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European cross-border acquisitions: Long-run stock returns and firm characteristics

European cross-border acquisitions: Long-run stock returns and firm characteristics

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Highlights:

- We examine the long run performance of European cross-border M&As from 2002-2012.
- Underperformance by acquirers is not driven by the M&A event per se.
- Underperformance by acquirers is driven by differences in firm characteristics.

Abstract

We investigate the long-run stock return performance of European cross-border merger and acquisition (M&A) bidders for the period 2002-2012. Our analysis shows that, though acquirers underperform their matched control firms over the thirty-six months following deal completion, this underperformance is not ascribed to the acquisition event, but rather explained by differences between acquirers and control firms in seven firm characteristics. Results are obtained by applying the augmented buy-and-hold abnormal return (BHAR) method. We enhance the robustness of our results by introducing the propensity score methodology to the analysis in addition to matching based on size and book-to-market equity.

Keywords: Cross-border; Acquisitions; Europe; Long-run return; Event study

1 Introduction

Recent studies highlight both the relevance of and the need to focus on cross-border deals (Erel, Liao, and Weisbach 2012; Chakrabarti, Gupta-Mukherjee, and Jayaraman 2009; Shimizu et al. 2004). In the context of increasingly integrated world economies, the number of mergers and acquisitions (M&As) that combine firms from two different countries has been growing in volume worldwide. From less than one-fourth of the global M&A market in the late 1990s, in 2016, cross-border deals accounted for 1.4 tn\$, i.e., 36% of the total volume, up from 31% recorded in 2015. By giving access to new regions with different economic, market and consumer dynamics, cross-border transactions are likely to continue to represent an increasingly relevant source of value creation for worldwide companies in the future. Nevertheless, the vast majority of the existing academic literature on M&As focuses on domestic deals (Erel, Liao, and Weisbach 2012) or do not distinguish between cross-border and domestic deals in the analysis (e.g., T. Loughran and Vijh 1997; Andrade, Mitchell, and Stafford 2001; Rau and Vermaelen 1998).

By studying the long-run stock returns to European cross-border acquirers, this paper aims at enhancing our understanding of the performance of cross-border shareholders. Existing literature provides some evidence that the market reaction to cross-border M&As differs from domestic deals (Shimizu et al. 2004). Whereas domestic deals typically create negative or null abnormal returns to the acquirer's shareholders (e.g. T. Loughran and Vijh 1997; Andrade, Mitchell, and Stafford 2001), wealth gains have been observed in some cross-border studies (Chakrabarti, Gupta-Mukherjee, and Jayaraman 2009; Markides and Ittner 1994; Morck and Yeung 1992; Kang 1993; Doukas and Travlos 1988). Researchers have explained this difference by pointing to the advantages of exploiting foreign countries' resources or imperfections in the financial markets (e.g., Buckley and Casson, 1976; Morck and Yeung, 1992; Wilson, 1980). For example, in a situation of imperfect integration of capital markets across countries, an acquirer could be able to purchase a relatively inexpensive target following changes in exchange rates, stock market valuations in

local currency, or different levels of taxation (Doukas and Travlos 1988). As such, although both cross-border and domestic deals originate from the same goal of value (or utility) generation from the perspective of the acquiring firm's managers (Erel, Liao, and Weisbach 2012), crossing national borders seems to provide additional elements to wealth creation relative to domestic deals (Williams and Liao 2008). However, other studies find opposite results. For example, André, Kooli, and L'Her (2004) find that both domestic and cross-border Canadian acquirers significantly underperform over the three-year postevent period, with cross-border M&As performing even worse than non-cross-border M&As. In fact, the decision to acquire abroad, other than providing advantages of risk diversification and development of synergies and market knowledge by exploiting cultural and geographic distance (Chakrabarti, Gupta-Mukherjee, and Jayaraman 2009), also leads to challenges in the postmerger integration phase, which may affect the bidder's wealth.

The difference among the existing findings has been linked, other than to the nature of the sample and the time span considered, to the methodology used for measuring abnormal returns (Bessembinder and Zhang 2013; Bessembinder, Cooper, and Zhang 2018; Eckbo, Masulis, and Norli 2007). In particular, Bessembinder and Zhang (2013) suggest a method of investigation that shows that the wealth creation (destruction) typically found for the acquirer following a deal is more likely caused by imperfect benchmark choice when performing the analysis than by the deal itself.

Following the assumptions and methodology of Bessembinder and Zhang (2013), we investigate 174 European cross-border acquirers observed monthly over the period 2002-2012. We investigate whether cross-border acquisitions carry over to the return of the bidding company's stock in the long run. Consistent with the findings obtained on domestic deals by Bessembinder and Zhang (2013), our empirical results show no event-specific abnormal returns to cross-border bidders over a three-year period when differences in firm characteristics across event and control firms are accounted for. The seven firm characteristics linked to variation in stock returns include idiosyncratic volatility, illiquidity, market beta, return momentum, and capital investment. In other words, we find that the negative abnormal returns to cross-border acquirers observed are not due to the acquisition event, but rather to the characteristics of the acquiring firms and their

matched counterparts used in the analysis. Our result is confirmed and emphasized by testing the robustness of the analysis through the replacement of the matching based on size and book-to-market equity proposed by Bessembinder and Zhang (2013) with state-of-the-art propensity score matching.

The contribution of our work is threefold. First, we filled a gap in the research on long-run shareholder value creation by focusing on cross-border Europe-based acquirers. In fact, cross-border deals typically studied are US-based (Markides and Ittner 1994; Morck and Yeung 1992; Kang 1993), despite the call for additional research on non US-based cross-border deals (Shimizu et al. 2004; Erel, Liao, and Weisbach 2012). In this regard, Europe deserves particular attention. The economic and financial integration of European national economies, in fact, stimulated over the two past decades a significant restructuring of companies and a reduced the cost of transactions across European borders, fostering cross-border deals (Lamfalussy et al. 2001; Campa and Hernando 2004; Moschieri and Campa 2009). However, to our knowledge, the majority of M&A performance studies within Europe do not have a long-run purpose, but address the firms' return around the announcement (Goergen and Renneboog 2004; Campa and Hernando 2004, 2006; Cybo-Ottone and Murgia 2000). Only very few rigorous studies investigate the long-run performance of European acquirers (Datta, Kodwani, and Viney 2013; Laabs and Schiereck 2010), and none of them focuses on the long-run return European cross-border bidders.

Second, by building our investigation on the innovative method introduced by Bessembinder and Zhang (2013) as a solution to the bad model problem (Fama 1998), we show that variation in firm characteristics completely explains the abnormal returns (BHARs) also for cross-border European M&A bidding firms. As such, our findings allow the reconciliation of the results, in terms of abnormal returns, between domestic and cross-border deals, while also showing a coherent pattern between the US and the European markets.

Third, we offer an improvement of the methodology of Bessembinder and Zhang (2013) by refining the original matching process through the implementation of the propensity score matching method. The results of this improved analysis confirm and further supported our findings.

The paper is structured as follows. In Section 2, we discuss the main results of the literature with reference to long-run abnormal return testing in the M&A field. In Section 3, we present the sample, data sources, and variables used in the analysis. In Section 4, we discuss the methodology used for the matching procedures and the return analysis. We discuss the empirical results in Section 5, and Section 6 concludes the study.

2 Long-run performance of cross-border acquiring companies

Several authors have engaged in studies on the long-run performance of acquirers. Most of these studies focus on the US market and use buy-and-hold returns (BHAR) and/or calendar time returns (CTAR) methods to assess abnormal returns. The BHAR method is based on the difference between the return to event firms compared with that to control firms, whereas the CTAR focuses on the mean abnormal time series returns to a portfolio of event firms. The use of BHAR or CTAR for measuring abnormal returns has sometimes led to incoherent results (Eckbo, Masulis, and Norli 2007). The BHAR method is typically preferred (Barber and Lyon 1997), as it is more robust (Lyon, Barber, and Tsai 1999) and powerful in detecting abnormal returns (Tim Loughran and Ritter 2000; Moeller, Schlingemann, and Stulz 2005).

Long-run studies focusing on cross-border acquirers are instead rather scarce, particularly with regard to European companies. Thus, we structure our literature review as follows. First, in section 2.1 we address those studies that, while including cross-border deals in their investigation, do not clearly separate them from domestic deals in the analyses. The studies presented in this section refer to the worldwide M&A market with particular attention on North American acquirers. Second, in section 2.2 we focus on long-run studies of pure cross-border deals, but still with worldwide focus. Finally, section 2.3 provides a review of the main studies on cross-border deals in Europe, although, for scarcity reasons, not always specifically focused on acquisitions' long-run returns.

2.1 Long-run studies not distinguishing between domestic and cross-border bidders, worldwide

Earlier research on the long-run returns of NYSE-listed acquiring firms, although not discriminating between domestic and cross-border deals, documents negative and typically significant abnormal returns for the bidder over the three to five years following the acquisition (Asquith 1983; Langetieg 1978; Mandelker 1974; Malatesta 1983). With reference to the empirical findings presented in Table I, Loughran and Vijh (1997) study a sample of 788 US deals in the 1970-1989 period. By matching event and control firms on size and book-to-market equity, they find that five-year BHARs are significantly negative (-25%) for stock mergers, whereas firms that complete tender offers earn significantly positive excess returns of 61.7%. Using a similar approach, Rau and Vermaelen (1998) examine a large number of US-listed acquirers for the period 1980-1991. The authors report a statistically significant abnormal return of -4.04% for mergers and a statistically nonsignificant abnormal return of 8.85% in the case of tender offers. Opting to use a CTAR approach, Moeller *et al.* (2004) find a statistically nonsignificant abnormal return of 0.018% for the whole sample of US acquirers. Applying the approach of Moeller *et al.* (2004), Harford (2005) also obtained coherent results of nonsignificant abnormal returns. Savor and Lu (2009) implement both the BHAR and the CTAR approaches. Although both the BHAR and the CTAR methods document significantly negative excess returns of -7% within the first 250 trading days after the announcement date for acquisitions using stocks as the means of payment, no statistically significant findings are reported for cash-financed acquisitions. In conclusion, as documented also in the review of studies presented by Bruner (2002) existing research suggests that bidders (with some interesting exceptions) basically break even, i.e. earn zero adjusted returns. A discussion of the reasoning of the above results is presented in section 2.4.

2.2 Cross-border focused studies, worldwide

Fewer studies focus on cross-border deals or discriminate between domestic and foreign bidders. However, those studies are mainly short-term focused and US based. For example, cross-border studies of US acquirers purchasing nonUS firms (Markides and Ittner 1994; Morck and Yeung 1992) or Japanese bidders acquiring US targets (Kang 1993) find average value creation around announcement. As such, short-

term wealth creation seems to favor cross-border actors over their domestic counterparts (Kang, 1993; Markides and Ittner, 1994; Morck and Yeung, 1991, 1992). However, this result becomes unstable as soon as the investigation time around the announcement is extended. For example, Eckbo and Thorburn (2000), observing up to one-year announcement-period returns of domestic and cross-border (US-based) firms acquiring Canadian targets, find that while domestic bidders earn a significantly positive average return, the returns of cross-border bidders are not significantly different from zero. Further extending the observation time span to three years after the acquisition event, André, Kooli, and L'Her (2004) find that both domestic and cross-border Canadian acquirers significantly underperform, with cross-border acquirers performing even worse than the domestic ones. Similarly, also Black, Carnes, and Jandik (2001) and Gugler *et al.* (2003) find significant negative returns to US cross-border bidders during the three and five years following a deal. Also ambiguous, Chakrabarti, Gupta-Mukherjee, and Jayaraman (2009), studying the effect of worldwide cross-border deals along one to three years after the deal, find BHARs that are positive on average, but with negative median values. Finally, Conn, Cosh, Guest, and Hughes (2001) do not find any evidence of postacquisition negative returns for cross-border acquisition.

2.3 European cross-border deals

There is a scarce number of studies strictly focusing on European cross-border acquisitions. Moreover, to our knowledge, none of those existing studies focuses on the bidders' long-run performance. For example, with reference to short-term studies Goergen and Renneboog (2004) analyze the return around the announcement of large intra-European takeover bids, finding a positive and statistically significant return to the bidders. The study of Campa and Hernando (2004), finds a null on average value generated by the announcement of M&As involving firms in the European Union, but without distinguishing between domestic and cross-border deals. Other studies, again considering domestic and cross-border deals together, address the short-run return of M&As within particular industries. For instance, a number of researchers focus on the European banking and financial industry. For example, according to the work of Campa and Hernando (2006) returns to shareholders of the acquiring firms were not significantly different from zero

both around announcement and one year after. A similar result emerges also from the study of Cybo-Ottone and Murgia (2000). More negative are instead the findings of Williams and Liao (2008) documenting value destruction, around the announcement of banks deals in Europe.

With regard to the long-run performance of European bidders, we can mention a few studies that, however, do not isolate cross-border deals in their analyses. For instance, Datta, Kodwani and Viney (2013), looking at M&As in the European utility sectors, find that shareholders of the bidder company typically experience losses in the long-run. A similar result is reported in a study addressing the European automotive supply industry, which reveals significant value destruction of about 20% over 3years (Laabs and Schiereck 2010).

2.4 Explaining the ambiguity: Bessembinder and Zhang's approach

The above review suggests that the findings related to the long-run abnormal return of both domestic and cross-border bidders remain ambiguous. Moreover, the interpretation of those results is complicated by possibly confounding events that are unrelated to the transaction (Bruner 2002). Returns might be effected by industry shocks. For instance, the poor performance of the bidder following a deal can be explained by economic turbulence in the industry rather than the acquisition itself (Mitchell and Mulherin 1996). Postmerger decline has also been explained by overvaluation of the buyers' shares (Shleifer and Vishny 2003). The buying firms, in fact, tend to acquire with stock when they believe their shares are overvalued. As such, the postmerger decline does not reflect the success of the deal, but rather a correction in the market's valuation of the buyer.

Indeed, one crucial determinant of abnormal return assessment, especially when addressing long-run performance (Bessembinder, Cooper, and Zhang 2018), has been identified in the choice of the benchmark against which to measure abnormal returns (Bessembinder and Zhang 2013). As discussed in this section, over time researchers have moved away from the straightforward use of country and market indices (Chakrabarti, Gupta-Mukherjee, and Jayaraman 2009) to instead define a comparable match for each of the

event firms included in the sample. The methods for the matching selection have also been refined over the years. In addition to the benchmark, Bessembinder and Zhang (2013) link the variety of researchers' results to the fact that event firms typically differ significantly from their control counterparts on a number of variables known to affect return performance. Thus, if these variables are omitted from the model specification, a significant abnormal return performance might be erroneously explained by the acquisition event. The authors propose an augmented BHAR approach that defines the difference in the continuously compounded return between the event and the matched firm as a function of seven explanatory variables: market beta, size, book-to-market equity, momentum, illiquidity, idiosyncratic volatility, and investments. Applying this methodology to 3,972 completed M&As in the US in the period 1980-2005, the authors find no significant abnormal return performance for any of the events in question. The idea behind this study and its findings is particularly relevant, as it enables reconciliation of the apparent differences in inferences across the literature to the conclusion that, in aggregate, abnormal returns to buyer shareholders from M&A activity are essentially zero.

In sum, we argue that the large majority of the existing cross-border studies addressing the bidders' long-term returns are US-based. European studies are very scarce and mostly focus on short-run implications or aspects other than performance. This evidence suggests a need for European cross-border studies that focus on long-run performance. By building on the model proposed by Bessembinder and Zhang (2013) and further improving their matching process, we expect our sample of European cross-border acquirers to show no evidence of long-run abnormal returns.

Table 1

Summary of findings in the related literature

This table presents a summary of findings on the long-run stock performance of event firms after acquisitions. Superscript *** indicates that the BHAR is statistically significant at the 1% level, ** indicates significance at the 5% level. ^a indicates that the reported table value is the alpha coefficient of the full regression model.

Author(s)	Period	Sample size	Deal type	Country	Method	Holding period (years)	Abnormal return (%)
Loughran and Vijh (1997)	1970-1989	385	Stock M&A	US	BHAR	5	-24.2***
Loughran and Vijh (1997)	1970-1989	196	Cash M&A	US	BHAR	5	18.5
Loughran and Vijh (1997)	1970-1989	207	Mixed M&A	US	BHAR	5	-9.6
Loughran and Vijh (1997)	1970-1989	788	All	US	BHAR	5	-6.5
Rau and Vermaelen (1998)	1980-1991	2,823	Mergers	US	BHAR	3	-4.04
Rau and Vermaelen (1998)	1980-1991	316	Tender offers	US	BHAR	3	8.85
Moeller, Schlingemann & Stulz (2004)	1980-2001	12,023	All	US	CTAR	3	.18
Harford (2005)	1981-2000	n.a.	All	US	CTAR	2	.25
Savor and Lu (2009)	1978-2003	1,050	Stock M&A	US	BHAR and CTAR	3	-13.1***
Savor and Lu (2009)	1978-2003	723	Cash M&A	US	BHAR and CTAR	3	.16
Betton, Eckbo & Thorburn	1980-2003	11,483	All	US	BHAR and CTAR	5	-21.9***; .08
Chakrabarti, Gupta-Mukherjee Jayaraman (2009)	1990-2004	825	Cross-border M&A	Worldwide	BHAR	3	.09**
Bessembinder and Zhang (2013)	1980-2005	3,972	All	US	Augmented BHAR	5	.02 ^a

3 Data and sample

3.1 Sample selection

We use the Zephyr database (a comprehensive database of M&A deals provided by *Bureau Van Dijk*) to identify all cross-border acquisitions completed by publicly listed European acquirers in the period 2002-2012. We cross-check the data against the M&A information provider MergerMarket. Considering the acquisition month as a reference, we retrieve financial data ranging from -36 to +36 months around the acquisition completion date (Rau and Vermaelen 1998; Moeller, Schlingemann, and Stulz 2004). Specifically, we measure the monthly abnormal return from month 1 through month 36 after the deal date, and we gather lagged explanatory variables for the calculation of the propensity score. Thus, the firms in our sample have been observed for 73 consecutive months, i.e., 36 months before and 36 months after the acquisition month (month 0). Although this period is sufficient to gauge long-run performance implications, it may create a look-ahead bias and overestimate postacquisition performance. Thus, we should be careful about generalizing the results of the study beyond firms that survived 36 months after the acquisition.

We use several criteria to ensure the reliability of our results. First, we select only strategic acquisitions; hence, we exclude from our sample institutional and management buy-ins and buy-outs, share buybacks, capital increases and joint ventures. For the same reason, we also exclude acquirers active in the financial sector, such as financial institutions, real estate companies, and legal advisors, because the specific nature of the regulatory environments and accounting standards would bias the study. Second, the deals have to be significant in terms of size to have an effect on the acquiring firm (Bessembinder and Zhang 2013). Specifically, acquisitions are significant when the ratio of the deal value to the market capitalization of the acquirer, measured as of the December before the deal, is higher than 2%. We chose the 2% level by assessing the tradeoff between removing noise and keeping the sample size at an acceptable level. When the deal value is undisclosed, the significant size criterion is proxied by observing the target revenue. In detail, we require that the target revenue at the acquisition date be higher than two million Euros. We choose

this threshold because it represents the lower revenue boundary set by the European Commission¹ to define small companies, which, together with medium-size companies, account for 99% of all European enterprises. Third, in line with Bessembinder and Zhang (2013) and Betton, Eckbo and Thorburn (2008), we require the acquiring company to hold a pre-event stake of less than 50% and a postevent controlling stake of more than 50%. Fourth, to avoid noise arising from an acquiring consortium with several participants or subsequent changes in the acquirer's ownership of the target after the acquisition date, we require the deals to be made by a single acquirer that is not allowed to divest, either fully or partially and either nationally or internationally, within a period of three years after the event. Fifth, for similar reasons, we also require that the acquirer not be involved in other deals within the three years before and after the event. This procedure results in a final sample of 174 deals, observed for 36 months before and after the deal. Table 2 presents a breakdown of our sample of the event firms by acquisition year (Panel A) and the acquirer's country (Panel B).

We match each acquiring firm with the most similar nonacquiring firm according to the two methodologies described in the next section, i.e., i) matching on size and book-to-market equity and ii) matching on propensity score.

Finally, we collect data on the companies' stock prices and financial items from the CompuStat Global database, cross-checked against Bloomberg, FactSet, and similar online financial providers. Moreover, we retrieve daily data on stock splits, dividends and currency denominations, and we account for these in the calculation of the variables used in the analysis.

¹ EU recommendation 2003/361.

Table 2

Event by year

This table presents the number of events in our sample by year of acquisition (Panel A) and country of acquiring firm (Panel B).

Year	# Acquisitions	Country	# Acquisitions
2002	1	United Kingdom	44
2003	2	France	24
2004	10	Sweden	23
2005	15	Germany	19
2006	19	Finland	18
2007	23	Poland	7
2008	24	Austria	7
2009	12	Belgium	6
2010	17	The Netherlands	6
2011	23	Spain	4
2012	28	Italy	4
		Ireland	4
		Other	8
Total	174	Total	174

3.2 Variables

Our measures closely follow those used by Bessembinder and Zhang (2013). We estimate the *market beta* for each firm from rolling monthly regressions in months $t-36$ to t . *Size* is calculated as the firm market capitalization, i.e., the number of shares outstanding multiplied by the current share price, in fiscal year $t-1$. *Book-to-market equity* is measured as the ratio of the book value of common equity at the end of fiscal year $t-1$ to the market value at the same point in time, and we measure *momentum* as the cumulative return from months $t-12$ to $t-2$. Following Amihud (2002), we measure *illiquidity* as the average of the daily ratio of the absolute stock return to the dollar trading volume. Following Ant *et al.* (2006), we measure *idiosyncratic volatility* as the standard deviation of the residuals obtained from three-year rolling regressions of monthly

stock returns on the five Fama and French (2015) factors.² We measure *investment* as the sum of the annual change in gross property, plant and equipment, which represents long-lived investments, and as the annual change in inventory, which represents short-lived investments, divided by the lagged asset value (Lyandres, Sun, and Zhang 2008). Finally, we add country and industry dummies, which assume the value of one if the acquirer and the target are active, respectively, in the same country and industry, and zero otherwise, along with time dummies to control for the acquisition year (Chakrabarti, Gupta-Mukherjee, and Jayaraman 2009).

4 Method

4.1 Matching sample

For each event firm, a match is gathered from the sample of all European firms. Using CompuStat Global as a data source, we obtain a sample of 6,566 potential matching companies with data availability within the time span of our analysis. We perform the matching of event with control firms by applying two methodologies. First, following Bessembinder and Zhang (2013), we match on size and book-to-market equity (BM) ratio. Second, to refine the matching selection, we adopt the propensity score matching method. The purpose of the implementation of this second matching procedure is rooted in the importance of a correct specification of normal or benchmark returns. Indeed, the specification of benchmark returns, though relatively less critical for studies that focus on abnormal returns over short time intervals (Kothari 2007), is

² We construct our measure of idiosyncratic volatility following the work of Bessembinder and Zhang (2013), which was based on the measure proposed by Ang, Hodrick, Xing, and Zhang (2006), as the annualized standard deviation of the residuals in monthly regressions of daily stock returns on the three Fama and French (1993) factors. However, in contrast to Bessembinder and Zhang (2013), who compute the idiosyncratic volatility on a monthly basis using daily data and the Fama–French three-factor model, the format of the data used in this paper dictates a monthly frequency. In addition, we implemented the more recent five-factor Fama–French (2015) model to replace the previous version (Fama–French three-factor model) used by Bessembinder and Zhang (2013). To obtain a sufficient and comparable number of observations, the idiosyncratic volatility factor is computed as the standard deviation of the residuals obtained from three-year rolling regressions using monthly data. The data on these factors computed on a global scale were retrieved from the website of French (2016) and the residuals were calculated during months $t-36$ to t . Thirty-six months were chosen based on the event horizon of three years used along the analysis.

a fundamental issue when examining long-term returns (T. Loughran and Vijh 1997; Bessembinder, Cooper, and Zhang 2018).

Finally, a clause common to both the matching methods is that to be selected, the benchmark firm is not allowed to be in our sample of bidders during the six years around the acquisition completion date (Bessembinder and Zhang 2013).

4.1.1 Size and book-to-market equity matching method

Following a standard procedure in the literature on long-run returns (Bessembinder and Zhang 2013; LOUGHRAN and RITTER 1995; Barber and Lyon 1997; Eckbo, Masulis, and Norli 2007; Fama and French 1992), we select the most similar firm in terms of size and BM ratio as the matched firm. Firm size is expected to positively affect the decision to acquire, as it is typically a proxy for resources, cash availability, financial leverage, economies of scale and business scope. The BM ratio, which captures the financial distress of a company, is expected to negatively affect the opportunity to engage in and finance an acquisition (Fama and French 1992; Chan and Chen 1991). For each acquirer, we match the firm with the closest BM ratio among firms with market capitalization between 70% and 130% of the bidder firm. The BM ratio is calculated as the ratio of the book value of common equity at the end of fiscal year $t-1$ to the market value of common equity at the end of year $t-1$. Market capitalization is measured at the end of the year prior to the deal.

According to Bessembinder and Zhang (2013), event and matching firms, although satisfying the comparability conditions required by the matching procedure, might nonetheless differ on several parameters, i.e., the seven variables described in the previous section. Figure 1 illustrates the time series of the median characteristics of event (blue line) and their size- and BM ratio-matched comparable (red line) firms in the 36 months before and after the event.

Figure 1 plots the time series of the cross-sectional median firm characteristics for bidding and size- and BM-matched firms over the 36 months before and after the effective date of the deal. Although the median BM and momentum are well matched on average at the event dates, the similarity of the event and control

firm degrades over time (Bessembinder and Zhang 2013). Significant differences also exist when considering other characteristics. The higher systematic risk for the matched firms is illustrated by their median market beta lying above that of the event firms for approximately 20 months around the event date. The median size is similar across the event and matching firms in the postevent period. One major change occurs when we consider the investment characteristic, where the median investment of the matching firms is significantly less variable. Next, the median illiquidity shows clear coherent spikes in the event and matching firm profiles. Finally, a clear difference is observed in the median idiosyncratic volatility, as the matching firms appear to be more sensitive to changes in the aggregate market volatility relative to the event firms.

Figure 1

4.1.2 Propensity score matching method

The propensity score matching methodology relies on the construction of the control sample based on a scalar similarity measure (the propensity score) between the event and matched firms (Rosenbaum and Rubin 1983). Empirically, the propensity score $p(x)$ is the probability of a firm experiencing an event (acquisition) conditional on a set of explanatory variables x (observable firm characteristics):

$$p(x) = \text{pr}(D = 1 | x) = G(\beta_0 + x\beta) \quad (1)$$

with D being an event dummy equal to 1 if an event occurs and 0 otherwise (X. Li and Zhao 2006). In our setting, this approach calculates the probability of firms engaging in acquisitions and then matches the event firm with the nonacquiring firm with the closest probability of engaging in the same event. Specifically, the predicted probability of treatment is calculated using the logistic function $G()$, as provided in Equation 1.

To calculate the propensity score, the choice of explanatory variable is crucial. The variables included should simultaneously affect both the propensity to acquire and the ex-post performance (X. Li and Zhao 2006). Drawing on the work of Bessembinder and Zhang (2013), we first include the size and BM ratio variables. Next, we add the return momentum to account for companies timing the market when engaging in corporate events (Schultz 2003; X. Li and Zhao 2006; Jegadeesh and Titman 1993). A higher momentum, typically implying overvalued stock, is expected to have a positive impact on the decision to acquire. Indeed, because stock payment represents a payment method widely used by acquiring firms, it has obvious advantages when the acquirer's stock price is overvalued (Heron and Lie 2002; S. Chang and Mais 2000; Martin 1996). The investment factor is also included as a proxy for a company's inclination to engage in major investments (Lyandres, Sun, and Zhang 2008), and the equity ratio (calculated as the ratio between common equity and total liabilities) is included as a proxy of the economic latitude and fund availability of a company. In particular, a highly levered company (i.e., one with a low equity ratio) is not expected to be able to engage in a major acquisition to the same extent as a company with a greater degree of equity financing (and thus greater debt capacity, *ceteris paribus*) (Fama and French 1992). Finally, we include

controls for the industry and the country of the acquiring firm to account for firms that usually cluster according to differences in industry- and country-specific environments such as industry and economic shocks, trends, market development, legality and taxation level (Becker-Blease, Goldberg, and Kaen 2008; Pistor, Berkowitz, and Richard 2003; La Porta *et al.* 2000). Finally, although the explanatory variables included in our model may not capture every factor that affects a firm's acquisition strategy, unknown rational or irrational factors are commonly held by all firms and are treated by the error term in the logit model (S.-J. Chang, Chung, and Moon 2013). Although propensity score matching has many advantages, it is not free from assumptions. In particular, propensity score matching relies on the *strongly ignorable assumption* (Rosenbaum and Rubin 1983). Applied to our work, this assumption states that the acquisition decision depends on postacquisition stock returns only through the variables included in the model. Thus, this matching method assumes that we can observe all variables that need to be adjusted. This assumption is strong, as a large number of characteristics predict stock returns (Harvey, Liu, and Zhu 2016). If there are unobservables that simultaneously affect the treatment assignment and our outcome, the treatment assignment is not strongly ignorable (M. Li 2013). The propensity score is thus calculated by Equation (2):

$$\begin{aligned}
 p(x) = & \beta_0 + \beta_1 \text{Momentum} + \beta_2 \text{Investment} + \beta_3 \text{Size} + \beta_4 \text{BM} \\
 & + \beta_5 \text{EQratio} + \beta_{\text{Acq. Industry dummies}} \\
 & + \beta_{\text{Acq. Country dummies}} + \beta_{\dots} \text{higher order terms} \\
 & + \beta_{\dots} \text{interaction terms}
 \end{aligned} \tag{2}$$

in which the variables are used at their nominal values and not the differences between the event and matching firms. Less complex models without higher-order and interaction terms were also estimated. We choose the model in Equation 2 based on the Akaike and Bayesian information criteria. The dependent variable is a dummy variable taking the value of 1 if the event occurred, i.e., if the firm is an acquirer, and 0 otherwise.

Table 3

Propensity score matching

This table illustrates the output from the logit model described in Eqs. 1 and 2. The dependent variable is a 0/1 variable, with 1 denoting if an event occurred. No normalization or standardization has taken place, and the resulting coefficients and standard errors thus contain zero in the first of many decimal places. The model has been estimated using a fixed effects logit model with country and industry dummy variables included. Robust standard errors are in parentheses, with the following indicators of significance levels *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Dependent variable: Event dummy	Fixed effects logit
Size	6.29e-11*** (1.09e-11)
Size ²	-5.90e-22*** (1.25e-22)
BM	-0.3590*** (0.0739)
BM ²	-0.0343 (0.0216)
Momentum	0.2540*** (0.0859)
Momentum ²	-0.0592** (0.0249)
Investment	0.3890*** (0.0813)
Investment ²	-0.0201*** (0.0065)
EQratio	2.6820*** (0.6040)
EQratio ²	-3.4320*** (0.6610)
BM × Momentum	0.0678 (0.0912)
EQratio × Size	-7.64e-12 (2.01e-11)
Constant	-6.1730*** (0.4710)
Observations	184,412
Number of vID	1,053
Country dummies included	Yes
Industry dummies included	Yes

Figure 2

The results of the logit model presented in Table 3 confirm the expected effects of the explanatory variables in terms of both sign and significance. Nonetheless, beyond the coefficient estimates, the purpose of the logit regression is to produce probabilities for use in matching event and control firms. Specifically, each event firm is matched to the nonevent firm with the closest probability of being in an acquisition, i.e., the propensity score resulting from Equation 2.

Figure 2 shows that the median firm characteristics of event and matching firms are far from identical over time. Similar to Figure 1, we observe similarities between event and matching firms as long as they concern median BM and momentum; however, these similarities do not apply to the remaining firm characteristics. The median market betas of event and matching samples have a similar pattern until shortly before the event date. At this point, the market beta of the event firms overcomes that of the matching firms, suggesting that the systematic risk of the event firms increases around the date of the event and remains higher throughout the postevent period. The median size also shows great variation. In particular, the event firms experience higher growth rates in the pre-event period (especially from month $t-20$) until they reach a size similar to that of the matching firms at the event time. This situation might have occurred because the event firms previously utilized organic growth opportunities to realize higher growth rates. When such growth opportunities become exhausted, inorganic initiatives such as M&A might commence. Variations also exist when considering the median investment. In particular, the investment profile of event firms spikes shortly after the acquisition date. This explanation supports the notion of event firms investing more heavily to keep growth rates high when the number of organic growth opportunities starts to decline. In contrast, the matching firms seem to be investing more heavily several months prior to the event date. A comparable spike pattern is also observed in Bessembinder and Zhang (2013). With respect to the median idiosyncratic volatility, the event firms show lower levels than the matching firms throughout the period observed. Finally, the median illiquidity value seems to fluctuate significantly both before and after the event, with the spikes of the event firms being greater. Furthermore, it appears that increased trading activity occurs around the date of the event. However, the event firm's illiquidity increases again shortly after the event relative to the illiquidity of the matching firms.

In conclusion, Figures 2 and 3 both show differences in the median firm characteristics between event and matched firms. Since extant empirical research documents a relation between these firm characteristics and the return, consistent with Bessembinder and Zhang (2013), it is fundamental to take them into account when testing for abnormal return performance after an acquisition event. In other words, knowing that the PSM matches are not perfect, it is beneficial to use the information contained in all the additional variables to “clean” the intercept in the BHAR regression for as much noise (i.e., information not related to the event but to the difference in stock returns) as possible to evaluate the effect of an M&A event.

4.2 Long-run return analysis

The BHAR methodology is standard in studies of long-term stock performance, and it is typically preferred over the CTAR approach (e.g., Barber and Lyon 1997; Chakrabarti, Gupta-Mukherjee, and Jayaraman 2009). The calculation of the BHAR of an event firm e over τ months after an acquisition completed at date $t=0$ is defined in Equation (3):

$$\begin{aligned} \text{BHAR}_{e\tau} &= \prod_{t=1}^{\tau} (1 + r_{et}) - \prod_{t=1}^{\tau} (1 + r_{mt}) \\ &= \exp \left\{ \sum_{t=1}^{\tau} [\ln(1 + r_{et})] \right\} - \exp \left\{ \sum_{t=1}^{\tau} [\ln(1 + r_{mt})] \right\} \end{aligned} \quad (3)$$

with r_{et} and r_{mt} denoting the event and matching firm returns, respectively, and τ denoting the postevent period. To test the abnormal long-run stock returns after an acquisition, we follow Bessembinder and Zhang’s CIT. Specifically, we assess abnormal returns based on the intercept obtained in regressions of differences in monthly log returns across event and matched stocks on standardized differences in relevant firm characteristics. The model is provided in Equation 4:

$$\begin{aligned}
\ln(1 + r_{et}) - \ln(1 + r_{mt}) = & \\
& \alpha + \beta_1 \Delta \text{Beta} + \beta_2 \Delta \text{Size} + \beta_3 \Delta \text{BM} + \beta_4 \Delta \text{Momentum} \\
& + \beta_5 \Delta \text{Illiquidity} + \beta_6 \Delta \text{Idio. volatility} + \beta_7 \Delta \text{Investment} \\
& + \beta_8 \Delta \text{Industry} + \beta_9 \Delta \text{Country} + \beta_{10} \text{Time dummies} + \varepsilon_{et}
\end{aligned} \tag{4}$$

with $e = 1, 2, 3, \dots, E$ denoting the number of event firms, $t = 1, 2, 3, \dots, T$ denoting the time period, and Δ denoting the normalized differences in the respective firm characteristics between the event and control firms. The industry and country dummy variables indicate whether the industry/country of the event and matching firm is the same or not. The variable measures are described above in section 3.2, and the process of normalizing the variables follows the same procedure as in Bessembinder and Zhang (2013). Specifically, it is carried out by sorting monthly positive and negative differences in order from the smallest to the largest in terms of absolute value. Positive (negative) differences are then converted to (minus the) percentile rankings, resulting in a range of values between -1 and 1. This procedure is implemented to make coefficients comparable across the included characteristics, especially because of the large magnitude of firm size compared with the other variables.

The crucial element of this methodology is the estimated intercept α , which is an estimate of the average abnormal stock return conditional on the differences between event and matching firm characteristics being equal to zero. Testing the hypothesis that this parameter is equal to zero corresponds to testing whether abnormal stock BHARs are zero (Bessembinder and Zhang 2013). Another advantage of calculating the intercept α is that it is straightforward to convert into a value of wealth relative (WR) between the event and the matched firm. Specifically, the WR is defined as the ratio of the τ -period gross return to an investment in the event firm relative to holding an equivalent investment in the matched firm at the end of the period being considered (LOUGHRAN and RITTER 1995):

$$WR_{et} = \frac{\prod_{t=1}^{\tau} (1 + r_{et})}{\prod_{t=1}^{\tau} (1 + r_{mt})} = \exp \left\{ \sum_{t=1}^{\tau} [\ln(1 + r_{et})] - [\ln(1 + r_{mt})] \right\} = \exp(\hat{\alpha}\tau) \tag{5}$$

Table 4

Regression results using size and book-to-market matching

This table illustrates regression results from the pooled OLS and Fama–MacBeth procedures on the normalized differences in seven firm characteristics and two dummy variables using the difference in log returns as the dependent variable. Each event firm is paired with a matching firm that satisfies the following conditions: 1) the size is within 70 and 130% of the event firm and 2) of all firms satisfying 1, the matching firm has the smallest absolute difference in the book-to-market equity. OLS refers to the pooled OLS procedure, and FM refers to the Fama–MacBeth procedure. When a variable ends with 2 as a superscript, the variable has been squared to allow for nonlinear effects. Robust standard errors are in parentheses with the following indicators of significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Dependent variable: Difference in log returns	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS	(7) OLS	(8) OLS	(9) OLS	(10) OLS	(11) FM
Δ Beta		-.0071* (.0039)							-.0087* (.0047)	-.0086* (.0048)	.0348 (.0391)
Δ Beta ²										-.0087 (.0079)	.0097 (.0322)
Δ Size			.0428*** (.0034)						.0479*** (.0043)	.0479*** (.0043)	-.0433 (.0798)
Δ Size ²										-.0009 (.0076)	-.2820 (.2770)
Δ BM				-.0024 (.0036)					.0025 (.0037)	.0020 (.0037)	-.0785 (.0838)
Δ BM ²										.0095 (.0069)	.1810 (.1680)
Δ Momt.					.0127*** (.0039)				-.0077* (.0044)	-.0077* (.0045)	-.0477 (.0583)
Δ Momt. ²										-.0047 (.0083)	.0521 (.0460)
Δ Illiq.						.0058 (.0036)			.0097** (.0038)	.0099*** (.0038)	.0409 (.0286)
Δ Illiq. ²										.0027 (.0080)	-.2570 (.2410)
Δ Idio.							-.0014 (.0043)		.0024 (.0048)	.0023 (.0047)	.0221 (.0267)
Δ Idio. ²										-.0079	-.0671

										(.0078)	(.0572)
Δ Inv.								.0043 (.0035)	.0011 (.0034)	.0004 (.0034)	-.0246 (.0262)
Δ Inv. ²										.0051 (.0071)	.0686 (.0697)
Δ Country									-.0032 (.0053)	-.0016 (.0053)	.0417 (.0448)
Δ Industry									.0014 (.0052)	-.0004 (.0053)	.0107 (.0092)
Constant	-.0049*** (.0022)	-.0490*** (.0036)	-.0093*** (.0027)	-.0410*** (.0020)	-.0444*** (.0006)	-.0443*** (.0012)	-.0432*** (.0025)	-.0457*** (.0026)	-.0161*** (.0058)	-.0112 (.0106)	.0561 (.0552)
Observations	6,264	6,264	6,264	6,264	6,264	6,264	6,264	6,264	6,264	6,264	6,264
R^2	0.000	0.003	0.031	0.002	0.004	0.002	0.002	0.002	0.035	0.036	0.002
Cluster by id	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Wealth relative	.1714	.1714	.7155	.2286	.2022	.2111	.2111	.1930	.5601	.6682	7.5353

By construction, a value of WR above 1 corresponds to a positive abnormal return ($BHAR > 0$). Ordinary least square (OLS) regressions are used as base models, with the results estimated through pooled time series and cross-sectional data, giving equal weight to each event. Because the residuals in this kind of analysis are likely to be correlated both within firms and/or over time (Petersen 2009), we cluster the standard errors by deal and add the acquisition time dummy variable to avoid biases in the estimates of the coefficient standard errors.

Finally, to ensure the robustness of our results, we also report Fama and MacBeth (1973) estimates, which are based on a two-step procedure: a cross-sectional regression is initially estimated for each sample month, and the final estimates are then obtained by using the time series mean of the monthly estimates (Bessembinder and Zhang 2013; Chakrabarti, Gupta-Mukherjee, and Jayaraman 2009).

5 Results

5.1 Results using size and book-to-market equity matching

Table 4 reports our results from estimating Equation (4) on the data matched on size and BM. Column 1 of Table 4 presents the results from the intercept-only model obtained by pooled OLS estimation. Based on Equation (5), the negative intercept of -4.9% (corresponding to a WR of .84) translates into an average 16.1% underperformance of event firms relative to their matching peers. This result is consistent with that of Betton, Eckbo and Thorburn (2008) and Bessembinder and Zhang (2013). The intercept is statistically significant at the 5% level.

Next, Columns 2 to 8 present the results from including the differences in each of the firm characteristic variables in turn. Both size and momentum are significant and positively related, whereas investment is nonsignificant. Market beta is significant and negative, indicating that the higher the exposure to the systematic market risk is, the lower the return. Considering the first eight columns, it is clear that none of the individual firm characteristics can account for the abnormal underperformance of European cross-border acquisitions. The estimated intercepts range from -4.9% (corresponding to a WR of .17) to -9.3%

(corresponding to a WR of .71). Each of the intercepts is statistically significant at the 1% level. Consequently, specifying the benchmark return model using only one firm characteristic at a time indicates that abnormal stock returns arise in the wake of European cross-border acquisitions.

The conclusion does not change when we control for all seven firm characteristics simultaneously, including industry, country and time dummies. As shown in Column 9, the estimated intercept decreases to -1.61% (corresponding to a WR of .56) from -.49% in Column 2 (corresponding to a WR of .84). The estimated intercept in Column 9 is statistically significant at the 1% level. This result suggests abnormal returns even when we include all seven characteristics at once in the linear pooled regression model.

Columns 10 and 11 of Table 4 report the results when we incorporate nonlinear relations between firm characteristics and abnormal returns. Column 10 reports the pooled OLS results, and Column 11 reports the results obtained by the Fama–MacBeth procedure. In Column 10, the inclusion of the squared terms hardly affects the coefficients of nontransformed variables, and the estimated intercept (-1.12%) is substantially smaller than that in most of the models, including those that include firm characteristics one at a time. In the Fama–MacBeth specification, however, the estimated intercept is positive and substantial in size (5.61%). Importantly, in both the nonlinear pooled OLS and Fama–MacBeth specifications, the estimated intercepts (-1.12% and 5.61%, respectively) are statistically nonsignificant ($p = .29$ and $p = .31$, respectively). Thus, we cannot reject the null hypothesis of no abnormal long-run stock returns from European cross-border acquisitions. These results are coherent with our expectations.

Although the estimated intercept in the Fama–MacBeth specification is nonsignificant, its size is still substantial³. Below, we show that the intercept shrinks close to zero when we perform the estimation procedures on event and control firms and use the more comprehensive propensity score matching technique.

³ As in Bessembinder and Zhang (2013), we checked that our full model results were robust to using matching firms selected within the same industry as the even firm. The estimated intercepts are similar to those of the reported analysis and non-significant. The results are available upon request.

Table 5

Regression results using propensity score matching

This table illustrates the regression results from the pooled OLS and Fama–MacBeth procedures on the normalized differences in seven firm characteristics and two dummy variables using the difference in log returns as the dependent variable. Each event firm is matched with the matching firm with the closest propensity score. OLS refers to the pooled OLS procedure, and FM refers to the Fama–MacBeth procedure. When a variable ends with 2 as a superscript, the variable has been squared to allow for nonlinear effects. Robust standard errors are in parentheses with the following indicators of significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Dependent variable: Difference in log returns	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS	(7) OLS	(8) OLS	(9) OLS	(10) OLS	(11) FM
Δ Beta		-.0067 (.0047)							-.0068 (.0047)	-.0040 (.0047)	-.0070 (.0075)
Δ Beta ²										.0010 (.0063)	-.0004 (.0108)
Δ Size			.0114*** (.0033)						.0155*** (.0042)	.0165*** (.0047)	.0082 (.0087)
Δ Size ²										.0018 (.0072)	.0184** (.0079)
Δ BM				.0025 (.0045)					.0028 (.0047)	.0036 (.0046)	.0094 (.0072)
Δ BM ²										-.0004 (.0077)	-.0121 (.0141)
Δ Momt.					.0108*** (.0040)				.0079* (.0041)	.0058 (.0041)	.0136 (.0086)
Δ Momt. ²										-.0028 (.0079)	.0080 (.0135)
Δ Illiq.						.0012 (.0042)			.0083 (.0052)	.0084* (.0050)	.0180** (.0078)
Δ Illiq. ²										-.0033 (.0067)	.0010 (.0122)
Δ Idio.							-.0061 (.0049)		-.0007 (.0051)	-.0009 (.0051)	-.0159* (.0094)
Δ Idio. ²										-.0302*** (.0094)	-.0347*** (.0124)

Δ Inv.									-.0070*	-.0068*	-.0061*	-.0037
									(.0038)	(.0035)	(.0035)	(.0052)
Δ Inv. ²											.0177**	.0251**
											(.0073)	(.0118)
Δ Country										.0024	.0030	.0060
										(.0058)	(.0057)	(.0084)
Δ Industry										.0061	.0028	-.0051
										(.0048)	(.0047)	(.0063)
Constant	-.0040*	.0217***	.0107***	.0173***	.0081**	.0186***	.0152***	.0230***	.0034	.0147	-.0024	-.0024
	(.0024)	(.0021)	(.0024)	(.0027)	(.0040)	(.0009)	(.0029)	(.0023)	(.0072)	(.0123)	(.0101)	(.0101)
Observations	6,264	6,264	6,264	6,264	6,264	6,264	6,264	6,264	6,264	6,264	6,264	6,264
R ²	0.000	0.003	0.004	0.002	0.004	0.002	0.003	0.003	0.008	0.012	0.006	0.006
Cluster by id	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Wealth relative	.8659	2.1841	1.4699	1.8641	1.3386	1.9535	1.7284	2.2887	1.1302	1.6976	.9172	.9172

5.2 Result using propensity score matching

Table 5 provides an overview of the results from the pooled OLS and Fama–MacBeth procedures on the propensity score matched data set of normalized differences in firm characteristics. The coefficient of -0.40% corresponds to a WR of 0.87 (cf. Equation 5), implying that the accumulated returns of the event firms are, on average, 13.5% lower than their propensity score matched counterparts over a postevent period of 36 months. This underperformance is statistically significant at the 10% level and is in accordance with the 24% underperformance reported by Bessembinder and Zhang (2013).

Columns 2 to 8 allow for differences in firm characteristics one at a time. In Column 3, the reported results illustrate that the size variable has a positive and significant effect on the dependent variable, implying that larger firms have a higher stock return. The estimated intercepts in Columns 2 to 8 range from .81% (corresponding to a WR of 1.34) to 2.3% (corresponding to a WR of 2.29) and remain statistically significant at the 1% significance level (5% level for Column 5). This change in sign illustrates that the choice of regression model has a significant effect on the results regarding the stock return over-/underperformance. Furthermore, it clearly illustrates the drawback of considering the abnormal BHAR in isolation.

Column 9 presents the results from the pooled OLS estimation with all seven firm characteristic variables along with the country, industry and time dummies. Table 5 illustrates that the individually significant variables carry over to the full model. The size (1% level), momentum (10% level) and investment variables (10% level) are all statistically significant and have the same signs as in their individual models. Column 9 shows an estimated intercept of .34% (corresponding to a WR of 1.13), which is economically and statistically nonsignificant ($p = .22$). This indicates that abnormal performance may be explained by differences in fundamental firm characteristics rather than by the event in question.

Columns 10 and 11 allow firm characteristics to be nonlinearly related to abnormal returns while also including dummy variables. The marginal effect of the investment variable is negative but decreasing, and the coefficient of the illiquidity variable has the expected positive sign. The squared term of the idiosyncratic volatility variable is significantly negative, as expected. Most importantly, the intercepts in Columns 10 and

11 are estimated to be 1.47% and -.24%, respectively (corresponding to a WR of 1.70 and .92) and are economically and statistically nonsignificant ($p = .23$ and $p = .82$, respectively). Therefore, data matched by the propensity score technique yield an even clearer picture than those using the size and BM matching technique. Namely, no evidence is found of long-run abnormal return performance following European cross-border acquisitions. This finding is consistent with Bessembinder and Zhang (2013), Moeller, Schlingemann and Schulz (2004), Harford (2005), Betton, Eckbo and Thorburn (2008), and Rau and Vermealen (1998).

5.3 Robustness checks

We checked the robustness of our results to alternative model specifications and a change in the postevent period. A random effects model of the full linear and nonlinear models yielded results that were very similar to those obtained using the pooled OLS estimator. Hence, the pooled OLS estimator with cluster robust standard errors is appropriate. Furthermore, we checked the effect of shortening the event horizon to two years. The main finding of no abnormal returns in the wake of European cross-border acquisitions is also supported within a two-year horizon.

6 Conclusions

The paper examines long-run stock returns to 174 acquirers that engaged in cross-border M&As in Europe in the period 2002-2012. Although a range of studies investigate the long-run abnormal returns of US acquisitions, only a few works have turned their attention to the European cross-border market despite its increasing trend and size. Our analysis shows that acquirers underperform their matched control firms over the thirty-six months following deal completion. However, the findings of our work show that the initially found underperformance is not ascribed to the acquisition event but instead explained by differences between acquirers and control firms in seven firm characteristics that have been found to predict future stock returns.

We perform our analysis by relying on the augmented BHAR method suggested by Bessembinder and Zhang (2013). Following the latter method, we first performed our analysis by matching the acquirers of our sample to control peers by implementing the size and BM matching method. Next, we improved the matching method by introducing the propensity score methodology to the analysis, which led the estimated WR to further reduce to close to zero. Our results suggest that abnormal returns are likely to result from imperfect matching rather than from the acquisition event per se.

Our findings are relevant to reconciling the results in terms of abnormal returns between domestic and cross-border deals while showing a coherent pattern between the US and European markets. Moreover, our analyses offer robustness to previous studies through the use of an improved matching technique.

Coherent with the recent paper by Bessembinder, Cooper, and Zhang (2018), we aim to stress the importance of a well-constructed benchmark when testing the long-run stock returns to M&As. However, although Bessembinder, Cooper, and Zhang (2018) address the benchmark issue by eliminating the need to identify control firms entirely, we built on the work of Bessembinder and Zhang (2013) to contribute to the literature by improving control firm selection. While acknowledging the innovativeness of the method of Bessembinder, Cooper, and Zhang (2018), we suggest a comparison of the two methods as a natural extension of our work. Furthermore, by having contributed with this investigation on long-run stock returns to cross-border European acquirers, we call for more research on European cross-border deals, for example, comparing their performance to domestic deals. In a broader perspective, we also call for more research on cross-border M&As in general, for example, analyzing the different determinants of short- and long-run returns.

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