Selling to Buy: Asset Sales and Acquisitions

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ABSTRACT

This study explores the impact of joint corporate asset restructuring decisions where firms sell an asset in order to fund a subsequent acquisition (selling-to-buy). We find that firms with asset sales are associated with increased acquisition probability. The effect is more pronounced for financially constrained firms. We also show that, in addition to the established improved firm efficiency from focus-increasing asset sales, financially constrained firms obtain the necessary funds to conduct focus-increasing acquisitions, improving further their efficiency. This translates into both higher long-run operating performance and stock abnormal returns at the asset sale announcement.

JEL Classification: G14; G32; G34

Keywords: Asset sales; Acquisitions; Restructuring; Operating efficiency; Abnormal returns; Financial constraints

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1. Introduction

Prior literature on corporate asset restructuring has focused mainly on either asset sale or acquisition decisions. The focus of this paper is to examine the *joint* corporate asset restructuring decisions of selling-to-buy assets (henceforth selling-to-buy) for the following reasons. First, acquisitions following asset sales represent *pure* asset restructuring events, which normally keep the size of assets fixed but change their composition. Such changes are not confounded by capital structure effects associated either with proceeds being used for retiring corporate debt; with payout policy implications related with distribution of cash to shareholders (i.e., dividends or stock repurchases); or with the signaling effects associated with the method of payment used in acquisition transactions (see Travlos (1987)). Second, the joint selling-to-buy asset restructuring can have a double benefit effect on a firm's operating efficiency and improvement of its capital liquidity. This is particularly important for financially constrained firms where not only do they dispose of an unwanted operation unrelated to its core business but also obtain funds from asset sales, thus undertaking investments that otherwise would be missed. Further, when these investments are of a focus-increasing nature, they can further improve the operating efficiency of the firm. While prior literature has focused on the first benefit of asset sales,[1] the double benefit effect of asset sales followed by acquisitions has not yet been explored. Third, given that acquisitions represent the most economically important corporate investment in the life of a firm,[2] it is rather surprising that the extant literature on funding sources for acquisitions is silent on the

[1] John and Ofek (1995) and Daley et al. (1997) identify the benefits from focus increasing asset sales, showing that these divestitures lead to an improvement in the operating performance of the seller's remaining assets and make the firm's remaining segments more efficient. In addition, Schlingemann et al. (2002) also find that firms often prefer to dispose of assets or operations which are not related to the firm's core industry.

[2] Over the period between 1990 and 2014, the U.S. takeover market has faced 396,056 deals worth almost $80 trillion (Source: Thomson Financial SDC).

use of proceeds from asset sales, focusing only on operating cash flows, cash holdings, debt, and equity (see, e.g., Jensen (1986), Amihud et al. (1990), Harford (1999), Schlingemann (2004), and Martynova and Renneboog (2009)).[3]

The importance of asset sales as a means for corporate restructuring has been documented by existing research on divestitures, showing that asset sale proceeds can become a significant source of allocable capital for firms, with proceeds frequently used to fund corporate investments.[4] Additionally, there is abundant anecdotal evidence suggesting that firms sell assets with the intent to pursue acquisition deals. For instance in 2011, Boston Scientific sold its stroke-treating neurovascular business for $1.5 billion with the intent of using a large part of the after-tax proceeds for acquisitions. Following the completion of the deal, Boston Scientific acquired three firms using $490 million of cash proceeds derived from the asset sale.[5]

However, prior research on the use of proceeds from asset sales as a potential source of funds in acquisitions is, at best, sparse. For example, Lang et al. (1995) hint that many firms "[…] seem to sell assets while engaged in a program of acquisitions so that the asset sales provide cash for these programs […]", and Kaplan and Weisbach (1992) and John and Ofek (1995) provide brief descriptive statistics showing that some firms raise cash through asset sales to fund acquisitions.

In this study, we start with the established result that asset sales (particularly focus-increasing) improve firm efficiency,[6] and go one step further suggesting that asset sales improve firms' liquidity offering important funds to finance corporate investments (Edmans and Mann (2019));

[3] In prior literature, the term 'method of payment' is usually considered as synonymous to the 'sources of takeover funds' (see, e.g., Travlos (1987), Faccio and Masulis (2005)). Nevertheless, Schlingemann (2004) and Martynova and Renneboog (2009) have reconciled the two concepts, providing evidence that the source of funds (in addition to the method of payment) plays an important role in acquisitions.

[4] See for instance, Bates (2005), Hovakimian and Titman (2006), Borisova and Brown (2013), and Arnold et al. (2017).

[5] Source: The Wall Street Journal, "Stryker to Buy Boston Scientific Unit", October 28, 2010, and Thomson Financial SDC.

[6] See, John and Ofek (1995) and Daley et al. (1997).

the increase in firms' liquidity allows a selling-to-buy activity, particularly for those firms that being financially constrained would otherwise miss positive NPV projects and the opportunity to improve their operating efficiency further. This is in line with Bates (2005), who argues that asset sales increase firms' liquidity and that cash proceeds from a sale can be re-allocated to the unfunded projects of the divesting firm. Additionally, asset sales are particularly helpful for financially constrained firms which might not otherwise be able to fund important corporate investments. In this respect, Hovakimian and Titman (2006) and Borisova and Brown (2013) provide empirical evidence that asset sale proceeds are used by financially constrained firms to fund capital expenditures and R&D investments, respectively. Moreover, it has already been documented in the literature that cash-richness (Harford (1999)), free cash flows (Jensen (1986)), and cash windfalls (Blanchard et al. (1994)) are positively associated with corporate acquisitions. Therefore, given that i) cash proceeds from asset sales are expected to increase firms' liquidity and cash-richness; and ii) financially constrained firms can use asset sales when other funding sources may be difficult to obtain, we predict that, *ceteris paribus*, *firms that sell assets are more likely to conduct acquisition investments (Hypothesis 1a); this effect should be more pronounced for financially constrained firms (Hypothesis 1b).* There is no reason to expect that unconstrained firms would conduct acquisitions after asset sales, as these firms, having sufficient funds, are less likely to need asset sales to gain the necessary liquidity for acquisitions.

Additionally, building on the findings by John and Ofek (1995) and Daley et al. (1997) who concentrate on focus increasing asset sales, we predict that *focus increasing asset sales followed by focus increasing acquisitions should lead to improved operating efficiency (Hypothesis 2a).* Again, this result should be more pronounced among financially constrained firms (*Hypothesis 2b*), because these are the firms which will be able to relax their financial constraints enjoying a

double benefit. Additionally, if financially constrained selling-to-buy firms do indeed enjoy a double benefit, then this should be reflected in the market at the announcement of the asset sale; this is the event date which incorporates the information of the joint asset restructuring decision of focus-increasing asset sales followed by focus-increasing acquisitions. The expectation is that the market should react favorably to reflect both efficiency and capital liquidity improvement. Therefore, we predict relatively *higher asset sale announcement stock abnormal returns for constrained firms that conduct focus increasing asset sales followed by focus-increasing acquisitions (Hypothesis 3).*[7]

We use a broad sample of US acquisitions over the period from 1990 to 2014 and find strong empirical support for our hypotheses. We provide evidence of a lead-lag effect in which there is a positive relation between an individual firm's asset sales and the probability of the asset seller making a subsequent acquisition bid. In economic terms, firms with asset sales are associated with a 3.42% increase in acquisition probability in the following year, relative to firms without asset sales, which translates into 60% increase relative to the sample mean acquisition probability. Additionally, this effect is more pronounced for financially constrained firms by further 0.72%.

Next, we attempt to shed light on the mechanism and our implied intuition that asset sales increase firms' cash richness, which, in turn, allows firms to conduct acquisitions. We begin with the established result that cash reserves are associated with increase in acquisition likelihood (Harford (1999)). If asset sales are associated with increase in cash reserves (controlling for all other sources of cash reserves such as operating cash flows, equity flows, and debt flows), then this can plausibly be the mechanism for the positive relation between asset sales and acquisition

[7] It should be noted, however, that we do not conjecture that other uses of the proceeds do not create any other benefits; we simply argue that firms using asset sale proceeds to conduct focus increasing acquisitions benefit more than those which do not.

likelihood. Indeed, we find that firms that sell assets experience an increase in cash richness. This finding provides further empirical evidence on prior literature (Edmans and Mann (2019)), that asset sales increase firm liquidity, which constitutes a plausible mechanism behind our results.

Additionally, looking at the long-term operating performance of firms that sell unrelated assets and make focus-increasing acquisitions, we provide evidence of the double benefit effect, which concentrates on firms that are financially constrained. In particular, we report that financially constrained firms that perform this type of firm restructuring experience a 5.72% increase in operating performance. Additionally, we find that the market reflects the efficiency improvement for constrained firms that sell unrelated asset with the intent to make focus-increasing acquisitions, as these specific firms experience relatively higher stock abnormal returns of 4.69% at the asset sale announcement.

Overall, our findings do suggest that there is an important lead-lag effect between asset sales and acquisitions. In particular, we argue that firms take *joint* asset restructuring decisions of selling-to-buy assets where there is no clear causality of who drives whom. In other words, firms which decide to do a joint selling-to-buy asset restructuring do not intend to only sell assets or only make acquisitions, but they want to do both as part of a general restructuring strategy with a lag between the two corporate actions. To examine the direction of the association, we run a Granger causality test and find that there is a strong positive time-series relation between asset sales and acquisitions, but not vice versa. Our results are also robust to potential bias arising from the choice of asset sales being correlated with potentially omitted variables. To control for unobservable characteristics, we run the coefficient stability approach of Oster (2019), and also perform an instrumental variable approach using heteroskedasticity-based instruments generated using the

method by Lewbel (2012). We also perform a propensity score matching technique to control for observable characteristics, obtaining similar results.

To further validate that our results suggest a double benefit effect stemming from *both* efficiency and capital liquidity improvement of financially constrained firms, we perform the following exercise. Rather than using asset sales (i.e., sell-offs), we focus on spin-offs, which provide a suitable alternative to testing the "joint corporate asset restructuring decisions". Given that firms conducting spin-offs do not raise cash to improve their capital liquidity, focusing on spin-offs isolates the efficiency improvement effect from the financing (i.e., capital liquidity improvement) effect. Whereas it has been established that spin-offs (similarly to sell-offs) are associated with efficiency improvement (see for instance, Daley et al. (1997) and Desai and Jain (1999)), we find that firms performing spin-offs, contrary to asset sale firms, are *not* more likely to make acquisitions afterwards; similarly, firms with focus increasing spin-offs followed by focus increasing acquisitions are *not* associated with improved long-run operating performance, and are *not* related with higher stock abnormal returns at the spin-off announcement. We obtain similar results when we interact the main variables of interest with financial constraints. Collectively, these results suggest that only the joint selling-to-buy activity allows firms to benefit from *both* efficiency and capital liquidity improvement.

This study makes two important contributions to the source of funds, asset sales, acquisitions, and restructuring literature. First, it provides empirical evidence that proceeds from asset sales are likely to be used as a funding source in the most important corporate investment that a firm can

undertake, i.e., acquisitions.[8] Second, it contributes to our understanding of the operating efficiency derived beyond asset sale restructuring only, stemming from the joint restructuring transactions of both selling and buying assets.

Our study is related to the work on the uses of asset sale proceeds by Bates (2005), Hovakimian and Titman (2006), and Borisova and Brown (2013). Bates (2005) identifies distributions to debt or equity holders, retention of proceeds by management, and financing of capital expenditure as potential uses of asset sales. Hovakimian and Titman (2006) and Borisova and Brown (2013) also show that asset sale proceeds are deployed to finance capital expenditure investments and R&D, respectively, especially for financially constrained firms. We provide evidence that financing acquisitions is another use of asset sale proceeds.

Moreover, our work is related with studies which provide associations between increases in firms' cash liquidity and acquisition bids, such as Jensen (1986) with free cash flows, Blanchard et al. (1994) with cash windfalls, and Harford (1999) with cash holdings. Particularly, our study shows that proceeds from asset sales, which increase firms' liquidity, are associated with higher probability of takeover bids.

In addition, we expand the work on asset restructuring and firm focus by John and Ofek (1995) and Daley et al. (1997), who study the performance of firms with asset sales (without examining subsequent acquisitions), by illustrating an additional advantage to simply selling unrelated assets, as identified by the double benefit effect of disposing unrelated assets and using the proceeds to acquire a firm that would further improve operating efficiency.

[8] An alternative argument to asset sales increasing firm-specific capital liquidity, with the proceeds being used to fund acquisitions, is that firms could also be selling assets in anticipation of making acquisitions, because they know that antitrust rules would require them to divest certain assets before a deal can be closed. Antitrust authorities routinely make asset sales a requirement to clearing acquisitions. Importantly also, this argument is toward the notion that asset sales most likely precede acquisitions (i.e., for antitrust reasons, firms will sell assets before conducting acquisitions, but it is unlikely for antitrust reasons firms to make acquisitions before selling assets).

The remainder of this study will be presented as follows: Section 2 identifies our sample and data. Our main empirical findings are presented in Section 3. In Section 4, we examine and control for potential endogeneity issues. We also check whether the increase in cash reserves constitutes a plausible mechanism behind our results. Section 5 provides results on long-run performance and announcement returns, and also performs tests on spin-offs. Additional auxiliary tests to further substantiate the robustness of our results are presented in Section 6. Finally, Section 7 concludes the study.

2. Sample and Data

Our initial sample consists of all NYSE, Amex, and Nasdaq firms listed on the Compustat annual industrial file from 1989 through 2013. Our sample is composed of 22,770 firms for a total of 190,190 firm/year observations. Our primary asset sale sample consists of asset sale deals announced between January 1, 1990 and December 31, 2014, and is obtained from the Thomson Financial SDC Mergers and Acquisitions Database (SDC). Asset sellers are the target's ultimate parent in the transaction and are US public firms. We find that 3,770 sellers conducted 8,319 asset sales over the period 1990 to 2014, out of which 1,059 had subsequent acquisition transactions.

2.1. Asset Sale Measure

One challenge in observing asset sale proceeds as a funding source for acquisitions is that it is difficult to observe an exact correspondence between a dollar raised in time t and a dollar spent on an acquisition in time $t+\tau$ (Schlingemann (2004)). Similar to Schlingemann (2004), rather than attempting to establish a precise correspondence, we consider the cash made available to the firm through asset sales which occurred within 12 months prior to the acquisition announcement. For

purposes of clarity, we define asset sales to include any divestitures or sell-offs of business segments, product lines, investment assets, or property, plant, and equipment.[9]

Similar to Edmans and Mann (2019), we identify asset sales from the SDC database as completed acquisition transactions[10] with the form of transaction being either acquisition of assets or acquisition of certain assets, and where the acquisition technique field includes at least one out of divestiture,[11] property acquisition, auction, or internal reorganization,[12] and none out of buyout, bankrupt, takeover, restructuring, liquidation, private, tender, unsolicited, and failed. In these transactions, the asset seller is the firm raising funds to be used in a subsequent corporate investment (i.e., acquisitions). Because some asset sales, as defined by Edmans and Mann (2019), could also be reported by the asset buyer as an acquisition, we eliminate any deals in our acquisition sample that are also found in our asset sale sample to avoid them being counted as both an asset sale and an acquisition transaction.[13] The definition for our asset sale measure is outlined in the Appendix.

We create our main variable of interest, *asset sale*, which is a dummy variable taking the value of 1 if there is an asset sale in a given year, and zero otherwise. Out of the 10,780 firm-year observations with acquisition transactions, 770 observations (7.14%) involve firms with an asset sale in the prior year. In contrast, 179,410 firm-year observations had no acquisitions, with 4,992

[9] The term divestiture has been defined in the literature as pertaining to the modification of a firm's productive assets through either sell-offs or spin-offs (Alexander et al. (1984), Tehranian et al. (1987)). Hite and Owers (1983) observe that a spin-off results in the creation of an independent firm with a corresponding reduction in the asset base of the divesting firm. Thus, spin-offs are restructuring events that do not generate proceeds for the divesting firm, nor do they create an opportunity for managers to continue the control of spun-off assets. Consequently, spin-offs will not be relevant to our study except in Section 5.3 where we use them as an exercise to further validate our main hypotheses. Unless specifically noted, where the term divestiture is used in this paper, it refers to sell-offs only.

[10] The majority of the deals (i.e., 52.1%) excluded from the asset sale sample are classified as *mergers* in the acquisition technique field in SDC and are included in our acquisition sample.

[11] 98.7% of the asset sale sample appears in the acquisition technique field as "divestiture".

[12] We deviate from Edmans and Mann (2019) by excluding *spin-offs* for purposes described in footnote 9. While spin-offs are nominally excluded, adding this restriction does not remove any observations from our asset sale subsample.

[13] A total of 7,414 overlapping deals (approximately 25%) are eliminated from the acquisition sample.

(2.78%) of those experiencing an asset sale in the prior year. The difference in asset sales between the acquisition and no-acquisition sub-samples is statistically significant at the 1% level and gives our first indication that asset sales are positively associated with acquisitions in the following year. Finally, the median relative size of asset sale to acquisition is 0.31, with the mean at 5.59.

2.2. Sample Statistics

We report summary statistics in Table 1 on dependent and control variables for the overall firm-year sample and further partition the sample by those firm-year observations with asset sales and those without asset sales. Variable definitions are provided in the Appendix. We winsorize all non-binary variables at the 1st and 99th percentiles, apart from cash reserves and leverage, which are winsorized only at the 99% percentile (right-hand side).[14]

Panel A provides statistics for our dependent variable, acquisition probability, and offers initial indication that firms with asset sales are more likely to engage in acquisitions in the following year. Additionally, there are notable mean and median differences in the characteristics between firms with asset sales and those without. In Panel B, we display firm characteristics and observe that firms with asset sales are larger in size, have less cash reserves, have higher leverage, and more growth opportunities. Panel C provides industry characteristics and shows that firms with asset sales come from industries that are more concentrated (in mean terms only).

[Please Insert Table 1 About Here]

However, because univariate comparisons do not consider any confounding effects, they can be misleading. Consequently, to discover the net effect of asset sales on our dependent variable,

[14] Note that, where size is included in regressions, we use the natural logarithm of size which is not winsorized.

firm- and industry-specific characteristics need to be controlled for through multivariate regression analysis, as presented in the next section.

3. Empirical Findings

3.1. Asset Sales and Acquisitions

We analyze the relation between a firm's asset sales and subsequent acquisition investments, while controlling for several firm- and industry-specific characteristics which have been identified in the literature as affecting acquisition investments.

Table 2 reports the results for this analysis. All independent variables are lagged by one year to reduce endogeneity concerns. As in Harford and Uysal (2014), we exclude financial firms (6000–6999) and regulated utilities (4900–4999). We also control for year and industry fixed effects as previous research suggests that there are patterns across time and industry in the level of acquisitions (see, for example, Harford (2005) and Mitchell and Mulherin (1996)). Additionally, we use heteroskedasticity-robust standard errors adjusted for clustering at firm-level due to the presence of repeated firm observations in our sample.

To ease interpretation of the coefficients, we run linear probability models (LPM) in which the dependent variable takes the value of 1 if the firm makes at least one acquisition in a given year, and 0 otherwise. In specification (1) our main variable of interest is asset sale, which is an indicator that takes the value of 1 for firms with asset sales in that given year, and 0 otherwise. In specification (2), our main variable of interest is the interaction of asset sales with financial constraints which shows how financial constraint status affects the relation between asset sales and acquisition likelihood. Financial constraint is measured using the Size/Age index as in Hadlock

and Pierce (2010).[15, 16] Firms with a Size/Age index in the top quartile of the year and industry are considered to be constrained. Further, we employ similar controls as in Harford and Uysal (2014) for comparison reasons, which consist of *size, cash reserves, leverage, stock return, market-to-book value, ROA, industry M&A liquidity*, and *Herfindahl index.*[17] To reduce concerns that time invariant unobservable firm characteristics may bias our results, both specifications include the lagged dependent variable.[18]

We find that the coefficient on asset sale is positive and statistically significant at conventional levels, supporting Hypothesis 1a. In economic terms, having asset sales is associated with an increase in firm's probability of subsequently conducting an acquisition by a significant 3.42% relative to firms without asset sales, which translates in 60% increase relative to the mean value of acquisition probability in our sample. The effect is more pronounced for financially constrained firms, as for such firms, asset sales are associated with a further increase of 0.72% in the likelihood of acquisition (specification (2)), supporting Hypothesis 1b. The results of the control variables are in agreement with prior work, indicating that firms are more acquisitive when they have larger size, higher cash reserves, less leverage, strong stock performance, high growth opportunities, higher operating returns, higher industry M&A liquidity, and are from more concentrated industries. Overall, our results indicate that asset sales are likely to offer financially constrained firms the essential capital liquidity needed to proceed to an acquisition bid.

[15] We have also employed the KZ index developed by Kaplan and Zingales (1997) as an alternative proxy for financial constraints and our results are qualitatively similar.

[16] The authors perform a critical analysis of commonly used financial constraint measures, relating qualitative measures from financial filings to quantitative factors using order logit regressions. Their analysis reveals that age and size are particularly effective in predicting financial constraint levels. Additionally, Beck et al. (2006), using the World Business Environment Survey, show that smaller and younger firms have relatively lower access to external finance.

[17] We do not include credit ratings in the models to avoid any confounding effects due to the inclusion of our financial constraint measure. Nevertheless, using credit ratings does not alter our results.

[18] In unreported tests, we also run a linear probability model (LPM) using firm fixed effects to further reduce concerns about unobserved heterogeneity at the firm-level that can affect acquisition decisions. Our results are qualitatively similar to those reported in Table 2.

[Please Insert Table 2 About Here]

4. Endogeneity Issues and Potential Mechanism for the Positive Relationship Between Asset Sales and Acquisition Likelihood

In this section, we examine potential endogeneity issues by using: i) a Granger causality test; ii) a coefficient stability approach; iii) an instrumental variable (IV) approach; and iv) propensity score matching techniques.

4.1. Granger Causality Test

An important issue stemming from the lead-lag effect we uncover is whether the opposite is true, i.e., that the direction is not from asset sales to acquisitions but from acquisitions to asset sales. For instance, Kaplan and Weisbach (1992) study the success of acquisitions by looking at a sample of 282 acquisitions with subsequent divestitures, giving some evidence that acquisitions lead to divestitures within a median period of seven years, without, however, performing any tests to examine the time series relation. To determine whether there is a predictive relationship between asset sales and acquisitions and which direction this relationship runs, we implement a Granger causality test established by Granger (1969), which uses forward-looking predictive regressions to measure the ability to predict the future values of one time series (i.e., acquisitions) using prior values of another time series (i.e., asset sales).

Table 3 displays results from the Granger causality test, following Ahern and Harford (2014), to determine whether acquisitions are "Granger caused" by asset sales or vice versa. In Panel A, we run predictive vector autoregressions (VARs) with the lagged values of acquisition probability and asset sale as our main endogenous variables. Tests for our full sample are in specifications (1)

and (2); specifications (3) and (4) and specifications (5) and (6) are tests for the financially constrained and not constrained subsamples, respectively. We find that the lagged asset sale variable is positively related to acquisition probability as shown in specifications (1), (3), and (5), while lagged acquisition probability is negatively associated with asset sales as found in specifications (2), (4), and (6). Panel B reports the Granger causality Wald tests, in which the first null hypothesis assumes that asset sales do not Granger cause increase in acquisitions, and the second assumes that acquisitions do not Granger cause decrease in asset sales. Again, we further split our sample by financial constraint status. The results in Panel B allow us to reject the null that asset sales do not Granger cause increase in acquisitions. These results confirm that there is a strong positive time-series relation between asset sales and acquisitions in the following year. Additionally, we can also reject the null that acquisitions do not Granger cause decrease in asset sales in the following year.

Overall, these predictive tests show that asset sales precede acquisitions, rather than the opposite, reflecting the direction of the lead-lag effect we uncover.

[Please Insert Table 3 About Here]

4.2. Coefficient Stability Approach

Further, we evaluate the robustness of our results to omitted variables bias using the coefficient stability approach of Oster (2019). A common method found in the literature to assuage omitted variable bias concerns is to explore the sensitivity of the treatment effect to the addition of observable control variables. However, coefficient movements alone are not a sufficient statistic to determine omitted variable bias. To be an effective tool for diagnosis, we must observe how much of the variance in the outcome is explained by the inclusion of the control variable, or in

other words, by how much the R^2 changes when that particular control is added. In this respect, Altonji et al. (2005) propose a method which assumes that, if one could observe the full set of observable and unobservable characteristics, the outcome variance could be fully explained and the regression would have an R^2 of 1. Building on their method, Oster (2019) proposes a new approach for evaluating robustness to omitted variable bias with the assumption that the relationship between the treatment and unobservable characteristics can be informed by the relationship between the treatment and observables. This is because omitted variables bias is proportional to coefficient movements, if those movements are scaled by the change in R^2 when the observables are included. Based on these assumptions, one can estimate the effect of the omitted variables on the coefficient of asset sale and identify bounds of the bias-adjusted asset sale coefficient.

We display results for this analysis in Table 4. As recommended by Oster (2019), we assume that the omitted and the controlled variables have equal effect on treatment coefficient outcomes (i.e., δ=1), and that the addition of omitted variables can lead to a maximum R^2 (R_{max}) of 1.3 times the estimated R^2 in the controlled regression. Panel A displays results for our full sample, while Panels B and C show results for our financially constrained and unconstrained subsamples, respectively. We find that potential omitted variables do not significantly affect our primary estimates, as the bias-adjusted asset sale coefficient meets both robustness criteria of Oster (2019). First, while the bias-adjusted asset sale coefficient (Panel A=0.0359; Panel B=0.0406; and Panel C=0.0379) is less than our controlled coefficient in each panel (Panel A=0.0397; Panel B=0.0436; and Panel C=0.0409), the identified set displayed in column (3) does not include zero. Second, we observe that the changes on the adjusted coefficient generally fall within the 95% confidence interval of the estimated coefficients in the controlled regression as shown in column (4).

Additionally, our bound estimates for delta in column (5) show that unobservable variables would need to have a much higher effect than our observed variables on the outcome in order to bias our results. For instance, in Panel B, unobservables would need to have over 7.172 times the effect of our observables on the outcome in order to bias the results. Taking into consideration that we have a good set of control variables suggested by the prior literature, the likelihood of unobservables confounding our results is unlikely.

[Please Insert Table 4 About Here]

4.3. Instrumental Variable (IV) Approach

To further reduce concerns that our findings could be attributed to some unobservable characteristics that might affect both asset sales and acquisitions, we employ an IV approach using a method developed by Lewbel (2012).[19] This approach estimates an instrumental variables regression model with heteroskedasticity-based instruments. This technique allows the identification of structural parameters in regression models with endogenous regressors when traditional identifying information, such as external instruments, is absent. Identification is accomplished in this context by having regressors that are uncorrelated with the product of heteroskedastic errors, which is a feature of many models where error correlations are due to an unobserved common factor. Using this form of Lewbel's method, instruments are constructed as simple functions of the model's data. Thus, this approach can be applied when no external

[19] Recent studies using the Lewbel (2012) approach include work by Schlueter et al. (2015) and Ivanov et al. (2016).

instruments are available, or, alternatively, to supplement external instruments to improve the efficiency of the IV estimator.[20, 21]

Table 5 displays results from the first and second stage of our IV approach. Specification (1) reports the first stage regression including Lewbel estimated instruments which are based on the control variables in the model. We find that the Lewbel estimated instruments provide a strong set of instrumental variables. The Kleibergen-Paap rk Wald F statistic for the weak identification test is 442.94 which is comfortably higher than the critical value prescribed by Stock and Yogo (2002) (i.e., LIML Size of Nominal 10% Wald that is 11.39 in our case), allowing us to reject the null of weak identification. Additionally, the Hansen J statistic is not significant, which gives an indication that we do not have an overidentification problem.

Specification (2) reports the second stage regression, with our interaction term exhibiting a positive and significant association with acquisition probability. Further, the Wu-Hausman test shows insignificance at conventional levels, indicating that our variables are exogenous and do not suffer from endogeneity concerns; therefore, we can rely upon the results found in our main tests in Table 2.

[Please Insert Table 5 About Here]

4.4. Propensity Score Matching

To further reduce concerns of bias based on observable characteristics, we implement a propensity score matching (PSM) process (not reported for brevity) as in Subrahmanyam et al.

[20] We use the Stata command *ivreg2h* by Baum and Schaffer (2012) to estimate Lewbel instruments.

[21] A caveat is in order: In the absence of a source of exogenous variation in the asset sale decisions, we stop short of making strong causal statements. Nevertheless, even relatively noisier than a conventional IV approach, the Lewbel's method still allows us to draw some useful inferences on whether our results are robust to potential unobservable characteristics.

(2014). We match firms with asset sales (treated) with firms exhibiting analogous characteristics but did not have an asset sale (control). The treatment effect from the PSM estimation is the difference between the treated sample and the matched control sample, as measured by the asset sale coefficient. In order to match firms, we calculate a one-dimensional propensity score, which is a function of observable characteristics used in Table 2 for acquisition probability tests. We implement a one-to-one (i.e., nearest neighbor) matching estimator.[22] The treatment effect of asset sales is significantly positive at conventional levels, supporting the finding that asset sales are positively related with acquisition probability. Thus, it appears that selection on observable characteristics does not bias our results.

4.5. Is the Increase in Cash-Richness the Mechanism for the Positive Relation Between Asset Sales and Acquisition Likelihood?

Prior literature suggests that firm cash reserves are associated with higher acquisition likelihood (Harford (1999)). Additionally, asset sales improve firms' liquidity offering important funds to finance corporate investments (Bates (2005) and Edmans and Mann (2019)). Thus, if asset sales are associated with increase in cash reserves, then this can plausibly be the mechanism for the positive relation between asset sales and acquisition likelihood.

We examine this issue and report the results in Table 6. Confirming our expectations, specification (1) shows a positive relation between asset sales and increase in cash reserves. This relation is obtained after controlling for other sources of cash, such as, operating cash flows, debt flows, and equity flows. In specification (2) we interact asset sales with financial constraints and find that the positive relation between asset sales and increase in cash reserves is more pronounced

[22] For robustness, we also use 30-nearest-neighbors, 50-nearest-neighbors, and Gaussian and Epanechnikov kernel-based matching estimators. We find similar results with these different estimators.

for financially constrained firms. Overall, the results of this analysis provide evidence on a plausible mechanism for the positive relationship between asset sales and acquisition likelihood, i.e., the increase in cash liquidity from asset sales.

[Please Insert Table 6 About Here]

5. Further Findings

In this section, we examine effects on sample firms that pursue joint asset restructuring activities. In Sections 5.1 and 5.2, we investigate the impact of asset sales on long-run operating performance and announcement stock abnormal return for firms that subsequently conduct acquisitions. Finally, in Section 5.3 we perform the same tests as in Sections 3.1, 5.1. and 5.2, but this time, instead of asset sales, for spin-offs.

5.1. Long-Run Operating Performance

Prior empirical research shows that focus increasing asset sales result in improved operating efficiency (John and Ofek (1995), Daley et al. (1997)). However, past empirical work has not examined the efficiency effects derived from the double benefit of a focus increasing asset sale followed by a focus increasing acquisition. In particular, firms that sell unrelated assets have a first benefit of increasing industry focus which improves their operating efficiency. This effect is magnified, offering a double benefit, if the firm, by increasing its capital liquidity, uses the proceeds of the asset sales to buy an asset that further improves its focus and operating efficiency.

Therefore, we examine the three-year industry-adjusted operating performance from the date of the asset sale announcement to detect any efficiency improvements resulting from these two events for firms that used the proceeds of unrelated asset sales to conduct focus increasing

acquisitions versus those that did not make post asset sale focus increasing acquisitions.[23] This approach allows us to capture the effect on operating efficiency coming from the above selling-to-buy decisions.

Table 7 displays the OLS estimates from these tests. We use a sample of focus increasing asset sales, which is the group of asset sellers who divest a unit that has a different three-digit Standard Industrial Classification (SIC) code relative to their core operations. To avoid the potential confounding effects of firms having multiple asset sales in the same year, we eliminate any firms that had more than one asset sale in that year. The dependent variable is the three-year industry-adjusted operating performance as in Healy et al. (1992) and Harford et al. (2012). Our main variables of interest are *focus increasing asset sale and focus increasing acquisition* and the *interaction between focus increasing asset sale and focus increasing acquisition and financial constraint*, respectively. The *focus increasing asset sale and focus increasing acquisition* is a dummy variable that takes the value of 1 if the firm has a focus increasing acquisition in the year following the asset sale, and 0 otherwise. In this case, the main variable of interest shows whether firms that made a focus increasing acquisition after a focus increasing asset sale experience higher operating efficiency relative to firms that did not make a post-sale focus increasing acquisition. An acquisition is focus increasing if the bidder has the same three-digit SIC code as the target. In addition to the customary control variables in the operating performance tests, we also control for the lagged industry-adjusted operating performance as in Healy et al. (1992) and Harford et al. (2012) because past performance is a strong predictor for future performance, and we also want to control for any time-invariant omitted variables.

[23] We have also examined two-year industry-adjusted operating performance from the date of the asset sale announcement and found qualitatively similar results.

While in specification (1) the main variable of interest is statistically insignificant at conventional levels, we observe that the effect is concentrated among financially constrained firms. In particular, in specification (2) the main variable of interest is the *interaction between focus increasing asset sale and focus increasing acquisition and financial constraint*. Conditioning on financial constraint status, firms that sell unrelated assets and conduct focus increasing acquisitions also experience an improvement in their three-year operating performance by 5.72% that is significant at the 5% level, in support of Hypothesis 2b. This finding is consistent with the notion that firms which concentrate their assets around their core industry (by selling unrelated assets and buying related assets) experience a double benefit effect, improving *both* their operating efficiency and their cash liquidity; this increase in cash liquidity allows particularly financially constrained firms to undertake investments that otherwise would be missed, thus further improving their efficiency.[24]

[Please Insert Table 7 About Here]

5.2. CARs

In the previous section, we showed that financially constrained selling-to-buy firms enjoy a double benefit. If this is indeed the case, then this should be reflected in the market at the announcement of the asset sale; this is the event date which incorporates the information of the joint asset restructuring decision of focus-increasing asset sales followed by focus-increasing acquisitions. We therefore perform the same exercise and examine stock abnormal returns at the asset sale announcement for firms that sell unrelated assets and conduct focus increasing

[24] In unreported analysis (for brevity), we have also performed the Lewbel (2012) instrumental variable approach to control for omitted variable bias. Our results persist.

acquisitions. We then interact such firms with their financial constraint status.[25] The dependent variable is the 5-day market-adjusted value-weighted CAR surrounding the asset sale announcement.[26] The results are reported in Table 8.

The expectation is that the market should react favorably to reflect both operating efficiency and capital liquidity improvement. Thus, we predict higher asset sale announcement stock abnormal returns for constrained firms that conduct focus increasing asset sales followed by focus-increasing acquisitions. This is precisely what we find. As shown in specification (2), financially constrained firms that perform focus increasing asset sales followed by focus increasing acquisitions experience 4.69% higher CARs at the asset sale announcement, *ceteris paribus*. In economic terms, the selling-to buy-decision leads to an increase of $253.17 million in the value of a mean size acquirer at the asset sale announcement. This result is consistent with Hypothesis 3 and reaffirms that the market rewards joint asset restructuring activities, which offer a double benefit.

In unreported analysis (for brevity), we have also performed the Lewbel (2012) instrumental variable approach to control for omitted variable bias. The coefficient of the main variable of interest carries a positive and economically significant coefficient, which misses marginally only its statistical significance (*t*-stat=1.57). Nevertheless, the Wu-Hausman test shows insignificance at conventional levels, suggesting there is no evidence of endogeneity, so we can rely on our main results in Table 8.

[Please Insert Table 8 About Here]

[25] We use the KZ index as a measure of financial constraints.
[26] We obtain qualitatively similar results when we use a different event window (-1, +1), or equally weighted CARs.

5.3. Spin-offs

To further validate that selling-to-buy firms enjoy a double benefit effect stemming from *both* efficiency and capital liquidity improvement of financially constrained firms, we perform the following exercise. Rather than using asset sales (i.e., sell-offs), we focus on spin-offs, which provide a suitable alternative to testing the "joint corporate asset restructuring decisions". Given that firms conducting spin-offs do not raise cash to improve their capital liquidity [they simply improve their efficiency (see, e.g., Daley et al. (1997) and Desai and Jain (1999))], focusing on spin-offs isolates the efficiency improvement effect from the financing (i.e., capital liquidity improvement) effect.

Tables 9 to 11 present the results for acquisition likelihood, long-run operating performance, and acquisition CARs, respectively. Contrary to asset sale firms, we find that firms with spin-offs are *not* more likely to make acquisitions afterwards (Table 9); additionally, spin-off firms that make subsequent acquisitions are *not* associated with improved long-run operating performance (Table 10), and are *not* associated with higher stock abnormal returns at the spin-off announcement (Table 11). These results are similar when we interact spinoff with financial constraint status.

Collectively, these results suggest that only the joint selling-to-buy activity allows firms to have a double benefit stemming from *both* efficiency and capital liquidity improvement.

[Please Insert Tables 9, 10 and 11 About Here]

6. Robustness Tests

To further substantiate our results, we run a number of additional robustness tests. In particular: i) we include equity and debt flows as other potential sources of financing in the firm-level regressions; ii) we add measures of firm distress and further measures of financial constraints,

which are commonly cited motivations for asset sales: in particular, we include the distance to default as in Campbell et al. (2008) and the Altman Z score as in Altman (1968) to control for financial distress; we also add the rating level as in Karampatsas et al. (2014) to capture further financial constraint concerns; iii) we include R&D/total assets and R&D/total sales, and number of analysts as proxies for information asymmetry; and iv) we check for the existence of multicollinearity amongst our variables using Variance Inflation Factor (VIF) tests and confirm the absence of any multicollinearity issues that would materially affect our estimates. Altogether, we confirm that our main findings are robust.

Additionally, we have considered and controlled for potential tax implications that could occur for firms with asset sales which could perhaps influence our results. In particular, firms with asset sales: 1) could recognize a gain as a result of the sale and would therefore experience a higher tax burden in the year of the asset sale; or 2) could recognize a loss, resulting in a tax loss carry forward. We have looked at both of these scenarios by calculating the changes in taxes paid and tax loss carry forward from the year before the asset sale to the year after the asset sale. We have found that there was no significant year-over-year difference for these variables; when these variables were included in our models, they made no material differences to the results.

Further, to shed additional light on the double benefit of selling-to-buy activities and whether it is also evident when asset sales are followed by other corporate actions, we perform "placebo type" tests (not reported for brevity). In these tests, we replace acquisitions with other corporate actions and examine the market reaction at the asset sale announcement. In particular, we examine whether the double benefit effect we find for acquisitions shows up when asset sales are followed by increase in capital expenditures or decrease in long-term debt. We find that the joint decision of asset sales with each of the above corporate actions is never associated with higher CARs at the

asset sale announcement, regardless of the financial constraint status. Overall, there is no evidence that the market recognizes a double benefit when the proceeds of asset sales are used for other corporate actions.

Finally, to further ensure that our results represent pure asset restructuring events, we control for capital structure changes, dividend payout changes, and method of payment. Our results persist.

7. Conclusion

This paper provides new evidence of a lead-lag effect related with the reallocation of firm assets through the joint restructuring activities of asset sales and subsequent acquisitions. More specifically, we offer empirical confirmation of the role of asset sale proceeds as a source of funds in acquisitions, particularly for financially constrained firms. Additionally, we find that this type of selling-to-buy asset restructuring results in a double benefit for financially constrained firms that sell unrelated assets and use the proceeds to conduct focus increasing acquisitions. The first benefit comes from the improvement in their operating efficiency, and the second from the increase in capital liquidity; the latter allows them to undertake investments which can further improve operating efficiency, that otherwise would be missed. Particularly, we show that these firms experience greater industry-adjusted operating performance improvement in the three years following the asset sale and higher stock abnormal returns at the announcement of the asset sale.

The findings of this study have important implications for academics, managers, and practitioners. Specifically, our findings reveal the significant importance of asset sale proceeds as an additional funding source for corporate investments, mitigating the negative effects associated with traditional external funding sources such as equity and debt issues. Furthermore, managers

should also consider in their asset restructuring-investment agenda this type of selling-to-buy activity, as it appears that firms that engage in these activities enjoy a double benefit effect.

Overall, this study provides evidence on the role of asset sales as a source of funds in acquisitions and highlights the benefits that come to a firm engaging in this form of selling-to-buy asset restructuring.

Appendix

Variable descriptions

Variable	Description
Panel A: Dependent variables	
Acquisition probability	A dummy variable that takes the value of 1 if the firm announced at least one acquisition in year *t*, and 0 otherwise. This variable is created using data from Thomson Financial SDC.
Operating performance	The three-year average industry-adjusted operating returns where operating returns are calculated as the operating income before depreciation, scaled by total assets. Industries are defined based on Fama and French 49 industry classification. This variable is created using data from Compustat.
Cumulative abnormal return	The market adjusted value weighted cumulative abnormal stock returns at the announcement of the asset sale in the 5-day event window (−2, +2) where 0 is the announcement day. The returns are computed using the market model with the market model parameters estimated over the period (-240, -41) days before the announcement. This variable is created using data from the Center for Research in Security Prices (CRSP).
Panel B: Measure of asset sales and financial constraints	
Asset sale	A dummy variable that takes the value of 1 when the asset sale is a completed acquisition transaction with the form of transaction being either *acquisition of assets* or *acquisition of certain assets*, where the acquisition technique field includes at least one out of *divestiture*, *property acquisition*, *auction*, *internal reorganization*, or *spinoff*, and none out of *buyout*, *bankrupt*, *takeover*, *restructuring*, *liquidation*, *private*, *tender*, *unsolicited*, and *failed* as in Edmans and Mann (2019), and 0 otherwise. This variable is created using data from Thomson Financial SDC.
Financial constraint	A dummy variable that takes the value of 1 when the firm has a Size/Age index (as in Hadlock and Pierce (2010)) or a KZ index (as in Kaplan and Zingales (1997)) in the top quartile of the year and industry. This variable is created using data from Compustat.
Panel C: Control variables for acquisition probability tests	
Size	Sales at fiscal year-end. This variable is created using data from Compustat. In the regressions analysis we use the ln(size).
Cash reserves	Cash and short-term investments divided by total assets at fiscal year-end. This variable is created using data from Compustat.
Leverage	Total debt (long-term debt + debt in current liabilities) divided by total assets at fiscal year-end. This variable is created using data from Compustat.
Stock return	The annualized market-adjusted return (using the value-weighted CRSP index as benchmark).
M/B	The market value of equity (common shares outstanding * closing price at fiscal year-end) divided by the book value of equity at fiscal year-end. Similar to Fama and French, book value of equity is total shareholders' equity plus deferred taxes and investment tax credit minus the book value of preferred stock. In case the data are not available, shareholders' equity is calculated as the sum of common and preferred equity. If none of the two are available, shareholders' equity is defined as the differences of total assets and total liabilities. This variable is created using data from Compustat.
ROA	Earnings before interest, taxes, depreciation, and amortization scaled by total assets. This variable is created using data from Compustat.
Industry M&A liquidity	Sum of acquisitions values for each year and three-digit SIC code divided by the aggregated assets of firms in the same three-digit SIC and year. This variable is created using data from Compustat.
Herfindahl index	Sum of squares of the market shares of all firms sharing the same three-digit SIC, where market share is defined as sales of the firm to the aggregated sales of the industry. This variable is created using data from Compustat.
Panel D: Control variables for change in cash reserves tests	
Equity flows	The difference between the flows of the sale of common and preferred stock and the purchase of common and preferred stock plus the change in the liquidating value of preferred stock at the fiscal year-end, normalized by the book value of the firm's total assets at the previous fiscal year-end. This variable is created using data from Compustat.
Debt flows	Debt flow is the change in the sum of short- and long-term debt financing at the fiscal year-end, normalized by the book value of the firm's total assets at the previous fiscal year-end. This variable is created using data from Compustat.
Cash flows	Operating income before depreciation, minus interest expense on debt, income taxes, and preferred and common dividends at the fiscal year-end, normalized by the book value of the firm's total assets at the previous fiscal year-end. This variable is created using data from Compustat.
Panel E: Control variables for long-run operating performance and stock abnormal returns tests	
Focus increasing asset sale and focus increasing acquisition	A dummy variable that takes the value of 1 if the firm has a focus increasing acquisition in the year following focus increasing asset sale, and 0 otherwise. An asset sale is focus increasing if asset sellers divest a unit that has a different 3-digit SIC code relative to their core operations. An acquisition is focus increasing if the bidder has the same three-digit SIC code as the target. This variable is created using data from Thomson Financial SDC.

3-yr industry-adjusted operating returns	The industry-adjusted operating return three years prior to the asset sale, where operating returns is calculated as the operating income before depreciation, scaled by total assets. Industries are defined based on Fama and French 49 industry classification. This variable is created using data from Compustat.
Size	Firm market value of equity 4 weeks prior to the acquisition announcement. This variable is created using data from CRSP. In the regressions analysis we use the ln(size).
Asset sale relative size	The ratio of the asset sale value (from Thomson Financial SDC) to the seller's market value of equity 4 weeks prior to the asset sale announcement (from CRSP database).
Leverage	Total debt (long-term debt + debt in current liabilities) divided by total assets at fiscal year-end. This variable is created using data from Compustat.
Cash flows	Operating income before depreciation, minus interest expense on debt, income taxes, and preferred and common dividends at the fiscal year-end, normalized by the book value of the firm's total assets at the previous fiscal year-end. This variable is created using data from Compustat.
M/B	The market value of equity (common shares outstanding * closing price at fiscal year-end) divided by the book value of equity at fiscal year-end. Similar to Fama and French, book value of equity is total shareholders' equity plus deferred taxes and investment tax credit minus the book value of preferred stock. In case the data are not available, shareholders' equity is calculated as the sum of common and preferred equity. If none of the two are available, shareholders' equity is defined as the differences of total assets and total liabilities. This variable is created using data from Compustat.
Panel F: Spinoff definition for spinoff tests	
Spinoff	A dummy variable that takes the value of 1 for deals defined as a spinoff, and 0 otherwise. This variable is created using data from Thomson Financial SDC.

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Table 1
Sample descriptive statistics by asset sale

This table presents descriptive statistics for firm-year observations for the universe of US publicly listed with data from SDC and COMPUSTAT over the period 1990-2014. We report the mean, median, and number of observations for the dependent variable in Panel A, firm characteristics in Panel B, and industry characteristics in Panel C. The sample is further classified by whether the firm had an asset sale. Refer to Appendix for detailed variable descriptions. Statistical tests for differences in means and equality of medians for each characteristic between the two categories are also included.

	Full Sample (1)			Asset Sale=1 (2)			Asset Sale=0 (3)			Difference (*p*-value) (2)-(3)	
	Mean	Median	N	Mean	Median	N	Mean	Median	N	Mean	Median
Panel A: Dependent variable											
Acquisition probability	0.057	-	190,190	0.134	-	5,762	0.054	-	184,428	0.000	-
Panel B: Firm characteristics											
Size	2,407.29	264.09	147,632	9,451.39	1,666.15	5,717	2,123.52	249.68	141,915	0.000	0.000
Cash reserves	0.152	0.075	148,596	0.115	0.062	5,725	0.154	0.075	142,871	0.000	0.000
Leverage	0.261	0.214	148,654	0.290	0.259	5,725	0.260	0.211	142,929	0.000	0.000
Stock return	0.029	-0.054	111,165	0.025	-0.044	5,375	0.029	-0.055	105,790	0.659	0.108
M/B	2.460	1.667	131,107	2.372	1.734	5,711	2.464	1.663	125,396	0.065	0.000
ROA	0.093	0.111	147,458	0.095	0.111	5,671	0.093	0.111	141,787	0.177	0.755
Panel C: Industry characteristics											
Industry M&A liquidity	0.057	0.033	143,987	0.056	0.033	5,515	0.057	0.033	138,472	0.175	0.786
Herfindahl index	0.164	0.111	150,761	0.169	0.111	5,659	0.164	0.111	145,102	0.014	0.974

Table 2
Asset sales and acquisition probability

This table presents the effect of asset sales and financial constraint on acquisitions announced over the period 1990-2014 for the universe of US publicly listed firms. We present coefficients of linear probability models where the dependent variable takes the value of 1 if the firm undertakes an acquisition in year *t*, and 0 otherwise. All control variables are measured at year *t*-1. Refer to the Appendix for detailed variable descriptions. Year and industry fixed effects, whose coefficients are suppressed, are based on fiscal year and Fama-French 49 industry classification dummies, respectively. The *t*-statistic are reported in parentheses and are based on standard errors adjusted for heteroskedasticity and firm clustering. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
Asset sale	0.0342***	0.0341***
	(5.83)	(5.81)
Financial constraint		-0.0076*
		(-1.92)
Asset sale × Financial constraint		0.0072*
		(1.76)
Acquisition probability$_{(t-1)}$	0.1813***	0.1812***
	(29.50)	(29.45)
Size	0.0104***	0.0102***
	(11.36)	(9.57)
Cash reserves	0.0499***	0.0492***
	(5.93)	(5.83)
Leverage	-0.0103*	-0.0106**
	(-1.93)	(-1.97)
Stock return	0.0221***	0.0221***
	(11.69)	(11.68)
M/B	0.0014***	0.0015***
	(4.46)	(4.53)
ROA	0.1020***	0.1008***
	(12.12)	(11.89)
Industry M&A liquidity	0.1315***	0.1314***
	(7.24)	(7.23)
Herfindahl index	0.0205*	0.0205*
	(1.88)	(1.88)
Constant	-0.0402*	-0.0377*
	(-1.91)	(-1.76)
Year & industry fixed effects	Yes	Yes
No. of obs.	79,075	79,075
Adjusted R^2	0.0735	0.0735

Table 3
Granger causality test for asset sales and acquisition probability

This table presents results from panel vector autoregression and Granger causality tests for the full sample and also after partitioning the sample by financial constraint status. Panel A displays panel vector autoregressions with the lagged values of acquisition probability and asset sale as our main endogenous variables. *Z*-statistics are reported in parentheses and are based on standard errors adjusted for heteroskedasticity and firm clustering. Panel B reports the Granger causality Wald tests, following Ahern and Harford (2014), wherein the null hypothesis for the first test assumes that asset sales do not Granger cause acquisitions, and the second null that acquisitions do not Granger cause asset sales. We report the χ^2 and p-value for each test. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Predictive Vector Autoregressions

	Full sample		Financially constrained		Unconstrained	
	Acquisition probability (1)	Asset sale (2)	Acquisition probability (3)	Asset sale (4)	Acquisition probability (5)	Asset sale (6)
Acquisition probability$_{(t-1)}$	0.1782***	-0.0181***	0.2021***	-0.0400***	0.1749***	-0.0149***
	(26.01)	(-4.40)	(11.54)	(-4.65)	(23.34)	(-3.25)
Asset sale$_{(t-1)}$	0.0366***	0.0991***	0.0546***	0.0582***	0.0375***	0.0959***
	(5.30)	(9.96)	(2.19)	(1.84)	(5.00)	(9.15)
No. of obs.	127,292	127,292	16,394	16,394	65,870	65,870

Panel B: Granger Causality Wald Tests

	Full sample	Financially constrained	Unconstrained
H_0: Asset sales $\nRightarrow$ Acquisitions			
Wald χ^2	28.129	4.791	25.002
(p-value)	(0.000)	(0.029)	(0.000)
H_0: Acquisitions $\nRightarrow$ Asset sales *(decrease)*			
Wald χ^2	19.336	21.618	10.553
(p-value)	(0.000)	(0.000)	(0.001)

Table 4
Sensitivity to unobservable characteristics

This table presents the robustness test for the treatment effect of asset sales on acquisitions following the coefficient stability approach of Oster (2019). Panel A presents the results for the full sample, and Panels B and C for financially constrained and unconstrained firms, respectively. Baseline effect in column (1) includes only asset sale, while controlled effect in column (2) includes all controls from Table 2. The identified set in column (3) is bounded below by the estimated beta and above by the controlled beta, calculated based on R_{max} and δ=1. Column (4) gives the confidence interval for asset sale. Column (5) shows the value of $\tilde{\delta}$ for β= 0 given the value of R_{max} reported in column (2). ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Full Sample

Treatment variable	Baseline effect [R^2] (1)	Controlled effect [R^2] (2)	Identified set (3)	Controlled confidence interval (4)	$\tilde{\delta}$ for β= 0 Given R_{max} (5)	Reject null (6)
Asset sale	0.0515*** [0.002]	0.0397*** [0.040]	0.0359, 0.0397	0.0312 to 0.0481	7.808	Yes

Panel B: Financially Constrained

Treatment variable	Baseline effect [R^2] (1)	Controlled effect [R^2] (2)	Identified set (3)	Controlled confidence interval (4)	$\tilde{\delta}$ for β= 0 Given R_{max} (5)	Reject null (6)
Asset sale	0.0507*** [0.002]	0.0436*** [0.028]	0.0406, 0.0436	0.0255 to 0.0616	7.172	Yes

Panel C: Unconstrained

Treatment variable	Baseline effect [R^2] (1)	Controlled effect [R^2] (2)	Identified set (3)	Controlled confidence interval (4)	$\tilde{\delta}$ for β= 0 Given R_{max} (5)	Reject null (6)
Asset sale	0.0498*** [0.002]	0.0409*** [0.042]	0.0379, 0.0409	0.0313 to 0.0505	10.168	Yes

Table 5
Endogeneity control for asset sales and acquisition probability

This table shows first and second stage results from a 2SLS instrumental variable (IV) approach to test for potential endogeneity. Specification (1) shows the first stage regression measuring the likelihood of asset sales, with heteroskedasticity-based instruments estimated following Lewbel (2012) methodology. Specification (2) provides coefficients from the second stage analysis, with acquisition probability as the dependent variable. The sample period is between January 1, 1990 and December 31, 2014 for the universe of US publicly listed firms. Refer to the Appendix for detailed variable descriptions. Year and industry fixed effects, whose coefficients are suppressed, are based on fiscal year and Fama-French 49 industry classification dummies, respectively. The *t*-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity and firm clustering. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	1st stage (1)	2nd stage (2)
Lewbel size	0.2123***	
	(36.29)	
Lewbel cash reserves	-0.6366***	
	(-4.39)	
Lewbel leverage	0.5759***	
	(8.73)	
Lewbel stock return	0.0631***	
	(2.72)	
Lewbel M/B	-0.0130***	
	(-3.16)	
Lewbel ROA	-1.7376***	
	(-14.06)	
Lewbel industry M&A liquidity	0.9993***	
	(6.30)	
Lewbel Herfindahl index	-0.1374*	
	(-1.70)	
Asset sale		0.0360***
		(2.95)
Financial constraint		-0.0115***
		(-2.75)
Asset sale × Financial constraint		0.0095**
		(2.28)
Size		0.0121***
		(9.59)
Cash reserves		0.0376***
		(4.00)
Leverage		-0.0109*
		(-1.81)
Stock return		0.0229***
		(12.38)
M/B		0.0018***
		(5.14)
ROA		0.1077***
		(11.57)
Industry M&A liquidity		0.1617***
		(8.84)
Herfindahl index		0.0248**
		(1.97)
Constant	0.0299**	-0.0498**
	(2.30)	(-2.05)
Industry & year fixed effects	Yes	Yes
No. of Obs.	83,352	83,352
Adjusted R^2	0.3362	0.0390
K-P rk Wald F-test	442.94	
LIML Size of Nominal 10% Wald	11.39	
Hansen J Statistic	7.652	
(p-value)	(0.3643)	
Wu-Hausman		0.3618
(p-value)		(0.5475)

Table 6

Asset sales and change in cash reserves

This table presents the effect of asset sales on change in cash reserves over the period 1990-2014 for the universe of US publicly listed firms. We present coefficients of linear probability models where the dependent variable takes the value of 1 if the firm experienced a positive change in cash reserves following an asset sale, and 0 otherwise. All control variables are measured at year *t-1*. Refer to the Appendix for detailed variable descriptions. Year and industry fixed effects, whose coefficients are suppressed, are based on fiscal year and Fama-French 49 industry classification dummies, respectively. The *t*-statistic are reported in parentheses and are based on standard errors adjusted for heteroskedasticity and firm clustering. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
Asset sale	0.0647***	0.0643***
	(9.00)	(8.89)
Financial constraint		-0.0236***
		(-3.20)
Asset sale × Financial constraint		0.0239***
		(2.86)
Acquisition probability$_{(t-1)}$	-0.0945***	-0.0946***
	(-16.24)	(-16.26)
Size	0.0070***	0.0063***
	(7.25)	(5.77)
Leverage	0.0342***	0.0341***
	(4.12)	(4.10)
Stock return	0.0620***	0.0619***
	(20.06)	(20.04)
M/B	-0.0029***	-0.0029***
	(-5.65)	(-5.55)
ROA	0.2269***	0.2238***
	(9.50)	(9.36)
Industry M&A liquidity	-0.0127	-0.0129
	(-0.47)	(-0.48)
Herfindahl index	0.0026	0.0025
	(0.17)	(0.17)
Equity flows	0.2812***	0.2805***
	(27.87)	(27.81)
Debt flows	-0.2254***	-0.2261***
	(-18.92)	(-18.97)
Cash flows	-0.0247	-0.0251
	(-1.11)	(-1.13)
Constant	0.3689***	0.3752***
	(10.40)	(10.51)
Year & industry fixed effects	Yes	Yes
No. of obs.	78,669	78,669
Adjusted R^2	0.0394	0.0395

Table 7
Selling-to-buy 3-year long-run operating returns

This table reports coefficients from OLS regression analysis of three-year industry-adjusted operating performance after asset sales for firms that made focus increasing acquisitions after focus increasing asset sales, which is the group of asset sellers who divest a unit that has a different three-digit SIC code relative to their core operations. An acquisition is focus increasing if the bidder has the same three-digit SIC code as the target. Refer to the Appendix for detailed variable descriptions. Year and industry fixed effects, whose coefficients are suppressed, are based on fiscal year and Fama-French 49 industry classification dummies, respectively. The *t*-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity and firm clustering. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
Focus increasing asset sale and focus increasing acquisition	0.0078	0.0001
	(1.07)	(0.02)
Financial constraint		-0.0582***
		(-3.89)
Focus increasing asset sale and focus increasing acquisition × Financial constraint		0.0572**
		(2.15)
3-yr industry-adjusted operating returns	0.4925**	0.4779**
	(2.47)	(2.41)
Size	0.0130***	0.0094***
	(4.07)	(3.71)
Asset sale relative size	-0.0080*	-0.0076*
	(-1.85)	(-1.78)
Leverage	0.0135	0.0116
	(0.58)	(0.51)
Cash flows	0.0012	0.0016*
	(1.47)	(1.92)
M/B	0.0075**	0.0075**
	(2.50)	(2.53)
Constant	-0.1523**	-0.1293**
	(-2.49)	(-2.11)
Year & industry fixed effects	Yes	Yes
No. of obs.	2,358	2,358
Adjusted R^2	0.3907	0.4008

Table 8
Selling-to-buy cumulative abnormal returns

This table presents the effect focus increasing selling-to-buy transactions and financial constraints have on the cumulative abnormal returns at the announcement of the asset sale. We present coefficients of regression analysis where the dependent variable is the market adjusted value weighted (-2, +2) cumulative abnormal return. All control variables are measured at year *t-1*. Refer to the Appendix for detailed variable descriptions. Year and industry fixed effects, whose coefficients are suppressed, are based on fiscal year and Fama-French 49 industry classification dummies, respectively. The *t*-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity and firm clustering. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
Focus increasing asset sale and focus increasing acquisition	0.0057	-0.0005
	(0.85)	(-0.08)
Financial constraint		-0.0380**
		(-2.39)
Focus increasing asset sale and focus increasing acquisition × Financial constraint		0.0469**
		(2.39)
Size	-0.0033*	-0.0028
	(-1.72)	(-1.49)
Asset sale relative size	0.0634***	0.0666***
	(3.64)	(3.74)
Leverage	0.0069	0.0107
	(0.34)	(0.55)
Cash flows	-0.0044	-0.0069
	(-0.33)	(-0.53)
M/B	-0.0009	-0.0009
	(-0.95)	(-0.94)
Constant	0.0837**	0.0812**
	(2.46)	(2.45)
Year & industry fixed effects	Yes	Yes
No. of obs.	505	505
Adjusted R^2	0.1079	0.1223

Table 9
Spinoffs and acquisition probability

This table presents the effect of spinoffs on acquisitions announced over the period 1990-2014 for the universe of US publicly listed firms. We present coefficients of linear probability models where the dependent variable takes the value of 1 if the firm undertakes an acquisition in year *t*, and 0 otherwise. All control variables are measured at year *t*-1. Refer to the Appendix for detailed variable descriptions. Year and industry fixed effects, whose coefficients are suppressed, are based on fiscal year and Fama-French 49 industry classification dummies, respectively. The *t*-statistics are reported in parentheses and are based on standard errors adjusted for heteroskedasticity and firm clustering. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
Spinoff	-0.0167	-0.0313
	(-0.66)	(-1.17)
Financial constraint		-0.0122
		(-0.92)
Spinoff × Financial constraint		0.1076
		(1.45)
Acquisition probability$_{(t-1)}$	0.2059***	0.2059***
	(10.82)	(10.82)
Size	0.0066**	0.0060*
	(2.12)	(1.87)
Cash reserves	0.1044**	0.1036**
	(2.35)	(2.33)
Leverage	-0.0191	-0.0196
	(-0.76)	(-0.78)
Stock return	0.0217**	0.0218**
	(2.24)	(2.26)
M/B	0.0031**	0.0031**
	(2.03)	(2.05)
ROA	0.1797***	0.1737***
	(3.96)	(3.79)
Industry M&A liquidity	0.2496***	0.2511***
	(2.86)	(2.87)
Herfindahl index	0.0499	0.0500
	(1.17)	(1.17)
Constant	-0.0113	-0.0073
	(-0.14)	(-0.09)
Year & industry fixed effects	Yes	Yes
No. of obs.	5,127	5,127
Adjusted R^2	0.0902	0.0903

Table 10
Spinoff-to-buy 3 year long-run operating returns

This table reports coefficients from OLS regression analysis of three-year industry-adjusted operating performance after the spinoff for firms that made focus increasing acquisitions after focus increasing spinoffs, which is the group of spinoffs who divest a unit that has a different three-digit SIC code relative to their core operations. An acquisition is focus increasing if the bidder has the same three-digit SIC code as the target. Refer to the Appendix for detailed variable descriptions. Year and industry fixed effects, whose coefficients are suppressed, are based on fiscal year and Fama-French 49 industry classification dummies, respectively. The *t*-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity and firm clustering. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
Focus increasing spinoff and focus increasing acquisition	-0.0097	-0.0106
	(-0.44)	(-0.39)
Financial constraint		-0.0567***
		(-3.91)
Focus increasing spinoff and focus increasing acquisition × Financial constraint		0.0343
		(0.92)
3-yr industry-adjusted operating returns	0.4897**	0.4759**
	(2.41)	(2.36)
Size	0.0132***	0.0095***
	(3.95)	(3.57)
Asset sale relative size	-0.0083*	-0.0079*
	(-1.89)	(-1.82)
Leverage	0.0123	0.0098
	(0.51)	(0.41)
Cash flows	0.0012	0.0016*
	(1.46)	(1.85)
M/B	0.0077**	0.0077**
	(2.35)	(2.38)
Constant	-0.1537**	-0.1293**
	(-2.47)	(-2.07)
Year & industry fixed effects	Yes	Yes
No. of obs.	2,193	2,193
Adjusted R^2	0.3793	0.3892

Table 11
Spinoff-to-buy cumulative abnormal returns

This table presents the effect focus increasing spinoff-to-buy transactions have on the cumulative abnormal returns at the announcement of the asset sale. We present coefficients of regression analysis where the dependent variable is the market-adjusted value weighted (-2, +2) cumulative abnormal return. All control variables are measured at year *t*-1. Refer to the Appendix for detailed variable descriptions. Year and industry fixed effects, whose coefficients are suppressed, are based on fiscal year and Fama-French 49 industry classification dummies, respectively. The *t*-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity and firm clustering. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
Focus increasing spinoff and focus increasing acquisition	0.0286	0.0107
	(1.02)	(0.33)
Financial constraint		-0.0315*
		(-1.78)
Focus increasing spinoff and focus increasing acquisition × Financial constraint		0.0781
		(1.47)
Size	-0.0068**	-0.0060*
	(-2.02)	(-1.76)
Asset sale relative size	0.0683**	0.0751**
	(2.28)	(2.44)
Leverage	0.0048	0.0123
	(0.14)	(0.35)
Cash flows	0.0296	0.0234
	(0.74)	(0.61)
M/B	-0.0016	-0.0014
	(-0.80)	(-0.70)
Constant	0.1426***	0.1260***
	(3.15)	(2.82)
Year & industry fixed effects	Yes	Yes
No. of obs.	217	217
Adjusted R^2	0.0675	0.0839