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The stock market evaluation of IPO-firm takeovers

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The Stock Market Evaluation of IPO-Firm Takeovers

We conduct an event study to assess the stock market evaluation of public takeover announcements. Unlike the majority of previous research, we specifically focus on acquisitions targeted at newly public IPO-firms and show that the stock market positively evaluates these M&As as R&D. However, bidders' abnormal announcement returns are significantly lower for takeovers directed at targets with critical intangible assets and innovative capabilities inalienably bound to their initial owners than for those that have internally accumulated respective resources and capabilities. We explain these findings with the acquirer's post-acquisition dependence on continued access to the IPO-firm founders' target-specific human capital. Our results contribute to literature in that they show that the stock market perceives these potential impediments to successful exploitation of acquired strategic resources and thus identify a potential cause for heretofore mostly inconsistent evidence on bidder abnormal returns in corporate takeovers found in previous research.

Keywords: Ownership Structure, High-Tech IPO-Firms, Mergers & Acquisitions

JEL: D23, G32, G34, L22, M13

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Abstract

We conduct an event study to assess the stock market evaluation of public takeover announcements. Unlike the majority of previous research, we specifically focus on acquisitions targeted at newly public IPO-firms and show that the stock market positively evaluates these M&As as R&D. However, bidders' abnormal announcement returns are significantly lower for takeovers directed at targets with critical intangible assets and innovative capabilities inalienably bound to their initial owners than for those that have internally accumulated respective resources and capabilities. We explain these findings with the acquirer's post-acquisition dependence on continued access to the IPO-firm founders' target-specific human capital. Our results contribute to literature in that they show that the stock market perceives these potential impediments to successful exploitation of acquired strategic resources and thus identify a potential cause for heretofore mostly inconsistent evidence on bidder abnormal returns in corporate takeovers found in previous research.

Keywords: Ownership structure, high-tech IPO-firms, mergers & acquisitions

JEL classification: D23, G32, G34, L22, M13

INTRODUCTION

This paper investigates the stock market reaction to announcements of corporate takeovers. While there already exists a wealth of event studies investigating abnormal behavior of stock prices mainly of large and established firms involved in corporate mergers and acquisitions around the announcement of the intended takeover as well as over lengthier post-acquisition periods (see e.g. Datta, Pinches, and Narayanan, 1992; Bruner, 2002; Halebian, Devers, McNamara, Carpenter, and Davison, 2009 for surveys), evidence on takeovers targeted at young and innovative firms seems to be scarce. In this paper, we conduct a short-horizon event study focusing specifically on takeovers targeted at newly public German IPO-firms. In addition to this, we differentiate among takeover announcements of targets that are independent of their initial owners with respect to having all critical strategic resources and innovative capabilities accumulated internally and takeovers of targets that at least to some extent depend on their initial owners since these individuals have inalienably accumulated part of the target's indispensable intangible strategic resources and innovative capabilities.

Our results show that the stock market evaluates this type of acquisitions, oftentimes considered as a viable and advantageous substitute to an incumbent's internal development of novel technologies and innovation, overall positively. However, we find evidence that shareholders of bidders targeting firms that depend on their initial owners earn significantly lower and negative abnormal returns as compared to shareholders of firms intending to acquire independent targets. This study thus provides evidence that the market for corporate control indeed serves as a matching device among innovative young firms on the one and established incumbent firms on the other hand and that takeovers in this market for external innovation sourcing are expected to create value overall from efficient use of a takeover target's innovative capabilities and know-how in an incumbent's value creation process. Impediments to successful post-acquisition exploitation of target resources and capabilities arising from its initial owners' holdings in indispensable complementary intangible strategic resources, however, are perceived and efficiently priced by the stock market as well.

While the evidence concerning significantly positive abnormal returns earned by target shareholders found in this study is in line with past research and thus adds additional evidence that takeovers are generally advantageous for target firm shareholders, our results contribute especially to our understanding of factors determining abnormal returns accruing to bidder shareholders. Specifically, we identify a previously largely neglected influence on bidder shareholders' abnormal returns, namely post-acquisition exploitability of acquired resources,

to have an important and significant influence on whether bidder shareholders earn or lose wealth in corporate takeovers. These findings can clarify the inconsistent evidence on abnormal returns earned by bidder shareholders that has been found in previous research.

The paper is structured as follows: The next section develops our theoretic argument and derives our hypotheses. The third section describes our data samples and the event study approach employed in our analyses. The results of these analyses as well as potential drawbacks and corresponding robustness checks are presented and discussed in the forth section, while the final section summarizes our main findings and concludes.

THEORY AND HYPOTHESES

A growing body of literature argues that the market for corporate control serves as a matching mechanism between large and established firms on the one and younger, smaller and entrepreneurial firms on the other hand (Hall 1990; Blonigen and Taylor 2000; Jones, Lanctot, and Teegeen 2001; Grimpe and Hussinger 2008; 2009; Bonardo, Paleari, and Vismara 2010a). Young and entrepreneurial firms' innovation endeavors are assumed to be more likely to create breakthroughs but these firms are not always able to bring their innovations to the market (Wright, Birley, and Mosey 2004). In contrast, established and large firms have sufficient financial resources but often only provide incremental innovations. Since start-up and entrepreneurial innovation is more radical than that of incumbents, Granstrand and Sjölander (1990) suggest a division of scientific labor between entrepreneurial firms and established firms that implicitly defines their roles as targets and acquirers so that takeovers may lead to a win-win situation for both parties (Gans and Stern 2000).

According to this line of reasoning, literature suggest specialization in the market for innovations among young and entrepreneurial firms on the one and established incumbents on the other hand (Steffens, Davidsson, and Fitzsimmons 2009). With respect to opportunity identification and exploration of promising innovations, environmental conditions seem to increasingly favor young and small entrepreneurial firms that are founded based on the belief in a new and widely untested invention or technology (Audretsch and Thurik 2001; Steffens et al. 2009). Specific human capital and technological know-how play key roles in these "New Enterprises" (Rajan and Zingales 2000) as they can allow for competitive advantages, if successfully employed. Due to their organizational specifics, entrepreneurial firms provide both strong incentives to specifically invest in the innovation process and corresponding selection devices (Rajan and Zingales 2001; Fabel 2004) so that younger firms seem to identify opportunities more successfully as compared to incumbents.

However, entrepreneurial firms oftentimes cannot develop competitive advantages in the exploitation of their inventions independently (Ireland, Hitt, and Sirmon 2003; Steffens et al. 2009). This exploitation of a majority of opportunities and corresponding innovations identified by new enterprises requires a tedious period of further research and product development. In this course, many knowledge-based small firms face severe resource gaps, mostly with respect to funding, or simply lack basic business skills. Since competitive advantage not only requires control over strategic resources and capabilities but also the ability to exploit these (Barney 1995), these resource gaps might hinder initial owners from independently exploiting innovative resources and might provide them with incentives to seek alternatives in appropriating the returns on these intangible assets.

Event studies and the market evaluation of IPO-firm takeovers

While, in the line of reasoning so far, acquisitions of innovative and entrepreneurial firms are of great popularity in academic literature, there is only limited evidence available on acquisitions of high-tech start-ups and entrepreneurial firms by larger incumbents and the degree to which these takeovers deliver expected results. This limited evidence, however, suggests that takeovers of young and innovative firms by larger incumbents oftentimes do not deliver in reality what theoretically can be expected, most importantly it seems that acquired key inventors oftentimes deliver poor post-acquisition innovative output (see e.g. Ernst and Vitt 2000; Paruchuri, Nerkar, and Hambrick 2006; Kapoor and Lim 2007).

Given the fact, however, that stock markets can be expected to be at least semi-efficient in that they incorporate available new information into stock prices relative quickly after they have become aware of it¹, the stock market's reaction to announcements of corresponding takeovers of young and entrepreneurial firms can provide information on the market's expectation concerning the value that will be generated from the proposed takeover. Event studies are in this context employed to assess the impact of a specific corporate event on the behavior of stock prices of firms involved in this specific event around the point in time at which the market becomes aware of the event. With respect to takeover announcements, event studies allow for an assessment of the market's evaluation of the impact that a reallocation of ownership in the target from target to bidder shareholders will have on the wealth of both of these groups of shareholders, this is, if the market expects the announced takeover to create or destroy additional values as compared to both entities operating independently. Additionally, as event studies rely on the assumption that capital markets are at least semi-efficient, they assess the significance of the intended takeover as well as the degree to which the market

¹ See for example Oler, Harrison and Allen (2008) for a broader discussion of stock market efficiency.

perceives the event and prices the information conveyed in the underlying announcement (see e.g. Brown and Warner 1980; Armitage 1995; MacKinlay 1997; McWilliams and Siegel 1997; Kothari and Warner 2007, pp. 5-8). Finally, especially for firms with value creation processes largely based on intangible assets, as Bonardo, Paleari, and Vismara (2010b) among others argue, can market-based measures provide a more precise and complete performance estimate than can solely accounting based measures. Despite these obvious advantages past research has, however, not yet broadly employed event studies in assessing the expectable wealth effects of takeovers of young and high-tech firms by larger incumbents but has largely focused on corporate mergers and acquisitions involving large and established firms.

Previous event studies on announcements of corporate takeovers, largely based on large and established firms, have found target shareholders to consistently earn significantly positive abnormal returns – this is, unexpected returns caused by the previously unexpected information on the planned takeover reaching the market (Haleblian, Devers, McNamara, Carpenter, and Davison 2009). In short-horizon event studies, Bradley (1980) for example finds that target shareholders earn 49% abnormal returns as compared to a market portfolio, Bradley, Desai and Kim (1988) find 31% abnormal returns to target shareholders, and Lang, Stulz and Walking (1989) report 40% abnormal returns, while they find shareholders of targets with low managerial performance to benefit more than those of targets with efficient management. More recently, Datta, Pinches and Narayanan (1992) report significant target abnormal returns of 22% in the month of takeover announcement, Houston, James and Ryngaert (2001) report 24.6%, Campa and Hernando (2004) abnormal returns between 3.93% and 8.9%, and Ben-Amar and André (2006) finally find abnormal target shareholder returns between 0.7% and 2.0%. With respect to abnormal returns accruing to bidder shareholder, however, previous research exhibits largely inconsistent findings: While some literature finds acquisitions to not enhance the value of the acquiring firm and correspondingly does not report any significant abnormal returns (see e.g. Asquith 1983; Agrawal, Jaffe, and Gershon 1992; Andrade, Mitchell, and Stafford 2001), other studies show significant losses to acquiring firms' shareholders following acquisition announcements (see e.g. Dodd 1980; Chatterjee 1992; Datta et al. 1992; Moeller, Schlingemann, and Stulz 2003; King, Dalton, Daily, and Covin 2004). Other studies finally show significantly positive abnormal returns of the acquirers in acquisitions (see e.g. Asquith, Bruner, and Mullins 1983; Goergen and Renneboog 2004).

Closest to the research interest followed in this paper, finally, is the study by Kohers and Kohers (2001) investigating acquisitions of high-technology firms. They report an average

significantly positive short-period gain of 0.92% accruing to bidder shareholders at the time of the merger announcement which pertains for both, cash and stock offers. However, for the three year period subsequent to the takeover they report significant losses to bidder shareholders of -17.45%. Quite similar results can be found in Kohers and Kohers (2000) exhibiting positive cumulative abnormal bidder returns of 1.26% in a two day event-window surrounding the announcement of high-tech firm takeovers which leads them to attribute the observed significantly positive bidder shareholder returns to investors' optimistic forecasts on bidders' announcements of takeovers of young and innovative firms.

Expected returns to IPO-firm shareholders

Acquirers usually pay premiums on a target's stand-alone value (Haleblian et al. 2009) that result from higher returns extractable by the acquirer from a combination of the target's and their existing resources and capabilities as compared to the values that could be extracted from the target as an independent entity. For initial owners, takeovers of newly public IPO-firms therefore can be an attractive means of divesting their stakes in the target firm. Accordingly, literature suggests the supply of acquisition targets to largely depend on initial owners exit decisions. DeTienne and Cardon (2010) find that acquisitions of their firms are one of the preferred exit modes initial owners choose from the wealth of harvesting options.

According to the above proposed specialization among young and entrepreneurial firms on the one and established incumbents on the other hand, many high-tech start-ups are taken over by larger firms early in their firm life cycles because these larger firms own the necessary resources and have a comparative advantage in bringing entrepreneurial firms' innovations to the market (Dai 2005; Audretsch and Lehmann 2007). Start-ups and entrepreneurial firms, conversely, often lack the resource bases of established firms to commercialize their ideas and innovations. Then, it may be favorable for the firm's current shareholders to have their firm being taken over by an established firm (Gans and Stern 2000) as they are not likely to survive on their own due to an inability to access required resources. Additionally, if there are advantages to be gained from exploiting economies of scale or scope or access to complementary resources indispensable in developing a marketable product based on the target's innovation, incumbent firms typically enjoy competitive advantages over smaller start-ups (Audretsch 2001) so that their willingness-to-pay for the target might exceed the value that can be extracted by initial owners from running the firm independently. The market for corporate control accordingly can be expected to increase the value that can be created from a newly-public IPO-firm's resources and capabilities by reallocating ownership in the takeover target to the incumbent (Bonardo et al. 2010a).

Finally, having taken the firm public by means of an IPO may signal initial owners willingness to exit their ventures. Especially for targets with significant holdings in intangible and difficult-to-value resources, the IPO market and the market for corporate control might be interrelated in that the IPO market alleviates inefficiencies in the M&A market if information asymmetries concerning the privately held target's intangible resources are prohibitively high (Ang and Kohers 2001; Shen and Reuer 2005; Bonardo et al. 2010a). Bonardo, Paleari, and Vismara (2010c) argue that investors generally have concerns about IPO-firm's legitimacy, especially if these possess few tangible assets only and do not command extensive track records, which can be alleviated by "uncertainty-reducing signals", whereupon the authors consider those start-ups that finally can conduct an IPO the successful among all new ventures. IPOs accordingly can be part of a larger process of transferring control rights from initial owners of a privately held firm to another firm (Audretsch and Lehmann 2007). Taking the firm public prior to its eventual sale therefore can significantly increase returns to its initial owners by reducing information asymmetries and with that reducing corresponding bid price discounts. Accordingly, an acquirer's intention to acquire a newly public IPO-firm should signal their expectation of generating additional value from combining the target with their existing resources and capabilities and leads the market to expect, besides acquisition premiums for current target shareholders, increases in post-acquisition target value from efficient use of its resources and capabilities arising from the target's takeover.

Hypothesis 1: The stock market evaluates takeover announcements of IPO-firms positively, so that target shareholders on average earn positive cumulative abnormal returns.

Expected returns to bidder shareholders

For the last couple of years many of the world's economies have been facing radical changes in their market places. Technological but also political and cultural changes have led to an increase in entrepreneurial activities in technology and knowledge intensive sectors all over the world (Audretsch and Thurik 2001). Mainly the same forces have led to an increase in international activities of firms which gives pressure to firms even if they act on national markets only. In this context, a particular firm's success increasingly depends on its capability of innovating faster than its best competitors (Teng 2007). One crucial facet of this capability is the development of novel technologies, products, and services. While incumbents in general can choose among several options of innovating (Teng 2007) in this process of continuous identification and exploitation of profitable opportunities and, simultaneously, maintaining and enhancing the firm's competitive advantage over rivals (Phan, Wright, Ucbasaran, and

Tan 2009), takeovers of small and innovative firms seem oftentimes to be advantageous. Especially industries with short innovation cycles and technologically complex products could make it infeasible for firms to internally develop all new technologies they need for innovation at sufficient pace (Ranft and Lord 2002). Thus, established incumbents largely depend on novel technologies possessed by high-tech start-ups, given the increasing pressure of timing innovations in many industries (Desyllas and Hughes 2008). Additionally, given the high failure rates common in developments especially of radical innovation and with that the high expected cost of innovating internally, for the bidder accessing the resources and capabilities accumulated by smaller, young, and innovative firms that already have identified promising innovations can be a cost efficient means of innovation.

Mergers and acquisitions accordingly can be viable vehicles in pursuing a resource-based strategy as they allow for access to strategic and possibly otherwise not marketable resources that enable acquirers to create a sustainable competitive advantage (Wernerfelt 1984; Barney 1991). With respect to the proposed specialization among technology-based start-ups and technology-seeking incumbent firms in the market for innovation, incumbent firms are said to enjoy competitive advantages in the commercial exploitation of innovations, while start-up firms enjoy advantages in their exploration (Granstrand and Sjölander 1990; Gick 2008; Steffens et al. 2009). For incumbent firms, takeovers of start-up and entrepreneurial firms allow for acquiring innovations, such as new and sophisticated variations of products or services already offered by incumbents (Fabel 2004), that already have proven their viability and subsequently can be brought to the market by exploiting incumbents' advantages such as broader resource bases, sufficient funding, and economies of scale and scope in production and other value chain activities. As a consequence of this rationale, the acquisition of technologies, competencies, and knowledge from external sources has become one of the major motives for corporate mergers and acquisitions in recent years (Dushnitsky and Lenox 2005; Desyllas and Hughes 2009). Given entrepreneurial start-ups' relative advantages in exploration of promising innovations and capabilities and incumbents relative advantages in their exploitation, the combination of corresponding resources and capabilities accumulated within entrepreneurial start-ups with those of an incumbent firm by means of mergers and acquisitions can be an efficient way for incumbents to innovate.

Stock markets will perceive these advantages associated with accessing external technology and innovation sources by means of takeovers of newly-public IPO-firms and will expect additional values to be generated for the acquiring firm resulting from the target's integration.

Hypothesis 2a: The stock market evaluates takeover announcements of IPO-firms positively, so that bidder shareholders on average earn positive cumulative abnormal returns.

As we have argued, the limited evidence available on acquisitions of high-tech start-ups and entrepreneurial firms by larger incumbents suggests that these takeovers oftentimes do not deliver expected results (see e.g. Ernst and Vitt 2000; Paruchuri et al. 2006; Kapoor and Lim 2007). Previous research at large has attributed these findings to incumbents' post-merger integration decisions (see e.g. Kapoor and Lim 2007; Puranam and Srikanth 2007; Colombo, Mustar, and Wright 2010). Alternative explanations could be derived from Bonardo et al. (2010b; 2010c): They find post-IPO underperformance to be especially pronounced in university-based IPO-firms and attribute this finding to key individuals motives in that academics might not be primarily interested in economically exploiting their discoveries.

Our reasoning, however, is based on individuals anticipating issues in ex post appropriating a commensurate return to their firm specific investment after the IPO-firm's takeover which decreases their corresponding incentives ex ante: As put forth by Ireland, Hitt, and Sirmon (2003), a firm's ability to derive competitive advantage from ownership of strategic resources critically depends on its ability to control those resources and capabilities that are indispensable for value creation. Arthurs, Busenitz, Hoskisson and Johnson (2009) argue that for a young and knowledge-based firm's development its founders are both important as well as endangering since these ventures closely develop around their skills and specific knowledge and require their continued availability. Accordingly, successful exploitation of an entrepreneurial firm's resources generally seems to pose exceptional difficulties with respect to its ability to ensure optimal specific investments by parties in possession of indispensable intangible assets so that a knowledge-intense firm's success hinges on its ability to provide efficient incentives which induce individuals to make relationship-specific investments. However, optimal investments in human capital and capabilities are non-contractible and an outside party cannot verify the extent of investments (Soubeyran and Stahn 2007). Given this incomplete contracting on investments in specific human capital and the quasi sunk-cost character of their investments, individuals face potential hold-up problems after having specified their human capital to a firm's value creation process (Rajan and Zingales 2000) which especially pertains to bargaining on ex ante non-contractible returns resulting from their specific human capital investments. As argued by the property rights theory and the model of vertical integration developed by Grossman and Hart (1986) and Hart and Moore (1990) and extended by Brynjolfsson (1994), equity ownership can equip key individuals with both the right to decide on the use of assets in all instances not governed by contracts and the

power to contradict unfavorable distributions of residual income by threatening to withdraw the assets they own in any ex ante not contractually specified situation. Residual rights of control derived from equity ownership thus can provide essential incentives for optimal specific investment (Rajan and Zingales 2001; Lehmann 2006).

However, a target's initial owners sell their equity ownership in the course of a takeover of their firm which leaves them without bargaining power in any not contractually specified situations after their firm's acquisition. If the initial owner has at least a fraction of the target's indispensable innovative knowledge and human capital complementary to the target's alienable assets inalienably accumulated, they can be held-up by the acquirer in bargaining for a fraction of the integrated firm's surplus. This hold-up risk will be increasingly severe the more initial owners invest in firm-specific human capital and capabilities, since they cannot derive any value from these without access to the complementary assets owned by the acquirer. Since initial owners can anticipate this potential hold-up, their incentives for continued post-acquisition specific human capital investments necessarily decrease. Given this specific investment being indispensable for the value creation process, however, these reduced incentives will be inefficient in maximizing total production value, since the joint value of the production relationship is positively related to the specific investments of all relevant individuals. In conclusion, the reallocation of ownership in a firm's assets in the course of a takeover then inevitably lowers the value extractable from the target's assets.

Similar impacts on the value extractable from the takeover target's resources follow from the line of reasoning brought forth in Rajan and Zingales (1998): If initial owners have relevant and indispensable knowledge then there may be no need for these individuals to have equity ownership to have bargaining power. As long as their knowledge and human capital cannot be transferred to other parties within the firm but is indispensable for value creation and use of complementary assets they can exert power by the mere threat of withdrawal of or exclusion of others from their knowledge. Accordingly, if initial owners' specific human capital is required after a takeover of their firm, they can exert power over the acquirer by threatening to withhold their human capital and can, by doing so, divert surplus from bidder's shareholders to themselves. This would, similar to underinvestment by initial owners, decrease the value that the bidder can finally extract from the target, or in other words, it would decrease the share of revenues from the target's resources the bidder can appropriate.

We expect the stock market to perceive these potential issues in generating additional value from the target's resources that arise from inefficient underinvestment by targets' initial

owners as well as from former target owners' potential to divert part of generated values away from bidder shareholders so that we can derive our final hypothesis as follows:

Hypothesis 2b: The stock market perceives and negatively evaluates potential impediments to successful exploitation of a takeover target's resources and capabilities. Shareholders of bidders targeting IPO-firms with intangible strategic resources inalienably bound to their initial owners correspondingly earn lower cumulative abnormal returns as compared to shareholders of bidders targeting IPO-firms that are independent of their initial owners.

METHODOLOGY

To test our hypotheses, we assess the stock market reaction to public takeover announcements targeted at German IPO-firms by employing the standard event study methodology.

Data sample

Our data sample compiles corporate takeovers targeting German IPO-firms that had been floated in the ten-year period from 1997 to 2006. 83 of the total of 411 non-financial initial public offerings by German issuers in segments of the German Stock Exchange (Deutsche Boerse AG) received publicly announced takeover bids between their dates of IPO and December 31, 2007. IPO-firms were identified from Deutsche Boerse AG's official primary market statistics, takeover announcements from several publicly available sources, most importantly the German Federal Financial Supervisory Authority (BaFin). Historic stock price information for bidders and targets was obtained from Thomson Reuters Datastream and in a limited number of cases supplemented with information from Ariva.de, an independent German supplier of financial information. Due to limitations in the availability of historic stock prices, our final samples contain information on 59 of this total of 83 takeover targets as well as on 42 bidders. The majority of cases where we could not obtain bidder stock price information entails takeovers of IPO-firms by privately held bidders where there naturally is no corresponding stock price. Missing target stock price information is mainly caused by deletion of historic daily stock prices from our data sources due to a delisting of the corresponding target subsequent to its successful takeover and applies foremost to the earliest takeovers in our initial sample. While these issues in data availability generally could bias our results, however, we do not have any reason to expect our final data sample to comprise an adverse selection of all IPO-firm takeovers.

We additionally divide these full samples of 59 targets and 42 bidders into two groups each. The first groups ("*entrepreneurial firms*") are comprised of bidders and targets, respectively,

involved in transactions targeting IPO-firms that have inalienably bound intangible strategic resources to their initial owners, while the other groups (“*independent firms*”) contain those transactions targeting firms that have directly accumulated all these intangible strategic assets. We proxy an initial owners’ holdings in inalienable and intangible strategic resources by them being (partial) owners of patents so that a takeover transaction was classified as involving an entrepreneurial firm if the target’s initial owners are mentioned as applicants for at least one patent, either alone or together with the target as a legal entity. Information concerning an individual’s patent ownership was manually extracted from the patent database of the German Patent and Trademark Office (www.depatist.net) by searching for individuals’ names as patent applicants. Patents retrieved from this database are not limited to those registered at the German Patent and Trademark Office or valid in Germany only but also include patents with a broader scope of protection and those registered at several foreign patent offices. Previous research has identified patents as a suitable surrogate for intangible strategic resources critical to a firm’s performance and innovative output. Most importantly, they reflect “*underlying organizational processes related to knowledge creation, scientific capability, inventive capacity, and R&D management prowess*” (Markman, Espina, and Phan 2004, p. 535) that result from an organization’s previous innovative endeavors. As such, these intangible resources and capabilities underlying an IPO-firm’s patent portfolio do not only determine a takeover target’s current competitive position but are also related to future innovation and its successful commercialization in that they strengthen and foster innovative capabilities and know-how indispensable for sustaining competitive advantage (see e.g. Markman et al. 2004). These capabilities and related firm-specific human capital, however, can hardly be codified so that they are highly tacit and inalienably bound to the individuals who developed them. Accordingly, patents registered by a takeover target’s initial owners are a suitable measure to approximate their inalienable holdings in capabilities, know-how, and similar intangible resources indispensable for deriving and sustaining competitive advantage from a takeover target’s resources and capabilities.

Table 1 below gives an overview of all takeover announcements considered in our full data samples as well as in the entrepreneurial and independent firms groups by year of IPO and of their coverage relative to all 83 takeovers in the respective time period.

-- Insert Table 1 about here --

Table 2 below gives an overview of all takeover announcements considered in our full data samples as well as in the entrepreneurial and independent firms groups by target industries and of their coverage relative to all 83 takeovers in the respective time period.

-- Insert Table 2 about here --

As table 1 depicts, the relative coverage of all takeovers targeting German IPO-firms in our samples in general increases the closer the respective IPOs are to the end of our observation period on December 31, 2007. Table 2 shows that the relative coverage of all corporate takeovers overall is higher for IPOs in technology and human capital intense industries than it is for those in traditional industries such as consumer goods. Announcements of takeovers of firms in technology-based industries and announcements from more recent takeover years might therefore be slightly overrepresented in our final samples.

Computation of average and cumulative average residuals

An event study is based on analyzing abnormal returns to a firm's shareholders, this is, returns that are unexpected as the underlying event is unexpected and accordingly has not yet been priced by the market. Our analyses employ the standard event study methodology (see e.g. Brown and Warner 1985; Armitage 1995; MacKinlay 1997; McWilliams and Siegel 1997) and use the market model² to estimate the returns that could have been expected without the respective takeover announcement. This accordingly leads us to derive each individual bidder's and target's abnormal announcement return AR_{it} at day τ in event time relative to the takeover announcement day, which is labeled $\tau = 0$, according to

$$AR_{it} = R_{it} - E(R_{it}) \quad (1)$$

where the expected return to firm i 's stock follows from

$$E(R_{it}) = \alpha_i + \beta_i R_{mt} \quad (2)$$

and where R_{it} is the realized return on firm i 's stock and R_{mt} is the return investors would have earned on a market portfolio. Each return is computed as the percentage change in stock and market portfolio prices, respectively, from day $\tau - 1$ to day τ . We employ the CDAX as the value-weighted market index of all stocks traded in regulated market segments of the German Stock Exchange to approximate daily returns on a market portfolio.

In a next step we need to define one or several event windows (i.e. periods of time around the day at which the intended takeover is publicly announced) during which we expect the market to take note of and accordingly evaluate the proposed acquisition, this is, the period during which we expect to observe abnormal returns. While, from a theoretic point of view, it is hard to justify any specifically chosen event window, research employing short-horizon event

² We additionally checked for robustness of our results with abnormal returns derived from the market adjusted model. See our discussion of drawbacks and robustness checks below for details.

studies typically considers several event windows of different length. Most importantly, the market oftentimes can be expected to become at least partially aware of an event some time before the actual event day since for example rumors are spread. If the market can at least partly anticipate the event, part of abnormal stock price behavior will take place before the event day. Similarly, depending on event characteristics and market efficiency, incorporation of relevant information into stock prices can last for some time. Too lengthy event windows, however, entail the danger that other events than the investigated takeover announcement could bias abnormal returns attributed to this specific event by causing abnormal stock price behavior themselves (see e.g. Kothari and Warner 2007, p. 10; Betton, Eckbo, and Thorburn 2008, p. 338 ff.; Oler et al. 2008). Accordingly, we chose three different event windows $[t_1, t_2]$: the lengthiest one investigates abnormal returns across a symmetric 21-days window around the takeover announcement day $\tau = 0$, this is, the period $[-10, +10]$. Two asymmetric 6-day event windows finally investigate cumulative average residuals earned by target and bidder shareholders due to rumors preceding eventual public takeover announcements or other reasons for anticipation. They were chosen to cover the event windows $[-10, -5]$ and $[-5, 0]$.

We now can derive individual firm i 's abnormal returns AR_{it} for each of the event window days by estimating its intercept and slope, α_i and β_i , by regressing historic pre-event window (this is, estimation window) returns on its stock against corresponding market portfolio returns and subsequently computing expected returns for the event window days according to equation (2). While estimation periods of at least 100 trading days of length seem appropriate to derive accurate estimations of α_i and β_i from the market model (Armitage 1995), we employed estimation periods of the 250 trading days³ preceding each of our event windows. Finally, abnormal returns are obtained by subtracting these expected from actually observed returns, as expressed by equation (1) above. Subsequently, these abnormal returns AR_{it} are aggregated cross-sectionally to bidder average residuals and target average residuals across all N bidders and targets, respectively, according to

$$AR_{\tau} = \frac{1}{N} \sum_{i=1}^N AR_{it} \quad (3)$$

Time-series aggregation of bidder average residuals and target average residuals according to

$$CAR_{(\tau_1, \tau_2)} = \sum_{\tau=\tau_1}^{\tau_2} AR_{\tau} \quad (4)$$

³ With the exception of one target firm which was publicly quoted for 160 trading days only prior to the announcement of its takeover.

finally yields the corresponding cumulative average residuals for the portfolios of firms under consideration for each time period $[t_1, t_2]$.

RESULTS AND DISCUSSION

Figure 1 below plots cumulative average residuals for our portfolios of bidder and target firms for our lengthiest (21-days) event window against event window days⁴. As such, it exhibits the development of cumulative abnormal returns earned by investors in our bidder and target firms portfolios, respectively, relative to those earned by investors in the market portfolio.

-- Insert Figure 1 about here --

Figure 1 suggests several preliminary conclusions. Firstly, the market seems to anticipate takeover announcements at least for takeover targets since the corresponding cumulative average residuals begin to notably increase well before the actual announcement day, which is event day 0. Our plot of cumulative average residuals suggests a notable increase in abnormal returns earned by investors in the targets portfolio around day -4 relative to the day of the public announcement of the targets' takeovers. Secondly, the information that the rumored event in fact takes place seems to already get to the market one day before the public takeover announcement, which leads to a clearly visible drop in bidders' and to a pronounced increase in targets' cumulative average residuals. We could fix the announcement dates with certainty, the actual event date in its sense with respect to an event study, however, seems to be fixed incorrectly. Thirdly, already about two days after the takeover announcement cumulative average residuals seem to begin a steady decline. These observations point to a considerably fast incorporation of information conveyed with a public takeover announcement into bidders' and targets' stock prices and thus suggest an efficient working of the stock market.

Cross-sectional distribution of cumulative abnormal returns

In a next step, we assess the cross-sectional distribution of the cumulative average residuals aggregated across our event windows for both the full samples of bidders / targets and for bidders / targets divided according to their involvement in takeovers of entrepreneurial and independent targets, respectively. We test our hypotheses by testing whether mean cumulative abnormal returns are significantly different from zero and exhibit the hypothesized signs.

-- Insert Table 3 about here --

⁴ Table A-1, which has been relegated to the appendix, exhibits average as well as cumulative average residuals for the full samples of bidders and targets across all the individual days of our event windows.

Table 3 above presents our results for the bidders and targets full samples as well as divided into the two groups covering takeovers targeted at entrepreneurial and at independent firms respectively. In testing whether observed cumulative average residuals are significantly different from zero we employ standard or classic t-tests⁵. While classic t-tests might be biased if individual stock's event period returns are not independent due to event-time clustering, employing one of the specific t-tests suggested in literature might understate event-period returns in cases of above-average stock price variability around the event (Kothari and Warner 2007, pp. 11, 12). Comparisons among the two groups of takeover targets were obtained from two-tailed tests of mean comparisons, with adjustments for differences in individual firm cumulative abnormal returns' variances among both, if applicable.

Hypothesis 1, which postulates positive abnormal returns to target shareholders, can be confirmed for two of our three event-windows. The market seems, as is already suggested by figure 1, to notice the takeover attempt some days before its public announcement so that target shareholders earn significantly positive abnormal returns during the 6-days pre-event window ranging from event day -5 to the takeover announcement day and during our lengthiest 21-days event-window ranging from day -10 to day +10. We do not observe any significant abnormal returns during the earliest of our pre-event windows, however. During the [-5, 0] event window, investors in the full sample of takeover targets earned an abnormal 16.232% return relative to the market portfolio, during the lengthiest window they earned significantly abnormal 14.465%. While investors in the entrepreneurial target portfolio seem to earn slightly higher abnormal returns as those in the independent target portfolio, these differences are not statistically significant to any reliable level of confidence.

Also our results concerning abnormal returns accruing to bidder shareholder suggest that the stock market gets aware of the takeover several days prior to its public announcement. Hypothesis 2, which states that shareholders of bidders targeting newly public IPO-firms should earn positive abnormal returns in the time period around the takeover announcement, can also at least partly be confirmed. During the 6-days event window from event day -5 until the announcement day, investors in the full portfolio of bidders earn statistically significant positive returns, namely 2.653% as compared to the overall market portfolio. During the earlier pre-event window and across our lengthiest event-window which also covers post-announcement days, however, we find positive but not statistically non-zero abnormal returns. These results overall are in line with those found in Kohers and Kohers (2000; 2001).

⁵ We additionally checked for robustness of our results with the specific t-test proposed in MacKinlay (1997). See our discussion of drawbacks and robustness checks below for details.

Finally, our results derived from dividing the full sample of bidders into the two groups of those bidding for entrepreneurial and those bidding for independent targets, respectively, allows us to test hypothesis 3. While we do not find any statistically significant abnormal returns for investors in the entrepreneurial target acquirers group across the lengthiest 21-days and the 6-days event-window from days -5 to 0, these investors earn significantly negative - 5.43% abnormal returns as compared to the market portfolio across the [-10, -5] event-window. Especially, however, we can partly confirm hypothesis 3: across the earliest 6-days event-window and across the lengthiest event-window, investors in the entrepreneurial target acquirers portfolio earn significantly lower abnormal returns than investors in the independent target acquirers portfolio. The latter group of investors consistently earns significantly positive abnormal returns as compared to the market portfolio, namely 2.154% across the earlier and 3.324% across the later 6-days event window (although not significantly different from those earned on the entrepreneurial target acquirers portfolio), and finally an abnormal return of 4.952% across the lengthiest event-window considering a symmetric 21-days period around takeover announcements.

Considered together, our results thus strongly support our theoretic reasoning: The stock market indeed perceives and positively evaluates the benefits theory proposes for takeovers of small innovative by larger incumbent firms and thus expects additional values to be created from incumbents exploiting entrepreneurial innovations. This positive perception pertains to both target and bidder shareholders and, with respect to the latter, is in line with previous event studies on high-tech firm takeovers (Kohers and Kohers 2000; 2001). However, our results also point to a potential explanation for previously inconsistent findings on abnormal returns earned by bidder shareholders since, although in our full sample we find overall slightly positive abnormal returns, shareholders of bidders targeting firms that depend on their initial owners significantly lose wealth. Shareholders of bidders targeting firms whose resources and capabilities can readily and without exploitation impediments be exploited by incumbents, on the other hand, earn significantly positive abnormal returns even surpassing those found in Kohers and Kohers (2000; 2001). We accordingly could identify impediments in successful post-acquisition exploitation of acquired resources that result from successful exploitation depending on targets' initial owners' inalienable holdings in complementary and indispensable intangible strategic resources to have an important and reverse effect on abnormal announcement period returns earned by bidder shareholders. To sum up, the market not only seems to perceive and positively evaluate the value creation potential of takeovers of small innovative firms but also their initial owners' decisive role in actually deriving value

from the target's resources and capabilities and their potential to divert part of generated values away from bidder shareholders.

Drawbacks and robustness checks

As for all studies some drawbacks apply to our study. These need to be discussed subsequently along with our robustness checks.

Most importantly, the data samples employed in our study are quite limited in size. However, due to the type of event we are interested in, namely acquisitions of newly public IPO-firms, our options in gathering a larger number of observations were naturally quite limited. While our sample sizes, however, are not uncommon for event studies, especially for those investigating relatively rare events, as for example the studies summarized in McWilliams and Siegel (1997) reveal, small observation numbers might negatively impact the reliability of event study test methods. Especially the power of tests employed in event studies⁶, this is, tests' abilities to detect significantly abnormal performance if it is present, is highly sensitive to sample sizes while test specification is generally not a major concern in studies of short event-windows (Kothari and Warner 2007, pp. 12-18). To check our results for robustness with respect to identified significantly non-zero cumulative average residuals, we conducted specific t-tests as proposed in MacKinlay (1997) for the large samples of bidders and targets in addition to the classic t-tests employed so far. Consistent with previous research we do not find any major qualitative differences as compared to our results derived from classic t-tests⁷.

A closely related issue in determining significantly non-zero abnormal returns results from the "joint-test problem" since reliable results from tests of significantly non-zero abnormal returns do not only depend on well-specified and powerful tests but also on the correctness of the assumptions made concerning the process generating expected returns. Event study tests accordingly do not only test for non-zero abnormal performance but also for the correctness of the employed expected returns model. Event studies have been found to deliver qualitatively similar results largely independent of the estimation model employed in determining expected returns (see e.g. Brown and Warner 1980; 1985), and the market model employed in our study seems to be one of the prevailingly used models (Armitage 1995). Nonetheless, as a robustness check of our results we additionally derived expected returns for

⁶ For a detailed discussion as well as comparative studies of several of these tests, thorough discussion of potential issues in test reliabilities and powers, and influences of sample sizes and volatilities of sampled securities, see e.g. Patell (1976), Brown and Warner (1980; 1985), Armitage (1995), MacKinlay (1997), McWilliams and Siegel (1997), and Kothari and Warner (2007, pp. 12-19).

⁷ Corresponding results are not reported in detail in this paper, but are available on request.

the large samples of bidders and acquirers from the market adjusted model⁸. As compared to our results reported in this study and consistent with past research we did not find any major qualitative differences in results, neither when testing with the classic nor when testing with the specific t-tests.

Finally, given the selection of our final set of observation our issues experienced in data collection could potentially bias our results. However, we do not have any reason to expect our selection of investigated takeover announcements to be a somewhat adverse selection of all 83 takeovers that were announced during our investigation period, this is, we do assume our samples to contain the least promising or least valuable takeover targets or acquirers of the overall population. As tables 1 and 2 above suggest, takeover announcements of targets in technology-based industries and announcements from more recent takeover years might be slightly overrepresented in our final samples. However, especially with respect to our research interest we do not expect these potential issues to severely bias our results.

Suggestions for future research

As argued above, a common but nonetheless important potential drawback to our study is the limited data sample sizes we could employ in this study due to the relatively rare event of interest. Future research might want to consider our research question in the context of larger-scaled event studies which could improve overall quality and reliability of event study tests.

Furthermore, bidders and targets involved in takeover announcements arguably are much more heterogeneous than can be covered by discriminating among only a limited set of distinct groups as we did in differentiating takeovers of entrepreneurial from those of independent firms. Past research has identified several firm characteristics to have important influences on abnormal returns earned by bidder and target shareholders, such as for example past stock market valuation as evident by book-to-market ratios (Fama and French 1993; Rau and Vermaelen 1998), the decision between tender offers and mergers (Jensen and Ruback 1983), or the relative sizes of bidders and targets (Agrawal et al. 1992). The outcomes of takeovers of young and IPO-firms with significant dependence on intangible strategic assets also might be influenced by the degree of decision autonomy granted to acquired key inventors after an acquisition of their firm (Colombo et al. 2010) or by the respective IPO-firm's and its key inventor's origins such as university affiliations (Bonardo et al. 2010b; 2010c), all of which can be expected to influence takeover announcement abnormal returns.

⁸ The market-adjusted model assumes an individual firm's stock on average to earn the return on the market portfolio for any given point in time. See for example Brown and Warner (1980; 1985) for details. Our results again are not reported in detail in this paper but are available on request.

Similarly, the strategic intent of an acquirer finally determines the relevant performance threshold as well as the degree to which target resources are to be combined with those of the bidder. Accordingly, one might expect issues in bidder-internal exploitation of acquired resources to be more important for strategic than for financial (i.e. portfolio) investments. Future research might wish to consider these potential influences of firm characteristics on abnormal returns to individual firms in the context of cross-sectional tests.

Finally, employing regression analyses to determine potential influences of several firm characteristics on abnormal returns to individual firms would then allow to also improve on our approximation of relevance and importance of intangible strategic resources allocated to IPO-firms' initial owners by not only considering patent ownership but also patent counts and ratios as well as a measure of (economic) value such as a respective patents cross-citations with patents directly owned by the respective firm. This suggestion taken a step further, inclusion of patent citation patterns and especially cross-citations among bidder, target, and target initial owner patents would allow for better assessing complementarities among and relatedness of these intangible resources as well as of whether the new list's takeover is only one step in a longer process of integrating target and bidder resources (see e.g. Mowery, Oxley, and Silverman 1996; Ahuja and Katila 2001; Schildt, Maula, and Keil 2005).

CONCLUSION

While the majority of previous research consistently finds target firm shareholders to earn significantly positive abnormal returns upon announcements of takeovers of their firms, previous evidence on abnormal returns earned by bidder shareholders has largely been inconsistent. Unlike most previous research, our event study exclusively focuses on public announcements of takeovers targeted at newly public IPO-firms. We focus on the specific trade-offs that incumbent firms face in taking over young and innovative IPO-firms with respect to potential issues in successfully exploiting acquired resources and capabilities. By discriminating among founder-dependent and independent targets, this study probably is the first to account for the relevance of firm-specific human capital and innovative capabilities inalienably bound to a takeover target's initial owners which might impede the post-acquisition exploitability of acquired resources and capabilities.

Our results show that the market positively evaluates public announcements targeted at newly public IPO-firms for both bidders and targets which is consistent with the importance and viability attributed to externally sourcing required new knowledge and technologies by means of young firm takeovers by incumbents. Literature proposes the advantages of this distinct

type to result from specialization among these types of firms in the market for innovations with the market for corporate control serving as the matching mechanism (Wernerfelt 1984; Granstrand and Sjölander 1990; Barney 2000; Teng 2007; Desyllas and Hughes 2008; 2009; Bonardo et al. 2010a; Colombo et al. 2010). While the significantly positive abnormal returns we find target shareholders to earn on announcements of takeovers of their firms are consistent with the vast majority of past research, research so far has found evidence on abnormal returns earned by bidder shareholders to be rather inconsistent. Our results make a contribution to this body of literature in that they clearly show that bidder shareholders earn significantly positive abnormal returns upon announcements of takeovers targeted at IPO-firms whose resources and capabilities can readily be employed in the acquirers' value creation processes. Conversely, takeover announcements that involve targets with at least a fraction of indispensable intangible strategic resources inalienably bound to initial owners lead bidder shareholders to earn significantly lower and obviously negative abnormal returns. Thus, we find evidence that the stock market negatively perceives and efficiently prices impediments to successful exploitation of an acquired target firm's resources and capabilities as it positively and efficiently evaluates the advantages associated with takeovers of innovative IPO-firms by larger and established incumbents.

We explained the negative stock market perception of takeovers targeting firms depending on continued access to their initial owners' specific human capital and innovative capabilities with issues that arise from this dependence in post-acquisition exploitation of acquired resources and capabilities. As argued by the property rights theory of the firm (Grossman and Hart 1986; Hart and Moore 1990; Brynjolfsson 1994), if contracts are considerably incomplete, ownership of physical assets complementary to intangible assets such as specific human capital should be allocated to those individuals that need to specifically invest in their human capital. Otherwise, potentially being held up in the division of unforeseen or unforeseeable surplus due to the quasi sunk-cost character of their human capital investment would lead these individuals to suboptimal specific investment. Since initial owners sell their shareholdings in the firm to the acquirer in the course of its acquisition, the firm's acquirer necessarily must anticipate this underinvestment by initial owners which lowers the value that can be generated from the target's resources and capabilities. From a similar point of reasoning, negative impacts on the value that an incumbent can extract from acquired strategic resources after settlement of the takeover follow from Rajan and Zingales (1998): if the strategic assets acquired by an incumbent firm in the course of an IPO-firm's takeover are sufficiently complementary to the specific human capital of the latter's initial owners, these

individuals will have bargaining power arising from their holdings in relevant knowledge that allows them to extract a significant share of residual income from the firm's new owners.

To the extent that bidder managers are concerned with and respond to developments of their firms' stock prices, our results might advise bidder managers to postpone a potential takeover target's acquisition and to choose different organizational arrangements in accessing its intangible strategic resources if an important fraction of these is inalienably bound to the target's initial owners. Additionally, potential issues in exploiting a target's resources and capabilities might demand for being proactively addressed and communicated. Major shareholders of entrepreneurial firms such as founder managers and venture capitalists that plan to divest their stakes in the ventures in turn can be advised to credibly make their ventures independent of founder-specific intangible assets as early as possible in the firm life cycle. Especially if bidder managers can anticipate negative impacts on their firms' stock market valuations arising from takeover attempts targeted at IPO-firms that critically depend on their initial owners, these initial owners might be able to substantially increase a new list's prospects of being taken over by choosing to accumulate innovative capabilities and relevant know-how within the firm instead of allocating these intangible assets to initial owners.

Figure 1: Cumulative average residuals for 21 days event window

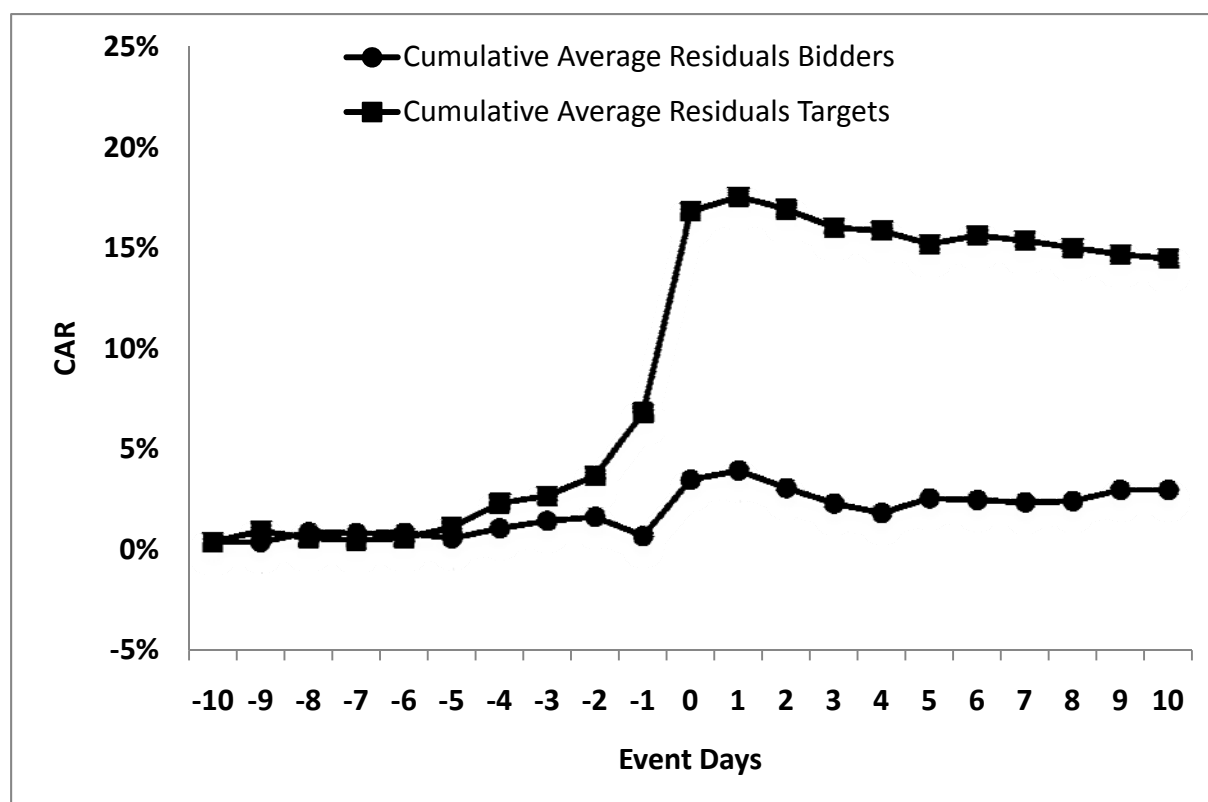


Table 1: Takeover announcements and relative coverage by years of takeovers

Takeover years	Takeovers		Targets						Bidders					
	Totals	Full Sample	Entr. T.		Ind. T.		Full Sample		Entr. T.		Ind. T.		Ind. T.	
1999	1	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0%
2000	5	3	60%	1	20%	2	40%	2	40%	0	0%	2	40%	40%
2001	7	1	14%	0	0%	1	14%	3	43%	0	0%	3	43%	43%
2002	10	3	30%	1	10%	2	20%	4	40%	2	20%	2	20%	20%
2003	15	11	73%	1	7%	10	67%	6	40%	1	7%	5	33%	33%
2004	12	10	83%	3	25%	7	58%	5	42%	1	8%	4	33%	33%
2005	10	9	90%	3	30%	6	60%	6	60%	2	20%	4	40%	40%
2006	10	9	90%	1	10%	8	80%	7	70%	1	10%	6	60%	60%
2007	13	13	100%	2	15%	11	85%	9	69%	2	15%	7	54%	54%
Total	83	59	71%	12	14%	47	57%	42	51%	9	11%	33	40%	40%

Table 2: Takeover announcements and relative coverage by years of takeover

Target industries	Takeovers Totals	Targets						Bidders					
		Full Sample		Entr. T.		Ind. T.		Full Sample		Entr. T.		Ind. T.	
Medtech	1	1	100%	0	0%	1	100%	1	100%	0	0%	1	100%
Biotech	3	3	100%	3	100%	0	0%	3	100%	3	100%	0	0%
IT & TC Hardware	4	3	75%	0	0%	3	75%	3	75%	1	25%	2	50%
Consumer Goods	4	1	25%	0	0%	1	25%	2	50%	0	0%	2	50%
Other Technologies	5	2	40%	1	20%	1	20%	2	40%	1	20%	1	20%
Trad. Industries	6	4	67%	0	0%	4	67%	2	33%	0	0%	2	33%
E-Commerce	7	6	86%	1	14%	5	71%	6	86%	1	14%	5	71%
Trad. Services	8	6	75%	1	13%	5	63%	5	63%	0	0%	5	63%
Media & Entertainment	11	8	73%	1	9%	7	64%	2	18%	0	0%	2	18%
IT & TC Service	34	25	74%	5	15%	20	59%	16	47%	3	9%	13	38%
Total	83	59	71%	12	14%	47	57%	42	51%	9	11%	33	40%

Table 3: Cumulative average residuals for bidders and targets

	Window	Subsamples				T-Value	Full Sample	
		Entrepreneurial Targets	Obs.	Independent Targets	Obs.		All Targets	Obs.
Targets								
	[-10, -5]	-0.324%	12	+1.436%	47	+0.715	+1.078%	59
	[-5, 0]	+16.816% *	12	+16.082% ***	47	-0.075	+16.232% ***	59
	[-10, +10]	+16.158% **	12	+14.033% **	47	-0.182	+14.465% ***	59
Bidders								
	[-10, -5]	-5.430% ***	9	+2.154% *	33	+3.082 ***	+0.529%	42
	[-5, 0]	+0.187%	9	+3.325% ***	33	+1.144	+2.653% **	42
	[-10, +10]	-4.407%	9	+4.952% *	33	+1.698 *	+2.947%	42

* / ** / ***: cumulative average residuals for sampled targets / bidders significantly different from zero to 90% / 95% / 99% levels of confidence. Column “T-Value” reports the results of two-tailed tests of mean comparisons among the entrepreneurial and the independent targets groups.

APPENDIX

Table A-1: Average and cumulative average residuals for bidders and targets

Event Day	Targets				Bidders			
	AR [-5;+5]	AR [-10;+10]	CAR [-5;+5]	CAR [-10;+10]	AR [-5;+5]	AR [-10;+10]	CAR [-5;+5]	CAR [-10;+10]
-10		+0.363%		+0.363%		+0.343%		+0.343%
-9		+0.539%		+0.902%		+0.002%		+0.345%
-8		-0.355%		+0.547%		+0.483%		+0.828%
-7		-0.105%		+0.442%		-0.037%		+0.791%
-6		+0.107%		+0.549%		+0.017%		+0.808%
-5	+0.533%	+0.529%	+0.533%	+1.078%	-0.261%	-0.278%	-0.261%	+0.529%
-4	+1.182%	+1.199%	+1.715%	+2.277%	+0.498%	+0.503%	+0.237%	+1.033%
-3	+0.378%	+0.379%	+2.093% *	+2.656%	+0.372%	+0.368%	+0.610%	+1.400%
-2	+0.984%	+0.990%	+3.077% **	+3.646% **	+0.195%	+0.197%	+0.805%	+1.598%
-1	+3.163% ***	+3.155% ***	+6.239% ***	+6.802% ***	-0.962% **	-0.954% **	-0.158%	+0.644%
0	+9.992% ***	+10.004% ***	+16.232% ***	+16.806% ***	+2.810% ***	+2.813% ***	+2.653% **	+3.457% **
1	+0.740%	+0.743%	+16.971% ***	+17.548% ***	+0.434%	+0.450%	+3.087% **	+3.907% **
2	-0.649%	-0.627%	+16.322% ***	+16.922% ***	-0.880% *	-0.872% *	+2.207%	+3.035% *
3	-0.924% *	-0.922% *	+15.399% ***	+16.000% ***	-0.775% **	-0.765% **	+1.432%	+2.271%
4	-0.135%	-0.146%	+15.264% ***	+15.854% ***	-0.485%	-0.479%	+0.947%	+1.791%
5	-0.686%	-0.664%	+14.578% ***	+15.190% ***	+0.731% *	+0.737% *	+1.678%	+2.528%
6		+0.423%		+15.613% ***		-0.093%		+2.435%
7		-0.254%		+15.359% ***		-0.109%		+2.326%
8		-0.352%		+15.007% ***		+0.061%		+2.387%
9		-0.336%		+14.671% ***		+0.557% *		+2.944%
10		-0.205%		+14.465% ***		+0.003%		+2.947%

* / ** / ***: (cumulative) average residuals for sampled targets / bidders significantly different from zero to 90% / 95% / 99% levels of confidence.

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