# Financial Hedging and Corporate Investment*

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**Abstract**

Building on the well-documented relationship between corporate financial hedging and firms' borrowing costs, this study examines the impact of utilizing financial derivative instruments on corporate investment. We document that engaging in financial hedging enables firms to pursue more inorganic growth opportunities in the form of M&As. Acquiring firms with financial hedging programs have a lower borrowing cost and are more likely to pay for their deals with cash and use external borrowing. While financial hedging serves as a vehicle for firms to bring their inorganic investment plans to fruition by facilitating their financing, it also leads to inferior investment choices when conflicts of interest among managers and shareholders are more likely to arise. Our study shows for the first time that the financial flexibility emanating from corporate financial hedging can give rise to agency costs by instigating entrenched managers to overinvest.

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# 1 Introduction

Optimal hedging theories have identified various gains from corporate financial hedging including its tendency to alleviate financial constraints by reducing firms' borrowing costs and increasing their external financing capacity. Yet, while the financial flexibility associated with corporate financial hedging can enable firms to bring their investment plans to fruition, it might also amplify agency costs and ultimately lead to overinvestment.[1]

Accordingly, this study investigates the effect of utilizing financial derivatives on corporate investment through the lens of mergers and acquisitions (M&As). Arguably, M&As provide an ideal setting to study how financial hedging influences investment financing and quality, for the following reasons. First, M&As comprise the most important form of corporate investment frequently deployed as the main path to corporate growth. U.S. deal volume reached $1.50 trillion in 2017 according to SDC, while the total value of organic investment (CAPEX) for all U.S. firms for the same year was only $0.87 trillion.[2] Second, risk management is more of an issue for acquisition deals since they naturally entail more risk because of their inorganic nature and have been shown to frequently destroy shareholder value (Bruner, 2002; Moeller et al., 2005; Betton et al., 2008; Alexandridis et al., 2017). Third, M&As are more likely to be financed through external debt due to their capital intensiveness,[3] while payment method and financing information are more directly observable for M&A transactions than for CAPEX (e.g., Petersen and Thiagarajan, 2000; Campello et al., 2011),[4] allowing us to more effectively investigate the impact of financial hedging on investment financing decisions. Last, and perhaps more importantly, acquisition decisions have directly measurable quality which allows us to examine whether the

[1] Previous literature has documented that the financial flexibility associated with excess cash (Jensen, 1986; Harford et al., 2008; Von Beschwitz, 2018) and underleverage (Uysal, 2011) can lead to overinvestment.

[2] The figures reported here are for U.S. firms listed on NYSE, AMEX, or NASDAQ.

[3] According to Elsas et al. (2014), U.S. firms externally finance 67% of their capital expenditures and 83% of their acquisition deals.

[4] Cash, stock, and a combination of both comprise the main payment modes in acquisition deals while earlier literature has highlighted the importance of public debt and bank loans as key sources of funding in cash-financed transactions (e.g., Bharadwaj and Shivdasani, 2003; Faccio and Masulis, 2005; Harford et al., 2009; Uysal, 2011).

financial flexibility attained through financial hedging can ultimately lead to superior or inferior investment decisions.

Campello et al. (2011) show that firms using interest rate (IR) and foreign currency (FX) derivatives are subject to fewer investment restrictions in bank loan contracts and lower interest rates, fostering more organic investment for firms with financial hedging programs. However, due to its focus on CAPEX, for which financing and investment quality information are not directly observable, this study does not tackle the overarching question of whether financial hedging improves or hampers the quality of investment decisions. We conjecture that, while financial hedging can facilitate investment by reducing a firm's external financing costs, it may also give rise to agency costs associated with financial flexibility which leads to inferior investment decisions.

We study a sample of U.S. public acquisitions and collect financial hedging information for acquiring firms following Hoberg and Moon (2017) from 10-K reports filed prior to the deal announcement using the textual analysis software developed by MetaHeuristica LLC. The MetaHeuristica search index covers EDGAR filings between 1997 and 2011 so our sample of acquisitions spans 1998–2012. Among our sample M&A deals, 61% of acquirers use at least one of two types of financial derivatives: interest rate derivatives ($Ird$) and foreign currency derivatives ($Fcd$), in the fiscal year prior to the deal announcement. Around 47.5% of our sample acquirers use $Ird$ and 42.7% use $Fcd$ in the fiscal year prior to announcing acquisition deals.

Along with ordinary multivariate regressions,[5] we also adopt an instrumental variable (IV) approach as a quasi-experiment by augmenting the regression models with an endogenous binary treatment variable in order to address the possibility that our regression results are driven by omitted variables, simultaneity, or measurement errors. The IV in the first-stage regression should drive corporate financial hedging decisions but not be directly correlated with the dependent variable in the second-stage regression. Based on other literature (e.g., Smith and Stulz, 1985; Nance et al., 1993; Geczy et al., 1997;

[5]The term "ordinary" here refers to non-IV regressions.

Graham and Smith, 1999), one of the major reasons for firms to employ financial hedging programs is the associated tax savings. According to Graham and Smith (1999), financial hedging reduces firms' volatility in taxable liabilities, which in turn can lead to lower tax liabilities. The authors employ a simulation model to estimate a firm's incentive to hedge which is the convexity of the firm's tax function. To the best of our knowledge, there is no literature pointing to a direct relation between tax convexity and firms' financing choices in M&As. The tax convexity measure developed by Graham and Smith (1999) as an IV for financial hedging has also been utilized by Campello et al. (2011), Chen and King (2014), Ippolito et al. (2018), and Manconi et al. (2018). Since the endogenous variables in our regressions are discrete, we use a bivariate probit model when the dependent variable in the second-stage regression is discrete (e.g., Angrist, 2001; Karampatsas et al., 2014) and a treatment effect model if it is continuous. As an alternative way to address endogeneity concerns associated with any potential self-selection bias, we also employ a propensity score matching (PSM) approach by pairing derivatives users with similar non-users in our M&A sample based on observable firm and deal characteristics. Controlling for endogeneity with either method yields similar results with our ordinary multivariate regression tests.

We first examine the impact of corporate financial hedging on acquisitiveness: the likelihood of a firm carrying out acquisition investments. When comparing acquiring firms to randomly selected non-acquirers from the same fiscal year and industry, we find that the former are more likely to employ financial derivatives. Matching acquirers to non-acquiring firms based on additional firm characteristics, including industry, size, asset growth, stock return, Tobin's Q, and cash holdings, also points to a positive association between utilizing financial hedging instruments and the probability of a firm being an acquirer. For example, when the matching is based on a combination of industry, size, and asset growth, firms with hedging programs have a 6.4% higher probability (marginal effect) of announcing acquisition deals relative to their counterparts that do not utilize hedging instruments. Our test results confirm that firms with financial hedging programs in place are more likely to engage in acquisitions. Along these lines, corporate financial hedging has a significant role

to play in a firm's investment behavior; the use of financial derivatives at the corporate level can contribute towards alleviating financial constraints, enabling firms to carry out their M&A investment plans.

Next, we examine whether corporate financial hedging has an impact on M&A financing choices. We conjecture that the share of cash in acquisition offers should increase with financial hedging activities, for two reasons. First, financial hedging can facilitate access to external capital markets by reducing the probability of negative future cash flows, making derivatives users more likely to meet interest payments to creditors than non-users. Second, financial hedging can improve access to debt financing by reducing the borrowing cost. In accord with our hypothesis, we document a positive association between acquiring firms' hedging activity and the use of cash in the M&A offers. Acquirers with risk hedging programs have a 9.5% higher probability of paying for a deal entirely in cash compared to those not engaging in hedging activity. We also find that the typical M&A offer of derivatives users comprises 32.0% more cash than that of non-users. Since derivatives users generally have lower cash holdings than non-users in our M&A sample, the higher cash element, in this case, can be linked to acquirers' ability to raise financing through external borrowing.

In order to examine whether the higher propensity for cash payments can indeed be attributed to external borrowing, we collect external financing information on corporate bonds and loans for our sample M&A transactions from three sources: SDC M&A, SDC Global New Issues, and Loan Pricing Corporation (LPC) DealScan. We provide additional evidence that acquirers with financial hedging programs tend to use more external borrowing when paying for acquisitions. For instance, acquirers employing hedging programs have a 6.7% higher probability of utilizing external borrowing to finance their M&A deals. We also document a negative relation between the incidence of utilizing derivatives instruments and the borrowing costs associated with corporate bonds and loans issued around the M&A transaction window.

Finally, we examine the impact of corporate financial hedging on M&A synergistic

gains. If the resulting financial flexibility acts as a vehicle for firms to bring sound investment plans into fruition, then having a hedging program in place should enable them to create more synergies through their M&A investments. Conversely, if the ensuing financial flexibility gives rise to agency cost related managerial incentives, then it could instigate managers to overinvest, which would be manifested in suboptimal M&A choices. Utilizing the overall synergistic gain of M&A deals as a measure of investment quality, we find that firms that embark on financial hedging make acquisitions with a lower synergistic gain. For an average-sized deal in our sample, the total synergy creation is lower by $252 million for derivatives users. The negative relation between financial hedging and synergy creation from M&As appears to be driven by agency problems, since it is only evident among firms more prone to manager–shareholder agency conflicts. Accordingly, our evidence is consistent with the conjecture that the financial flexibility induced by hedging activity can exacerbate the agency costs arising from manager–shareholder conflicts, leading to overinvestment by entrenched managers, thus hampering the quality of corporate investment decisions.

Our study contributes to the existing literature in several important ways. First, we provide evidence that financial hedging and investment activities are inter-related; acquirers with financial hedging programs are more likely to undertake M&A investment projects, taking advantage of the more favorable financing terms and ample access to external financing. We thus contribute to the existing literature on the relation between the cost of borrowing and corporate investment by showing that financial hedging can serve as a vehicle for firms to bring their investment plans to fruition by lowering their borrowing cost and facilitating their financing. Second, this is to our knowledge the first study providing direct evidence on the role of financial hedging in investment financing choices. Our findings point to a significant role of financial hedging as a determinant of M&A financing over and above a firm's capital structure and other factors identified by the existing literature as determinants of the acquisition payment method (e.g., Travlos, 1987; Martin, 1996; Faccio and Masulis, 2005; Karampatsas et al., 2014). This result is

consistent with the view that financial hedging can improve a firm's borrowing capacity and reduce its borrowing costs, in accordance with the pecking order theory's prediction that the cost of capital should have a significant impact on a firm's investment and financing choices. Third, this paper directly addresses the overarching question of whether the financial flexibility attained through corporate financial hedging, allowing firms to bring their inorganic investment plans into fruition, has a positive or negative impact on the quality of corporate investment decisions. Accordingly, our study shows that under certain circumstances, hedging may exacerbate the agency cost arising from conflicts of interest between managers and shareholders, leading to overinvestment.

## 2 Hypothesis development and literature review

In this section, we develop our hypotheses, building from the existing literature on financial hedging, borrowing costs, corporate investment, financing decisions, as well as their inter-relationships. Two focal strands of the literature on corporate financial hedging have focused on why firms use financial derivatives (e.g., Nance et al., 1993; Geczy et al., 1997; Graham and Rogers, 2002; Knopf et al., 2002; Haushalter et al., 2007) and how financial hedging affects firm value (e.g., Guay, 1999; Allayannis et al., 2001; Hentschel and Kothari, 2001; Carter et al., 2006; Chen et al., 2017; Gilje and Taillard, 2017). Optimal hedging theories have shown that firms have incentives to engage in hedging activities due to market frictions such as taxes, information asymmetry, and transaction costs (e.g., Mayers and Smith, 1982; Smith and Stulz, 1985; Campbell and Kracaw, 1990; Froot et al., 1993; Leland, 1998; Kuersten and Linde, 2011). However, the empirical findings on the gains of financial hedging are inconclusive, with some studies documenting a positive impact on firm value (e.g., Adam and Fernando, 2006; Mackay and Moeller, 2007; Gilje and Taillard, 2017), while others not finding a significant relationship (e.g., Guay, 1999; Hentschel and Kothari, 2001; Jin and Jorion, 2006).

The impact of financial hedging on firm value can be largely attributed to the former's

relationship with the cost of capital. Froot et al. (1993) document that financial hedging improves a firm's ability to use internal cash and thus mitigate the financing restrictions on investment. Campello et al. (2011) argue that financial hedging reduces a firm's financial distress cost as well as the agency cost of risk-shifting. As a result, firms with financial hedging programs tend to be subject to more favorable bank loan terms. They also show that financial hedging can enhance a firm's investment opportunity set. Similar effects of commodity hedging on loan prices in oil and gas industry are also documented by Kumar and Rabinovitch (2013). Along these lines, Chen and King (2014) show that firms with financial hedging experience have lower borrowing costs in public debt markets, and attribute this to a reduction of agency costs related to underinvestment and risk-shifting, the lower information asymmetry, and the mitigation of the bankruptcy risk. Overall, financial hedging can reduce the likelihood of observing negative cash flows and mitigate information asymmetry, therefore contributing to a lower cost of borrowing and better access to credit markets.

Previous studies have also examined the relation between borrowing costs and investment decisions. The "underinvestment theory", first pioneered by Myers (1977), posits that firms tend to bypass profitable investment opportunities when external borrowing is expensive, hampering the after-interest profits available to shareholders. Theoretical studies have applied this theory when examining the interaction between firm financing frictions and investment decisions. For example, Stulz and Johnson (1985) develop a model in which secured debt can help firms mitigate the underinvestment problem because the associated borrowing cost is reduced due to the less stringent monitoring requirements relative to unsecured debt. Similarly, Berkovitch and Kim (1990) demonstrate that issuing new debt with a higher seniority than the average seniority of a firm's outstanding debt can reduce its cost of borrowing and boost the incentive to invest in positive net present value (NPV) projects. Consistent with these theoretical predictions, empirical studies provide evidence that the cost of borrowing has a significant impact on firms' investment activities. Using quarterly capital expenditure as a proxy for firms' investment choices, Chava and Roberts

(2008) examine the relationship between firms' financing restrictions and their investment decisions by focusing on debt covenants. They find that an increase in financing restrictions due to a violation of debt covenants results in investment cut-backs.

Given the inter-relationships among corporate financial hedging, borrowing costs, and investment decisions, a firm's financial hedging policy should have an impact on its investment decisions. On the one hand, financial hedging may reduce a firm's precautionary cash reserve due to the lower probability of covenant violations (Disatnik et al., 2014). Since firms with more cash holdings are more likely to engage in acquisitions (Harford, 1999a), financial hedging should decrease firms' propensity to undertake M&As. On the other hand, both Campello et al. (2011) and Chen and King (2014) find that financial derivatives users have lower external borrowing costs and better access to credit markets. Rehman (2007) argues that borrowing costs should have a significant effect on a firm's acquisition decisions and Harford and Uysal (2014) document that better access to credit markets can make a firm more acquisitive. This would imply that financial hedging should increase firms' propensity to undertake M&As. Consequently, the direction of the relationship between financial hedging and a firm's acquisitiveness remains an open empirical question. Our first testable hypothesis is derived as follows:

- ***Hypothesis (H1):*** *Firms with financial hedging programs are more likely to become acquirers.*

Next, we focus on the relationship between corporate financial hedging and M&A financing. According to the pecking order theory (Myers, 1984; Myers and Majluf, 1984) three sources of funds are available to the firm: internal cash, debt, and equity, and firms follow a financing hierarchy based on the different financing costs associated with these three sources, due to information asymmetry. Firms employ internal finance first, then external borrowing, and equity as the last resort. To this effect, when the amount of investment required exceeds a firm's retained cash and the cost of external borrowing is reduced as a result of financial hedging, firms should be more likely to opt for external borrowing to finance their investments. Since internal funds and external debt are the two

main sources of cash payments in M&As, we would naturally expect that lower borrowing costs would lead to a higher cash component in the M&A offer.[6] If financial hedging is associated with better access to external borrowing, then acquirers with financial hedging programs should be more likely to use cash as their method of payment in M&As.

In addition, Froot et al. (1993) and Altuntas et al. (2017) find that financial derivatives users have lower cash flow volatility than non-users and Minton and Schrand (1999) show that cash flow volatility is negatively associated with corporate investment. Although firms with financial hedging programs may have lower cash holdings (Disatnik et al., 2014), the cash flow stability they achieve through hedging risk exposures may allow them to more effectively plan ahead and utilize their expected cash flow to pay for M&As. Along these lines, our second testable prediction is stated as follows:

- ***Hypothesis (H2):*** *Acquirers with financial hedging programs are more likely to pay for their targets with cash.*

Our third hypothesis is directly linked to the fact that corporate financial hedging is typically associated with lower borrowing costs and cash holdings. Given the capital intensiveness of M&A investments, much of the cash component of an M&A offer typically stems from debt and we would expect this to be more pronounced the lower the cost of borrowing, which can be achieved through the use of financial derivatives. Hence, our third testable prediction is stated as follows:

- ***Hypothesis (H3):*** *Acquirers with financial hedging programs are more likely to finance their deals by external debt.*

Finally, our fourth hypothesis sets out to examine the overarching question of whether corporate financial hedging can enhance or impair the quality of corporate investment decisions. The documented financial flexibility emanating from utilizing financial derivatives

[6] Martin (1996) notes that there are three possible payment methods in M&As: cash, stock, or a combination of both. Although it is possible that an acquirer may issue new shares and use the cash proceeds to pay for a deal, this secondary equity offering (SEO) practice is relatively rare in M&As. Marina and Renneboog (2009) find that only 11% of equity-financed deals in their sample involve SEOs, while the remaining 89% of their equity-financed deals involve an outright stock swap.

can have both a negative or a positive effect. For instance, if financial hedging activities enable firms to take advantage of the lower borrowing costs and implement a value enhancing investment plan, then the M&A investments of those with a hedging program in place should create more synergies. On the other hand, if the resulting financial flexibility gives rise to agency costs and ill-fated managerial incentives (Jensen, 1986; Dittmar and Mahrt-Smith, 2007; Harford et al., 2008), this could lead to suboptimal M&A choices and overinvestment, manifested in inferior M&A synergistic gains. Moreover, such agency costs are more likely to arise in firms more prone to agency problems between the management and shareholders. Hence, our fourth testable prediction is stated as follows:

- ***Hypothesis (H4):*** *Acquirers with financial hedging programs that are more prone to agency conflicts between managers and shareholders will make acquisition deals with inferior synergistic gains.*

# 3 Data and sample description

## 3.1 M&A data

Our M&A sample is from Thomson SDC database and comprises U.S. deals announced during the period 1998–2012.[7] Both acquirers and targets are public firms. We also impose the following sample selection criteria: i) the deal status is either completed or withdrawn; ii) we exclude all minority stake purchases, acquisitions of remaining interest, privatizations, repurchases, exchange offers, self-tenders, recapitalizations or spinoffs; iii) the transaction value is at least $1 million and greater than 5% of the acquirer's market value; iv) the acquirer owns less than 50% of the target's shares before the transaction and seeks to own at least 90% following the deal completion; v) the acquirer has data available in Compustat and CRSP; vi) we exclude companies operating in the financial trading and

[7]The search index developed by MetaHeuristica LLC, which we use for collecting financial hedging data, is only available for the period 1997–2011, and hence the last year in our sample is 2012. In addition, the domestic sample enable us to avoid the significant impact of exchange rate changes in cross-border acquisitions (Lin et al., 2014; Chen et al., 2017).

banking industries according to the Fama–French 48 industry classification because they may hold financial derivatives for trading purposes.

## 3.2 Financial hedging data

We collect financial hedging data for acquirers from annual financial reports filed in the fiscal year prior to the deal announcement. Following Hoberg and Moon (2017), we use the textual analysis software developed by MetaHeuristica LLC (accessed via Application Programming Interface) to search for financial hedging information in acquirers' annual financial reports. The MetaHeuristica database covers firm electronic annual filings in the EDGAR database between 1997 and 2011. We search in 10-K and 10-K405 filings including subreports EX-13 and EX-13.1, since financial hedging information is typically reported there. We focus on IR and FX derivatives because they are directly related to a firm's external financing costs (Campello et al., 2011; Chen and King, 2014). We collect IR hedging data as follows:

1. To be recorded as an instance (hit) of IR derivatives use, there must be at least one word (or its plural form) from each of the following three groups:
    - interest rate
    - forward, future, option, swap, spot, collar, cap, ceiling, floor, lock, derivative, hedge, hedging, hedged
    - contract, position, instrument, agreement, obligation, transaction, strategy
2. We require that the distance between any two words from the above three groups is no more than 25 words.
3. We exclude false-positive hits with phrases such as: in the future, not, or insignificant.
4. We record the number of related hits for each acquirer's Central Index Key (CIK) code and fiscal year.[8]

[8] As in Hoberg and Moon (2017), we delete the hits only stating the definitions of financial derivatives.

We use the same process to collect information on the use of FX derivatives but replace the term "interest rate" with terms "currency, foreign exchange, exchange rate". To ensure that our collection process is optimal, we also use different variations of the above data collection criteria including alternative specifications of the keyword list as well as the distance between keywords. We then randomly select a subsample of acquirers and go through their financial reports. We compare the manually collected hit results with those obtained through different variations of the automated process discussed above, and find that the criteria we employ for the latter yield data that best matches the information collected manually. We obtain a sample of 1,738 cases for which financial hedging data is available for acquiring firms. Based on the number of hits, we derive an indicator variable $Ird/Fcd$ which is equal to one if there is at least one hit related to the use of either IR or FX derivatives for the fiscal year preceding the deal announcement, and zero otherwise.[9]

## 3.3 Deal financing data

To examine the impact of corporate financial hedging on the external borrowing linked to acquisition deals, we collect financing information from the SDC M&A database, SDC Global New Issues database, and LPC DealScan database. The SDC M&A database reports a deal's source of funding and classifies external borrowing in six sources: bank loan, debt, line of credit, bridge loan, foreign lenders, and junk bonds.[10] However, the deal financing information documented in the SDC M&A database is incomplete and thus we supplement it with information on private credit agreements and public corporate bond deals from the SDC Global New Issues and LPC DealScan databases. This additional external borrowing information is collected for a window from one year before the deal announcement to the deal completion.[11] Specifically, we match LPC DealScan with Com-

[9] See Section 5 for tests based on the alternative indicators of financial hedging.

[10] We go through all sources of funds descriptions in SDC to verify the source of funds. A sample of excerpts from SDC is included in Appendix B to show how deal financing information is disclosed.

[11] Using alternative windows such as from one week before the deal announcement to the deal completion or from one year before the deal announcement to one year after the deal announcement does not change our results.

pustat using the link table provided by Chava and Roberts (2008) and we match SDC Global New Issue with our M&A sample using the 6-digit CUSIP.

We derive a broad borrowing indicator variable, *Borrowing_broad*, based on the deal financing information collected following the process above. This is equal to one when the acquirer utilizes private or public borrowing credit facilities during the transaction window, and zero otherwise. We also employ a narrower version of the financing variable, *Borrowing_narrow*, which is equal to one only if the credit facility is intended for the financing of the corresponding M&A deal, and zero otherwise.[12] We note, however, that the variable *Borrowing_narrow* may underestimate an acquirer's use of external borrowing to finance M&A deals, as in some cases even loan facilities classified as "Corp. Purpose" can be used for financing acquisition deals (Gao et al., 2018).[13]

## 3.4 Summary statistics

The breakdown of deals in our M&A sample by deal announcement year and industry is reported in Table 1. In Panel A of the table, the distribution of deals among the sample years seems normal, although there are relatively more deals in the first half of the sample period.[14] The breakdown of sample acquirers by the Fama–French 10 industry classification is presented in Panel B of Table 1. Business equipment accounts for the largest share in our sample deals (37.51%), followed by other (13.35%),[15] healthcare (13.18%), and manufacturing (11.85%).

Table 2 reports the descriptive statistics for the control variables used in our main tests, partitioned by derivatives users and non-users based on the indicator variable $Ird/Fcd$.

[12]For the private credit contracts from DealScan, we check whether the "PRIMARYPURPOSE" is either "Takeover", "Acquis line", or "Merger". Then we manually verify whether the "TARGETCOMPANY" in each case corresponds to the target firm from the M&A deal in question. For public bond deals from SDC Global New Issues, we check whether the related M&A target's CUSIP (REL_MA_ACUSIP) is equal to that of the acquisition target.

[13]The inconsistency of the primary purpose of facility tagged "Corp. Purpose" between DealScan and firms' 10-Q filing is also noted by the Wharton Research Data Services (WRDS): https://wrds-www.wharton.upenn.edu/pages/support/data-overview/wrds-overview-dealscan/.

[14]The period 1998–2001 includes the technology bubble boom.

[15]According to the definition of the Fama–French 10 industry classification, "other" includes industries such as mining, construction and building materials, transportation, business services, and entertainment.

Detailed variable definitions are provided in Appendix A. Among our sample of 1,738 acquisitions, 1,061 (61.1%) are carried out by derivatives users while 677 (38.9%) deals are undertaken by non-users. The share of firms utilizing financial derivatives in our M&A sample is slightly higher than those shown in Campello et al. (2011) (50.1%) and Manconi et al. (2018) (43.3%). This divergence may be explained by a positive association between firms' employing financial hedging instruments and their propensity to engage in M&As, which is in accordance with Hypothesis (H1).

With regards to deal and acquiring firm characteristics, deals carried out by derivatives users are associated with a higher deal completion probability. Derivatives users tend to be larger firms than non-users and carry out deals of smaller relative size. Moreover, derivatives users have lower *Tobin's Q*, higher leverage, higher free cash flow-to-equity, lower cash holdings, higher collateral, and lower stock price runup than non-users. We later control for these characteristics when examining the impact of financial hedging on acquisition likelihood, financing choices, and deal synergies. Derivatives users also have a higher tax convexity than non-users, which supports the relevance condition of our IV.

# 4 Main results

## 4.1 Financial hedging and acquisition likelihood

In this section, we examine the relationship between corporate financial hedging and acquisition likelihood. According to our hypothesis, underinvestment should be less of a problem for firms that employ financial derivatives. This is because derivatives users tend to be subject to lower borrowing costs and exhibit more stable future cash flows, thus being more likely to undertake inorganic investment in the form of M&As (i.e., be more acquisitive).

#### 4.1.1 Baseline Results

Panel A of Table 3 provides a univariate comparison of the acquisition likelihood between derivatives users and non-users based on $Fcd/Ird$. Each acquirer is matched with a random non-acquiring firm from the same industry-year drawn from Compustat. We follow Ishii and Xuan (2014) and repeat this matching process 500 times with replacement. The randomly selected – through this bootstrapping approach – non-acquiring firms serve as the control sample. The panel reports the percentage of firms using financial derivatives in the M&A and control samples for matching processes based on the Fama–French 10, 30, and 48 industry classifications. The share of derivatives users in our M&A sample is higher than those in the control samples, and the differences are statistically significant at the 1% level. For instance, according to the matched sample based on the Fama–French 10 industry classification, 61% of acquirers employ at least one category of IR and FX derivatives, compared to only 41% of randomly selected non-acquirers. The results of our univariate tests based on simulation samples suggest that firms with financial hedging programs in place are more likely to carry out acquisition investments.

We also employ a multivariate regression framework on matched samples to examine the relationship between financial hedging and the likelihood of carrying out acquisition investments, controlling for a number of deal likelihood determinants that can be captured by our hedging indicators, hence driving our results. The dependent variable in the regressions, *Acquirer_dummy* is a binary variable taking the value of one if a sample firm is from our M&A deal sample, and zero if it is from the control sample. Following Harford (1999a) and Khan et al. (2012), acquirers are matched to non-acquirers from the Compustat/CRSP merged database in the same fiscal year prior to the deal announcement as well as different combinations of firm characteristics, including industry (Fama–French 10 industries), firm size, asset growth rate, stock returns, Tobin's Q, and cash holdings. For the continuous firm characteristics we employ a ±20% matching range, so an acquirer with a *Tobin's Q* of 1 would be matched to non-acquiring firms with a *Tobin's Q* between 0.8 and 1.2 in the fiscal year prior to the deal announcement. Following Bena and Li (2014), we limit the

number of matching firms to five by applying a random selection without replacement.

The logit regression results are reported in Panel B of Table 3. The independent variable of interest is the financial hedging variable $Ird/Fcd$. We control for variations in market valuation and growth opportunities, by including the one-year firm stock return over the fiscal year prior to the deal announcement $One\text{-}year\_return$ (Khan et al., 2012) as well as $Tobin's\ Q$ (Shleifer and Vishny, 2003; Rhodes-Kropf et al., 2005). We also control for the value of a company's cash reserves ($Cash\_holding$) (Harford, 1999a) as well as for acquirer size ($Size$), asset growth ($Asset\_growth$), leverage ($Leverage$), return on assets ($ROA$), and industry and year fixed effects.

Columns 1, 4, 7, and 10 of Panel B report the logit regression results for a matching process where acquirers are matched to non-acquiring firms based on different combinations of matching criteria as indicated at the top of the panel. The coefficients of the financial hedging proxy variable, $Ird/Fcd$, are all positive and statistically significant at the 1% level across different combinations of matching criteria. These results show that corporate financial hedging is positively associated with the probability that a firm carries out acquisition investments. The effect of financial hedging on the likelihood of a firm being an acquirer is economically significant. For instance, in Column 1, financial hedging increases the probability of announcing an M&A deal by 6.4%. Overall, our findings are consistent with our hypothesis that financial hedging programs can exert a positive influence on the firm's capacity to pursuing inorganic growth through undertaking M&A investments.

### 4.1.2 Instrumental variable estimation

A potential concern in corporate financial hedging studies is that firms do not make financial hedging decisions randomly (e.g., Campello et al., 2011; Chen and King, 2014; Manconi et al., 2018; Bartram, 2019). Accordingly, hedging strategy may be associated with unobservable firm characteristics (e.g., stakeholder and shareholder incentives) that can, in turn, affect M&A related decisions. Although we control for a set of important firm and deal characteristics as well as the industry and year fixed effects in our tests,

any omitted variables could still lead to biased regression results. It is also possible that a more acquisitive firm will naturally employ more financial hedging instruments due to an increase in its exposure to deal related financial risks. In this case, financial hedging and acquisition decisions would be jointly determined, leading to a simultaneity problem. Finally, despite our hedging measures capturing firms' hedging activity directly, we cannot entirely rule out measurement errors in our independent variable of interest. All the above would give rise to endogeneity concerns, casting doubts on the causality of our main results.

In order to mitigate potential endogeneity problems, we employ an IV approach as our identification method (e.g., Heckman, 1978; Greene, 2007; Wooldridge, 2010; Allayannis et al., 2012). In the first-stage regressions, we estimate an acquirer's decision to use financial derivatives ($Ird/Fcd$) as a function of various deal and firm characteristics, as well as year and industry fixed effects. Following the existing literature, we use $Tax\_convexity$ as an IV in the first-stage regressions. The incentives behind corporate financial hedging have been discussed and examined in previous studies. Tax related benefits have been identified as one of the major rationales for firms to hedge. Along these lines, if a firm has a convex function of tax schedule, financial hedging can smooth the taxable income of the company and thus reduce its expected tax liability (e.g., Mayers and Smith, 1982; Smith and Stulz, 1985; Nance et al., 1993; Mian, 1996; Geczy et al., 1997). In theory, there are two main factors contributing to the convexity of a firm's tax schedule: tax shields (Zimmerman, 1983) and the progressivity of a firm's corporate tax structure (Smith and Stulz, 1985). Empirical studies also provide evidence in support of hedging incentives being driven by these two factors (e.g., Nance et al., 1993; Mian, 1996; Geczy et al., 1997). Graham and Smith (1999) adopt simulation methods to model the convexity of a firm's tax schedule and estimate it based on a 5% reduction in the volatility of taxable income. They further provide evidence for the tax related benefits of corporate financial hedging. Following Graham and Smith (1999) and Campello et al. (2011), we define $Tax\_convexity$ for our

sample firms using the formula below:

$$\begin{aligned} Tax\_convexity =& 4.88 + 0.019TIVol - 5.50TICorr - 1.28D_{ITC} + 7.15D_{SmallNeg} \\ &+ 1.60D_{SmallPos} + D_{NOL}(3.29 - 4.77D_{SmallNeg} - 1.93D_{SmallPos}) \end{aligned}$$

where $TIVol$ is the volatility of a firm's taxable income, $TICorr$ is the serial correlation of the taxable income, $D_{ITC}$ is a dummy variable indicating whether the firm has investment tax credits, $D_{SmallNeg}$ is a dummy variable capturing small negative taxable income between $-\$500,000$ and \$0, and $D_{SmallPos}$ is a dummy variable indicating small positive taxable income between \$0 and $\$500,000$.

The tax convexity estimated by Graham and Smith's (1999) model has been adopted by Campello et al. (2011), Chen and King (2014), Ippolito et al. (2018), and Manconi et al. (2018) as an IV to address the endogeneity problem in corporate financial hedging decisions. Our IV satisfies the exclusion restriction because it is unlikely that $Tax\_convexity$ is associated directly with the M&A related decisions. Our IV also satisfies the relevance condition given the theoretical predictions on how $Tax\_convexity$ can motivate firms to hedge. Table 2 provides support on this by showing that the difference of $Tax\_convexity$ between the derivatives user and non-user sample is statistically significant. Finally, it is unlikely that there exists any systematic correlation between potential measurement errors in our hedging variables and $Tax\_convexity$.

In the second-stage regressions, we replace the financial hedging indicator variable with the predicted probability of financial hedging from the first-stage regressions. According to Angrist (2001), when the endogenous explanatory variable ($Ird/Fcd$) is binary, non-linear models in the second-stage regressions do not provide consistent estimates if the model specifications are not absolutely correct. Since the dependent variable ($Acquirer\_dummy$) in the second-stage regressions is discrete, we employ a bivariate probit model (Karampatsas et al., 2014).

Columns 2–3, 5–6, 8–9, and 11–12 of Table 3 Panel B present the results of the IV regressions. In the first-stage regressions, the coefficients of $Tax\_convexity$ are all positive

and statistically significant at the 1% level, suggesting that our IV meets the relevance condition. Untabulated test statistics show that Shea's partial $R^2$ values are above 10% and the F-statistics are above 10 providing further support for the relevance of our instrument in the first-stage regressions. Comparing the F-statistics with the critical values of Stock and Yogo (2005) for the weak instrument test, we are able to reject the null hypothesis that our IV is weak. Comparing the coefficients of $Ird/Fcd$ in logit regressions and the coefficients of the instrumented $Ird/Fcd$ in bivariate probit regressions, we observe that although the $Ird/Fcd$ coefficient estimates are positive and statistically significant for both approaches, the magnitude of the IV coefficient estimates is larger. This could indicate that the potential endogeneity problems may lead to a downward bias on the coefficients of $Ird/Fcd$ in the logit regressions. One possible reason is that omitted variables related to a firm's attitude toward investment or financial management policy can have a positive impact on inorganic investment while, at the same time, impinge on the use of financial derivatives. For example, a firm with a more aggressive growth strategy may be more acquisitive but does not hedge specific financial risks with financial derivatives due to its neglect of risk management in the process of attaining rapid growth. Moreover, a preference for operational hedging over financial hedging could result in utilizing acquisitions as an operational hedging tool (e.g., forward/backward integration or diversifying deals) to mitigate firm risk exposures, in place of using financial derivatives. The resulting correlation between financial hedging and the residuals in the logit regressions could be driving the coefficients of $Ird/Fcd$ downwards. The IV identification method can tackle this endogeneity issue, thus resulting in higher $Ird/Fcd$ coefficients. Alternatively, the higher coefficients of $Ird/Fcd$ in the IV regressions may be due to the magnitude of the local average treatment effect estimated by the IV regressions being larger than the true population average treatment effect, even when our IV satisfies the standard exclusion restriction (Jiang, 2017). For instance, the impact of financial hedging on firms' acquisition decisions may be significantly larger for firms with a financial hedging policy that is more responsive to the tax benefits from financial hedging, which in turn can result in inflated

$Ird/Fcd$ coefficients in our second-stage IV regressions.

In the second-stage regressions, where the dependent variable is *Acquirer_dummy*, the estimated coefficients for all the predicted hedging indicator variables continue to be positive and statistically significant at the 1% level. After correcting for potential endogeneity problems, the IV estimation results support our hypothesis predicting a significantly positive relation between corporate financial hedging and the propensity to undertake acquisitions.

## 4.2 Financial hedging and M&A payment method

In this section, we examine the relationship between corporate financial hedging and the payment method used in M&As. Typically, a deal is paid for with cash, stock, or a combination of both. According to our hypothesis, acquirers with financial hedging programs should exhibit lower cash flow variability and have better access to external capital markets. Therefore, derivatives users should be expected to use more cash to pay for M&As. We employ three payment mode variables. *Pure_cash* is an indicator variable equal to one for deals paid with 100% cash payment, and zero otherwise. *Cash_major* is an indicator variable equal to one if more than 50% of the payment is in cash, and zero otherwise. Finally, we use a continuous variable, *Pct_cash*, which captures the percentage of cash consideration in the offer.

Similar to Section 4.1, we use both ordinary multivariate regressions and the IV approach to examine the relation between payment method and the hedging indicator $Ird/Fcd$, controlling for variables that have been linked to the M&A payment mode in earlier literature. Specifically, we control for acquirer cash holdings ($Cash\_holding$) (e.g., Martin, 1996; Duchin et al., 2010; Disatnik et al., 2014), free cash flow ($Cashflow/Equity$) (e.g., Jensen, 1986; Karampatsas et al., 2014; Yang et al., 2019), borrowing capacity ($Collateral$) and capital structure ($Leverage$) (e.g., Chaney et al., 1991; Faccio and Masulis, 2005), market timing ($Runup$) (e.g., Savor and Lu, 2009; Akbulut, 2013; Fu et al., 2013), information asymmetry between inside and outside shareholders ($Average\_EPSSD$)

(e.g., Brown and Ryngaert, 1991; Boone et al., 2014; Eckbo et al., 2018), ownership structure (*Blockholder_ownership*) (e.g., Harris and Raviv, 1990; Yook et al., 1999; Harford et al., 2012a), and growth opportunities (*Tobin's Q*) (e.g., Martin, 1996; Dass et al., 2016). We also control for deal characteristics, such as acquirer toehold (*Toehold*), deal attitude (*Hostile*), tender offer (*Tender_offer*), industry relatedness between the acquirer and target (*Related_industry*), multiple bidders (*Competition*), and the target-to-bidder relative size (*Relative_size*). Finally, we include the year and industry fixed effects. The detailed definitions for these control variables are in Appendix A.

Table 4 reports the regression results. In Columns 1 and 4, we employ a probit regression model since the dependent variable is a binary variable (*Pure_cash* or *Cash_major*). In Column 7, we use a tobit regression model since the dependent variable is continuous and takes values between zero and one (*Pct_cash*) . To address potential endogeneity, we also report the IV regression results in Columns 2–3, 5–6, and 8–9. We adopt a bivariate probit model when the dependent variable in the second-stage regression is binary, and a treatment effect model when it is continuous (Heckman, 1978; Wooldridge, 2010).

The coefficients of the financial hedging variable *Ird/Fcd* are all positive and statistically significant, suggesting that the use of financial derivatives contributes to a higher likelihood of cash being used in the M&A offer. In Column 1, a marginal effect test shows that there is a 9.5% higher probability that deals carried out by derivatives users are financed entirely with cash (*Pure_cash*) relative to those carried out by non-users. Our result for *Cash_major* in Column 4 captures a similar pattern. A marginal effect test shows that the probability of cash major financing is 5.9% higher for acquirers utilizing at least one type of IR and FX derivatives than non-users. In Column 7, we examine the relationship between financial hedging and the percentage of cash in the deal offer (*Pct_cash*) as reported in SDC. The coefficient of *Ird/Fcd* remains positive and statistically significant, suggesting that the use of IR and FX derivatives contributes to a higher percentage of cash in M&A offers. Column 7 shows that, on average, the occurrence of corporate financial hedging increases the percentage of cash consideration in an acquisition offer by

32%. For our IV regressions, the coefficients of instrumented $Ird/Fcd$ in the second-stage regressions continue to be positive and statistically significant at the 1% level. Overall, our test results are consistent with our hypothesis that acquirers utilizing financial derivatives are more likely to pay for their M&A deals with cash.

## 4.3 Financial hedging and M&A external financing

So far, our results suggest that corporate financial hedging increases firms' propensity to engage in M&As as acquirers and enables them to directly finance their inorganic growth plans with cash. According to our hypotheses, the documented pattern stems from the external borrowing cost reduction properties of financial hedging. Given the capital intensiveness of M&A transactions and the fact that derivatives users are typically associated with lower precautionary cash reserves (Disatnik et al., 2014), the documented propensity to pay with cash can be in fact attributed to external borrowings. In this section, we offer further insights on the impact of financial hedging on external debt financing in M&As.

Untabulated summary statistics show that 60.2% of the acquirers in our M&A sample make use of credit facilities ($Borrowing\_broad$) around the transaction window (from one year before the deal announcement to the deal completion). Further, derivatives users are linked to more external borrowing activities than non-users: 74.1% of derivatives users finance their deals through external borrowings compared to only 47.7% of non-users. In terms of M&A deal-specific borrowings ($Borrowing\_narrow$) around the transaction window, 22.3% of the acquirers in our M&A sample use external borrowings directly attributed to the corresponding M&A transaction while 26.0% of derivatives users finance their deals through external borrowings compared to only 16.5% of non-users. Untabulated univariate tests indicate that the mean differentials of $Borrowing\_broad$ and $Borrowing\_narrow$ between derivatives users and non-users are statistically significant at the 1% level.

Table 5 reports the results of ordinary multivariate regressions and the IV approach. In the first case, we employ a probit model and control for various deal and firm characteristics. In Columns 1 and 4, the coefficients of $Ird/Fcd$ are positive and statistically

significant, suggesting that the use of financial derivatives contributes to more external borrowing. Column 1 (4) indicates that acquirers with financial hedging programs have a 6.7% (4.9%) higher probability of using external financing (deal-specific borrowing) to fund their M&A deals. After controlling for the potential endogeneity, the coefficient of instrumented $Ird/Fcd$ in the second-stage of IV regressions continues to be positive and statistically significant at the 1% level when the dependent variable is *Borrowing_narrow* in Column 6, although the coefficient becomes statistically insignificant for *Borrowing_broad* in Column 3.

Overall, our results suggest that corporate financial hedging has a significant impact on the likelihood of acquirers raising funds through external borrowing to finance their acquisition investments. This is consistent with our hypothesis that the use of financial derivatives will be associated with a lower cost of borrowing, therefore, enabling firms to finance capital intensive investment projects such as M&As with external debt.

## 4.4 Financial hedging and M&A deal synergies

In this section, we examine the impact of corporate financial hedging on M&A deal synergies. According to Hypothesis (H4), the financial flexibility stemming from financial hedging can potentially lead to overinvestment and hence inferior investment decisions, especially in firms more prone to the conflicts of interest between managers and shareholders. We conjecture that if the financial flexibility arising from hedging activity gives rise to agency cost related managerial incentives, then it can lead to firm overinvestment.[16] Following Bradley et al. (1988), Lin et al. (2011), Custódio and Metzger (2013), and John et al. (2015), we use the value-weighted average of acquirer and target abnormal returns over a 5-day announcement window $(-2, +2)$ to capture the market's perceived synergy creation for a deal (*Synergy*). We employ both the ordinary least squares (OLS) and treatment effect models to examine the relation between deal synergistic gains and finan-

[16] In the same spirit, Krüger et al. (2015) find that managers using a single discount rate to evaluate target firms or investment projects across divisions subject to different costs of capital can distort firm valuations and affect investment decisions.

cial hedging. In addition to the control variables employed in Section 4.2 and 4.3, we also control for payment method ($Pct\_cash$) (e.g., Travlos, 1987; Shleifer and Vishny, 2003; Savor and Lu, 2009). The OLS regression results are reported in Column 1 of Table 6. The coefficient of $Ird/Fcd$ in the OLS regression is negative and statistically significant, suggesting that on average acquisitions undertaken by derivatives users are associated with a 1.3% lower deal synergistic gain than those undertaken by non-users. This is equivalent to a lower overall synergy creation of $252 million for an average-size deal.[17] Column 3 shows that the coefficient of $Ird/Fcd$ remains negative and statistically significant in the second-stage regression of the treatment effect model. Overall, our findings suggest that the financial flexibility associated with financial hedging leads to inferior firm investment choices, as measured by deal synergistic gains.

If the documented relationship between deal synergies and financial hedging is attributed to the agency cost of financial flexibility (Jensen, 1986; Dittmar and Dittmar, 2008; Harford et al., 2008), then it should be stronger in firms more prone to the conflicts of interest between managers and shareholders. Accordingly, although the alleviation of external financing constraints can enable firms to pursue attractive investment opportunities, it may also motivate entrenched managers to overinvest in suboptimal acquisitions. To investigate this possibility, we repeat our original analysis within subsets of high and low agency conflict enviroments. For brevity, we only report the second-stage of the treatment effect models for our subsample analyses, although our results are consistent for OLS regressions. First, we split our sample based on the median of $CEO\_pay\_slice$, which is the ratio of an acquirer CEO's total compensation to the total compensation of the five highest-paid executives in the firm. Bebchuk et al. (2011) find that the CEO pay slice measures a CEO's power relative to other top executives and captures the CEO's ability to extracts rents. Columns 4 and 5 of Table 6 show that the coefficient of the instrumented $Ird/Fcd$ is negative and statistically significant for the high $CEO\_pay\_slice$ subsample, while it is statistically insignificant for the low $CEO\_pay\_slice$ subsample. Second, we

[17] This is estimated for an average-size acquirer and target in our M&A sample.

divide our sample based on whether an acquirer CEO also holds the board chairman's role ($CEO\_duality$). Core et al. (1999) and Goyal and Park (2002) use the CEO-chair duality to proxy for ineffective governance structure and find it associated with reduced CEO turnover sensitivity to firm performance and excessive compensation. Columns 6 and 7 show that the coefficient of the instrumented $Ird/Fcd$ is negative and statistically significant for firms with CEOs holding a dual role, while it is statistically insignificant for the rest of the cases.[18] These results suggest that the inferior M&A synergistic gains associated with financial hedging are concentrated among acquirers where the manager–shareholder conflict is likely to be more pronounced, hence giving rise to a higher agency cost of financial flexibility. This comes with significant implications for firms utilizing financial derivatives and their shareholders, as it suggests that corporate financial hedging can give rise to agency cost related managerial incentives, leading to overinvestment.

Along these lines, we also examine whether the financial flexibility induced by utilizing hedging instruments prompts derivatives users to engage in serial acquisitions. Multiple deals carried out by the same companies have been used as a proxy for managerial hubris and are associated with suboptimal acquisition choices (e.g., Fuller et al., 2002; Guest et al., 2004; Ahern, 2008; Billett and Qian, 2008). The dependent variable $Repeat\_acquirer$ is an indicator taking the value of one if an acquirer undertakes more than one acquisition during our sample period, and zero otherwise. The regression results of probit and bivariate probit models are presented in Columns 8–10. The coefficients of $Ird/Fcd$ are positive and statistically significant at the 1% level in both models, indicating that derivatives users are more likely to be repeat acquirers than non-users. Column 8 shows that, all else equal, derivatives users are 15.4% more likely to be repeat acquirers than non-users.

Overall, our results suggest that although financial hedging may reduce firm external financing costs and increase firm acquisitiveness, the financial flexibility emanating from it can also give rise to agency costs by instigating entrenched managers to overinvest.

[18]Since 37.2% of our sample acquirers are not in the S&P 1500 index, we choose not to use the traditional corporate governance entrenchment indexes in our subsample analyses.

# 5 Robustness and additional tests

Next, we perform several additional tests to check the robustness of our results.[19]

## 5.1 Alternative measures of financial hedging

In our main analyses, the hedging indicator variable $Ird/Fcd$ is equal to one if there is at least one hit related to the use of either IR or FX derivatives, and zero otherwise. To examine the robustness of our results to alternative measures of financial hedging, we conduct additional untabulated tests with $Ird$ ($Fcd$), an indicator variable equal to one if there is at least one hit related to the use of IR (FX) derivatives, and zero otherwise, and $Hedging\_scope$, a categorical variable taking an integer value ranging from zero to two capturing the number of financial derivatives types employed by an acquiring firm. Our main results remain robust to employing these alternative proxy variables for financial hedging.

Next, we examine the robustness of our results using the total and net notional value of derivatives (Graham and Rogers, 2002) to construct continuous measures of financial hedging, instead of indicator variables. We note however that the notional value information disclosed by firms about their hedging positions might be incomplete after Statements of Financial Accounting Standards (SFAS) No. 133 superseding SFAS No. 119 in 2000 (Geczy et al., 1997; Allayannis and Weston, 2001). As a result, recent financial hedging studies tend to use categorical hedging variables capturing whether firms utilize specific types of financial derivatives (e.g., Geczy et al., 1997; Chen and King, 2014; Manconi et al., 2018). We manually collect the total and net notional values of hedging positions for the derivatives users in our sample from their annual financial reports. Following Campello et al. (2011), we exclude cases where we do not have sufficient information to derive the total or net notional value while we also scale these values by the book value of total assets (Purnanandam, 2008; Campello et al., 2011). Replacing our hedging indicator $Ird/Fcd$

[19] For brevity, some of the test results are not reported in the paper but are available upon request.

with the ratio *Hedging_total_notional* and *Hedging_net_notional* in our regressions,[20] we find that the direction of our main results and conclusions remain largely unaffected.

## 5.2 Financial hedging and deal related borrowing costs

Our main results are consistent with the conjecture that financial hedging plays a significant role in determining a firm's propensity to undertake acquisition investments, the deal financing choice, and acquisition synergistic gains. While our hypotheses predict that these relationships are driven by the borrowing cost curbing role of financial hedging, we have not provided direct evidence that financial derivatives users are in fact subject to lower borrowing costs when financing their deals. In this section, we delve into the relation between the use of financial hedging instruments and external borrowing costs at both the borrowing-facility (loan or bond) and deal level.[21]

To this end, we collect deal related loan and bond data for our sample of acquiring firms from LPC Dealscan and SDC Global New Issues over a period of one year prior to the deal announcement up to the deal completion.[22] The bond-level borrowing cost is recorded as the "Basis Point Spread Over Treasury" multiplied by 100, which is the percentage point spread of a bond over a U.S. Treasury bill with a comparable maturity. The loan-level borrowing cost is recorded as "All-In-Spread" for each loan facility multiplied by 100, which gives the percentage point spread of the loan over LIBOR or LIBOR equivalent plus any related facility fees.[23] The corresponding borrowing costs at the deal level are computed as the value-weighted average of the costs for all facility-level borrowings issued

[20] *Hedging_total_notional* (*Hedging_net_notional*) equals to the total (net) notional value of the acquirer's hedging positions divided by the acquirer's book value of total assets at the fiscal year end prior to the deal announcement.

[21] A deal can be financed by several loans or bonds. Therefore, for a sample deal, there may be multiple observations at the borrowing-facility level, but there is only one observation at the deal level.

[22] Our results remain robust when using alternative event windows: from one week before the deal announcement to the deal completion and from one year before the deal announcement to one year following the deal announcement.

[23] We include all loan facilities without setting any restrictions on the base rate a loan is tied to, as LPC converts all spreads into LIBOR-based terms (Hubbard et al., 2002; Graham et al., 2008; Hertzel and Officer, 2012). However, since Hertzel and Officer (2012) point out that there is a systematic difference between the borrowing costs of loans tied to the U.S. prime rate and LIBOR, we repeat our tests in this section by excluding non-LIBOR-based loans and our results remain robust.

during the transaction window defined above. [24]

Regression results for both the OLS and treatment effect models are reported in Table 7. In these regressions, we control bond and loan characteristics on top of all the control variables employed in our main empirical analyses. The bond and loan characteristics at the deal level are computed as the value-weighted averages of the corresponding facility-level characteristics. Our results show that financial hedging significantly reduces the deal related borrowing costs for bonds and loans, at both the borrowing facility and deal levels. The relationship is economically significant. For example, in Columns 1 and 7, derivatives users are subject to a lower borrowing cost than non-users by 42.5 basis points and 42.8 basis points for their deal related bonds and loans, respectively. This result is consistent with the conjecture that financial hedging is a determinant of deal related borrowing costs, and highlights its role as a vehicle for firms to manage their borrowing costs in order to bring their investment plans to fruition.

## 5.3 Propensity score matching

A potential weakness of our IV approach is that although it accounts for unobserved confounding variables, the exclusion restriction for the selected IV may not be fully met. In this section, we adopt a propensity score matching (PSM) process as an alternative identification approach to tackle potential endogeneity concerns. While the IV approach involves using an IV linked to financial hedging but not correlated with M&A related decisions to control for *unobservable* differences in firm characteristics between derivative users and non-users, the PSM approach generates a matching group of non-users that are similar to derivatives users based on *observable* firm and deal characteristics. In the case of the PSM, the difference in M&A related choices between the two groups can then be attributed to financial hedging, which tackles the concern that corporate financial hedging decisions may be non-random.

[24] As the borrowing costs of bonds and loans are based on different benchmarks, we have to compute the deal level borrowing costs for bonds and loans separately.

We first run a probit model to estimate the propensity score of each acquirer employing financial hedging instruments. The dependent variable for the probit models is $Ird/Fcd$ and the explanatory variables include all the firm and deal characteristics we have controlled for in our main tests. We then use the estimated propensity scores to construct the matched sample using one-to-one nearest-neighbor matching without replacement. A caliper of 1% is applied. In untabulated tests, we test the difference in each explanatory variable used in the above probit model between derivatives users and the matched non-users. The results confirm that the covariate balance is achieved.

We then use the matched sample described above and re-estimate the impact of financial hedging on our main dependent variables of Section 4. We report the ordinary multivariate regression results in Table 8. All the results are consistent with earlier tests, confirming that our main results are robust after we balance the observable firm and deal characteristics between derivatives users and non-users.

## 5.4 The impact of CFO attributes

Our tests so far suggest that financial hedging plays an important role in driving a firm's acquisition behavior. A potential issue arises from the possibility that the decision to employ financial derivatives is driven by characteristics not controlled for in our main tests. This could lead to a situation where derivatives users would be more acquisitive even if they had not utilized financial derivatives. One such prominent case stems from considering that a firm's CFO typically plays a critical role in both setting financial hedging policy (Tufano, 1996; Servaes et al., 2009) as well as M&A investment processes (Bertrand and Schoar, 2003; Huang and Kisgen, 2013; Shi and Chen, 2019). As a result, the CFO's attributes might be separately linked to both the likelihood of engaging in financial hedging as well as a lower borrowing cost or finding creative solutions to finance the firm's investment plans.[25] Along these lines, CFO-specific characteristics such as quality, commitment, power, career concern, and knowledge about the derivatives market comprise significant omitted variables

[25] We thank an anonymous referee for pointing out this angle.

in our main tests. To address this concern, we investigate whether our results survive after directly controlling for a number of important CFO characteristics that can be potentially associated with both financial hedging and M&A related decisions.

We collect CFO information for our sample acquirers from Boardex complemented with information from Execucomp.[26] We classify an executive as a CFO if the job title (ROLENAME) is "CFO", "Chief Finance Officer", "Chief Financial Officer", or "Principal Financial Officer". We exclude the cases where the job title is prefixed by "Region", "Division", "Area", or "Deputy". Overall, we are able to identify CFO information for 81.6% of our sample deals (1419 deals).

We construct the following variables to capture different CFO personal traits: i) $CFO\_financial\_expertise$ to indicate whether a CFO has previous investment/trading experiences in the financial markets (Badolato et al., 2014; Custódio and Metzger, 2014);[27] ii) $CFO\_top\_universities$ to indicate whether a CFO has graduated from a top university (Gompers et al., 2016), which has been linked to managerial quality (Bhagat et al., 2010; Custódio and Metzger, 2014; Benmelech and Frydman, 2015; Falato et al., 2015; Miller et al., 2015; King et al., 2016);[28] iii) $CFO\_age$ and $CFO\_tenure$ to capture a CFO's age and tenure in her CFO role, since both of the traits have been documented to be associated with an executive's risk preferences and corporate financial decisions (Diamond, 1989; Hirshleifer and Thakor, 1992; Yim, 2013; Serfling, 2014; Ali and Zhang, 2015; Croci

[26]Since our sample acquirers include both S&P 1500 and non-S&P 1500 firms, using Execucomp alone for CFO information would lead to losing almost half of our observations.

[27]CFOs' employment histories are obtained from Boardex. Following Custódio and Metzger (2014), we classify a CFO with investment experience if she has previously worked at banking or financial trading companies (SIC code starting with 60, 61, 62, or 67) or in investment related positions at a non-financial company. Since our focus is on the CFO's expertise related to investment or trading, we thus do not take accounting or financial management related experience into account. The SIC codes of the past employers are obtained from Compustat for public firms and manually collected from Datastream, Manta, or Google for private firms (Custódio and Metzger, 2014; Wang et al., 2015). In the spirit of Badolato et al. (2014), we look for keywords "investment director", "investment manager", "fund manager", "asset manager", and "trader" in the titles of a CFO's past employment to identify investment related roles in a non-financial firm.

[28]Following Gompers et al. (2016), we take the following as the top universities in the world: Brown, Berkeley, Cambridge, Chicago, Columbia, Cornell, Dartmouth, Harvard, Princeton, Pennsylvania, Yale, Amherst, Caltech, Duke, INSEAD, London Business School, London School of Economics, MIT, Northwestern, Oxford, Stanford, University of California, and Williams College.

et al., 2017), managerial entrenchment (Berger et al., 1997; Bertrand and Schoar, 2003), career concern (Bertrand and Schoar, 2003), experience (Aier et al., 2005; Liu et al., 2016), as well as financial hedging policy (Tufano, 1996); iv) *CFO_on_board* to indicate whether an acquiring firm CFO sits on the board of the acquirer as board membership is related to a CFO's power and impact on firm policy (Adams and Ferreira, 2007), financial flexibility (Florackis and Sainani, 2018; Mobbs, 2018), and financial statement quality (Bedard et al., 2014); and finally, v) *CFO_external_positions* (Fich and Shivdasani, 2006) to control for CFO commitment in light of the evidence that the number of external director positions is associated with firm performance (Hauser, 2018).[29]

Table 9 reports the results from IV regressions when controlling for all the above CFO related variables in addition to all the control variables and fixed effects included in our main tests. It appears that the direction and significance of our main hedging variable remains robust to the inclusion of these additional control variables.[30] As a result, it is unlikely that CFO attributes are behind the relationship between financial hedging and acquisition related decisions documented in this paper.

## 5.5 The role of CEOs' exposure to stock prices

In Section 4.4, we have shown that the financial flexibility emanating from hedging may give rise to agency costs by instigating entrenched managers to overinvest. To align CEOs' incentives with shareholders' interests, firms usually adopt equity-based managerial compensation to increase the exposure of CEOs' personal wealth to stock prices (Jensen and Murphy, 1990). In this section, we discuss if there exists a "double agency problem" associated with corporate hedging when CEOs get excessive exposure to firm stock prices.[31] That is, CEOs may adopt financial hedging to reduce their own exposure to firm stock

[29]Following Fich and Shivdasani (2006), we define *CFO_external_positions* as the number of external positions a CFO holds from the fiscal year preceding the deal announcement year up to the deal announcement. Our results remain robust if we focus only on external board seats.

[30]Although in the tests presented we include all CFO related variables simultaneously, our results are similar when including each of the additional controls individually.

[31]We thank an anonymous referee for suggesting this analysis.

prices, which further amplifies the agency costs associated with financial hedging.

First, we test whether firms whose CEOs have larger exposure to their stock prices are more likely to engage in financial hedging activities. To measure a CEO's personal wealth exposure to his firm's stock price, we use the *Delta* of a CEO's stock and option portfolio. Following Core and Guay's (2002) one-year approximation method, *CEO_Delta* is defined as the natural logarithm of the dollar value change in a CEO's stock and option portfolio for a 1% change in the underlying stock price. In Column 1 of Table 10, we employ a probit regression model where the dependent variable is *Ird/Fcd* and the independent variable of interest is *CEO_Delta*. In Column 2 of Table 10, we control CEO characteristics ($CEO\_ownership$, $CEO\_Vega$, $CEO\_age$, and $CEO\_firm\_wealth$) on top of all the control variables used in the corresponding baseline empirical analyses (Section 4.4). Columns 1 and 2 of Table 10 show that the coefficients of *CEO_Delta* are positive and statistically significant at the 1% level, suggesting that firms whose CEOs have larger exposure to firms' stock prices are more likely to employ financial derivatives. Our results are consistent with Knopf et al. (2002) who also document a positive association between the sensitivity of managers' total portfolios to stock prices and firms' hedging activities.

Second, we examine whether firms with CEOs who are more exposed to their firms' stock prices are more likely to engage in diversifying deals, which is an alternative way for managers to utilize the company resources to reduce their own risk exposure. In Column 3 of Table 10, we employ a probit regression model in which the dependent variable is a diversifying deal indicator variable (1 for diversifying deal and 0 otherwise) and the independent variable of interest is *CEO_Delta*. In Column 4 of Table 10, we further control for the deal, firm, and CEO characteristics. Columns 3 and 4 show that the coefficients of *CEO_Delta* are positive and statistically significant, suggesting that firms whose CEOs have a higher exposure to their stock prices are more likely to diversify their business as this can serve as a vehicle for those CEOs to reduce their risk exposures.

Third, we test whether the documented inferior deal synergistic gains associated with financial hedging is more pronounced for firms with CEOs having a high stock price ex-

posure. We divide our sample into two sub-samples based on the median of *CEO_Delta*. Then we repeat our synergy treatment effect tests, as those reported in Columns 2 and 3 of Table 6, over these two sub-samples. Columns 5 and 6 of Table 10 report the second-stage regression results. We find that the coefficient of the instrumented *Ird/Fcd* is negative and statistically significant for firms with high *CEO_Delta*, while it is statistically insignificant for firms with low *CEO_Delta*. These results confirm that the documented inverse relationship between financial hedging and M&A synergistic gains is more pronounced for CEOs whose stock and option portfolios have a higher sensitivity to stock price.

Overall, our results confirm the possibility of a "double agency problem" that the decision of using financial derivatives itself is partially driven by managerial compensation incentives and therefore the agency issue associated with financial hedging can be further exaggerated when CEOs get excessive exposure to the firms' stock prices.

## 5.6 Financial hedging and its interaction with other factors

Our results in Section 4.4 suggest that financial hedging may instigate entrenched mangers to undertake M&As with inferior synergistic gains. In this section, we further examine the impact of financial hedging on M&A deal synergies by taking into account some factors linked to M&A deal quality in the previous literature (Harford, 1999a; Masulis et al., 2007; Harford et al., 2012a; Alexandridis et al., 2013). Specifically, we focus on how financial hedging interacts with these factors and, more importantly, whether financial hedging remains a significant predictor of deal synergies after controlling for the effect of these factors, as well as their interactions with financial hedging.

We examine the following three factors that are associated with suboptimal M&A choices: i) *Relative_size* is the ratio of deal value to the acquirer's market value. Previous studies show that larger deals are associated with greater shareholder losses in M&As, which can be attributed to the greater degree of complexity associated with such transactions (Alexandridis et al., 2013), the larger private benefits for acquiring firms' managers (Grinstein and Hribar, 2004), and amplified managerial overconfidence (Roll, 1986; Mal-

mendier and Tate, 2008); ii) $Cashflow/Equity$ is the acquirer's cash flows standardized by its market value to account for the findings of previous studies showing that in light of the exaggerated agency cost of free cash flow, cash-rich firms tend to make inferior acquisitions choices (Harford, 1999b); iii) $Low\_CEO\_pay\_slice$ is a dummy variable indicating whether the ratio of a CEO's total compensation to the sum of the five highest paid executives' total compensation is lower than the sample median, which serves as a proxy for the potential agency problem related to managerial incentives. Previous studies show that entrenched managers are more likely to undertake empire-building acquisitions (Masulis et al., 2007; Harford et al., 2012b). To examine the impact of financial hedging over and above these factors, we have added the three variables themselves, as well as the interaction terms between $Ird/Fcd$ and each of the three variables in the treatment effect regressions as reported in Table 6.

Untabulated results show that in the second-stage regressions of our treatment effect model, the coefficients of $Ird/Fcd * Relative\_size$ are positive and statistically significant, suggesting that the inverse relationship between financial hedging and deal synergies is less pronounced when the deal relative size is larger. Next, the coefficients of $Ird/Fcd * Cashflow/Equity$ are also positive and statistically significant, suggesting that the negative effects of financial flexibility emanating from financial hedging is less pronounced when the firm has higher free cash flow. In addition, the coefficients of $Ird/Fcd * Low\_CEO\_pay\_slice$ are positive and statistically significant, indicating that the inferior synergy creation associated with financial hedging is significantly mitigated when firms have less manager–shareholder agency conflicts. Yet, the coefficients of $Ird/Fcd$, which capture the direct effect of financial hedging on M&A synergetic gains, remain negative and statistically significant in all model specifications, which points to financial hedging having a direct impact on deal synergies after controlling for a battery of factors associated with suboptimal M&A choices.

Taken together, our results indicate that although financial hedging interacts with the previously studied factors leading to suboptimal M&A choices, there still exists a significant

direct effect of financial hedging on deal synergies.

# 6 Conclusion

In this paper, we examine the impact of corporate financial hedging on corporate investment. We present evidence that the use of financial derivatives increases the likelihood of a firm undertaking capital intensive inorganic investments in the form of M&As. Along these lines, we find that acquiring firms with financial hedging programs in place are more likely to pay for their deals with cash, utilize external borrowing, and have a lower borrowing cost. This is consistent with the view that financial hedging can serve as a vehicle for firms to bring their inorganic investment plans to fruition and facilitating their financing through mitigating financing restrictions. We also provide evidence that firms employing financial hedging instruments make inferior investment choices when conflicts of interest among managers and shareholders are likely to be more pronounced. This suggests that the financial flexibility emanating from corporate financial hedging can give rise to agency costs by instigating entrenched managers to overinvest.

# Appendix A

**Table A1: Variable definitions**

| Variable | Definition | Source |
|---|---|---|
| **Payment/Financing characteristics** | | |
| *Acquirer_dummy* | Indicator variable: 1 if firms attempt at least one acquisition, 0 otherwise. | SDC |
| *Pure_cash* | Indicator variable: 1 for deals with 100% cash payment, 0 otherwise. | SDC |
| *Cash_major* | Indicator variable: 1 for deals with more than 50% cash payment, 0 otherwise. | SDC |
| *Pct_cash* | The percentage of cash payment involved in the M&A transaction. | SDC |
| *Borrowing_broad* | Indicator variable: 1 if an acquirer utilizes any private or public borrowing credit facilities during the transaction windows without setting any restrictions on the purpose of these facilities, 0 otherwise. | SDC/Global New Issue/DealScan |
| *Borrowing_narrow* | Indicator variable: 1 if an acquirer utilizes credit facilities with the primary purpose of financing the corresponding M&A deals, 0 otherwise. | SDC/Global New Issue/DealScan |
| *Synergy* | Total synergy creation of the deal measured by the value-weighted average of acquirer and target 5-day cumulative abnormal returns around the deal announcement day. | CRSP/Compustat |
| *Repeat_acquirer* | Indicator variable: 1 if an acquirer undertakes more than one acquisition during the sample period, 0 otherwise. | SDC |
| *Bond_borrowing_cost* | Bond level: the percentage point spread of a bond over a Treasury bill with a comparable maturity ("Basis Point Spread Over Treasury"×100); Deal level: the value-weighted average of each bond's borrowing cost at the bond level, with the value being the amount of each bond issued by an acquirer between one year before the deal announcement and the deal completion. | Global New Issue |
| *Loan_borrowing_cost* | Loan level: the percentage point spread of a loan over LIBOR or LIBOR equivalent plus any related facility fees ("ALL-IN-SPREAD"×100). Deal level: The value-weighted average of each loan's borrowing cost at the loan level, with the value being the amount of each loan facility issued by an acquirer between one year before the deal announcement and the deal completion. | Dealscan |
| **Deal characteristics** | | |

Continued on next page

**Table A1 – continued from previous page**

| Variable | Definition | Source |
|---|---|---|
| *Complete* | Indicator variable: 1 if a deal is successfully completed, 0 otherwise. | SDC |
| *Toehold* | Indicator variable: 1 if an acquirer holds a non-zero percentage of the target's shares before the deal announcement, 0 otherwise. | SDC |
| *Hostile* | Indicator variable: 1 if a deal is classified as hostile, 0 otherwise. | SDC |
| *Tender_offer* | Indicator variable: 1 if a deal is classified as a tender offer, 0 otherwise. | SDC |
| *Related_industry* | Indicator variable: 1 if an acquirer and target share the same first two-digit SIC, 0 otherwise. | SDC |
| *Competition* | Indicator variable: 1 if there is more than one bidder, 0 otherwise. | SDC |
| *Relative_size* | Transaction value over the market value of an acquirer at the fiscal year end prior to the deal announcement. | SDC/Compustat |
| **Other controls** | | |
| *Size* | The acquirer's book value of total assets at the fiscal year end prior to the deal announcement, in bil. 2012 U.S.$. | Compustat |
| *Tobin's Q* | The acquirer's book value of assets plus the market value of equity minus the book value of equity, divided by its book value of assets at the fiscal year end prior to the deal announcement. | Compustat |
| *Leverage* | The acquirer's book value of debt over its book value of assets at the fiscal year end prior to the deal announcement. | Compustat |
| $Cashflow/Equity$ | The acquirer's income before extraordinary items plus depreciation minus dividends on common and preferred stocks divided by the acquirer's market value at the fiscal year end prior to the deal announcement (Karampatsas et al., 2014). | Compustat |
| *Cash_holding* | The acquirer's cash and short-term investments divided by total assets at the fiscal year end prior to the deal announcement. | Compustat |
| *Collateral* | The acquirer's property, plant and equipment normalized by total assets at the fiscal year end prior to the deal announcement. | Compustat |
| *Runup* | The acquirer's market adjusted buy-and-hold return over the $(-205, -6)$ window relative to the announcement day (Golubov et al., 2012). | CRSP |
| *Average_EPSSD* | The standard deviation of analysts' forecasts on the acquirer's stock price during the fiscal year prior to the deal announcement. | IBES |

Continued on next page

**Table A1 – continued from previous page**

| Variable | Definition | Source |
|---|---|---|
| *Blockholder_ownership* | The acquirer's blockholder ownership at the fiscal year end prior to the deal announcement (Karampatsas et al., 2014). | 13-F |
| *One-year_return* | The acquirer's stock return over the fiscal year prior to the deal announcement. | CRSP |
| *Asset_growth* | The growth of the total asset of an acquirer over the fiscal year prior to the deal announcement. | Compustat |
| *ROA* | The return on assets over the fiscal year prior to the deal announcement. | Compustat |
| *Tax_convexity* | The convexity of the firm's tax schedule, as defined in Section 4.1 (Graham and Smith, 1999; Campello et al., 2011). | Compustat |
| *CFO_fin_expertise* | Indicator variable: 1 if an acquirer's CFO has previously worked in the banking or financial trading industries (SIC Code starting with 60, 61, 62, or 67) or worked as investment related roles (investment director, investment manager, fund manager, asset manager, and trader) in a non-financial firm (Custódio and Metzger, 2014; Badolato et al., 2014; Wang et al., 2015). | Boardex/Compustat-/Datastream/Manta-/Google |
| *CFO_top_uni* | Indicator variable: 1 if an acquirer's CFO holds a degree from one of the following universities: Brown, Berkeley, Cambridge, Chicago, Columbia, Cornell, Dartmouth, Harvard, Princeton, Pennsylvania, Yale, Amherst, Caltech, Duke, INSEAD, London Business School, London School of Economics, MIT, Northwestern, Oxford, Stanford, University of California, and Williams College (Gompers et al., 2016). | Boardex |
| *CFO_tenure* | The natural logarithm of the number of years since an acquirer's CFO starts the role. | Boardex |
| *CFO_age* | The natural logarithm of the age of an acquirer's CFO. | Boardex & Execucomp |
| *CFO_on_board* | Indicator variable: 1 if an acquirer's CFO is also the firm's board of director, 0 otherwise. | Boardex |
| *CFO_external_position* | The number of external positions which the acquirer's CFO holds at the deal announcement. | Boardex |
| *Loan_maturity* | The maturity of a loan measured as the number of years left before the loan's expiration date. | Dealscan |
| *Loan_amount* | The facility amount of a loan, in billions of U.S. dollars. | Dealscan |
| *Loan_short_maturity* | Indicator variable: 1 if the maturity of a loan is less than 11 months (Kumar and Rabinovitch, 2013; Schwert, 2018). | Dealscan |

Continued on next page

**Table A1 – continued from previous page**

| Variable | Definition | Source |
|---|---|---|
| *Bond_maturity* | The maturity of a bond measured as the number of years left before the bond's expiration date. | Global New Issue |
| *Bond_amount* | The amount of a bond, in billions of U.S. dollars. | Global New Issue |
| *Bond_rating* | Indicator variable: 1 if a bond is rated as non-investment grade (below $BBB-$) by Standard & Poor's. | Global New Issue |
| *CEO_pay_slice* | The ratio of a CEO's total compensation to the sum of five highest paid executives' total compensation. | Execucomp/Capital IQ/Boardex |
| *CEO_duality* | Indicator variable: 1 if an acquirer's CEO is also its board chairman, 0 otherwise. | Execucomp/ISS/-Boardex |
| *CEO_age* | The natural logarithm of the age of an acquirer's CEO. | Execucomp |
| *CEO_Delta* | The natural logarithm of an acquirer CEO's *Delta*. *Delta* is the dollar value change in a manager's stock and option portfolio associated with a 1% change in the underlying stock price (Core and Guay, 2002). | Execucomp |
| *CEO_Vega* | The natural logarithm of an acquirer CEO's *Vega*. *Vega* is the dollar value change in a manager's stock and option portfolio associated with a 0.01 unit change in the underlying stock return volatility (Core and Guay, 2002). | Execucomp |
| *CEO_firm_wealth* | The value of an acquirer CEO's stock and option portfolio, in billions of U.S. dollars. | Execucomp |
| *CEO_ownership* | The percentage of shares held by an acquirer's CEO. | Execucomp/ISS/-Boardex |
| **Financial hedging variables** | | |
| *Ird/Fcd* | Indicator variable: 1 if an acquirer engages in financial hedging (either interest rate or foreign currency) in the fiscal year prior to the deal announcement, 0 otherwise. | EDGAR 10-K |

# Appendix B

In this appendix, we present examples of external borrowing related information from SDC on selected deals in our sample. The statements in quotes are from "Source of Funds" in SDC. Each deal is linked to a unique SDC deal number.

**Bank Loan**

**775308020** SPX Corp announced a deal to acquire General Signal Corp on 20/07/1998: "The transaction was financed via a *$1.65 bil facility underwritten by Chase Manhattan Bank, consisting of a 1.4 mil term loan and $250 mil of revolving credit.*"

**787551020** Maxxim Medical Inc announced a deal to acquire Circon Corp on 20/11/1998: "The transaction was financed through *bank borrowings of up to $325 mil from NationsBank NA and NationsBanc Montgomery Securities.*"

**1064738020** Weyerhaeuser Co announced a deal to acquire Willamette Industries Inc on 13/11/2000: "The transaction was financed through a commitment from *Morgan Stanley Senior Funding Inc and Chase Manhattan Bank to provide senior bank financing in the aggregate amount of $5.3 bil.*"

**Bridge Loan**

**1220000020** Dominion Resources Inc announced a deal to acquire Louis Dreyfus Natural Gas Corp on 07/09/2001: "The cash portion of the transaction was financed with *a bridge loan facility*, which was *to be replaced with proceeds from a combination of permanent debt financing* and equity hybrids."

**1284207020** Quest Diagnostic Inc announced a deal to acquire Unilab Corp on 02/04/2002: "The cash portion of the transaction was financed with *a new $550 mil one year bridge loan facility from Bank of America and Merrill Lynch Capital Corp.*"

**1527077020** Deluxe Corp announced a deal to acquire New England Business Service Inc on 17/05/2004: "The transaction was financed through *a $800 million bridge financing arranged by Bank One, NA, The Bank of New York and Wachovia Bank, National Association.*"

**Debt**

**860058020** International Game Technology announced a deal to acquire Sodak Gaming Inc on 11/03/1999: "Then transaction was financed through a *$1 bil issue of 7.84% bonds.*"

**954115020** Honeywell International Inc announced a deal to acquire Pittway Corp on 20/12/1999: "The transaction was financed through *issuing commercial paper at prevailing market terms* and expects that it will repay some or all of such commercial paper with proceeds from the sale of longer-term debt in the public or private debt markets."

**1417227020** Armor Holdings Inc announced a deal to acquire Simula Inc on 23/07/2003: "The transaction was financed through *the private placement of $150 mil in senior subordinated notes due 2013*."

**Line of Credit**

**1523992020** Pioneer Natural Resources Co announced a deal to acquire Evergreen Resources Inc on 04/05/2004: "The transaction was to be financed via *a $900 mil, 364-day senior unsecured revolving credit facility underwritten by JPMorgan Chase Bank*."

**733499020** Hadco Corp announced a deal to acquire Continental Circuits Corp on 17/02/1998: "The transaction was financed with approximately *$222 million of borrowings pursuant to an existing $400 million senior revolving credit loan facility with BankBoston*."

**1830244020** Moog Inc announced a deal to acquire ZEVEX International Inc on 12/01/2007: "The transaction was financed by its *existing revolving credit facility*."

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**Table 1: Sample distribution**

This table reports the distribution of M&A deals in our sample. The final sample includes 1,738 U.S. public M&As announced between 1998 and 2012. Acquirers and targets have CRSP and Compustat data, and acquirers have 10-K reports available on EDGAR for the fiscal year prior to the deal announcement. Panel A reports the distribution of M&A deals in our sample by deal announcement year and Panel B by acquirer Fama-French 10 industry.

**Panel A. Distribution of sample acquisitions by announcement year.**

| Year | Number | Percentage |
|---|---|---|
| 1998 | 216 | 12.43% |
| 1999 | 226 | 13.00% |
| 2000 | 196 | 11.28% |
| 2001 | 158 | 9.09% |
| 2002 | 96 | 5.52% |
| 2003 | 106 | 6.10% |
| 2004 | 88 | 5.06% |
| 2005 | 95 | 5.47% |
| 2006 | 105 | 6.04% |
| 2007 | 94 | 5.41% |
| 2008 | 89 | 5.12% |
| 2009 | 67 | 3.86% |
| 2010 | 80 | 4.60% |
| 2011 | 58 | 3.34% |
| 2012 | 64 | 3.68% |
| Total | 1,738 | 100.00% |

**Panel B. Distribution of sample acquisitions by acquirer industry.**

| Fama–French 10 industries | Number | Percentage |
|---|---|---|
| Business Equipment | 652 | 37.51 |
| Other | 232 | 13.35 |
| Healthcare, Medical Equipment, Drugs | 229 | 13.18 |
| Manufacturing | 206 | 11.85 |
| Wholesale, Retail, and Some Services | 115 | 6.62 |
| Telephone and Television Transmission | 82 | 4.72 |
| Oil, Gas, and Coal Extraction and Products | 75 | 4.32 |
| Consumer NonDurables | 65 | 3.74 |
| Utilities | 51 | 2.93 |
| Consumer Durables | 31 | 1.78 |
| Total | 1,738 | 100 |

**Table 2: Sample summary statistics**

This table reports the descriptive statistics for our sample of M&As described in Table 1. The number of observations, means, and standard deviations for each variable are reported for the full sample, the sample of derivative users, and non-users. Derivatives users and non-users are determined based on the variable *Ird/Fcd*. The full sample, derivatives user sample, and derivatives non-user sample include 1,738, 1,061, and 677 observations, respectively. The statistical significance levels from t-tests for difference in means of each variable across derivatives users and non-users are shown in the last column. Variable definitions are provided in Appendix A. $*$, $**$, and $***$ stand for statistical significance at the 10%, 5%, and 1% levels.

| | **Full sample (1,738)** | | | **Derivatives user (1,061)** | | | **Derivatives non-user (677)** | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Variable** | **Obs.** | **Mean** | **Std. Dev.** | **Obs.** | **Mean** | **Std. Dev.** | **Obs.** | **Mean** | **Std. Dev.** | **Diff** |
| **Deal characteristics** | | | | | | | | | | |
| *Complete* | 1,738 | 0.835 | 0.371 | 1,061 | 0.879 | 0.326 | 677 | 0.767 | 0.423 | *** |
| *Toehold* | 1,738 | 0.032 | 0.175 | 1,061 | 0.032 | 0.176 | 677 | 0.031 | 0.173 | |
| *Hostile* | 1,738 | 0.024 | 0.154 | 1,061 | 0.025 | 0.155 | 677 | 0.024 | 0.152 | |
| *Tender_offer* | 1,738 | 0.187 | 0.390 | 1,061 | 0.209 | 0.407 | 677 | 0.152 | 0.359 | *** |
| *Related_industry* | 1,738 | 0.631 | 0.483 | 1,061 | 0.604 | 0.489 | 677 | 0.672 | 0.470 | *** |
| *Competition* | 1,738 | 0.078 | 0.268 | 1,061 | 0.074 | 0.261 | 677 | 0.084 | 0.278 | |
| *Relative_size* | 1,692 | 0.431 | 0.944 | 1,041 | 0.380 | 1.025 | 651 | 0.515 | 0.790 | *** |
| *Pct_cash* | 1,738 | 0.467 | 0.451 | 1,061 | 0.548 | 0.448 | 677 | 0.340 | 0.426 | *** |
| **Acquirer characteristics** | | | | | | | | | | |
| *Size* | 1,738 | 14.367 | 39.329 | 1,061 | 20.702 | 42.742 | 677 | 4.439 | 30.793 | *** |
| *Tobin's Q* | 1,697 | 2.746 | 4.279 | 1,036 | 2.381 | 2.546 | 661 | 3.318 | 6.029 | *** |
| *Leverage* | 1,738 | 49.096 | 24.807 | 1,061 | 53.690 | 22.289 | 677 | 41.897 | 26.780 | *** |
| *Cashflow/Equity* | 1,735 | -0.005 | 0.901 | 1,059 | 0.045 | 0.292 | 676 | -0.084 | 1.393 | *** |
| *Cash_holding* | 1,738 | 0.199 | 0.211 | 1,061 | 0.160 | 0.176 | 677 | 0.261 | 0.245 | *** |
| *Collateral* | 1,729 | 0.233 | 0.217 | 1,054 | 0.247 | 0.214 | 675 | 0.212 | 0.220 | *** |
| *Runup* | 1,733 | 1.206 | 0.738 | 1,060 | 1.155 | 0.582 | 673 | 1.287 | 0.926 | *** |
| *Average_EPSSD* | 1,460 | 1.285 | 17.430 | 930 | 1.792 | 21.553 | 530 | 0.396 | 4.574 | |
| *Blockholder_ownership* | 1,738 | 0.149 | 0.135 | 1,061 | 0.146 | 0.130 | 677 | 0.152 | 0.143 | |
| *Tax_convexity* | 1,667 | 11.168 | 16.863 | 1,036 | 14.087 | 20.241 | 631 | 6.376 | 6.477 | *** |

**Table 3: Financial hedging and acquisitiveness**

**Panel A. Univariate tests on simulation samples.** The panel reports financial hedging statistics for firms engaging in M&As and control samples of firms that do not carry out M&A investments. Each sample acquirer is matched to a random firm drawn from the sample acquirer's industry in the same year as the deal announcement and we repeat the bootstrap process 500 times. The table reports the percentage of acquirers and control firms using financial derivatives, and their differences. Fama–French 10, 30, and 48 industry classifications are used in the matching process. $*$, $**$, and $***$ stand for statistical significance at the 10%, 5%, and 1% levels.

| | **M&A Sample** | | **Control Sample** | | **Difference** |
|---|---|---|---|---|---|
| | **Mean** | **S.D.** | **Mean** | **S.D.** | **M&A−Control** |
| | | | **Fama–French 10 industries** | | |
| $Ird/Fcd$ | 0.610 | 0.488 | 0.410 | 0.152 | 0.200 *** |
| | | | **Fama–French 30 industries** | | |
| $Ird/Fcd$ | 0.610 | 0.488 | 0.401 | 0.152 | 0.210 *** |
| | | | **Fama–French 48 industries** | | |
| $Ird/Fcd$ | 0.610 | 0.488 | 0.398 | 0.157 | 0.212 *** |

**Panel B. Multivariate analyses on matching samples.** The panel reports the regression results of firm acquisitiveness on financial hedging. The dependent variable is *Acquirer_dummy*, a binary variable equal to one for acquiring firms, and zero for the matched non-acquiring firms in the control sample. The independent variable of interest is *Ird/Fcd*. In Column 1–3, the control sample for each acquirer comprises of firms with the same industry, a similar range of total assets (80%–120%), and a similar range of *Asset growth* (80%–120%). In Columns 4–6, 7–9, and 10–12, we replace the matching criteria *Asset growth* by *Stock return* (80%–120%), *Tobin's Q* (80%–120%), and *Cash holding* (80%–120%), respectively. The maximum number of matched firms for each acquirer is limited to five as in Bena and Li (2014). In the bivariate probit models, we report the first-stage regression results in Columns 2, 5, 8, and 11, and report the second-stage regression results in Columns 3, 6, 9, and 12. Following Campello et al. (2011), Chen and King (2014), and Manconi et al. (2018), the IV used in the first-stage regressions is *Tax_convexity*. Variable definitions are provided in Appendix A. All regressions include industry and year fixed effects. P-values are reported in parentheses beneath the corresponding coefficients. $*$, $**$, and $***$ stand for statistical significance at the 10%, 5%, and 1% levels.

| | **Industry, Size, & Asset growth** | | | **Industry, Size, & Stock return** | | | **Industry, Size, & Tobin's Q** | | | **Industry, Size, & Cash holding** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Logit** | **Bivariate probit** | | **Logit** | **Bivariate probit** | | **Logit** | **Bivariate probit** | | **Logit** | **Bivariate probit** | |
| | | **1st** | **2nd** | | **1st** | **2nd** | | **1st** | **2nd** | | **1st** | **2nd** |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| *Ird/Fcd* | 0.308*** | | 1.519*** | 0.199*** | | 1.211*** | 0.186*** | | 1.317*** | 0.205*** | | 1.275*** |
| | (0.000) | | (0.000) | (0.009) | | (0.000) | (0.006) | | (0.000) | (0.005) | | (0.000) |
| *One − year_Return* | 0.011 | 0.025 | -0.005 | 0.147*** | 0.041 | 0.071** | -0.025 | 0.0004 | -0.010 | -0.012 | 0.015 | -0.010 |
| | (0.741) | (0.243) | (0.771) | (0.004) | (0.178) | (0.021) | (0.422) | (0.966) | (0.373) | (0.531) | (0.322) | (0.129) |
| *Tobin's Q* | 0.021 | -0.014 | 0.016** | 0.064*** | -0.013* | 0.028** | 0.130*** | -0.003 | 0.057*** | 0.068*** | -0.011 | 0.036*** |
| | (0.136) | (0.120) | (0.041) | (0.002) | (0.098) | (0.040) | (0.000) | (0.765) | (0.000) | (0.000) | (0.241) | (0.000) |
| *Leverage* | -0.008*** | 0.013*** | -0.010*** | -0.007*** | 0.013*** | -0.008*** | -0.006*** | 0.011*** | -0.008*** | -0.007*** | 0.012*** | -0.008*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| *ROA* | 1.109*** | 1.378*** | -0.154 | 1.574*** | 1.445*** | 0.325* | 1.030*** | 1.278*** | (0.000) | 1.008*** | 1.386*** | 0.021 |
| | (0.000) | (0.000) | (0.287) | (0.000) | (0.000) | (0.060) | (0.000) | (0.000) | (0.538) | (0.000) | (0.000) | (0.869) |
| *Cash_holding* | 0.230 | -0.472*** | 0.346*** | 0.118 | -0.678*** | 0.334*** | 0.077 | -0.979*** | 0.509*** | -1.180*** | -0.853*** | -0.220 |
| | (0.300) | (0.001) | (0.005) | (0.586) | (0.000) | (0.009) | (0.694) | (0.000) | (0.000) | (0.000) | (0.000) | (0.111) |
| *Asset_growth* | 0.206*** | -0.074** | 0.123*** | 0.002 | -0.001 | -0.000 | 0.012 | -0.036** | 0.014 | 0.028 | -0.041*** | 0.026** |
| | (0.000) | (0.014) | (0.000) | (0.868) | (0.858) | (0.920) | (0.489) | (0.011) | (0.210) | (0.147) | (0.001) | (0.014) |

**Continued on next page**

**Table 3 – Continued from previous page**

| | Industry, Size, & Asset growth | | | Industry, Size, & Stock return | | | Industry, Size, & Tobin's Q | | | Industry, Size, & Cash holding | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Logit | Bivariate probit 1st | Bivariate probit 2nd | Logit | Bivariate probit 1st | Bivariate probit 2nd | Logit | Bivariate probit 1st | Bivariate probit 2nd | Logit | Bivariate probit 1st | Bivariate probit 2nd |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| *Size* | 0.032*** | 0.004 | 0.007*** | 0.034*** | 0.003 | 0.012*** | 0.015*** | 0.006 | 0.005*** | 0.034*** | 0.005 | 0.011*** |
| | (0.000) | (0.379) | (0.004) | (0.000) | (0.465) | (0.000) | (0.000) | (0.275) | (0.000) | (0.000) | (0.320) | (0.000) |
| *Tax_convexity* | | 0.029*** | | | 0.029*** | | | 0.029*** | | | 0.026*** | |
| | | (0.000) | | | (0.000) | | | (0.000) | | | (0.000) | |
| Intercept | -0.813*** | -0.414** | -0.895*** | -0.667*** | -0.452** | -0.750*** | -1.563*** | -0.251* | -1.330*** | -0.991*** | -0.470*** | -0.945*** |
| | (0.001) | (0.019) | (0.000) | (0.009) | (0.011) | (0.000) | (0.000) | (0.070) | (0.000) | (0.000) | (0.002) | (0.000) |
| Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,120 | 4,071 | 4,071 | 4,390 | 4,362 | 4,362 | 6,637 | 6,603 | 6,603 | 5,371 | 5,322 | 5,322 |
| Pseudo R-squared | 0.104 | | | 0.109 | | | 0.051 | | | 0.113 | | |
| Prob > chi2 | | 0.000 | | | 0.000 | | | 0.000 | | | 0.000 | |

## Table 4: Financial hedging and M&A payment methods

The table presents the regression results of acquirer payment methods on financial hedging for the sample of M&As described in Table 1. We use three proxies for payment methods: *Pure_cash* is equal to one for deals with 100% cash payment, and zero otherwise; *Cash_major* is equal to one for deals with more than 50% cash payment, and zero otherwise; and *Pct_cash* is the percentage of cash consideration in the total offer. The independent variable of interest is *Ird/Fcd*. In the bivariate probit and treatment effect models, we report the first-stage regression results in Columns 2, 5, and 8, and report the second-stage regression results in Columns 3, 6, and 9. Following Campello et al. (2011), Chen and King (2014), and Manconi et al. (2018), the IV used in the first-stage regressions is *Tax_convexity*. Variable definitions are provided in Appendix A. All regressions include industry and year fixed effects. P-values are reported in parentheses beneath the corresponding coefficients. $*$, $**$, and $***$ stand for statistical significance at the 10%, 5%, and 1% levels.

| | ***Pure_cash*** | | | ***Cash_major*** | | | ***Pct_cash*** | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Probit** | **Bivariate probit** | | **Probit** | **Bivariate probit** | | **Tobit** | **Treatment effect** | |
| | | **1st** | **2nd** | | **1st** | **2nd** | | **1st** | **2nd** |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
| *Ird/Fcd* | 0.332*** | | 1.109*** | 0.197** | | 1.213*** | 0.320*** | | 0.364** |
| | (0.000) | | (0.003) | (0.026) | | (0.002) | (0.000) | | (0.014) |
| *Toehold* | 0.197 | -0.198 | 0.250 | -0.104 | -0.200 | -0.023 | -0.033 | -0.229 | 0.019 |
| | (0.401) | (0.399) | (0.269) | (0.659) | (0.388) | (0.919) | (0.898) | (0.343) | (0.776) |
| *Hostile* | 0.059 | 0.228 | -0.025 | 0.082 | 0.297 | 0.007 | -0.075 | 0.225 | -0.021 |
| | (0.808) | (0.430) | (0.938) | (0.733) | (0.338) | (0.983) | (0.814) | (0.391) | (0.769) |
| *Tender_offer* | 0.894*** | 0.173 | 0.813*** | 1.254*** | 0.188* | 1.079*** | 1.278*** | 0.148 | 0.352*** |
| | (0.000) | (0.106) | (0.000) | (0.000) | (0.079) | (0.000) | (0.000) | (0.150) | (0.000) |
| *Related_industry* | -0.104 | 0.065 | -0.133 | 0.004 | 0.069 | -0.027 | -0.073 | 0.070 | -0.028 |
| | (0.222) | (0.448) | (0.112) | (0.966) | (0.419) | (0.733) | (0.395) | (0.425) | (0.242) |
| *Competition* | 0.412*** | -0.093 | 0.404*** | 0.412*** | -0.091 | 0.411** | 0.389** | -0.089 | 0.133*** |
| | (0.006) | (0.546) | (0.010) | (0.006) | (0.562) | (0.011) | (0.017) | (0.563) | (0.002) |
| *Relative_size* | -0.709*** | -0.199*** | -0.565*** | -0.462*** | -0.204*** | -0.313*** | -0.380*** | -0.217*** | -0.088*** |
| | (0.000) | (0.005) | (0.006) | (0.000) | (0.003) | (0.009) | (0.000) | (0.002) | (0.000) |
| *Size* | -0.001 | -0.002 | -0.001 | -0.002 | -0.001 | -0.002** | -0.001 | -0.001 | -0.001 |

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**Table 4 – Continued from previous page**

| | *Pure_cash* | | | *Cash_major* | | | *Pct_cash* | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Probit** | **Bivariate probit** | | **Probit** | **Bivariate probit** | | **Tobit** | **Treatment effect** | |
| | | **1st** | **2nd** | | **1st** | **2nd** | | **1st** | **2nd** |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
| | (0.564) | (0.613) | (0.240) | (0.197) | (0.663) | (0.024) | (0.272) | (0.439) | (0.135) |
| *Tobin's Q* | -0.034* | 0.015 | -0.028 | -0.048** | 0.016 | -0.039* | -0.052** | 0.014 | -0.006 |
| | (0.089) | (0.319) | (0.194) | (0.019) | (0.300) | (0.076) | (0.014) | (0.308) | (0.129) |
| *Leverage* | -0.000 | 0.020*** | -0.006* | -0.001 | 0.020*** | -0.007** | -0.000 | 0.020*** | -0.002* |
| | (0.847) | (0.000) | (0.078) | (0.744) | (0.000) | (0.016) | (0.957) | (0.000) | (0.081) |
| *Cashflow/Equity* | 0.295 | 0.114 | 0.244 | 0.569** | 0.115 | 0.443* | 0.300 | 0.115 | 0.009 |
| | (0.205) | (0.477) | (0.350) | (0.017) | (0.478) | (0.069) | (0.120) | (0.387) | (0.416) |
| *Cash_holding* | -0.209 | -0.805*** | 0.063 | -0.372 | -0.787*** | 0.014 | -0.357 | -0.792*** | -0.033 |
| | (0.412) | (0.001) | (0.808) | (0.131) | (0.001) | (0.959) | (0.144) | (0.001) | (0.679) |
| *Collateral* | -0.162 | 0.132 | -0.161 | 0.119 | 0.141 | 0.076 | 0.024 | 0.124 | 0.023 |
| | (0.546) | (0.614) | (0.554) | (0.640) | (0.593) | (0.768) | (0.922) | (0.638) | (0.757) |
| *Runup* | -0.097 | -0.059 | -0.065 | -0.127 | -0.056 | -0.092 | -0.104 | -0.061 | -0.020 |
| | (0.260) | (0.408) | (0.432) | (0.117) | (0.430) | (0.236) | (0.190) | (0.397) | (0.353) |
| *Average_EPSSD* | 0.003 | 0.008*** | 0.003 | 0.003 | 0.008** | 0.003 | 0.004* | 0.008 | 0.001* |
| | (0.235) | (0.006) | (0.285) | (0.191) | (0.015) | (0.261) | (0.096) | (0.490) | (0.095) |
| *Blockholder_ownership* | 0.037 | -0.326 | 0.164 | -0.437 | -0.272 | -0.250 | -0.150 | -0.401 | 0.027 |
| | (0.904) | (0.319) | (0.613) | (0.152) | (0.412) | (0.443) | (0.627) | (0.210) | (0.772) |
| *Tax_convexity* | | 0.029*** | | | 0.027*** | | | 0.028*** | |
| | | (0.000) | | | (0.000) | | | (0.000) | |
| Intercept | 0.039 | -0.467 | -0.415 | 0.730** | -0.481 | 0.148 | 1.207*** | -0.458 | 0.559*** |
| | (0.894) | (0.123) | (0.245) | (0.015) | (0.112) | (0.708) | (0.000) | (0.147) | (0.000) |
| Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,393 | 1,339 | 1,339 | 1,393 | 1,339 | 1,339 | 1,393 | 1,339 | 1,339 |
| Pseudo R-squared | 0.235 | | | 0.238 | | | 0.166 | | |
| Prob > chi2 | | 0.000 | | | 0.000 | | | 0.000 | |

## Table 5: Financial hedging and M&A external financing

The table presents the regression results of external financing on financial hedging for the sample of M&As described in Table 1. We use two proxies for firms' M&A external borrowing: *Borrowing_broad* is an indicator variable equal to one if an acquirer utilizes any private or public borrowing credit facilities during the transaction window without setting any restrictions on the purpose of these facilities, and zero otherwise; and *Borrowing_narrow* is an indicator variable equal to one if an acquirer utilizes credit facilities with the primary purpose of financing the corresponding M&A transaction, and zero otherwise. The independent variable of interest is $Ird/Fcd$. In the bivariate probit models, we report the first-stage regression results in Columns 2 and 5, and report the second-stage regression results in Columns 3 and 6. Following Campello et al. (2011), Chen and King (2014), and Manconi et al. (2018), the IV used in the first-stage regressions is *Tax_convexity*. Variable definitions are provided in Appendix A. All regressions include industry and year fixed effects. P-values are reported in parentheses beneath the corresponding coefficients. $*$, $**$, and $***$ stand for statistical significance at the 10%, 5%, and 1% levels.

| | ***Borrowing_broad*** | | | ***Borrowing_narrow*** | | |
|---|---|---|---|---|---|---|
| | **Probit** | **Bivariate probit** | | **Probit** | **Bivariate probit** | |
| | | **1st** | **2nd** | | **1st** | **2nd** |
| | **1** | **2** | **3** | **4** | **5** | **6** |
| *Ird/Fcd* | 0.213** | | -0.199 | 0.213** | | 1.383*** |
| | (0.012) | | (0.831) | (0.038) | | (0.000) |
| *Toehold* | -0.234 | -0.230 | -0.242 | 0.044 | -0.252 | 0.108 |
| | (0.304) | (0.336) | (0.282) | (0.861) | (0.280) | (0.646) |
| *Hostile* | -0.616*** | 0.231 | -0.621** | -0.275 | 0.198 | -0.352 |
| | (0.010) | (0.383) | (0.028) | (0.289) | (0.458) | (0.170) |
| *Tender_offer* | 0.598*** | 0.139 | 0.646*** | 1.126*** | 0.217** | 0.905*** |
| | (0.000) | (0.196) | (0.000) | (0.000) | (0.048) | (0.000) |
| *Related_industry* | 0.076 | 0.074 | 0.110 | 0.111 | 0.037 | 0.091 |
| | (0.358) | (0.392) | (0.193) | (0.239) | (0.668) | (0.322) |
| *Competition* | -0.562*** | -0.099 | -0.616*** | -0.332* | -0.081 | -0.299* |
| | (0.000) | (0.515) | (0.000) | (0.051) | (0.597) | (0.080) |
| *Relative_size* | -0.069 | -0.212*** | -0.079 | 0.369*** | -0.239*** | 0.423*** |

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**Table 5 – Continued from previous page**

| | *Borrowing_broad* | | | *Borrowing_narrow* | | |
|---|---|---|---|---|---|---|
| | **Probit** | **Bivariate probit** | | **Probit** | **Bivariate probit** | |
| | | **1st** | **2nd** | | **1st** | **2nd** |
| | **1** | **2** | **3** | **4** | **5** | **6** |
| | (0.279) | (0.002) | (0.383) | (0.000) | (0.001) | (0.000) |
| *Size* | 0.003** | -0.001 | 0.003 | -0.008*** | -0.001 | -0.010*** |
| | (0.028) | (0.885) | (0.311) | (0.000) | (0.754) | (0.000) |
| *Tobin's Q* | 0.021** | 0.014 | 0.016 | -0.029 | 0.014 | -0.026 |
| | (0.040) | (0.363) | (0.278) | (0.350) | (0.366) | (0.444) |
| *Leverage* | 0.003 | 0.020*** | 0.006 | -0.003 | 0.020*** | -0.010*** |
| | (0.171) | (0.000) | (0.330) | (0.274) | (0.000) | (0.001) |
| *Cashflow/Equity* | 0.320 | 0.115 | 0.427* | 0.964*** | 0.110 | 0.832** |
| | (0.134) | (0.476) | (0.094) | (0.003) | (0.486) | (0.024) |
| *Cash_holding* | -1.715*** | -0.784*** | -2.066*** | -2.265*** | -0.793*** | -1.667*** |
| | (0.000) | (0.002) | (0.000) | (0.000) | (0.001) | (0.000) |
| *Collateral* | 0.145 | 0.126 | 0.107 | 0.008 | 0.136 | -0.164 |
| | (0.568) | (0.626) | (0.686) | (0.976) | (0.597) | (0.523) |
| *Runup* | 0.052 | -0.063 | 0.071 | -0.160 | -0.055 | -0.128 |
| | (0.436) | (0.384) | (0.368) | (0.129) | (0.444) | (0.190) |
| *Average_EPSSD* | -0.003 | 0.008* | -0.003 | 0.007** | 0.005 | 0.007* |
| | (0.252) | (0.055) | (0.334) | (0.012) | (0.264) | (0.057) |
| *Blockholder_ownership* | -0.571* | -0.426 | -0.517 | -0.147 | -0.456 | 0.012 |
| | (0.057) | (0.196) | (0.111) | (0.676) | (0.152) | (0.970) |
| *Tax_convexity* | | 0.027*** | | | 0.026*** | |
| | | (0.005) | | | (0.000) | |
| Intercept | 0.784*** | -0.450 | 0.841* | 0.393 | -0.447 | -0.167 |
| | (0.008) | (0.147) | (0.050) | (0.229) | (0.140) | (0.628) |
| Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,393 | 1,339 | 1,339 | 1,393 | 1,339 | 1,339 |
| Pseudo R-squared | 0.173 | | | 0.247 | | |
| Prob > chi2 | | 0.000 | | | 0.000 | |

## Table 6: Financial hedging and M&A deal synergies

The table presents the impact of financial hedging on deal synergies and the probability of being a repeat acquirer for the sample of M&As described in Table 1. *Synergy* is the total synergy creation of the deal measured by a value-weighted average of acquirer and target cumulative abnormal announcment returns during a 5-day window $(-2, +2)$. *Repeat_acquirer* is equal to 1 if an acquirer has taken over more than one target in our sample period, and zero otherwise. The independent variable of interest is $Ird/Fcd$. In the treatment effect and bivariate probit models, we report the first-stage regression results in Columns 2 and 9, and report the second-stage regression results in Columns 3, 4–7, and 10. Following Campello et al. (2011), Chen and King (2014), and Manconi et al. (2018), the IV used in the first-stage regressions is *Tax_convexity*. In Columns 4 and 5, we divide our full sample into two subsamples based on the median of CEO pay slice which is measured by the ratio of a CEO's total compensation to the sum of five highest paid executives' total compensation (*CEO_pay_slice*). In Columns 6 and 7, we divide our full sample into two subsamples based on whether a CEO is also the firm's chairman of the board or not (*CEO_duality*). Variable definitions are provided in Appendix A. All regressions include industry and year fixed effects. P-values are reported in parentheses beneath the corresponding coefficients. $*$, $**$, and $***$ stand for statistical significance at the 10%, 5%, and 1% levels.

| | ***Synergy*** | | | | | | | ***Repeat_acquirer*** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Full sample** | | | **Subsample analysis** | | | | **Full sample** | | |
| | | | | **High CEO pay slice** | **Low CEO pay slice** | **CEO duality = 1** | **CEO duality = 0** | | | |
| | **OLS** | **Treatment 1st** | **Treatment 2nd** | **Treatment 2nd** | **Treatment 2nd** | **Treatment 2nd** | **Treatment 2nd** | **Probit** | **Bivariate Probit 1st** | **Bivariate Probit 2nd** |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
| *Ird/Fcd* | -0.013** | | -0.089** | -0.099** | -0.037 | -0.060* | -0.007 | 0.473*** | | 1.574*** |
| | (0.028) | | (0.013) | (0.016) | (0.389) | (0.086) | (0.902) | (0.000) | | (0.000) |
| *Toehold* | 0.011 | -0.308 | 0.004 | -0.008 | 0.016 | 0.001 | 0.018 | -0.289 | -0.274 | -0.210 |
| | (0.470) | (0.219) | (0.808) | (0.735) | (0.470) | (0.940) | (0.527) | (0.209) | (0.269) | (0.327) |
| *Hostile* | 0.011 | 0.192 | 0.017 | 0.029 | 0.023 | 0.018 | 0.025 | -0.004 | 0.291 | -0.138 |
| | (0.517) | (0.471) | (0.313) | (0.195) | (0.284) | (0.361) | (0.367) | (0.987) | (0.289) | (0.584) |
| *Tender_offer* | 0.006 | -0.014 | 0.008 | 0.001 | 0.008 | 0.001 | 0.012 | -0.024 | -0.021 | -0.027 |
| | (0.403) | (0.908) | (0.260) | (0.937) | (0.399) | (0.893) | (0.317) | (0.821) | (0.848) | (0.783) |
| *Related_industry* | 0.012** | 0.065 | 0.016*** | 0.011 | 0.016* | 0.013* | 0.011 | 0.139* | 0.051 | 0.112 |
| | (0.033) | (0.495) | (0.007) | (0.158) | (0.054) | (0.070) | (0.276) | (0.088) | (0.547) | (0.164) |
| *Competition* | -0.008 | -0.116 | -0.012 | -0.034** | 0.009 | -0.002 | -0.029* | 0.293** | -0.087 | 0.268* |
| | (0.451) | (0.477) | (0.238) | (0.020) | (0.546) | (0.847) | (0.075) | (0.050) | (0.570) | (0.057) |

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**Table 6 – Continued from previous page**

| | *Synergy* | | | | | | | *Repeat_acquirer* | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Full sample** | | | **Subsample analysis** | | | | **Full sample** | | |
| | | | | **High CEO pay slice** | **Low CEO pay slice** | **CEO duality = 1** | **CEO duality = 0** | | | |
| | **OLS** | **Treatment 1st** | **Treatment 2nd** | **Treatment 2nd** | **Treatment 2nd** | **Treatment 2nd** | **Treatment 2nd** | **Probit** | **Bivariate Probit 1st** | **Bivariate Probit 2nd** |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
| *Relative_size* | -0.001 | -0.180** | 0.001 | 0.017** | -0.002 | -0.003 | 0.019** | -0.280*** | -0.163** | -0.157** |
| | (0.771) | (0.021) | (0.885) | (0.031) | (0.797) | (0.560) | (0.030) | (0.000) | (0.014) | (0.028) |
| *Size* | -0.000* | -0.002 | -0.000 | -0.000 | -0.000 | -0.000 | -0.001 | 0.009*** | -0.001 | 0.007** |
| | (0.066) | (0.303) | (0.396) | (0.424) | (0.162) | (0.192) | (0.131) | (0.000) | (0.781) | (0.037) |
| *Tobin's Q* | -0.000 | 0.007 | 0.001 | -0.002 | 0.004*** | -0.001 | 0.004** | -0.002 | 0.013 | 0.004 |
| | (0.883) | (0.610) | (0.446) | (0.110) | (0.001) | (0.355) | (0.010) | (0.822) | (0.421) | (0.827) |
| *Leverage* | -0.000 | 0.020*** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.004* | 0.020*** | -0.003 |
| | (0.792) | (0.000) | (0.179) | (0.196) | (0.647) | (0.506) | (0.463) | (0.056) | (0.000) | (0.262) |
| *Cashflow/Equity* | -0.012 | 0.068 | -0.012 | -0.001 | -0.031** | 0.073** | -0.017* | -0.034 | 0.144 | -0.061 |
| | (0.189) | (0.626) | (0.211) | (0.928) | (0.022) | (0.030) | (0.077) | (0.524) | (0.260) | (0.282) |
| *Cash_holding* | -0.022 | -0.529* | -0.049*** | -0.080*** | -0.039 | -0.047* | 0.008 | -0.891*** | -0.709*** | -0.521** |
| | (0.179) | (0.053) | (0.009) | (0.004) | (0.112) | (0.050) | (0.754) | (0.000) | (0.005) | (0.041) |
| *Collateral* | 0.030* | 0.124 | 0.026 | 0.016 | -0.001 | 0.002 | 0.037 | -0.602** | 0.134 | -0.591** |
| | (0.074) | (0.660) | (0.143) | (0.538) | (0.970) | (0.910) | (0.195) | (0.013) | (0.618) | (0.017) |
| *Runup* | -0.015*** | -0.027 | -0.014*** | 0.006 | -0.027*** | -0.003 | -0.025*** | 0.088 | -0.038 | 0.090 |
| | (0.002) | (0.728) | (0.008) | (0.474) | (0.001) | (0.669) | (0.002) | (0.177) | (0.613) | (0.261) |
| *Average_EPSSD* | 0.000 | 0.108 | 0.000 | 0.037 | 0.000 | 0.000 | -0.051* | -0.002 | 0.006* | 0.001 |
| | (0.728) | (0.588) | (0.403) | (0.122) | (0.353) | (0.442) | (0.050) | (0.684) | (0.098) | (0.686) |
| *Blockholder_ownership* | 0.015 | -0.468 | -0.008 | -0.003 | -0.043 | 0.013 | -0.008 | -0.756*** | -0.272 | -0.572* |
| | (0.460) | (0.174) | (0.729) | (0.911) | (0.220) | (0.621) | (0.828) | (0.010) | (0.413) | (0.081) |
| *Pct_cash* | 0.023*** | 0.348*** | 0.034*** | 0.042*** | 0.028** | 0.034*** | 0.015 | 0.325*** | 0.377*** | 0.166 |
| | (0.001) | (0.002) | (0.000) | (0.000) | (0.016) | (0.000) | (0.296) | (0.001) | (0.000) | (0.101) |
| *Tax_convexity* | | 0.029*** | | | | | | | 0.032*** | |
| | | (0.000) | | | | | | | (0.000) | |
| Intercept | 0.021 | -0.629* | 0.101*** | 0.076* | 0.073** | 0.066** | 0.066* | -0.944*** | -0.832*** | -1.312*** |
| | (0.392) | (0.075) | (0.000) | (0.052) | (0.028) | (0.027) | (0.088) | (0.001) | (0.008) | (0.000) |
| Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,208 | 1,164 | 1,164 | 488 | 458 | 700 | 434 | 1,339 | 1,339 | 1,339 |
| Pseudo R-squared | 0.071 | | | | | | | 0.158 | | |
| Prob > chi2 | | 0.000 | | 0.000 | 0.000 | 0.000 | 0.000 | | 0.000 | |

## Table 7: Financial hedging and M&A borrowing costs

The table presents the regression results of M&A borrowing costs on financial hedging, for the loans and bonds issued by acquirers over a period of one year before the deal announcement to the deal completion. *Bond_borrowing_cost* is the percentage point spread of a bond over a Treasury bill with a comparable maturity. *Loan_borrowing_cost* is the percentage point spread of a loan over LIBOR or LIBOR equivalent plus any related facility fees. The corresponding borrowing costs at the deal level are computed as the value-weighted average of all the facility level borrowing costs issued during the transaction window. The OLS and treatment effect estimation results of both facility level (Columns 1–3 and 7–9) and deal level (Columns 4–6 and 10–12) are presented. Following Campello et al. (2011), Chen and King (2014), and Manconi et al. (2018), the IV used in the first-stage regressions is $Tax\_convexity$. The independent variable of interest is $Ird/Fcd$. Variable definitions are provided in Appendix A. All regressions include industry and year fixed effects. P-values are reported in parentheses beneath the corresponding coefficients. $*$, $**$, and $***$ stand for statistical significance at the 10%, 5%, and 1% levels.

| | ***Bond_borrowing_cost*** | | | | | | ***Loan_borrowing_cost*** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Bond level** | | | **Deal level** | | | **Loan level** | | | **Deal level** | | |
| | **OLS** | **Treatment** | | **OLS** | **Treatment** | | **OLS** | **Treatment** | | **OLS** | **Treatment** | |
| | | **1st** | **2nd** | | **1st** | **2nd** | | **1st** | **2nd** | | **1st** | **2nd** |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| *Ird/Fcd* | -0.425*** | | -0.858*** | -0.410** | | -0.937* | -0.428*** | | -1.790*** | -0.374*** | | -1.505*** |
| | (0.000) | | (0.000) | (0.021) | | (0.067) | (0.000) | | (0.000) | (0.000) | | (0.000) |
| *Size* | -0.005*** | 0.003 | -0.004*** | -0.005*** | 0.003 | -0.004*** | -0.006*** | 0.023*** | -0.004*** | -0.007*** | 0.020** | -0.006*** |
| | (0.000) | (0.694) | (0.000) | (0.000) | (0.766) | (0.002) | (0.000) | (0.000) | (0.000) | (0.000) | (0.016) | (0.000) |
| *Tobin's Q* | -0.203*** | 0.055 | -0.183*** | -0.148** | 0.035 | -0.132** | -0.221*** | -0.046 | -0.223*** | -0.180*** | 0.006 | -0.178*** |
| | (0.000) | (0.552) | (0.000) | (0.022) | (0.793) | (0.038) | (0.000) | (0.197) | (0.000) | (0.000) | (0.901) | (0.000) |
| *Leverage* | 0.002 | 0.009 | 0.003 | -0.003 | 0.021*** | -0.000 | 0.006*** | 0.017*** | 0.013*** | 0.002 | 0.017*** | 0.009*** |
| | (0.373) | (0.134) | (0.252) | (0.519) | (0.007) | (0.961) | (0.000) | (0.000) | (0.000) | (0.355) | (0.000) | (0.009) |
| *Cashflow/Equity* | 0.176 | -4.395*** | -0.244 | -0.216 | -2.844 | -0.650 | -0.594*** | 0.193 | -0.241 | -0.477** | 1.009** | 0.015 |
| | (0.738) | (0.003) | (0.657) | (0.777) | (0.131) | (0.395) | (0.000) | (0.496) | (0.297) | (0.032) | (0.030) | (0.957) |
| *Cash_holding* | 0.490 | -1.241 | 0.387 | 0.106 | -0.549 | -0.013 | 1.183*** | 0.378 | 1.260*** | 1.076*** | 0.118 | 1.041*** |
| | (0.196) | (0.161) | (0.306) | (0.871) | (0.624) | (0.984) | (0.000) | (0.369) | (0.000) | (0.002) | (0.841) | (0.008) |
| *Collateral* | -0.455** | -1.093** | -0.533*** | -0.358 | -1.411** | -0.513 | 0.256 | -0.654*** | -0.093 | 0.194 | -0.773** | -0.167 |
| | (0.023) | (0.010) | (0.009) | (0.327) | (0.018) | (0.183) | (0.116) | (0.005) | (0.627) | (0.407) | (0.036) | (0.537) |
| *Blockholder_ownership* | 0.089 | -0.878 | -0.096 | -0.002 | -1.323 | -0.243 | 0.491** | -0.363 | 0.114 | 0.432 | -0.434 | 0.185 |
| | (0.815) | (0.276) | (0.806) | (0.997) | (0.189) | (0.688) | (0.042) | (0.316) | (0.689) | (0.192) | (0.423) | (0.623) |

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**Table 7 – Continued from previous page**

| | *Bond_borrowing_cost* | | | | | | *Loan_borrowing_cost* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Bond level** | | | **Deal level** | | | **Loan level** | | | **Deal level** | | |
| | **OLS** | **Treatment** | | **OLS** | **Treatment** | | **OLS** | **Treatment** | | **OLS** | **Treatment** | |
| | | **1st** | **2nd** | | **1st** | **2nd** | | **1st** | **2nd** | | **1st** | **2nd** |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| *Toehold* | 0.110 | -0.503 | 0.014 | 0.177 | -0.381 | 0.064 | -0.130 | 0.507* | 0.079 | -0.231 | 0.277 | -0.105 |
| | (0.450) | (0.148) | (0.925) | (0.543) | (0.445) | (0.825) | (0.386) | (0.056) | (0.649) | (0.255) | (0.458) | (0.639) |
| *Hostile* | 0.307 | 1.301* | 0.380 | -0.174 | 0.804 | -0.164 | -0.016 | -0.421* | -0.091 | -0.086 | -0.613 | -0.180 |
| | (0.296) | (0.060) | (0.197) | (0.738) | (0.405) | (0.744) | (0.925) | (0.078) | (0.631) | (0.781) | (0.209) | (0.592) |
| *Tender_offer* | 0.036 | 0.534*** | 0.083 | 0.038 | 0.485* | 0.103 | -0.140** | -0.016 | -0.142* | -0.168* | -0.126 | -0.182* |
| | (0.667) | (0.009) | (0.323) | (0.803) | (0.092) | (0.501) | (0.048) | (0.879) | (0.077) | (0.076) | (0.409) | (0.077) |
| *Related_industry* | 0.113* | 0.593*** | 0.136** | 0.075 | 0.517** | 0.120 | 0.130** | 0.098 | 0.138** | 0.135* | 0.050 | 0.123 |
| | (0.096) | (0.001) | (0.048) | (0.557) | (0.029) | (0.349) | (0.032) | (0.295) | (0.046) | (0.096) | (0.715) | (0.166) |
| *Bond_maturity* | 0.011*** | 0.006 | 0.011*** | -0.002 | 0.026 | 0.000 | | | | | | |
| | (0.005) | (0.554) | (0.003) | (0.831) | (0.139) | (0.997) | | | | | | |
| *Bond_amount* | 0.073 | -0.650*** | 0.055 | -0.089* | -0.051 | -0.094* | | | | | | |
| | (0.246) | (0.001) | (0.391) | (0.100) | (0.801) | (0.073) | | | | | | |
| *Bond_rating* | 2.380*** | 0.082 | 2.420*** | 2.729*** | -0.147 | 2.765*** | | | | | | |
| | (0.000) | (0.740) | (0.000) | (0.000) | (0.633) | (0.000) | | | | | | |
| *Loan_maturity* | | | | | | | 0.109*** | 0.004 | 0.102*** | 0.160*** | -0.061 | 0.138*** |
| | | | | | | | (0.000) | (0.830) | (0.000) | (0.000) | (0.128) | (0.000) |
| *Loan_amount* | | | | | | | -0.060*** | 0.172** | -0.038** | -0.008 | 0.130*** | 0.006 |
| | | | | | | | (0.000) | (0.012) | (0.026) | (0.481) | (0.004) | (0.650) |
| *Loan_short_maturity* | | | | | | | 0.169 | -0.267 | 0.092 | 0.126 | -0.576** | -0.022 |
| | | | | | | | (0.235) | (0.199) | (0.565) | (0.404) | (0.020) | (0.900) |
| *Tax_convexity* | | 0.072*** | | | 0.040* | | | 0.026** | | | 0.004 | |
| | | (0.000) | | | (0.092) | | | (0.021) | | | (0.811) | |
| Intercept | 2.569*** | 1.992*** | 2.759*** | 2.587*** | 0.554 | 3.650*** | 2.614*** | -1.018*** | 2.717*** | 1.784*** | -0.304 | 2.478*** |
| | (0.000) | (0.008) | (0.000) | (0.000) | (0.563) | (0.000) | (0.000) | (0.002) | (0.000) | (0.000) | (0.586) | (0.000) |
| Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 969 | 959 | 959 | 356 | 350 | 350 | 1,585 | 1,531 | 1,531 | 665 | 643 | 643 |
| Pseudo R-squared | 0.584 | | | 0.639 | | | 0.354 | | | 0.394 | | |
| Prob > chi2 | | 0.000 | | | 0.000 | | | 0.000 | | | 0.000 | |

**Table 8: Robustness: Propensity score matching**

This table reports the impact of financial hedging on M&As based on ordinary multivariate regressions for the propensity score matched sample. The dependent variables are *Pure_cash*, *Cash_major*, *Pct_cash*, *Borrowing_narrow*, and *Synergy*. The independent variable of interest is $Ird/Fcd$. To construct our propensity score matched sample, we use a probit regression to estimate the likelihood of a firm utilizing financial derivatives captured by the dependent variable $Ird/Fcd$. The independent variables of the probit regression include all the firm and deal characteristics that we have controlled in our main tests of Section 4. Using the propensity score generated in the probit regression, we construct the matched sample using one-to-one nearest-neighbor matching without replacement. A caliper of 1% is applied. Variable definitions are provided in Appendix A. The coefficients of the control variables included in our main analyses are suppressed for brevity. P-values are reported in parentheses beneath the corresponding coefficients. $*$, $**$, and $***$ stand for statistical significance at the 10%, 5%, and 1% levels.

| | ***Pure_cash*** | ***Cash_major*** | ***Pct_cash*** | ***Borrowing_narrow*** | ***Synergy*** |
|---|---|---|---|---|---|
| $Ird/Fcd$ | 0.381*** | 0.215** | 0.370*** | 0.330*** | -0.015** |
| | (0.000) | (0.037) | (0.001) | (0.006) | (0.048) |
| Control Variables | Yes | Yes | Yes | Yes | Yes |
| Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Observations | 814 | 814 | 814 | 814 | 707 |
| Pseudo R-squared | 0.257 | 0.236 | 0.174 | 0.324 | 0.130 |

**Table 9: Robustness: Controlling for CFO managerial characteristics**

The table reports the impact of financial hedging on M&As based on IV estimations controlling for CFO managerial characteristics. The sample of M&As is described in Table 1. The dependent variables are *Pure_cash*, *Cash_major*, *Pct_cash*, *Borrowing_narrow*, and *Synergy*. Following Campello et al. (2011), Chen and King (2014), and Manconi et al. (2018), the IV used in the first-stage regressions is *Tax_convexity*. The independent variable of interest is instrumented *Ird/Fcd*. Variable definitions are provided in Appendix A. The coefficients of the other control variables included in our main analyses are suppressed for brevity. All regressions include industry and year fixed effects. P-values are reported in parentheses beneath the corresponding coefficients. $*$, $**$, and $***$ stand for statistical significance at the 10%, 5%, and 1% levels.

| | ***Pure_cash*** | | ***Cash_major*** | | ***Pct_cash*** | | ***Borrowing_narrow*** | | ***Synergy*** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **1st** | **2nd** | **1st** | **2nd** | **1st** | **2nd** | **1st** | **2nd** | **1st** | **2nd** |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
| *Ird/Fcd* | | 1.346*** | | 1.505*** | | 0.407*** | | 1.271*** | | -0.080** |
| | | (0.000) | | (0.000) | | (0.009) | | (0.001) | | (0.022) |
| *CFO_fin_expertise* | -0.026 | -0.086 | 0.017 | 0.059 | -0.016 | 0.010 | -0.022 | 0.048 | -0.040 | 0.009 |
| | (0.790) | (0.394) | (0.866) | (0.530) | (0.876) | (0.720) | (0.827) | (0.632) | (0.725) | (0.143) |
| *CFO_top_uni* | 0.363*** | 0.006 | 0.315*** | 0.019 | 0.352*** | 0.007 | 0.341*** | -0.056 | 0.396*** | -0.006 |
| | (0.000) | (0.955) | (0.002) | (0.853) | (0.001) | (0.821) | (0.001) | (0.629) | (0.001) | (0.434) |
| *CFO_on_board* | 0.054 | 0.027 | 0.018 | 0.016 | 0.065 | -0.012 | 0.041 | 0.287* | 0.141 | 0.004 |
| | (0.706) | (0.856) | (0.902) | (0.912) | (0.678) | (0.771) | (0.776) | (0.055) | (0.423) | (0.686) |
| *CFO_tenure* | 0.081** | 0.005 | 0.076** | -0.031 | 0.080** | -0.009 | 0.079** | 0.009 | 0.087** | 0.003 |
| | (0.023) | (0.891) | (0.029) | (0.374) | (0.030) | (0.379) | (0.027) | (0.827) | (0.030) | (0.261) |
| *CFO_age* | 0.214 | 0.267 | 0.174 | 0.331 | 0.187 | 0.114 | 0.148 | -0.231 | 0.131 | -0.034 |
| | (0.507) | (0.397) | (0.578) | (0.266) | (0.556) | (0.195) | (0.644) | (0.476) | (0.705) | (0.108) |
| *CFO_external_position* | 0.023 | -0.016 | 0.019 | -0.029* | 0.023 | -0.010** | 0.029 | -0.013 | 0.024 | -0.001 |
| | (0.242) | (0.274) | (0.274) | (0.067) | (0.250) | (0.032) | (0.134) | (0.451) | (0.239) | (0.539) |
| *Tax_convexity* | 0.026*** | | 0.023*** | | 0.027*** | | 0.024*** | | 0.028*** | |
| | (0.000) | | (0.000) | | (0.000) | | (0.000) | | (0.000) | |
| Intercept | -1.659 | -1.642 | -1.483 | -1.387 | -1.570 | 0.052 | -1.392 | 0.891 | -1.675 | 0.213** |

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**Table 9 – Continued from previous page**

| | *Pure_cash* | | *Cash_major* | | *Pct_cash* | | *Borrowing_narrow* | | *Synergy* | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **1st** | **2nd** | **1st** | **2nd** | **1st** | **2nd** | **1st** | **2nd** | **1st** | **2nd** |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
| | (0.205) | (0.193) | (0.244) | (0.229) | (0.229) | (0.882) | (0.282) | (0.495) | (0.239) | (0.012) |
| Control Variables | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,119 | 1,119 | 1,119 | 1,119 | 1,119 | 1,119 | 1,119 | 1,119 | 981 | 981 |
| Prob > chi2 | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | |

## Table 10: The role of CEOs' exposure to stock prices

The table presents the results of double agency problem tests. In Columns 1 and 2, we report the results of two probit regression models in which the dependent variable is *Ird/Fcd* and the independent variable of interest is *CEO_Delta*. In Columns 3 and 4, we report the results of two probit regression models in which the dependent variable is *Diversifying_deal* and the independent variable of interest is *CEO_Delta*. In Columns 5 and 6, we divide our sample into two sub-samples according to the median of *CEO_Delta*, and report the second-stage regression results of the treatment effect model similar to those reported in Table 6. *CEO_Delta* is defined as the natural logarithm of the dollar value change in a manager's stock and option portfolio associated with a 1% change in the underlying stock price (Core and Guay, 2002). Variable definitions are provided in Appendix A. All regressions include industry and year fixed effects. P-values are reported in parentheses beneath the corresponding coefficients. $*$, $**$, and $***$ stand for statistical significance at the 10%, 5%, and 1% levels.

| | ***Ird/Fcd*** | | ***Diversifying_deal*** | | ***Synergy*** | |
|---|---|---|---|---|---|---|
| | **Full sample** | | **Full sample** | | **Subsample analysis** | |
| | | | | | **High *CEO_Delta*** | **Low *CEO_Delta*** |
| | **Probit** | **Probit** | **Probit** | **Probit** | **Treatment 2nd** | **Treatment 2nd** |
| | **1** | **2** | **3** | **4** | **5** | **6** |
| *CEO_Delta* | 0.189*** | 0.214*** | 0.079*** | 0.153** | | |
| | (0.000) | (0.000) | (0.003) | (0.027) | | |
| *Ird/Fcd* | | | | | -0.061** | 0.006 |
| | | | | | (0.038) | (0.845) |
| *Toehold* | | 0.414 | | 0.421 | 0.009 | 0.033 |
| | | (0.364) | | (0.209) | (0.652) | (0.300) |
| *Hostile* | | 0.283 | | 0.337 | 0.027 | 0.003 |
| | | (0.429) | | (0.321) | (0.236) | (0.877) |
| *Tender_offer* | | -0.003 | | 0.222 | -0.007 | 0.017* |
| | | (0.985) | | (0.104) | (0.417) | (0.077) |
| *Related_industry* | | 0.086 | | | 0.016** | 0.008 |
| | | (0.464) | | | (0.043) | (0.326) |
| *Competition* | | -0.421** | | -0.108 | -0.028** | 0.001 |
| | | (0.035) | | (0.626) | (0.045) | (0.927) |
| *Relative_size* | | 0.112 | | -0.107 | 0.013 | 0.017** |
| | | (0.375) | | (0.441) | (0.288) | (0.011) |
| *Size* | | -0.001 | | -0.001 | -0.000 | -0.000* |
| | | (0.554) | | (0.518) | (0.320) | (0.077) |
| *Tobin's Q* | | 0.009 | | 0.018 | -0.001 | 0.005 |

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**Table 10 – Continued from previous page**

| | *Ird/Fcd* | | *Diversifying_deal* | | *Synergy* | |
|---|---|---|---|---|---|---|
| | **Full sample** | | **Full sample** | | **Subsample analysis** | |
| | | | | | **High *CEO_Delta*** | **Low *CEO_Delta*** |
| | **Probit** | **Probit** | **Probit** | **Probit** | **Treatment 2nd** | **Treatment 2nd** |
| | **1** | **2** | **3** | **4** | **5** | **6** |
| | | (0.662) | | (0.498) | (0.267) | (0.226) |
| *Leverage* | | 0.016*** | | 0.002 | 0.000 | -0.000 |
| | | (0.000) | | (0.488) | (0.918) | (0.680) |
| *Cashflow/Equity* | | -0.174 | | 0.078 | 0.074 | -0.004 |
| | | (0.406) | | (0.853) | (0.333) | (0.727) |
| *Cash_holding* | | -0.544 | | -1.384*** | -0.075*** | -0.061** |
| | | (0.154) | | (0.002) | (0.004) | (0.033) |
| *Collateral* | | 0.186 | | -1.730*** | -0.009 | 0.014 |
| | | (0.618) | | (0.000) | (0.777) | (0.543) |
| *Runup* | | -0.240* | | 0.004 | 0.015* | -0.021** |
| | | (0.058) | | (0.979) | (0.088) | (0.035) |
| *Average_EPSSD* | | 0.509 | | -0.681 | 0.007 | -0.042 |
| | | (0.128) | | (0.258) | (0.785) | (0.274) |
| *Blockholder_ownership* | | -1.121** | | 0.421 | -0.023 | -0.012 |
| | | (0.014) | | (0.344) | (0.530) | (0.664) |
| *Pct_cash* | | 0.182 | | -0.095 | 0.025** | 0.033*** |
| | | (0.202) | | (0.512) | (0.013) | (0.001) |
| *CEO_ownership* | | -0.007*** | | 0.001 | 0.000 | -0.000 |
| | | (0.001) | | (0.637) | (0.842) | (0.408) |
| *ln(CEO_Vega)* | | 0.062 | | -0.043 | 0.000 | -0.005* |
| | | (0.134) | | (0.278) | (0.965) | (0.083) |
| *CEO_age* | | 0.397 | | 0.150 | 0.064* | -0.029 |
| | | (0.354) | | (0.739) | (0.051) | (0.316) |
| *CEO_wealth* | | 0.085 | | -0.507 | 0.000 | 0.397 |
| | | (0.406) | | (0.107) | (0.968) | (0.360) |
| Intercept | -0.200 | -2.641 | -0.973*** | -1.250 | -0.225* | 0.211* |
| | (0.537) | (0.139) | (0.001) | (0.497) | (0.093) | (0.077) |
| Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,095 | 876 | 1,095 | 876 | 382 | 396 |
| Pseudo R-squared | 0.125 | 0.218 | 0.087 | 0.156 | | |
| Prob > chi2 | | | | | 0.000 | 0.000 |