table 6. Across all specifications, the estimated coefficients on the variables of customer concentration are insignificant, suggesting that the acquirer does not buy the customer-concentrated target at a higher premium. To further check whether the allocation of synergies is affected by the level of target's customer

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<sup>14</sup> We thank an anonymous reviewer for this insightful comment.

<sup>15</sup> Premiums are truncated at -100% and 200%, as suggested by Officer (2003).

concentration, following Ahern (2012), we calculate a relative gain of the target as the difference in dollar gains between the target and acquirer scaled by the sum of acquirer's and target's market value 50 days prior to the announcement date. The measure is specifically defined as  $\Delta\$Target\ CAR = \frac{Target\ MV \times TCAR - Acquirer\ MV \times ACAR}{Acquirer\ MV + Target\ MV}$ . In Columns (4)–(6), we find no evidence of a significant relation between  $\Delta\$Target\ CAR$  and our customer concentration measures. These results provide weak support to the explanation of wealth transfer, which suggests the acquirer pays a higher price and the target obtains a larger proportion of surplus created at the announcement.

Another way of explaining why target customer concentration is associated with low CARs is that market investors regard a concentrated customer base as a risk factor for post-merger operations. Thus, we test this prediction by investigating the impact on the operating performance of the acquirer. We use two measures of changes in ROA to reflect post-merger operating performance because change measures are more likely to capture the abnormal pattern (Barber and Lyon (1996)). The first one is the change in the acquirer's ROA between the year subsequent to the merger and the year prior to. In addition, following Healy et al. (1992), Chen et al. (2007), and Ben-David et al. (2020), we calculate an abnormal change in ROA over the 3-year horizon after the announcements by estimating the model as follows:

$$\frac{1}{3} \sum_{t=1}^3 (ROA_{i,t} - ROA_{ind,t}) = \alpha + \beta \frac{1}{3} \sum_{t=-3}^{-1} (ROA_{i,t} - ROA_{ind,t}) + \epsilon_{i,t}, \quad (4)$$

where  $i$ ,  $ind$ , and  $t$  denotes the acquirer, acquirer's industry, and year, respectively. Year 0 is the merger year. The right-hand side is the three-year average industry-adjusted ROA in pre-merger periods, and the left-hand side is the three-year average industry-adjusted ROA in post-merger periods. Thus, the residual from the regression, as our second performance measure, captures the average change in operating performance driven by the merger event.

Panel B of Table 6 reports the results. Across all specifications, the extent of the target's customer concentration is consistently and negatively related to the ROA-related measures. Take *Major Customer* as an example, the presence of a major customer in the target will significantly decrease the abnormal ROA of the acquirer by 0.8 percentage points. The results imply that buying a customer-concentrated target deteriorates the acquirer's long-run operating performance. Taken together, we cautiously conclude that the pessimistic expectations on the post-merger operating performance, instead of the wealth transfer between the acquirer and the target, lead to unfavorable market reactions surrounding the announcement dates.

[Table 6 is about here]

### 4.3. Endogeneity

Extensive literature has captured several good determinants of merger outcomes, such as board connections, director experience, and employee rights, which cannot be exhaustively controlled for in our estimations (e.g., Cai and Sevilir (2012), Field and Mkrtychyan (2017), John et al. (2015)). Hence, concerns about endogeneity may rise due to unobserved factors. Also, the relation between M&A performance and customer concentration in the abovementioned analysis is potentially subject to concerns about measurement error and estimation bias. Furthermore, if merger opportunities are predictable, targets may adjust their customer base in advance. In this case, observed relations between a target's customer concentration and announcement returns would be spurious. To address the endogeneity concerns, we perform several tests in following subsections.

#### 4.3.1. An instrumental variable approach

We first employ an IV approach to validate our findings. We construct two instrumental variables. The first instrument is the number of potential major customers for a target. A look at the customer data informs us that a large proportion of major customers are notable companies with a strong influence in their industry. For example, the well-known Wal-Mart Stores Inc., Cardinal Health Inc., Hewlett-Packard Co., Home Depot Inc., Intel Corp., and Samsung Electronics Co. are the six companies most frequently featured as major customers. Given that (a) public firms are more likely to be sizeable monopolists, and (b) the geographic distance between firms is crucial to the match of supplier and customer (Bönte (2008)), we construct a pool of potential major customers as the instrument for a target's customer concentration by using the weighted number of nearby public firms in the same industry as a target's major customers. Specifically, the instrument is structured as follows: (a) we manually collect the industry information of each major customer from the Compustat Segments Customer Database and calculate the customer composition for each industry, that is, a set of industry-pair indicators of sales from industry  $i$  to major customers in industry  $j$  scaled by total sales of industry  $i$ ;<sup>16</sup> (b) for a specific target  $q$  in industry  $i$ , we count the number of potential major customers, that is, public firms located in the  $q$ 's state and adjacent state in each customer industry  $j$  ( $j = 1, 2, \dots, J$ ) of industry  $i$  at time  $t$ ; and (c) we calculate an industry-weighted number of potential major customers for the specific target  $q$ , that

$$\text{is, } \sum_{j=1}^J \frac{\text{sales}_{i,j,t}}{\text{sales}_{i,t}} \times \text{number of listed firms nearby}_{q,j,t}.$$
<sup>17</sup>

<sup>16</sup> For example, in 2015, target companies whose SIC code was 3714 (motor vehicle parts and accessories) had 53.85% of their major customers coming from industry 3711 (motor vehicles and passenger car bodies), 38.46% from 3531 (construction machinery and equipment), and 7.69% from 5331 (variety stores).

<sup>17</sup> Some companies do not disclose their customer details. For example, the annual report of Robinson Nugent Inc. in fiscal year 1999

These procedures yield a firm-specific measure for each target, and we believe that they satisfy the two conditions of a valid instrument: relevance and exclusion. First, geographical proximity could increase the chance of customer-supplier match. The composition of potential major customers within a restricted distance from the target should affect the structure of the target's customer base. Second, the number of potential industry-weighted major customers will not directly affect M&A performance of an unrelated acquirer, aside from its influence on the customer concentration of the related target.

The second instrument is the one-year-lagged industry average of the number of major customers, that is, the mean for all firms—other than the target firm—in the same sector (three-digit SIC code) (see, e.g., Dhaliwal et al. (2016)). The industry average well represents the structure of customer base in the target's industry and other industry characteristics. The instrument is highly correlated with an individual target's customer base as it represents the structure of a supplier's industry. But it is less likely related to an acquirer's performance and merger outcomes after controlling for the individual target's risk.

Table 7 reports the results from a two-stage-least-square (2SLS) regression. The first-stage results of regressing each customer concentration measure on two instrument variables,  $\ln(1 + \text{weighted number of potential customers})$  and  $\ln(1 + \text{number of industry average major customers})$ , are presented in Columns (1)–(3) and Columns (4)–(6), respectively, of Panel A.<sup>18</sup> All estimated coefficients for the instrument are significantly positive and so validate the relevance condition. The Kleibergen-Paap LM statistics suggest that our instrument passes the under-identification test. Also, except for the HHI measure, F-statistics from the regressions for the other two measures imply that the weighted number of potential customers and the industry average variable do not suffer from the weak instrument problem.

The second-stage results across all columns of Panel B consistently show a significantly negative association between acquirer returns and target customer concentration. The magnitudes of economic influence are comparable to those from the baseline estimations: for example, from Column (2) of Panel B, we find that a one-standard-deviation increase in the instrumented  $\widehat{MajorALL}$  is associated with a reduction of 225 basis

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documents that the company has sales of approximately \$14 million to customer A, \$11 million to customer B, and \$10 million to customer C. In this case, we search for other target companies that share the same industry code and have data available for the major customers in the preceding two years of M&As, so as to proxy for the customer composition of those firms with absent information.

<sup>18</sup> The values of these two instruments are always positive, so they may suffer from the problem of skewed distribution. The standard deviation and mean value of the potential major customer IV are 5.228 and 5.423, and those of the industry average IV are 0.742 and 0.967. This finding implies a relatively large volatility within the data. The logarithmic transformation makes the data less skewed and improves the fitness of the OLS estimations. Nevertheless, we adopt the absolute versions of two instruments to ensure robustness. We consistently find strong evidence of a significantly negative association between the acquirer's returns and the target's customer concentration. The results can be provided on request.

points in the acquirer's five-day abnormal returns. The results for the 2SLS regression thus ensure our baseline findings: the pursuit of a customer-concentrated firm is more likely to destroy an acquirer's shareholder value.

[Table 7 is about here]

#### 4.3.2. *Durbin-Wu-Hausman test*

To formally test the extent of endogeneity, that is, unobserved heterogeneity at the firm level, which may decide both the level of customer concentration and M&A performance, we perform the augmented regression version of the Durbin-Wu-Hausman (DWH) test. Following the procedures in Davidson and MacKinnon (1993, chap. 7) and Drobetz and Momtaz (2020), we adopt a control function approach and model endogeneity in the error term. Specifically, we first model the endogenous customer concentration measures as a function of the exogenous regressors in our baseline model to obtain the residuals. In the second stage, we regress the acquirer CARs on each customer concentration measures, control variables, and particularly the DWH residuals.

According to Davidson and MacKinnon (1993), insignificant DWH residues in the second stage indicate that endogeneity is not a major concern. For each customer concentration measure, we test the endogeneity under this two-stage framework and report the results in Appendix Table A3. We find insignificant DWH residuals in all columns, suggesting that the observed customer-concentration-value relationship is less likely to be driven by unobserved heterogeneities.

#### 4.3.3. *Propensity score matching*

To further address the endogeneity issues, we perform additional analysis using propensity score matching (PSM) technique (Caliendo and Kopeinig (2008), Roberts and Whited (2013)). Specifically, we first regress the indicator variable for whether the target has at least one major customer on the firm- and deal-level controls introduced in the baseline model and compute the propensity score for each observation in our sample. Next, we one-to-one match the deals in the treatment group, that is, targets that have at least one major customer, with the remaining deals that have the closest propensity score. We require that the computed propensity score between the treatment and the match is within a maximum distance of 0.05. The procedure yields a matched sample consisting of 894 deals.

To evaluate the validity of our matching procedure, we first estimate a logit model predicting whether the target has at least one major customer, and we report the results for the full sample in Column (1), Panel A of Table 8, and for the PSM sample in Column (2). We find that all of the estimated coefficients for the control variables are insignificant in the PSM sample, and the pseudo- $R^2$  is less than 0.01%. Thus, none of the controls explains the variation in whether the target has major customers. Second, we present the statistics of the

predicted propensity score for the treatment and the matched groups. No discernable differences of these statistics can be found in Panel B. Third, we perform the mean difference tests for all controls between the treatment and the match. The univariate comparisons in Panel C show that the deals in the two groups are statistically indistinguishable with respect to those variables used to generate the matched sample. Together, the diagnostic tests strongly suggest that our matching is successful. Panel D reports the regression results of our baseline model using the PSM sample. Across all columns, the estimated coefficients for the target's customer concentration are negative and statistically significant, suggesting that buying a customer-concentrated firm harms the shareholder value of the acquirer. These results reinforce the causal effect in our models.

[Table 8 is about here]

#### **4.4. Acquirers' customer concentration**

The unfavorable market reaction and long-run operating performance of the acquirer imply that the presence of targets' major customers is associated with high business risks and expenses in post-merger operations. We posit that the acquirer bears the disadvantages of an increase in the concentration of customer base. However, the acquisition of a target with concentrated customers may not necessarily mean an increase of the customer concentration of the new combined entity.<sup>19</sup> Then, the bad performance may not be attributed to the business risks brought by the targets' customer concentration. To substantiate our analysis, we provide evidence on the change in the level of acquirers' customer concentration before and after M&As, as well as its effect on the acquirers' returns.

Using the methodology described in Section 3.2, we construct three measures of customer concentration for each acquirer at the year prior to the announcement and the year subsequent to, and calculate the change over the specified horizon. We first investigate whether pursuing a target with a concentrated customer base will increase the degree of customer concentration of the acquirer after the merger. Columns (1)–(3) of Table 9 report the results. We include the same firm and deal controls as in the baseline model and additionally control for an indicator for whether the acquirer has a major customer before the merger. Across all specifications, the results show a significantly positive relation between targets' customer concentration and the change in acquirer's customer concentration. Next, we examine the relation between the change of acquirers' customer concentration and announcement returns. The results in Columns (4)–(6) provide strong evidence that the increase in the

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<sup>19</sup> Take a simple numerical case for example. An acquirer has two major customers, each one taking 50% of the total sales. The HHI of the acquirer is 0.5. A target has one major customer taking 100% of its sales, and the HHI of the target is 1. Supposing that the acquirer is two times bigger than the target and there are no overlapped customers, the HHI of the combine entity is 0.344. In this case, acquiring a customer-concentrated target actually diversify the customer base of the acquirer. We thank an anonymous reviewer for point this out.

acquirers' customer concentrations lead to unfavorable stock market reactions surrounding the announcements. Overall, the findings in Table 9 suggest that the acquisition of a target with concentrated customers leads to an increase in the acquiring firm's customer concentration and also deteriorates merger performance.

[Table 9 is about here]

#### 4.5. Horizontal and vertical M&As

The motives behind the horizontal and vertical M&As are different. Many studies document that horizontal mergers can reduce the market competition and increase the bargaining power against either suppliers or customers (see, e.g., Levin (1990); Kim and Singal (1993)), and others suggest that horizontal mergers are motivated by efficiency improvement reasons (See, e.g, Eckbo and Wier (1985), Shahrur (2005), Bhattacharyya and Nain (2011)). Vertical mergers, however, allow firms to substitute the internal exchange within the boundaries of the firm for contractual or market exchanges (Fan and Goyal (2006)). Buying firms in the supplier or customer industries can reduce transaction costs and mitigate the hold-up problems (Perry (1989)). Such different motives of mergers may generate substantial heterogeneity in the relation between targets' customer concentration and acquirers' returns.

In horizontal mergers, acquiring a target with a concentrated customer base in the same industry might mitigate the business risk associated with the target's customer concentration, because the merged firm would have strong bargaining power against the target's major customers. In vertical mergers, acquiring an upstream target with a high level of customer concentration may strengthen the acquirer's position against its competitors that are the target's major customers. In this case, some existing major customers may choose to switch the supplier after the merger and the business risk of the merged firm will be significantly increased.<sup>20</sup>

To examine whether the effect of targets' customer concentration is heterogeneous, we follow Ahern and Harford (2014) to classify our deals into horizontal and vertical mergers. Horizontal mergers are identified by any overlap of industry codes between the acquirer and the target. Drawing on the data of Input-Output Table provided by the U.S. Bureau of Economic Analysis (BEA), we classify a deal as a vertical merger if any of the following four ratios exceed the threshold of 1%: (1) the percentage of the acquirer industry's sales that are purchased by the target industry, (2) the percentage of the target industry's sales that are purchased by the acquirer industry, (3) the percentage of the acquirer industry's inputs that are purchased from the target industry, and (4) the percentage of the target industry's inputs that are purchased from the acquirer industry. We also use

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<sup>20</sup> We thank an anonymous reviewer for pointing out these differences between horizontal and vertical deals.