

# Self-selection Bias and the Listing Status of Target Firms: Value Effects in the Spanish Market\*

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## Abstract

*As corporate announcement decisions are non-random events, standard OLS estimations must be corrected for the self-selection bias. In the M&A field several studies suggest that previous evidence on univariate analysis of abnormal returns is not fully reliable. We examine whether using the standard Heckman two-step estimation procedure to correct for endogeneity significantly changes the previous evidence with respect to the decision to acquire a listed versus an unlisted firm. Our results show that this correction does not change the conclusions drawn from unconditional abnormal returns. Therefore, we emphasize that the existence of self-selection bias should not mean a general invalidation of the previous evidence.*

## 1. Introduction

Several papers on the field of Mergers and Acquisitions (Bae *et al.*, 2013; Capron and Shen, 2007; Feito-Ruiz *et al.*, 2014; and Shaver, 1998; among others) claim that, unlike previous studies, one of their main contributions to the literature is that they do take into account the endogeneity of the acquirer when analysing the performance of the acquisition decision. This endogeneity comes from the fact that the firms self-select when choosing a certain strategy (to perform a takeover or not, to acquire a listed firm or an unlisted firm, etc.) The traditional event study methodology used to estimate value creation around the acquisition announcement relies on the implicit assumption that the set of firms under study randomly choose strategies. However, managers execute a certain strategy after careful consideration on the basis of higher information about the deal. As a result, the estimation of abnormal announcement returns that do not account for this selection process is potentially misspecified. In this framework, the results of Shaver (1998) are contrary to previous research about foreign direct investment survival in the United States regarding the choice of entry mode (acquisition versus greenfield) after accounting for self-selection. More recently, Akhtar (2015) also finds that her results after

\*We wish to thank the Cátedra Finanzas Internacionales–Banco Santander of the University of Valencia for their financial support. We acknowledge the valuable comments and suggestions from two anonymous referees of the review and the editor-in-chief, Roman Horváth. All remaining mistakes are our own.

controlling for sample selection are contrary to prior studies for the Australian market as the results of the conditional model suggest that bidding firms do not experience abnormal announcement returns. In brief, the underlying idea of these and other papers is that previous research that does not account for sample selection bias is not fully reliable.<sup>1</sup>

In this paper we investigate the positive reaction to acquisitions of private targets compared to those of public targets (that is, the *private target discount*) and the effect of controlling for the self-selection bias on the estimation of the acquirer's abnormal returns around the bidding announcement, since this remains largely unexplored. A large body of research has documented significant positive abnormal announcement returns to acquirers of unlisted targets, whereas the results for the acquirers of listed companies are mixed, either zero or significant negative abnormal announcement returns. Most of them can be found in Martynova and Renneboog (2008), as they overview 65 studies performed on samples that cover all the twentieth century. More recent papers include those of Draper and Paudyal (2006) and Petmezas (2009) for the UK market; Martynova and Renneboog (2011) and Feito-Ruiz *et al.* (2014) for 28 and 19 European countries, respectively; Shams *et al.* (2013) for the Australian market; and Farinós *et al.* (2011) and Latorre *et al.* (2014) for the Spanish market. None of them account for sample selection bias when performing univariate estimations of the acquirer's abnormal announcement returns, therefore they do not control for unobservable private information that would influence corporate acquisition decisions. According to Bae *et al.* (2013), if the firm's decision to select a private versus public target depends on the changes in its anticipated value, the assumption that publicly known information influencing the firm's decision to select a private vs. public target is exogenous (as OLS regression analysis does) is incorrect.

We employ a sample of 237 acquisition announcements driven by Spanish listed firms during 1991–2011, where target firms are listed and unlisted firms. We use the two-step estimation procedure of Heckman (1979) in order to control for endogeneity bias and find that the conclusions from the previous evidence in the Spanish market holds after accounting for self-selection in the acquiring firm's decision to purchase an unlisted versus a listed target.

Our analysis contributes to previous literature in two principal ways. First, as far as we know, this paper is the first one to perform a direct test of the effect of controlling for self-selection bias on the estimation of value creation at the announcement of the acquisition of a listed versus an unlisted target firm. Second, our results suggest that, though it is necessary to treat corporate decisions as non-random events, any generalisation about the lack of reliability of previous evidence must be taken with caution.

The remainder of the paper is organized as follows. Section 2 discusses some hypotheses to explain the choice between listed vs. unlisted firm acquisition. Section 3 describes our sample. In Section 4 are found the abnormal return estimation, the methodology used to resolve the self-selection bias and the analysis of the

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<sup>1</sup> In this regard, Shaver (1998; p. 584) recommends “[re-examining] many of the conclusions that have been drawn in the empirical strategy literature”.

determinants of the target status choice. The results are discussed in Section 5. Section 6 concludes.

## **2. Literature Review and Hypothesis on the Decision to Acquire Listing versus Private Target Firms**

Various hypotheses have been proffered to explain the observed phenomenon of the private target discount, that is, the different bidder firm reactions to the announcement of a private firm acquisition. These hypotheses include greater monitoring through the creation of blockholders in the unlisted targets (Chang, 1998); weak competition in the market for private companies (Chang, 1998); liquidity needs of selling firms (Fuller *et al.*, 2002; Officer, 2007); and information asymmetry associate with private targets (Capron and Shen, 2007; Reuer and Ragozzino, 2008). Following Feito–Ruiz *et al.* (2014) we group them into two sets: managerial opportunism and information asymmetry. More recently, some studies (Bae *et al.*, 2013; Feito–Ruiz *et al.*, 2014; Moschieri and Campa, 2014) claim that country characteristics may influence the decision of choosing between private or public firm acquisition. Specifically, they point out that unlisted target firms settled in countries with underdeveloped financial markets face greater difficulties in obtaining financing. As a result, unlisted firms are more likely to be placed on sale as a means of obtaining liquidity in those countries with higher costs and difficulties in accessing external financing, which, in turn, increases the probability of unlisted firm acquisition. Of all these hypotheses, we focus on those included in the two first groups.

### **2.1 Managerial Opportunism**

Managers motivated by a desire to maximise their private benefits will be willing to buy large and prestigious firms and to pay high premiums for them (Roll's, 1986 managerial hubris hypothesis) which, in turn, will have a negative effect on the bidder's stock price (Moeller *et al.*, 2004; Faccio *et al.*, 2006). Listed firms are usually larger and better known than private companies.

In addition, the listing status of the target firm introduces relevant differences in the negotiation process. The selling of public targets is typically an auction-like procedure in order to increase the number of potential bidders (Milgrom, 1987). In this context, Varaiya (1988) provides support for the existence of the winner's curse (Roll, 1986), which, in consequence, also supports the hubris hypothesis. On the contrary, competition in the market for private companies is likely to be weak as they often lack financial resources and the social connections with investment bankers needed to obtain them (Graebner and Eisenhardt, 2004). Thus, private targets are typically sold through negotiations based on voluntary exchange (Koepling *et al.*, 2000).

### **2.2 Information Asymmetry**

Acquisition discounts when bidding for private targets may reflect the unwillingness of acquiring firms to pay very much for assets sold in an opaque information environment (Bae *et al.*, 2013). Officer (2007) concludes that information asymmetry is the likely explanation for the portion of the acquisition

discount for private targets that remains unexplained after controlling by the liquidity proxies employed in his research. As well, Officer *et al.* (2009) show that information asymmetries between the acquiring and target firms about the target firm's value should be more intense with unlisted targets.

This lack of information availability on private firms has a twofold implication. On the one hand, it limits the extent of the acquirer's search and increases the evaluative uncertainty when evaluating a private target (Reuer and Ragozzino, 2008). Reduction of the offer price is a classic response to the threat of adverse selection (Akerlof, 1970). On the other hand, private targets, particularly small ones, face greater difficulties in signalling their value to investors (Becchetti and Trovato, 2002). As a result, acquirers of private firms increase their bargaining power so that they can experience positive abnormal returns since the likelihood of underpayment rises.

Furthermore, unlisted firms suffer from a lack of market liquidity, which leads a private seller to experience transaction costs or grant price concessions (Chang, 1998; Officer, 2007; Officer *et al.*, 2009).

In this context, Capron and Shen (2007) and Feito–Ruiz *et al.* (2014) wonder why listed firms would be acquired. They consider that if information asymmetry is excessive, acquirers would prefer to buy a listed firm even though that asymmetry would lead to a discount in the price paid for a private firm.

### 3. Sample Selection

Information on acquisitions driven by Spanish listed firms is obtained from the web page of the Spanish Security Exchange Commission (*Comisión Nacional del Mercado de Valores* –CNMV). Given the Spanish *Equity Market Law*, the CNMV orders a firm trading halt when it considers that a relevant piece of information could significantly affect a firm's market price. In our context, the CNMV always orders the trading halt of firms involved when a takeover is officially announced (article 33 of the Spanish *Equity Market Law*). Once the official date was identified for each acquisition, we searched the financial press in the Factiva dataset for any previous rumour or leak in order to determine the price reaction at the moment the information arrived at the market. Therefore, the event–day ( $t_0$ ) is the early date between:

- A rumour in press about an acquisition if (and only if) the CNMV halts trading of the acquirer.<sup>2</sup>
- The date of the official acquisition communication to the CNMV (which, in turn, implies a trading halt of the acquirer).

In any case, if a trading halt ordered by the CNMV exceeds one trading day, then the event–day ( $t_0$ ) is assigned to the first acquirer's trading day post-announcement that ends with active negotiation in the market. Otherwise, the event-day is assigned to be the trading day that contains the halt.

The necessary economic and financial information for this research comes from the web pages of *Sociedad de Bolsas S.A.* and *Banco de España* (Spanish Central Bank) and the databases of *SABI*, *Amadeus* and *Thomson ONE*.

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<sup>2</sup> This happens only if the CNMV considers that the piece of information revealed is relevant enough.

Similarly, to Chang (1998) and Fuller *et al.* (2002), and others, for an acquisition to be included in the sample, we require that it be a “completed control acquisition”. We define a completed control acquisition as one in which the acquirer increased its ownership position to greater than 50%, regardless of the amount of the target firm’s stake previously owned by the acquirer. As a result, our initial sample consists of 289 purchases conducted by listed firms in the Spanish market (SIBE) over the period 1991 to 2011 for which we know the listing status of the acquired firm. For an acquisition announcement to remain in the final sample, it needs to meet the following criteria:

1. We require that no other contaminating event must exist in the five days prior to and after the event–day that may affect the target firm price, such as dividend payments, equity issues or stock splits. Nineteen acquisition announcements were excluded.
2. We select those acquirers for which stock market data was available in the window  $(t_0-20, t_0+1)$ . The application of this criterion excluded eight acquisition announcements.
3. After the application of (1) and (2), we exclude those acquirers with returns in the three–day window centred on the announcement date  $(t_0-1, t_0+1)$  exceeding the sample return mean plus/minus three standard deviations. One observation was excluded.
4. We require full data availability for each variable needed to implement the first step of Heckman’s (1979) estimation procedure. Twenty-four acquisition announcements were excluded.

Application of these criteria yielded a sample of 237 acquisition announcements conducted by listed firms in the Spanish market (SIBE), where 57 of the targets were listed on an exchange and 180 were unlisted companies.

## 4. Methodology

### 4.1 Estimation of Announcement–period Abnormal Returns to Acquiring Firms

Conventional event study methodology uses the CAPM (or any other multifactor model) in order to estimate abnormal returns around the event day. In such methods, estimating ‘uncontaminated’ risk factors require a long estimation period (‘uncontaminated’ interval or estimation window) to ensure that the estimated risk parameters are independent of the effect of the event. In our case of study, as a number of bidding firms are involved in purchases on more than one occasion, this requirement reduces the available data by 35% (i.e. 83 cases would be lost). In order to overcome this problem, we follow Draper and Paudyal (2006) and examine the significance of abnormal returns using Jensen’s alpha in a cross–section estimation using the CAPM and the three–factor model developed by Fama and French (1993), which we show in expressions (1) and (2), respectively:

$$R_i - R_f = \alpha + \beta (R_m - R_f) + \varepsilon_i, \quad (1)$$

$$R_i - R_f = \alpha + \beta (R_m - R_f) + s \text{SMB}_i + h \text{HML}_i + \varepsilon_i, \quad (2)$$

where  $(R_i - R_f)$  is the excess return on the acquiring firm's  $i$ ,<sup>3</sup> being  $R_f$  the return on *Letras del Tesoro* (Spanish Treasury Bill),  $(R_m - R_f)$  is the excess return on a value-weighted market index (specifically the Madrid Stock Exchange Index – IGBM), *SMB* is the difference in the returns of value-weighted portfolios of small stocks and big stocks, and *HML* is the difference in the returns of value-weighted portfolios of high book-to-market stocks and low book-to-market stocks.<sup>4</sup>

For estimation purposes  $(R_i - R_f)$ ,  $(R_m - R_f)$ , *SMB* and *HML* are measured both as “buy-and-hold returns” (BHR) and “cumulative returns” (CR) for the announcement period defined as a three-day period around the event day ( $t_0-1$ ,  $t_0+1$ ). Expressions (3) and (4) show buy-and-hold and cumulative return computation, respectively, for the excess return on the acquiring firm:<sup>5</sup>

$$\text{BHR}_i = \left[ \prod_{t=t_0-1}^{t_0+1} (1 + (R_{it} - R_{ft})) \right] - 1, \quad (3)$$

$$\text{CR}_i = \sum_{t=t_0-1}^{t_0+1} (R_{it} - R_{ft}). \quad (4)$$

Therefore, the specific cross-section regression estimation of expressions (1) and (2) are shown in equations (5) and (6), respectively:<sup>6</sup>

$$\text{BHR}_i = \alpha + \beta \text{BHR}_m + \varepsilon_i, \quad (5)$$

$$\text{BHR}_i = \alpha + \beta \text{BHR}_m + s \text{SMB}_i + h \text{HML}_i + \varepsilon_i. \quad (6)$$

A significant  $\alpha$  in equations (5) and (6) will indicate an abnormal return in response to the announcement of a purchase and, therefore, it reveals the value of the information content of acquisition announcements.

<sup>3</sup> If a trading halt ordered by the CNMV exceeds one trading day then the  $t_0$  return for the acquiring firm is computed using the closing price of the first trading day after the halt relative to the closing price of the trading day prior to the announcement. Otherwise, the  $t_0$  return is computed using the closing price of the day that contains the halt relative to the closing price of the trading day prior to the announcement. The rest of returns are computed in a similar way.

<sup>4</sup> See Fama and French (1993) for details on the construction of the *SMB* and *HML* factors.

<sup>5</sup> Buy-and-hold and cumulative return computation for excess return on IGBM, *SMB* and *HML* are analogous.

<sup>6</sup> Cross-section regressions on cumulative returns (CR) are analogous.

## 4.2 Determinants of the Decision to Acquire Unlisted Target Firms: The self-selection Issue

As stated above, the choice of the listing status of the target firm is not random, but it is a deliberate decision made by acquiring firms or their managers to *self-select* into their preferred choice. As a result, if self-selecting firms are not random samples of the population, the usual OLS estimators applied to cross-sectional regressions of announcement-period returns on firms are no longer consistent.

In order to control for this source of endogeneity, we employ the Heckman (1979) two-step estimation procedure, similar to that used in related studies such as Shaver (1998), Capron and Shen (2007), Bae *et al.* (2013) and Akhtar (2015). In the first step, we model the acquirer's propensity to acquire a private target as a function of managerial opportunism and information asymmetry proxy variables. Specifically, we use a probit model to estimate the likelihood of private firm acquisition. In the second step, we estimate conditional abnormal returns around the announcement, that is, the constant from equations (5) and (6), by including the Lambda endogeneity bias control variable (the inverse of the Mills ratio) obtained from the probit equation in the first step. The coefficient for Lambda captures the effects on performance of unobserved, unmeasured differences between acquisitions of private targets and public targets. According to Li and Prabhala (2007), correcting for self-selection allows one to either (i) prevent parameter estimates from being biased, or (ii) incorporate and control for unobservable private information that influences corporate finance decisions. This private information comes from the fact that managers do not initiate a bid unless they have specific information about the target firm. As Akhtar (2015) points out, this set of information has a positive value and it is unobservable to outsiders (investors and researchers). Therefore, firms that announce a purchase are self-selecting themselves as bidders (that is, making a non-random choice), using some private information that is unobservable to investors (and researchers).

One concern that may arise at this point with the Heckman model is related to failure to use an exclusion restriction to obtain identification. The identification problem emerges when the explanatory variables are identical in both the selection model (choice decision) and the second-step regression model (return equation). However, according to Akhtar (2015) this is not a concern in studies like the current one because of two reasons. On the one hand, because the Heckman model relies on functional form assumptions for identification rather than relying on an exclusion restriction to obtain identification. On the other hand, as the return equation does not have any explanatory variables other than the sample selection correction term (the Lambda endogeneity bias control variable), hence, identification is not a concern.<sup>7</sup>

Drawing from Capron and Shen (2007) and Feito-Ruiz *et al.* (2014), among others, we select independent variables for the probit regression model that are expected to be related to the managerial opportunism and information asymmetry hypotheses in Section 2. We also employ some control variables. The dependent

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<sup>7</sup> See sections 7 and 8 from Akhtar (2015) for a further discussion of the identification problem and the relevance of exogenous variables in the Heckman (1979) model, respectively.

variable (target) is a binary variable that equals one for a private target and zero for a public target.

*Managerial opportunism proxy variables*

The proxy variables we employ in order to test the relevance of management opportunism in the choice between acquiring listed vs. unlisted firms are: acquiring firm size, cash flow, market-to-book ratio (MTB) and method of payment.

– *Acquiring firm size.* Managerial opportunism and “hubris” is expected to have more influence on larger firms. Therefore, we expect a positive relationship between the firm size and the probability of acquiring a listed firm. This variable is defined as the market value of the acquirer’s common stock in the most recent December or June prior to the acquisition announcement date (in millions of euros) divided by the level of the IGBM market index at each point of time. This is to avoid the obvious problems with unstandardized values when using a wide sample horizon (Mitchell and Stafford, 2000).

– *Cash flow and market-to-book ratios.* According to Jensen (1986), we expect the lower their free cash flow and their market-to-book ratios, the fewer acquisitions will be made in order to “build empires”. The cash flow variable is defined as the EBITDA divided by the acquiring firm’s total assets at the end of the year prior to the acquisition announcement (Moeller *et al.* 2004). The market-to-book ratio is defined as the market value of the acquirer’s common stock divided by the book value of the acquirer’s common stock at the end of the year prior to the acquisition announcement date.

– *Method of payment.* Within the framework of the Myers and Majluf (1984) model, the negative signal associated with the use of stock as the method of payment in an acquisition may turn positive if the target firm is unlisted. Therefore, when the acquisition of a private firm is paid with shares, it is likely that an outside blockholder could be created, since, by definition, private firms are closely held (Fuller *et al.*, 2002). Nevertheless, when a listed company is acquired, such concentration is unlikely to emerge since public targets generally have less concentrated ownership. Consequently, the existence of a large blockholder allows for greater monitoring of a bidder’s management, thus increasing value (Chang, 1998).<sup>8</sup> Hence, under the managerial opportunism hypothesis, we expect a lower probability of acquiring a private firm when stock is chosen as the method of payment. We define a dummy variable that takes the value of one in the case of a non *all-cash* bid, and zero otherwise.

*Information asymmetry proxy variables*

The proxy variables we employ in order to test the relevance of information asymmetry in the choice decision between acquiring listed vs. unlisted firms are: relative size of target firm, prior stake, diversified acquisition, cross-border acquisition and high-tech. Diversified acquisition, cross-border acquisition and high-tech variables are expected to be associated with excessive asymmetric information.

– *Relative size of the target.* According to Asquith *et al.* (1983), we expect less information asymmetry the larger the acquired firm is compared to the bidder

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<sup>8</sup> The correlation between active monitoring of managerial activities and lower agency costs has been documented by Ang *et al.* (2000) and others.

firm. Moreover, larger firms have more negotiating power. Therefore, we expect a lower probability of unlisted firm acquisition when the relative size of the target firm to the acquiring firm is high. The relative size of the target is computed as the target's total assets divided by the acquirer's total assets in the most recent December prior to the acquisition announcement date.

– *Prior stake*. This variable represents the percentage of ownership that the acquiring firm holds in the target firm. A lower degree of information asymmetry is expected if the acquiring firm has a stake in the acquired firm.

– *Diversified acquisition*. This is a dummy variable that takes the value of one when the target firm is not in the same industry as the acquirer and zero otherwise. An acquisition is classified as within-industry if both the acquirer and the target have the same 2-digit CNAE code.<sup>9</sup> As stated above, bidders face a higher likelihood of overvaluing targets outside of their core business as their knowledge base of the target industry is lower (Balakrishna and Koza, 1993). Therefore, the acquisition of unlisted firms is less likely if the transaction is an inter-industry deal.

– *Cross-border acquisition*. The acquisition of foreign firms involves higher information asymmetry, search costs and valuation difficulties (Shimizu *et al.*, 2004). Moreover, target firms integration may be harder because of regulatory and cultural differences between countries. As a result, cross-border transactions involving a private target are less often than domestic targets (Moeller and Schlingemann, 2005). This is a binary variable that takes the value of one when the target firm is foreign and zero otherwise.

– *High-tech*. This is a dummy variable equal to one if the target firm is a high-tech firm and zero otherwise. We follow Loughran and Ritter (2004) in order to define this variable. Capron and Shen (2007) argue that firms whose asset value is highly uncertain, such as high-tech firms, have difficulties in sending a credible signal of their value to bidders. One way to reduce information asymmetry and adverse selection problems is to be listed, so that high-tech firms send a signal of high quality and the likelihood of long-term survival.

#### *Control variables*

– *Leverage* is defined as the acquiring firm's total debt to total assets at the end of the year prior to the acquisition's announcement date. Theories proposed by Novaes (2003), and others, claim that higher debt reduces the probability of a takeover since leverage may act as a corporate control mechanism, reducing the probability of acquiring public firms for opportunistic reasons (Feito-Ruiz *et al.*, 2014).

– *Run-up*. Similar to Martynova and Renneboog (2011), this variable is defined as the buy-and-hold abnormal return in the pre-announcement period ( $t_0-20$ ,  $t_0-3$ ). We use this variable in order to control for the possible existence of inside information prior to the acquisition announcement (Farinós *et al.*, 2005).

– We also control for the *GDP annual growth rate* (GDP rate) and *fixed effects of year*.

Table 1 summarizes the definition and the expected value of all these variables.

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<sup>9</sup> CNAE codes are the Spanish equivalent to US SIC codes.

**Table 1 Variable Definitions and Expected Effect in the Probability of Acquiring an Unlisted Firm**

<i>Variable</i>	<i>Definition</i>	<i>Expected effect</i>
<i>Managerial opportunism proxy variables</i>		
Acquiring firm size	Market value of the acquirer's common stock in the most recent December or June prior to the acquisition announcement date (in millions of euros) divided by the level of the IGBM market index at each point of time.	Negative
Cash flow ratio	EBITDA divided by the acquiring firm's total assets at the end of the year prior to the acquisition announcement.	Negative
Market-to-book ratio	Market value of the acquirer's common stock divided by the book value of the acquirer's common stock at the end of the year prior to the acquisition announcement date.	Negative
Method of payment	Binary variable that takes the value of one in the case of a non <i>all-cash</i> bid, and zero otherwise.	Negative
<i>Information asymmetry proxy variables</i>		
Prior stake	Percentage of ownership that the acquiring firm holds in the target firm.	Negative
Diversified acquisition	Binary variable that takes the value of one when the target firm is not in the same industry as the acquirer and zero otherwise.	Negative
Cross-border acquisition	Binary variable that takes the value of one when the target firm is foreign (not Spanish) and zero otherwise.	Negative
High-tech	Binary variable equal to one if the target firm is a high-tech firm and zero otherwise.	Negative
<i>Control variables</i>		
Leverage	Acquiring firm's total debt to total assets at the end of the year prior to the announcement date of the acquisition.	Positive
Run-up	Buy-and-hold abnormal return in the pre-announcement period ( $t_0-20$ , $t_0-3$ ).	–
GDP rate	Gross Domestic Product annual growth rate of Spain. Source: Bank of Spain.	–

*Notes:* This table describes the explanatory variables used in the probit model to estimate the likelihood of private firm acquisition. For each variable we also show the expected effect on the probability of acquiring an unlisted firm.

## 5. Results

Table 2 exhibits the results from the first step of Heckman's (1979) two-step estimation procedure. The results from this first stage partially support the managerial opportunism hypothesis. As in Bae *et al.* (2013) and Feito-Ruiz *et al.* (2014), we find that the probability of acquiring an unlisted firm is lower the larger the acquiring firm. Additionally, we also find a lower probability of acquiring a private firm when the purchase is paid for with either stock or stock and cash (i.e. when it is a non *all-cash* payment). As stated in Section 4.2, this result is consistent with the managers of the acquiring firm reducing the possibility of creating an outside blockholder after the bidding when the acquisition is paid for with shares, since private firms are closely held. However, contrary to Bae *et al.* (2013) and

Feito–Ruiz *et al.* (2014), we do not find cash flow and market–to–book ratio variables to be significant determinants of acquiring a public firm.

Regarding information asymmetry as a determinant of private firm acquisition, our results support to some extent hypothesis that acquiring firms are likely to purchase an unlisted target over a public target due to information asymmetry, as the prior stake variable is significant and has the expected sign. That is, the higher the prior stake held by the bidder, the lower the probability of acquiring a private firm. However, the relative size of the target firm seems not to be a determinant of the acquisition choice as it is not significant, though Bae *et al.* (2013) and Feito–Ruiz *et al.* (2014) find a negative and significant relationship between relative size and the probability of acquiring an unlisted firm.

Moreover, contrary to Capron and Shen (2007) and Feito–Ruiz *et al.* (2014), our results mainly reject the hypothesis that excessive information asymmetry promotes the acquisition of listed firms. Instead, we find both diversified acquisition and high–tech variables to be positive and significant. However, the cross–border acquisition variable is negative and significant. These results suggest that when Spanish listed firms face the decision of diversifying their business or investing in a highly uncertain business, they prefer to acquire unlisted firms which, being smaller, are easier to integrate, and fewer financial resources are needed in the transaction than would be required for similar listed firm targets. Interestingly, they only consider a cross–border acquisition to be a highly asymmetric information event, so they attempt to reduce the inherent risk by acquiring better-known firms, that is, foreign listed firms.

**Table 2 Determinants of the Acquisition Choice between Listed and Unlisted Target**

<b>Variables</b>	
<i>Managerial opportunism</i>	
Acquiring firm size	-0.043 <sup>a</sup>
Cash flow	0.240
Acquiring MTB	0.001
Non all–cash payment	-1.169 <sup>a</sup>
<i>Information asymmetry</i>	
Prior stake	-0.871
Diversified acquisition	0.768 <sup>a</sup>
Cross–border acquisition	-0.421 <sup>c</sup>
High-tech	1.126 <sup>b</sup>
<i>Control variables</i>	
Leverage	0.429
GDP rate	5.157
Run–up	3.096 <sup>b</sup>
Intercept	-0.809
Year control	Yes
Wald chi–square	46.98
Prob>chi–square	0.000
Pseudo R–square	0.21
Observations	237

Notes: <sup>a, b, c</sup> Significantly different from zero at the 1%, 5% and 10% levels, respectively. The table exhibits the first step estimates from the Heckman (1979) two–step estimation procedure, which consists of the estimation of a probit regression where the dependent variable *Target* is a binary variable that equals one for private target and zero for public target. The remaining variables are defined in Table 1. Heteroskedasticity has been corrected using White's methodology.

Finally, we find that, among our control variables, only the run-up variable has a (positive) significant correlation with the choice of acquiring an unlisted firm. This result suggests the possible use of insider information prior to the acquisition announcement (Farinós *et al.*, 2005). Another plausible interpretation of this result is related to the weak competition in the market for private companies, thus bidding firms may not care about information leakages prior to the announcement date.

Table 3 exhibits unconditional and conditional bidder's buy and hold abnormal returns (BHAR) and cumulative abnormal returns (CAR) estimated over the  $(t_0-1, t_0+1)$  window for the full sample of acquisitions and for acquisitions classified into listed and unlisted targets and *t*-tests differences between them.

Several interesting issues arise from Table 3. First, when unconditional abnormal returns are estimated, the results are consistent with the previous evidence from the literature as we find that acquirers of unlisted targets gain significant positive abnormal returns in the acquisition announcement period regardless of the model and the return computation used. Also, consistent with the literature, shareholders of firms purchasing listed companies experience insignificant positive abnormal returns in any case. Second, when abnormal returns are estimated using the conditional models, that is, including the Lambda coefficient in equations (5) and (6), the results do not change the previous evidence. Actually, none of the differences between the estimated constants (i.e. the abnormal returns) is statistically significant. In other words, the results from the unconditional analysis do not significantly change after controlling for sample selection. Finally, none of the Lambda coefficients are statistically significant. According to Akhtar (2015), if the Lambda had been significant, then it would have led to a dilemma, as it would mean that after taking sample selection into account there were still some unaccounted factors affecting the results. Nevertheless, Lambda not being significant suggests that the selection model is well specified, indicating that the model is well identified. Therefore, the factors we have taken into account are enough to account for the bias.

**Table 3 Abnormal Returns around the Acquisition Announcement Day ( $t_0$ )**

Num. of observations	Full sample			Listed targets			Unlisted targets		
	Uncond. returns	Cond. returns	Diff. test p value	Uncond. returns	Cond. returns	Diff. test p value	Uncond. returns	Cond. returns	Diff. test p value
	237	237		57	57		180	180	
<i>Panel A: BHARs estimated through the CAPM</i>									
Intercept	1.02 <sup>a</sup>	1.29 <sup>a</sup>	0.583	0.74	1.61	0.593	1.14 <sup>a</sup>	1.00 <sup>b</sup>	0.795
Lambda		-0.006			-0.011			.004	
<i>Panel B: BHARs estimated through the Fama–French three-factor model</i>									
Intercept	0.99 <sup>a</sup>	1.06 <sup>a</sup>	0.880	1.06	1.25	0.900	1.07 <sup>a</sup>	0.83 <sup>c</sup>	0.658
Lambda		-0.002			-0.002			.007	
<i>Panel C: CARs estimated through the CAPM</i>									
Intercept	1.01 <sup>a</sup>	1.29 <sup>a</sup>	0.574	0.70	1.55	0.598	1.15 <sup>a</sup>	1.02 <sup>b</sup>	0.814
Lambda		-0.006			-0.011			.004	
<i>Panel D: CARs estimated through the Fama–French three-factor model</i>									
Intercept	0.99 <sup>a</sup>	1.07 <sup>a</sup>	0.861	1.01	1.21	0.892	1.08 <sup>a</sup>	0.85 <sup>c</sup>	0.675
Lambda		-0.002			-0.003			.007	

Notes: <sup>a, b, c</sup> Significantly different from zero at the 1%, 5% and 10% levels, respectively. Firm and risk factor returns are measured as Buy and Hold Returns (BHR) and Cumulative Returns (CR) for the interval ( $t_0-1, t_0+1$ ) relative to the acquisition announcement day ( $t_0$ ). Unconditional abnormal returns are estimated employing the Capital Asset Pricing Model (CAPM) and the Fama–French three-factor model. Conditional abnormal returns are estimated in the same way but including in the models the Lambda endogeneity bias control variable (the inverse of the Mills ratio) obtained from the probit regression model at the first step of Heckman (1979) two-step estimation procedure (Table 2). Abnormal returns are calculated for the interval ( $t_0-1, t_0+1$ ). The table exhibits results for the full sample of acquisitions and for acquisitions of listed and unlisted targets, respectively. Heteroskedasticity has been corrected using White's methodology. Abnormal returns (i.e. the intercept of equations (5) and (6)) are expressed in percentage.

## 6. Conclusions

Several studies in the Mergers and Acquisitions field suggest that the previous evidence on univariate analysis of abnormal returns around the announcement date of any related strategic decision (to perform a takeover or not, to acquire a listed firm or an unlisted firm, etc.) is not fully reliable as it does not take into account the sample selection bias. In this context, we explore whether taking into account endogeneity due to self-selection significantly changes the previous evidence on value creation with respect to the decision to acquire a listed versus an unlisted target firm.

The results in this study show that employing the Heckman two-step model in order to correct for sample selection bias do not change the conclusions drawn from univariate analysis of unconditional abnormal returns estimated around the acquisition announcement date. Specifically, and consistent with the evidence from the literature, we find that acquirers of unlisted firms gain significant positive abnormal returns around the bidding announcement date regardless of the model and the return computation used, whereas acquirers of listed firm targets gain insignificant abnormal returns. When we control for sample selection bias the conclusions remain unaltered, being that the conditional abnormal returns estimated are not significantly different from the unconditional abnormal returns in any case.

Therefore, though it is necessary to treat corporate announcement decisions as non-random events and, consequently, standard OLS estimations must be corrected to take into account the self-selection bias, this study emphasizes that it should not mean a general invalidation of the previous evidence.

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