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The undersigned

SURNAME	Chiarella
FIRST NAME	Carlo
PhD Registration Number	1287622

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SURNAME Chiarella

FIRST NAME Carlo

Essays on Informational Frictions and Corporate Decisions

DISSERTATION

by

Carlo Chiarella

In partial fulfillment of the requirements for the Degree of

DOCTOR OF PHILOSOPHY in FINANCE

DISSERTATION COMMITTEE

Professor Yakov Amihud

Professor Carlo Favero

Professor Stefano Gatti

Università Commerciale Luigi Bocconi

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Introduction

Since the seminal paper of Modigliani and Miller (1958), which established a benchmark frictionless world, corporate finance has primarily became the study of frictions which originate from market imperfections.

The focus of this dissertation is the study of the impact of informational frictions on corporate decisions. Common to all three papers is a search for a better understanding of whether and how limited information drives managerial choices and to what extent it reflects on observed firm actions. The analysis is organized in three distinct chapters that consider, at firm level, the role of informational frictions in the market for external finance and for control.

The first chapter, *"How much to pay for opacity and how? Negotiating premiums and the method of payment in M&As"* examines the relations between the method of payment, the bid premium and firms' individual opacity. The aim of the analysis is to quantify the impact of informational frictions, which originate from target and bidder opacity, on observed bidding behavior. The originality of the study is twofold. First, the method of payment and the magnitude of the proposed bid premium are considered simultaneously determined by modelling their choice in an endogenous switching regression framework. This is a novel type of test of this issue which allows to capture that the slope coefficient of the various drivers of the bid premium change across different methods of payment. Second, opacity about bidder and target firms is captured by an index based on the trading properties of each firm's stock, by combining on their first principal component several proxies of firm-specific adverse selection risk from market microstructure. This allows a direct and joint analysis of both bidder and target opacity. The observed evidence is consistent with a framework in which firm opacity reduces the likelihood of making a bid or receiving an offer and affects how much is paid and how. In particular, several interesting results are presented: the analysis shows target opacity is associated with higher premiums and, for transactions of substantial materiality, with the use of stock. Bidder opacity is related to lower premiums in stock bids and indirectly affects the choice of stock as the method of payment, by amplifying the difference in how much bidders anticipate to offer under alternative means of payment. Bid characteristics are then not only simultaneously determined, but also complementarily. Bidders address overpayment concerns by choosing to pay stock when targets are more opaque and the materiality of the deal is substantial. Bidders then manage the probability of bid success by using the bid premium as a signaling device. In particular they offer a higher bid premium for more opaque targets, to deter potential competitors' bids, and a lower bid premium if they are opaque and stock is involved, to signal their own valuation.

The second chapter, "*M&A in tough times*" studies the impact of uncertainty on the timing and the quality of deals: first by tracking the volume of deals in periods of uncertainty, then by asking whether such transactions are fundamentally different in terms of performance from those undertaken in more quiet periods and finally exploring possible explanations. The originality of this paper is that, in contrast to prior work which focuses on the causes and the consequences of high M&A activity, it contributes to the modelling of how drivers of M&A and value creation change in times of uncertainty. Evidence is consistent with the view that if uncertainty seems to de-incentivize M&A, it also creates opportunities. In particular, the analysis shows that periods of high uncertainty, which are defined on the basis of the VIX index, are associated with lower M&A activity. Still, deals announced in uncertain times realize a superior performance that hinges mainly on a more disciplined planning and execution of the deal and in part by negotiating from a better bargaining position.

The third chapter "*How do financing frictions affect SMEs finance? The interaction of country and firm characteristics"* examines firm-level financing patterns of SMEs across Europe to assess how country characteristics, in interaction with firm characteristics, affect the severity of the financing frictions faced by firms in the market for external finance and eventually explain the cross-section of the observed capital structure. Firm-level and country-level data are combined in a two-level hierarchical regression model to study how the individual characteristics of SMEs interact with the legal, financial and institutional environment of the countries in which they operate to determine their financing. The main contribution of the analysis is to propose a unified framework to interpret the differences in SMEs observed capital structure and to show that while country level variables are not *per se* informative about SMEs finance, they significantly predict SMEs debt ratios in interaction with firm characteristics.

Chapter 1: How much to pay for opacity and how? Negotiating premiums and the method of payment in M&As (joint with Stefano Gatti)*

Abstract

We focus on the choice of the bid premiums and the method of payment for different degrees of opacity of bidder and target firms. Our goal is to quantify the impact of informational frictions on managerial decisions, studying a sample of bids by and for U.S. publicly listed firms over the period 1979–2011. In particular, we condition cross-sectionally on the basis of firms' stock trading properties, which we assume to be representative of individual firm opacity, and we study the joint effect of target and bidder opacity on the simultaneous determination of the method of payment and the bid premium. Target opacity is associated with higher premiums and, for transactions of substantial materiality, with the use of stock. Bidder opacity is related to lower premiums in stock bids and indirectly affects the choice of stock as the method of payment, since more opaque bidders anticipate offering relatively smaller premiums. For bids of considerable materiality, preference for stock payment is in fact positively associated with the difference in how much bidders anticipate to offer in, respectively, cash and stock bids.

JEL Classification: G34, G14

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1. Introduction

The consequences of informational frictions on corporate activities have been documented in various contexts, from a firm's underpricing in initial public offerings (e.g., Beatty and Ritter (1986)) to its cost of capital (e.g., Easley and O'Hara (2005)) or discount in private equity negotiations (e.g., Hertzel and Smith (1993)). However, research on asymmetric information and bidding behavior in mergers and acquisitions (M&As) is still unsettled. A rich collection of anecdotal evidence suggests information asymmetry between target and bidder shareholders indeed results in frictions in the market for corporate control. In many cases, bidders eventually regret their ex post overpaid acquisitions and on several occasions bid valuation by targets with limited information has been so contentious as to end up in court. Deal success clearly hinges on how much is paid and how.[1] In this paper, we examine a sample of M&A bids by and for U.S. publicly listed firms over the period 1979–2011 to study the relations between three variables: the method of payment, the bid (acquisition) premium, and firm individual opacity. In doing so, we assess the rationality of the observed strategic bidding behavior and the efficiency of the market for corporate control.

In particular, with asymmetrically informed counterparties, we expect firms' individual opacity to be an important driver of the simultaneous determination of both the bid premium and the method of payment. Since the probability of bid success increases with the value of the offer but is accompanied by overpayment costs, bidders face an evident trade-off between the likelihood of overpaying and that of missing potential synergistic opportunities. Both these costs depend on the extent to which counterparties are privately informed and, most important, vary with bid premiums and across methods of payment. We then hypothesize that the informational structure of the deal reflects on how much is offered and how.

The theoretical framework for our research is provided by the models of M&A under asymmetric information of Hansen (1987), Stultz (1988), Fishman (1989), Eckbo et al. (1990), and Rhodes-Kropf and Viswanathan (2004). These models posit that the presence of information asymmetry has a significant impact on bid characteristics on the grounds of alternative motivations. However, to reconcile the different views, we propose that the resultant effect on actual bids depends on the intensity and interaction of the informational gaps between counterparties, which originate from target and bidder opacity. Our aim in this paper is to quantify the impact of these informational frictions on managerial decisions and negotiation.[2]

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[1] For a more detailed discussion see, for example, Cording et al. (2002), Antoniou et al. (2008), and Gillis (2009).

[2] Haleblian et al. (2009) provide a comprehensive review of empirical findings on managerial behavior related to M&As from research in management, economics, and finance.

Our empirical investigation of the choice of the method of payment and the bid premium for different degrees of opacity of bidder and target firms contributes to the M&A literature in several dimensions. First, by explicitly modeling the simultaneity of the choice of the premium and the method of payment, we depart from existing empirical studies, which have typically considered the method of payment to be predetermined with respect to the bid premium. In this regard, our analysis fully recognizes the duality of the relation between asymmetric information and bid characteristics and aims to capture that a bidder's decision to self-select a specific method of payment partly depends on the premiums the bidder expects to offer across alternative payment regimes. Indeed, a relatively lower anticipated premium under one form of payment would make this type of bid more likely. With respect to other studies, this framework allows us to reveal how the drivers of the bid premium change across different methods of payment and, in particular, to uncover an additional indirect link between firm opacity and the method of payment to the extent that its effect on premiums differs across alternative payment regimes.

Second, by testing our hypotheses jointly and directly, our analysis departs from existing empirical studies which have so far typically focused on either the bidder or target side and, regarding the method of payment, have mainly drawn indirect inferences based on cumulative abnormal returns upon the announcement of a bid.[3] Indeed, Moeller et al. (2007) find that if stock is used as the exchange currency, abnormal returns to bidders are negatively related to their own extent of private information and Officer et al. (2009) report higher announcement returns for bidders using stock to acquire targets that are difficult to value. To the best of our knowledge, the only paper that presents a direct and joint test of the implications of both target and bidder private information on the choice of the method of payment is by Chemmanur et al. (2009). Analogously, existing studies so far have explored the relation between the bid premium and asymmetric information, typically from just the bidder's perspective.[4] Indeed, Cheng et al. (2008) and Chatterjee et al. (2012) test how the opacity of target firms affects bid premiums, drawing on theories of overpricing due to divergence of opinion (e.g., Chen et al. (2002), Diether et al.

[3] For example, Travlos (1987), Amihud et al. (1990), Brown and Ryngaert (1991), and Servaes (1991) report significantly lower returns for bidders using stock instead of cash around the announcement date. Similarly, Franks et al. (1988) reveal that targets' returns are higher if they are offered cash instead of stock.

[4] For example, Koeplin et al. (2005) document that private firms are acquired at an average 20–30% discount relative to acquisition multiples (earnings) of similar publicly traded firms. The authors argue that the discount may partly be risk compensation to the bidder for adversely selecting a potential Akerlof *lemon* target under asymmetric information. However, for public targets, Fuller et al. (2002) and Officer (2007) find a lower price is paid for targets whose stock is less liquid.

(2002), Miller (1977). In this respect, we extend their analysis by also taking into consideration the opacity of the bidder.

Third, to the best of our knowledge, studies on M&As have only so far measured firm-specific opacity, the cross-sectional conditioning variable, on the basis of ex ante firm characteristics that, in our context, can have multiple interpretations. For example, Chemmanur et al. (2009) employ the number of analysts following a firm, the dispersion of their earnings per share (EPS) forecasts, and their forecast errors, while Chatterjee et al. (2012) use the dispersion of analysts' EPS forecasts, the breadth of mutual fund ownership, and idiosyncratic volatility. In this respect, we further contribute to the field of M&A by proposing instead to capture firm-specific adverse selection risk directly from a firm's equity trading properties, forming an index of firm-specific opacity on the basis of the first principal component of several proxies for adverse selection risk from the literature on market microstructure, as in Bharath et al. (2009).

Our analysis documents that the opacity faced by the bidder in assessing the value of the target is a significant driver of the choice of the method of payment. When the transaction is sufficiently material, stock bids are in fact preferred to alleviate the overpayment concerns associated with opaque targets. We do not find evidence on the use of cash bids as a signaling device to deter potential competitors' bids for more opaque targets, as do Chemmanur et al. (2009), but, in line with the same preemptive bidding rationale and Chatterjee et al. (2012), we find instead that higher bid premiums are associated with target opacity. Our analysis then documents that, for stock bids, the opacity of the bidder is related to lower premiums, which bidding firms offer to signal their value by taking advantage of targets' impaired ability to assess bid value. Through this conditional effect, we find bidder opacity then indirectly contributes to the choice of stock as the method of payment since it lowers a bidder's expectation of a stock bid premium, affecting the gap between the premiums that the bidder anticipates to offer under alternative payment regimes.

The rest of the paper is organized as follows. Section 2 formulates testable hypotheses for the choice of the method of payment and bid premium for different degrees of firm opacity. Section 3 introduces the sample, describes the methodology, the index of firm opacity and presents the results. Section 4 concludes the paper and introduces potential developments for further research.

2. How bidder and target opacity interact to determine bid premiums and the method of payment

To guide the construction of the relevant hypotheses, we focus on adverse selection and the incentives of wealth-maximizing counterparties. In particular, we consider a framework in which a bidder discovers a synergistic opportunity that requires the acquisition of a target under imperfect information. The informational structure of the deal is characterized by asymmetric information about the true unobservable value of the counterpart and the potential benefits from the transaction, with each firm knowing only its own standalone value. Both bidder and target have market values that may not reflect the true value of the firm. The extent of uncertainty outsiders encounter in assessing the other firm's value is firm specific and mainly driven by firm characteristics.

Wealth-maximizing counterparties negotiate, comparing their expected wealth gain conditional on alternative methods of payment and different bid premiums on the basis of the information they possess. A target firm satisfies its incentive constraint by accepting only bids in excess of its true value. When cash is offered, the value of the offer is independent of the true value of the target ex post and the bidder bears the entire cost of overpayment. The probability of bid success and expected overpayment costs increase in the value of the bid (and the premium) and depend only on the value of the target. On the other hand, in the case of a stock bid, the target is offered shares of the combined firm at some exchange ratio and needs to judge the value of the bid (and the premium) on the basis of its limited information. The terms of the offer are contingent and overpayment costs are reduced since the target eventually shares gains and losses from the deal. However, the probability of bid success and expected overpayment costs depend not only on the value of the target, as in the case of a cash offer, but also on the target's assessment of the value of the combined firm under imperfect information about the valuation of the bidder and synergies. Stock offers then provide additional flexibility to satisfy the incentive constraints imposed by the presence of private information, but also entail additional informational costs.

In light of these considerations, we formulate a series of testable hypotheses on how bidder and target opacity interact in determination of the method of payment and the bid premium, through their effect on the probability of bid success and expected overpayment costs.

Target opacity exposes the bidder to adverse selection risk. Expected overpayment costs increase with the opacity of the target because greater uncertainty reduces the expected value of the target conditional on the offer being accepted. Consequently, we expect the benefits of contingent pricing and risk sharing from the use of stock to

increase with target opacity. Moreover, as modeled by Hansen (1987), we expect those benefits to hinge on the materiality of the transaction and we formulate the following prediction for empirical testing.[5]

H1. For transactions of significant materiality, a bidder's preference for stock offers increases with target opacity.

A rich collection of anecdotal evidence indicates that there are always other players observing the bidding. In this respect, according to Fishman (1989), bids for opaque targets are more likely to attract potential competition since they reveal more information. Bidders can then use the bid premium to signal their high valuation of an opaque target and deter potential rival bids. Since more aggressive bids raise the probability of deal completion and would preempt competition, we formulate the following prediction for empirical testing. [6]

H2. The bid premium increases with target opacity.

In the context of stock payment, bidder opacity undermines a target's ability to properly assess the value of the offer and bidder stock misvaluation can drive strategic bidding. In this respect, Myers and Majluf (1984) argue that stock bidders are more likely to be overpriced and Rhodes-Kropf and Viswanathan (2004) predict that when a bidder's stock is misvalued, especially when it is overvalued, targets are more likely to overestimate the synergies and accept a bid, since they cannot discern whether misevaluation is due to firm-specific characteristics or market-wide factors. We expect this estimation error in valuing synergies, which in their model is correlated with overall valuation error, to increase in bidder opacity. When stock is exchanged, the benefit from the reduction in the expected overpayment of opaque targets is then accompanied by an increased probability of deal completion for opaque bidders. We then formulate the following prediction for empirical testing.

H3. A bidder's preference for a stock offer increases with its own opacity.

Intuitively, bidder opacity does not have any impact on the bid premiums of cash bids. In the context of stock bids, however, the bid premium is linked to the proposed exchange ratio, which is used by the target to infer the value of the bidder Hansen (1987). In this framework, the corresponding premium can reflect the benefit of signaling. We conceive the cost of signaling a high value by offering a lower exchange ratio to be decreasing in bidder opacity, since in the spirit of Rhodes-Kropf and

[5] According to Hansen (1987), if the target contribution to the combined firm is not material, the benefit from the use of stocks would be negligible.

[6] The rationale for bidding more aggressively for more opaque targets holds for both cash and stock bids. Cash bids are more informative, while stock payment alleviates overpayment concerns associated with higher premiums for any level of target opacity.

Viswanathan (2004) the probability of bid rejection is lower for opaque bidders (see H3). Therefore, we propose the following prediction for empirical testing.

> H4. With a stock payment, the bid premium decreases with bidder opacity.

Finally, to the extent bidders anticipate the premium under alternative payment regimes and choose the method of payment accordingly, bidder opacity can indirectly contribute to determine the choice of the consideration offered. In particular, being associated with lower bid premiums only in stock bids, bidder opacity would affect the difference in the premiums that would be offered under alternative payment regimes and make stock bids relatively less costly. We therefore propose the following prediction for empirical testing.

> H5. A bidder's preference for a stock offer increases with the difference in the anticipated premiums of cash and stock bids.

Our hypotheses H3 and H4 highlight how, in the context of M&As, the risk of overpayment and the risk of bid failure arise as specific drivers of bidding behavior that counterbalance the informational costs entailed in bidder opacity. Deal financing does not translate directly into payment and premium decisions.[7] In this respect, they complement the predictions of models of investment financing that link adverse selection risk and capital structure decisions such as that of Dittmar and Thakor (2007), in which the choice of debt or equity financing is a function of informational gaps between new and existing shareholders.[8,9]

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[7] In support of this claim, Martynova and Renneboog (2009) provide evidence on the choice of the method of payment and deal financing, which are modeled as distinct choices driven by specific determinants. Moreover, Hovakimian and Hutton (2010) document several IPOs that are motivated by subsequent acquisition activity and show that newly public firms benefit from both the cash raised and the ability to pay with publicly traded stock.

[8] Loughran and Schultz (2008) and Bharath et al. (2009) directly investigate the link between firm-specific adverse selection risk and capital structure. Closely related is also the study of Lipson and Mortal (2009), who analyze a firm's capital structure on the basis of its stock's liquidity, which is eventually tied to information asymmetries, as shown, for example, by Easley and O'Hara (2005).

[9] In a parallel with M&As, in the case of a stock bid, target shareholders can be viewed as new shareholders of the combined firm and financing theory suggests stock payment is optimal only if there is little disagreement on bidder value. The rationale is that the target would otherwise impose a discount on the bidder's stock by requesting a higher level of bid premium as disagreement grows, up to the point where eventually a cash bid becomes preferable.

3. Empirical analysis

Our empirical analysis focuses on bid premiums in regard to how much, as a percentage, is offered for the acquisition of a target in excess of its standalone market valuation and on the qualitative dimension of the choice of the method of payment concerning the type of consideration used in the transaction among either cash, stock, and a hybrid (i.e., a mixed stock and cash payment).

3.1. Data

Data on M&A announcements as reported by Thomson One are collected from 1979 to 2011. Both completed and withdrawn bids are considered.[10] We include in the sample only bids in which both the target and bidder firms are U.S. publicly listed non-financial firms.[11] We limit our sample to bids classified as mergers, acquisitions, or acquisitions of a majority interest. These restrictive requirements are expected to result in a sample of transactions for which asymmetric information is a potentially important concern.[12] We consider only transactions whose reported value is in excess of $10 million. Values are adjusted for inflation and expressed as 2011 equivalents. We exclude deals for which consideration is not reported as either cash, stock, or hybrid and for which the combined amount of cash and stock accounts for less than 95% of the transaction value. For each firm in the sample, we collect the relevant stock market and accounting data from the Center for Research in Security Prices (CRSP) and Compustat databases, respectively.

Our final sample covers 1152 bids and includes a significant and balanced representation of all methods of payment. Cash is the most common form of payment and is observed in around 48% of cases, followed by stock, which accounts for almost 40% of observations. The remaining transactions (i.e., around 12%) are settled using a mixed form of payment. Figure 1 presents the number of deals by year and method of payment. In their survey of corporate takeovers, Betton et al. (2008) identify three distinct merger waves for U.S. publicly traded firms occurring between 1979 and 2006. Visual inspection of Figure 1 suggests there is correspondence with these broad market trends in our sample as well.

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[10] We believe that firm opacity can result in different distributions of withdrawals across methods of payment. The inclusion of both successful and withdrawn bids then reduces potential concerns of selection bias.

[11] Firms whose main business activity is classified within Standard Industrial Classification (SIC) codes 6000–6999 are considered financial firms.

[12] In particular, we exclude bids classified as buybacks, exchange offers, recapitalizations, and acquisitions of assets and of partial or remaining interests. These requirements are in line with the work of Chemmanur et al. (2009).

Figure 1. Sample description

This figure shows the distribution of bids in the sample grouped by year and method of payment. No bid satisfies the requirements for inclusion in the sample in 1979, 1981, or 1982.

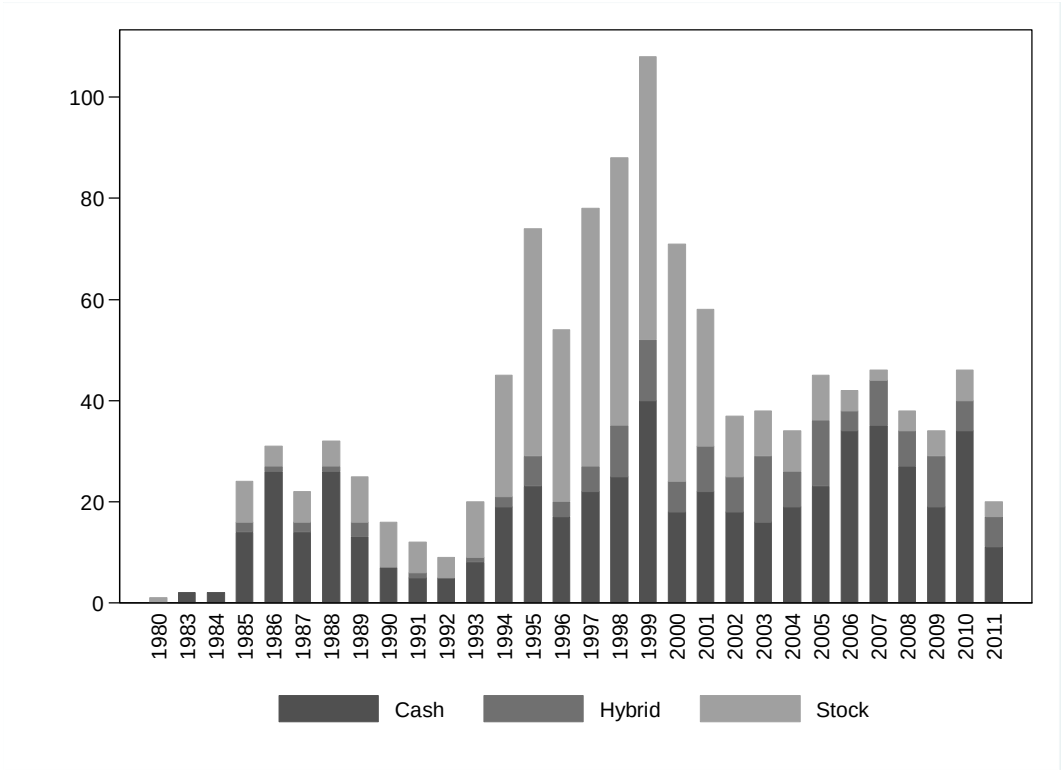

Table 1 provides additional insights on the composition of the sample. Most of the announced bids are for negotiated acquisitions and are unchallenged. Most bids are classified as friendly and eventually end up being successfully completed. Use of cash as the only method of payment seems significantly more frequent in hostile and unsolicited bids, while stock payments are relatively favored in friendly transactions. The sample includes an approximately balanced representation of deals that are intended for either business diversification (40%) or specialization (60%), classified on the basis of firms' two-digit SIC codes.[13] Cash seems to be relatively more frequent for transactions involving firms operating in different industries. This preliminary evidence may reflect the higher interest of the target's shareholders in maintaining a stake in the combined entity if the bidder operates in the same business. A majority of the deals (60%) in our sample occur in a merger wave that we identify at the industry level, as Harford (2005), and we observe the relatively more frequent use of stock for deals that are part of a wave.[14] The value of the deals is high, on average,

[13] A similar classification criterion on the basis of the first two digits of firms' SIC codes is adopted by Berger and Ofek (1995).

[14] Specifically, we consider a deal occurring during a merger wave if in the same period we assess an exceptional concentration of merger activity within the industry of either the

and in most of the cases 100% of the equity of the target is exchanged (not shown in the table). The use of cash is primarily concentrated in deals whose value and materiality (with respect to the bidder's market capitalization) are, on average, relatively lower. The economic impact of these transactions is less relevant. This empirical pattern confirms that informational gaps with respect to the target become significant determinants of the method of payment only for a given deal size, in line with Hansen (1987) and our hypothesis H1. Most bids are by firms with no significant toehold interest in the target firm. Finally, the bid premium varies significantly across methods of payment and is higher, on average, for cash bids. This difference is statistically significant at the 10% level in a parametric t-test of the equality of means, a non-parametric Wilcoxon (Mann–Whitney) rank sum test of the equality of the medians, and a Kolmogorov–Smirnov test for comparison of the distribution (unreported). In this respect, Eckbo (2009) documents that among deal characteristics expected to affect the bid premium, the method of payment is one of the most important and, in particular, that premiums tend to be higher when cash is used.

Table 1. Descriptive statistics of the sample

This table reports the descriptive characteristics of bids included in the sample. For categorical variables, bids are classified accordingly and the corresponding frequencies across methods of payment are reported: Attitude represents the nature of the offer as reported by Thomson One; Competition identifies bids challenged by an alternative bid; Type separates tender offers from negotiated deals; Status describes the outcome of the offer as reported by Thomson One; Focus captures the strategic motive that drives an offer (diversification or specialization, depending on the bidder's and target's two-digit SIC codes); and Wave captures deals that occur in a period of exceptional concentration of merger activity in the industry of either the target, the bidder, or both. Such periods are identified at the industry level following Harford (2005). Toehold flags bids by firms that already own a stake in excess of 5% of the target firm; Deal Value represents the total value of the transaction as reported by Thomson One (and adjusted for inflation); Deal materiality is measured as the ratio of the value of the transaction to the market capitalization of the bidder 63 business days before

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target, the bidder, or both. To identify periods of unusual merger activity concentration, we first assign each bidder and target in our sample to one of the Fama–French five industry classifications on the basis of SIC codes. To isolate potentially confounding time trends, we also split the sample into three periods: before 1990, between 1990 and 2000, and after 2000. For each industry we assess the concentration of bids in each 24-month period in each decade. Then, for each industry, we simulate 1000 distributions of the total number of bids in each industry in each decade over a 120-month period, randomly assigning each occurrence to a month. We identify periods of unusual concentration of merger activity by comparing the resulting distribution of bids in each 24-month period with respect to the actual distribution. If the actual concentration of bids in a period exceeds the 95th percentile of the maximum concentration within any 24-month period for the simulated distributions, then this cluster of bids is coded as an industry wave.

the announcement; and Premium is the percentage difference between the offering price and the target stock price four weeks before the announcement, as reported by SDC.

		Cash (544)	Hybrid (146)	Stock (462)	Total (1152)
Attitude	*Friendly*	478	129	449	1056
	Hostile	40	9	7	56
	Neutral/Unsol.	26	8	6	40
Competition	*Challenged*	76	24	25	125
	Unchallenged	468	122	437	1027
Type	*Tender offer*	281	19	14	314
	Negotiated deal	263	127	448	838
Focus	*Diversification*	241	43	158	442
	Specialization	303	103	304	710
Wave	*Not in a wave*	267	73	110	450
	Industry wave	277	73	352	702
Status	*Completed*	460	118	398	976
	Withdrawn	86	28	64	176
Toehold	*With toehold*	50	10	14	74
	Mean (%) toehold	12.9	18.3	18.9	14.7
	No toehold	494	136	448	1078
Deal Value	*Mean ($M)*	1007	2577	1307	1326
Deal Materiality	*Mean (%)*	27.4	57.9	36.6	35.0
Premium	*Mean (%)*	53.9	49	50.1	51.7
	St. Dev	39.7	41.6	38.6	39.5
	Med (%)	45.3	38.2	41.8	43.2

Table 2 summarizes the firm characteristics of bidders and targets in our sample conditional on the method of payment. As expected, bidder size is, on average, considerably larger than the size of targets. The use of stock and hybrid payments is associated with targets of significantly larger relative size. The cash holdings of bidders opting for stock payment are, on average, lower than those of bidders paying cash. Then, we observe, on average, considerably lower leverage and cash flows for bidders involved in stock deals. Bidders report, on average, higher market-to-book ratios in stock transactions. This evidence is consistent with the argument that bidders prefer to use stock when their own market to book is high to preserve cash for future investment opportunities and to exploit the high valuation of their own stock. The same pattern is observable in the average market to book of target firms, consistent with bidders' greater concern of overpayment. Still, looking at the relative market to book, one can see the relation is inverted. Cash transactions report, on average, larger values of relative market to book, suggesting bidder concern about using their stock when it is less favorably valued compared to that of the target. Finally, cash payment is associated, on average, with greater ownership concentration of the target, consistent with concerns about the potential dilution of control of a stock in stock transactions.

Table 2. Descriptive statistics of firms in the sample

This table reports summary statistics of firms included in the sample, conditional on the method of payment. The variables Bidder Size and Target Size are determined on the basis of firm total assets as reported at the end of the year before the announcement date, Relative Size measures the size of the target with respect to the bidder, Bidder Cash is a firm's cash holdings and equivalents reported at the end of the year before the announcement date, Bidder Leverage is measured as the sum of short- and long-term financial debt over total assets at the end of the year before the announcement date, Bidder Cash Flows indicates the firm's operating cash flows at the end of the year before the announcement date, and Bidder M/B and Target M/B are the firm market-to-book ratios. Relative M/B measures the market-to-book ratio of the target with respect to the bidder; Bidder and Target Block Ownership and Inst. Ownership represent, respectively, a firm's largest and top five institutional investors' cumulative ownership stakes according to their U.S. Securities and Exchange Commission (SEC) 13F filings. Dollar values are adjusted for inflation.

	Mean	Cash	Hybrid	Stock	Total
Bidder Size	*$Mil*	14404	8772	5834	10253
Target Size	*$Mil*	735	2191	847	965
Relative Size	*%*	22.2	50.5	40.9	33.2
Bidder Cash	*$Mil*	1941	1031	636.8	1303
Bidder Leverage	*%*	19.0	20.0	15.7	17.8
Bidder Cash Flow	*$Mil*	1765	1225	565	1217
Bidder M/B	-	3.64	3.86	6.06	4.64
Target M/B	-	2.64	2.67	3.81	3.11
Relative M/B	-	0.94	0.92	0.86	0.90
Bidder Block Own.	*%*	8.37	8.83	7.76	8.18
Bidder Inst. Own.	*%*	23.3	25.1	21.8	22.8
Target Block Own.	*%*	9.25	9.01	8.49	8.90
Target Inst. Own.	*%*	24.1	23.4	21.7	23.0

3.2. Methodology

We implement a multivariate analysis that controls for deal- and firm-specific attributes that, individually or in interaction with firm opacity, are expected to drive the determination of the observed method of payment and the bid premium. In particular, we consider a structural self-selection model to capture, in addition to the dependency of the premium on the method of payment, how drivers of the bid premium change across different payment regimes and to what extent the decision to self-select a specific method of payment depends on the difference in bid premium expectations under alternative forms of payment.[15] In this framework, the method of

[15] Dunbar (1995), Li and McNally (2004), Goyal (2005), and Scruggs (2007) provide examples of the application of endogenous switching regression models in different contexts of empirical corporate finance, such as the use of warrants for underwriter compensation in initial public offerings, debtholder discipline in bank risk taking, share repurchases, and the use of standby underwriting arrangements for convertibles. Moreover, in the context of M&As, an

payment and the bid premium are both endogenous and simultaneously determined. We design the method of payment as a categorical variable that recognizes the implicit ranking among different forms of consideration and takes the value of zero if the transaction is to be settled using only cash, one if a mixture of cash and stocks is offered, and two if only an exchange of shares is intended. We therefore specify the choice of the method of payment as an ordered probit model that includes target and bidder opacity, the difference in the premiums the bidder expects to offer under, respectively, cash and stock bids (Prm|C - Prm|S), and several deal- and firm-specific controls from related studies:

$$Method\ of\ Payment_b = \beta_0(Prm|C - Prm|S) + \beta_1 Target\ Opacity + \beta_2 Bidder\ Opacity + \\ + \beta_3 Controls^{MP} + \varepsilon_b \quad (1)$$

Bid premiums under different payment regimes are instead modeled as a linear function of target and bidder opacity and the corresponding deal- and firm-specific controls from related studies. Bid premium is the percentage difference between the offering price and the target's stock price four weeks before the announcement date:[16]

$$Prm|C_b = \beta_{0c} + \beta_{1c} Target\ Opacity + \beta_{2c} Bidder\ Opacity + \beta_{3c}\ Controls^{PRM} + \varepsilon_{bc} \quad (2a)$$

$$Prm|H_b = \beta_{0h} + \beta_{1h} Target\ Opacity + \beta_{2h} Bidder\ Opacity + \beta_{3h}\ Controls^{PRM} + \varepsilon_{bh} \quad (2b)$$

$$Prm|S_b = \beta_{0s} + \beta_{1s} Target\ Opacity + \beta_{2s} Bidder\ Opacity + \beta_{3s}\ Controls^{PRM} + \varepsilon_{bs} \quad (2c)$$

The control variables include firm- and deal-specific characteristics that previous research indicates as significant determinants of the method of payment and the bid premium. Some of them are common to $Control^{MP}$ and $Control^{PRM}$, while others are expected to affect either one or the other dimension of the bid. Their complete description and origin are provided in Appendix A. Table 3 presents the complete list of variables used in the analysis that follows, their measurements, and relevant sources.

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endogenous switching regression model is employed by Burch et al. (2012) to assess the impact of target shareholders' investment style preferences on the method of payment and premiums.

[16] As reported by SDC Thomson.

Table 3. Variables definition

This table summarizes the variables used in our empirical analysis, with a brief description and their sources.

Variable	*Definition*	*Source*
MP	Method of payment: cash (= 0), mixed (= 1) or stock (= 2).	SDC Thomson
Prm	Bid premium: percentage by which the offering price exceeds the target's stock price four weeks before the announcement.	SDC Thomson
DeltaPrm	The difference in the fitted predictions of premiums for cash and stock bids resulting from first-step FIML reduced-form estimations of the regime equations (2a) and (2c).	-
IndexOpq, BdrOpq TgtOpq	Index of firm opacity, measured on the basis of the common cross-sectional variation of i) the illiquidity measure of Amihud (2002), (ii) the volume–return autocorrelation of Llorente et al. (2002), (iii) the probability of informed trading of Easley et al. (1996), (iv) the adverse selection component of the proportional effective spread of Roll (1984), (v) the reversal coefficient of Pastor and Stambaugh (2003), and (v) the Amivest liquidity ratio of Cooper et al. (1985) and Amihud et al. (1997). The index is formed on the basis of the first principal component of the standardized values of these measures (at the year level with respect the corresponding means and standard deviations from all firms in CRSP).	CRSP
DealMat	Deal materiality: (deal value)/(bidder market capitalization 63 business days before the announcement).	SDC Thomson CRSP
TgtOpqMat	Interaction term between deal DealMat and TgtOpq.	SDC Thomson CRSP
DeltaPrmMat	Interaction term between deal DealMat and DeltaPrm.	SDC Thomson CRSP
BdrSize, TgtSize RelSize	Firm size: the logarithmic transformation of firm's total assets.	Compustat
BdrCash	Bidder's cash holdings: (cash and equivalents)/(deal value).	SDC Thomson Compustat
BdrLev	Bidder's leverage: (short + long-term debt)/(total assets).	Compustat
BdrCF	Bidder's cash flows: (operating cash flow)/(deal value).	SDC Thomson Compustat
RunUp	Cumulative return of the target's stock price in the window [-62,-1] with respect to the announcement date.	CRSP
CapGain	Dummy variable to identify bids announced from 1989 to 1996, a period of good market performance and a high (28%) tax rate on capital gains.	CRSP
BdrMB, TgtMB,	Market-to-book ratio: market capitalization (shares outstanding * price 63 business days before the announcement)/book value of common equity.	CRSP Compustat

BdrInvOpp	Bidder's investment opportunities: (capital expenditures + R&D expenses)/(total assets).	Compustat
BdrOwn, TgtOwn	A firm's cumulative top five institutional ownership stakes.	SEC 13F
Syn	Abnormal return synergy (as in Bradley et al. (1988): market capitalization-weighted average of the bidder's and target's cumulative abnormal returns in the window [-62, 126].	CRSP
Toehold	Dummy variable: equals 1 if the bidder owns an interest in excess of 5% (threshold for which a bidder has to file a Schedule 13D with the SEC) in the target pre-bid.	SDC Thomson
Competition	Dummy variable: equals 1 if the bid is challenged by a rival bid, 0 otherwise.	SDC Thomson
Moe	Dummy variable: equals 1 if the bid is reported as a merger of equals, 0 otherwise.	SDC Thomson
Tend	Dummy variable: equals 1 if the bid is reported as a tender offer, 0 otherwise.	SDC Thomson
Friend	Dummy variable: equals 1 if the deal is classified as friendly, 0 otherwise.	SDC Thomson
Focus	Dummy variable: equals 1 if the deal involves the bidder and target operating in the same two-digit SIC code, 0 otherwise.	SDC Thomson
Wave	Dummy variable: equals 1 if the deal occurs in a period of exceptional concentration of merger activity, as for Harford (2005), in the industry of either the bidder, the target, or both, and 0 otherwise.	SDC Thomson
InvSentiment	Price earnings index series for Standard & Poor's (S&P) 500 firms.	S&P

3.3. Firm opacity

Unfortunately, opacity, our cross-sectional conditioning variable, is not directly observable. Still, a firm's equity trading properties—and its liquidity in particular—can reflect the nature of the information available to market participants on the value of the firm. Based on this premise, we assume that the information asymmetry faced by counterparties in a deal is to some extent correlated with that of other outsiders and we rely on the adverse selection component extracted from existing measures of liquidity to proxy for firm opacity.[17]

[17] Adverse selection risk is the risk of facing better-informed counterparties when trading a specific stock. It increases with firm opacity. The link between equity trading characteristics and information is indirectly validated by Chae (2005), who documents that measures of market microstructure are significantly affected by announcements of corporate events, including M&As.

However, since the concept of liquidity is tightly and elusively interconnected to asymmetric information,[18] a possible concern is that every single potential proxy is driven by adverse selection, but not exclusively so.[19] We then design an index of firm opacity by capturing on the first principal component the common cross-sectional variation of six different constituents: (i) the illiquidity measure of Amihud (2002), (ii) the volume–return autocorrelation of Llorente et al. (2002), (iii) the probability of informed trading of Easley et al. (1996), (iv) the adverse selection component of the proportional effective spread of Roll (1984), (v) the reversal coefficient of Pastor and Stambaugh (2003), and (v) the Amivest liquidity ratio of Cooper et al. (1985) and Amihud et al. (1997). The intuition is that combining broader liquidity measures with more informational proxies on their first principal component minimizes the likelihood that these measures are connected to non-informational liquidity. Our approach replicates that of Bharath et al. (2009), who form an index to study the impact of a firm's private information on capital structure decisions.

Our index is computed for each bidder and each target in the year preceding the bid announcement. Relevant loadings on the individual components of the index are extracted by principal component analysis of our index constituents in each year for all firms with data available from CRSP.[20] Specifically, we estimate the first principal component of the correlation matrix of the standardized index constituents and then, for each firm, we form the index of firm opacity (IndexOpq) by combining our standardized proxies for firm opacity with the corresponding contemporaneous loadings. Higher values of the index are associated with higher opacity for the specific firm in the given year. Appendix B describes in detail the constituents of our index, how it is constructed, and its main properties and also presents robustness tests to validate its use in our empirical analysis. According to our index, the opacity of firm i in year y is computed on the basis of our six index constituents x standardized across all firms in the given year, as

$$IndexOpq_{i,y} = \sum_{j=1}^{6} w_{j,y}\bar{x}_{i,y} \qquad \text{where} \quad w_{j,y} = PC\left(\bar{x}_{i,y}\right) \tag{3}$$

[18] As for Hasbrouck (2009), liquidity is intended as the ability to trade promptly and with little or no price impact. It is then expected to be closely related to the extent of uncertainty over the value of the asset.

[19] Again, according to Hasbrouck (2009), there is no single measure that captures all the dimensions of liquidity.

[20] All firms with data available on CRSP are considered in the analysis, since the cross section of firms in our sample of bidders and targets over single years is limited and not homogeneous. The broader scope improves the efficiency of the principal component analysis. On average, 40% of cross-sectional variance is accounted for by the first principal component and in most years only the first eigenvalue is larger than one. Moreover, the elements of the first eigenvector are mostly positive, confirming that each constituent adds positively to the index.

Panel a. and Panel b. of Table 4 provide insight into the informational characteristics of the bids included in our sample by reporting the cross-sectional statistics of our index of firm opacity for bidders and targets classified by method of payment. To assess the impact of opacity on the choice of the form of payment, we propose parametric (t-test) and non-parametric (Wilcoxon rank sum and Kolmogorov–Smirnov tests) univariate tests for the distribution of firm-specific opacity across different payment groups of targets and bidders.

Table 4. Index of opacity: Descriptive statistics and univariate tests

*Panels a. and b. report cross-sectional summary statistics of our index of firm opacity for bidders and targets classified by method of payment. The full sample is composed of the 1052 bids in our sample for which data on bidder and target opacity are available and, of these, 450 report a bid value in excess of $500 million (adjusted for inflation and expressed in 2011 equivalents). Panels a. and b. then present parametric t-tests and non-parametric Wilcoxon (Mann–Whitney) rank sum and Kolmogorov–Smirnov (K–S) tests for the comparison of the distribution of firm-specific opacity across different payment groups of target and bidders. Panel c. reports cross-sectional summary statistics on the bid premium for bids classified on the basis of different levels of firm opacity. Firm opacity is labeled either low or high if it falls, respectively, below the 33th percentile or above the 66th percentile of the distribution of the index of firm opacity. Panel c. then presents parametric t-tests and non-parametric Wilcoxon (Mann–Whitney) rank sum and Kolmogorov–Smirnov (K–S) tests for the comparison of the distribution of bid premiums for different levels of firm opacity. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.*

Panel a. Target Opacity

	Full Sample				Deal Value > $500M			
	All	Cash	Hybrid	Stock	All	Cash	Hybrid	Stock
Mean	-0.15	-0.13	-0.15	-0.16	-0.33	-0.34	-0.33	-0.31
Median	-0.24	-0.23	-0.27	-0.24	-0.34	-0.35	-0.34	-0.34
Std. Dev.	0.35	0.37	0.39	0.32	0.15	0.13	0.15	0.17
Cash-Stock:			t-Test	0.02			t-Test	-0.03*
			Rank sum	0.01			Rank sum	-0.02
			K–S	0.03			K–S	0.14**

Panel b. Bidder Opacity

	Full Sample				Deal Value > $500M			
	All	Cash	Hybrid	Stock	All	Cash	Hybrid	Stock
Mean	0.33	-0.35	-0.31	-0.31	-0.36	-0.39	-0.36	-0.34
Median	0.35	-0.36	-0.34	-0.34	-0.37	-0.37	-0.35	-0.36
Std. Dev.	0.20	0.23	0.23	0.20	0.16	0.13	0.17	0.19
Cash-Stock:			t-Test	-0.04***			t-Test	-0.05***
			Rank sum	-0.02***			Rank sum	-0.01***
			K–S	0.15***			K–S	0.18***

Panel c. Premium

	Target Opacity				Bidder Opacity			
	All	Low	Med	High	All	Low	Med	High
Mean	0.51	0.46	0.49	0.61	0.51	0.52	0.48	0.55
Median	0.43	0.40	0.41	0.49	0.43	0.44	0.40	0.42
Std. Dev	0.39	0.35	0.36	0.47	0.39	0.39	0.38	0.42
High-Low:			t-Test	0.15***			t-Test	0.03
			Rank sum	0.09***			Rank sum	-0.02
			K–S	0.12***			K–S	0.09

On average, bidders report an opacity index that is lower and less volatile than that of targets. This is consistent with the observed patterns in their respective sizes. Bidders are, on average, larger firms, which we expect to be relatively more transparent. Across payment methods, evidence supports H1, that for deals of a substantial value, preference for stock bids increases in target opacity. Moreover, preference for stock bids is shown to increase in bidder opacity, in accordance with H3. In particular, Table 4 shows that bidders paying stocks report, on average, significantly higher values of opacity than those involved in cash deals and that targets offered stock are, on average, more opaque than those paid for with cash when the deal value is substantial. Empirical tests of the difference in the means and medians across different groups formed on the basis of the method of payment show that the observed relation between firm opacity and the method of payment is statistically significant. For bidder opacity, the t-test and Wilcoxon (Mann–Whitney) rank sum tests both reject the null hypothesis of the equality of means and medians, respectively, across groups at the 1% level. Statistical significance is at the 10% level for target opacity in the subsample of bids of substantial value.

Panel c. of Table 4 reports cross-sectional statistics on the bid premiums associated with different groups of bidders and targets classified by level of opacity. Consistent with H2, more opaque targets are associated with higher bid premiums. Both t-tests and Wilcoxon (Mann–Whitney) rank sum tests reject the null hypothesis of the equality of means and medians across target groups at the 1% level. We observe, instead, no significant difference in bid premiums across groups of bidders of diverse opacity, consistent with the intuition that this effect is conditional on stock payment.

Univariate analysis, however, fails to capture the potential interaction between target and bidder opacity in determining the preferred method of payment.[21] Moreover,

[21] In unreported analysis available upon request, we study the distribution of bids over groups formed on the basis of the combination of the different target and bidder opacity levels, either low, medium, or high. For each of the nine groups, we assess the number of

averaging across firms and deals of different characteristics could confound the observed empirical trends. Firm opacity is not the sole determinant of the choice of the method of payment and the bid premium and is likely to affect the two simultaneously. To draw robust conclusions on our hypotheses, we then extend the analysis to a multivariate test that controls for all deal- and firm-specific attributes that, simultaneously and in interaction with firm opacity, are expected to drive the choice of the method of payment and the bid premium under information asymmetry.

3.4. Results

We assess the impact of firm opacity on the simultaneous determination of the bid premium and the method of payment by consistent estimation of our system of equations —(1) and (2a) to (2c)—in two steps. Reduced-form estimation (with full information maximum likelihood, FIML) is followed by a step in which the fitted predictions of bid premiums from the different regime equations replace the corresponding regressors in the selection equation for the method of payment.[22] On the one hand, in fact, the observed bid premiums are conditional outcomes and depend on the self-selected regime of payment. The error terms in the premium equations may then be non-zero in expectation and may also be correlated with the error term in the selection equation. In addition, on the other hand, what would have been the bid premium had an alternative method of payment been chosen is unobservable.

The identifying restriction for the estimation of the system requires at least one instrument that determines whether a bidder chooses a given method of payment but is unrelated to the ex post bid premium for the selected method of payment; and vice versa, at least one instrument that determines the level of the bid premium but is unrelated to the choice of the method of payment for that level of the premium.

To satisfy the model's identification and exclusion restrictions, the set of controls for the selection equation and the regime equations overlap but do not coincide. The control variables excluded from the equation work as instruments for the endogenous regressor. On the basis of the evidence from the literature, the variables excluded

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observations, the relative frequency of the different methods of payment, and the average bid premium, overall and conditional on the method of payment. We then test for differences in bid characteristics across groups with respect to the class of bids with low target and bidder opacity. We confirm that the likelihood of observing a stock bid is higher for bids that involve higher-opacity targets and bidders. Differences across groups, however, are not always significant. Moreover, the bid premium results are positively and significantly related to the opacity of the target.

[22] Lee (1979), Maddala (1986), and Li and Prabhala (2005).

from the bid premium equations are tied to the financing dimension of the choice of the method of payment, which we expect to be independent of the bid premium. Analogously, the set of controls for the method of payment does not include variables used to instrument the bid premium, such as RunUp, which was demonstrated by Chatterjee et al. (2012) to drive the bid premium and can be considered unrelated to the method of payment, since it is calculated in the period before the announcement. In addition, in the estimation of the bid premium equations, we control for target industry fixed effects, while for the method of payment we consider the industry of the bidder.

3.4.1. Opacity, the bid premium, and the method of payment: A simultaneous choice

Table 5 reports the coefficients and t-statistics for the reduced-form estimation in the first step of the simultaneous estimation of the system of equations. Estimates for selection equation (1) are in the first column and those for the bid premiums conditional on different methods of payment, (2a)–(2c), are in the second to fourth columns.

Table 5. Structural self-selection model estimation: Step 1

This table reports the coefficients and t-statistics (in parentheses, based on robust standard errors clustered at the year level) for the full information maximum likelihood (FIML) estimation of the reduced-form ordered probit regression model for the method of payment (first column) and the corresponding outcome regressions for the bid premium in different regimes (columns (2)–(4)). In the ordered probit, the dependent variable MP is a dummy that takes the value of zero if the transaction is to be settled using only cash, one if a mixture of cash and stocks is offered, and two if only an exchange of shares is intended. In the last three columns, instead, the dependent variable is the four-week bid premium conditional on different values for MP. Independent variables are summarized in Table 3. The variables TgtOpq and BdrOpq measure, respectively, the opacity of the target and of the bidder in terms of our index; DealMat captures the materiality of the transaction, measured as the value of the transaction over the bidder's market capitalization; TgtOpqMat is an interaction term designed to capture the dynamics between deal materiality and target opacity; BdrCash is representative of the bidder firm's financial constraints in terms of cash holdings, computed as the amount of the bidder's cash holdings over the value of the transaction; CapGain is an indicator variable for bids announced in 1989–1996 to capture the higher tax rate on capital gains; BdrMB and TgtMB are the bidder's and the target's market-to-book ratios, respectively; BdrInvOpp proxies for the bidder's investment opportunities and is computed on the basis of capital expenditures and R&D expenses; BdrOwn and TgtOwn capture ownership concentration and the potential risk of control dilution, respectively, if the transaction is settled with stock, proxied by the cumulative top five institutional percentage ownerships; Toehold identifies bids in which the bidder owns a stake in the target in excess of 5% pre-bid; Syn captures expected synergies; RunUp proxies for the target's stock price performance before the announcement; InvSentiment is an index of price earnings reflecting market-wide investor sentiment; and Tend, Moe, Focus, Friend,

*Wave, and Challenged are dummy variables to capture, respectively, whether a bid is in the form of a tender offer, if it is a merger of equals, if it is initiated for business specialization or diversification, if its attitude is friendly, if it is part of a merger wave at the industry level, and if it is rivaled by a competitive bid. All model specifications are estimated including industry fixed effects for both bidder and target firms, classified according to the Fama–French five-industry classification. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.*

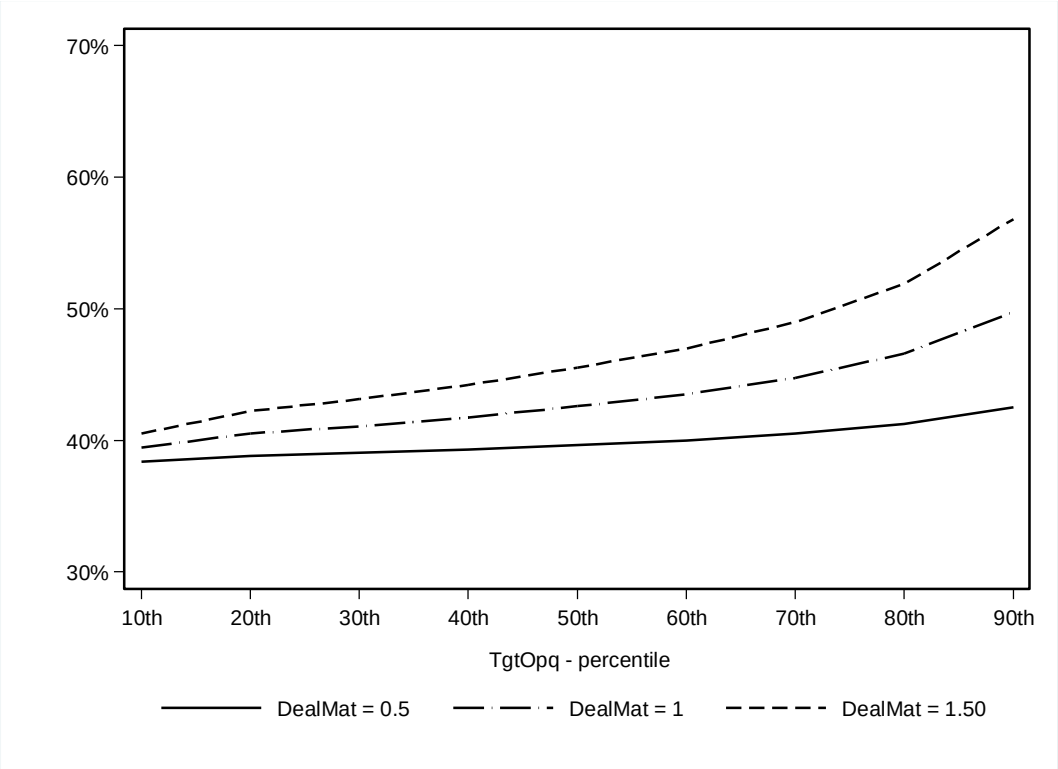
	Method of Payment	Premium		
		Cash	Hybrid	Stock
	(1)	(2)	(3)	(4)
TgtOpq	-0.20	0.15**	0.19*	0.33***
	(-1.11)	(2.39)	(1.75)	(2.85)
BdrOpq	-0.26	0.04	0.13	-0.26**
	(-1.03)	(0.34)	(0.61)	(-2.48)
DealMat	0.48***	-0.04*	0.02	0.01
	(3.48)	(-1.79)	(0.01)	(0.02)
TgtOpqMat	0.94***			
	(2.75)			
BdrCash	-0.04***			
	(-3.19)			
BdrMB	0.04***			
	(3.75)			
BdrInvOpp	3.04***			
	(4.58)			
CapGain	0.74***			
	(5.83)			
TgtOwn	-0.74*			
	(-1.70)			
BdrOwn	-0.38			
	(-0.93)			
Toehold	-0.43**			
	(-2.12)			
Moe	1.66***	-	-0.05	-0.29***
	(2.94)	-	(-0.21)	(-4.32)
Tend	-1.86***	0.04	0.50**	-0.07
	(-12.52)	(0.86)	(2.36)	(-0.49)
Friend	0.68***	0.08	-0.09	-0.28**
	(3.53)	(1.63)	(-0.77)	(-2.28)
Focus	0.15*	-0.02	-0.02	-0.05
	(1.70)	(-0.05)	(-0.27)	(-1.27)
InvSentiment	1.18***	0.21*	0.33	0.20
	(3.72)	(1.66)	(1.37)	(1.37)
Wave	0.61***	0.02	-0.03	0.07
	(6.15)	(0.01)	(-0.28)	(1.55)
TgtMB	0.02	-0.01	-0.02**	-0.01
	(1.38)	(-1.09)	(-1.98)	(-1.59)
Challenged	0.01	0.26***	0.11	-0.05

	(0.88)	(3.72)	(0.97)	(-0.78)
Syn	-0.01	0.11***	0.01	0.03
	(-0.17)	(2.75)	(0.11)	(0.82)
RunUp	-0.03	0.07***	0.15***	0.05**
	(-0.49)	-2.92	-3.09	-2.07
Constant		0.45***	0.40*	0.65**
		(4.36)	(1.62)	(4.03)
No. Obs.	936	936	936	936

Empirical evidence shows that the preference for a stock offer increases in target opacity, in line with H1. In particular, the interaction term between target opacity and deal materiality (TgtOpqMat) captures the increasing concern of overpayment as bid size grows and is positively related to the use of stock. On average, a one standard deviation increase in target opacity would increase the probability of choosing a stock payment by 2% in absolute terms. However, the magnitude of the effect varies with deal materiality. In a simulation exercise, we plot in Figure 2 what would be, on average, the predicted probability of a stock bid for different arbitrary levels of target opacity and deal materiality. Indeed, stylized evidence shows that the rate at which the predicted probability of a stock bid increases in target opacity is higher the more material the transaction is. For example, as the size of the deal gets close to the bidder's market capitalization, a one standard deviation increase in target opacity would raise the predicted probability of a stock payment by more than 6%, on average, in absolute terms. To grasp the specific contribution of target opacity, a hypothetical bid for a target at the first quartile (i.e., the 25^{th} percentile) of the distribution of firm opacity would not be significantly more likely in the form of stock if the value of the transaction were about one-half the size of the bidder's market capitalization rather than if the value of transaction were twice as big. However, a hypothetical bid for a target at the top quartile (i.e., the 75^{th} percentile) of the distribution of target opacity would be about 5% more likely in the form of stocks in the latter case rather than in the former.

Figure 2. Target opacity and the probability of a stock bid

This figure plots the predicted probability of a stock bid at different percentiles of the distribution target opacity, and for different levels of deal materiality. TgtOpq measures target firm opacity in terms of our index and DealMat captures the materiality of the transaction, measured as the value of the bid over the bidder's market capitalization.

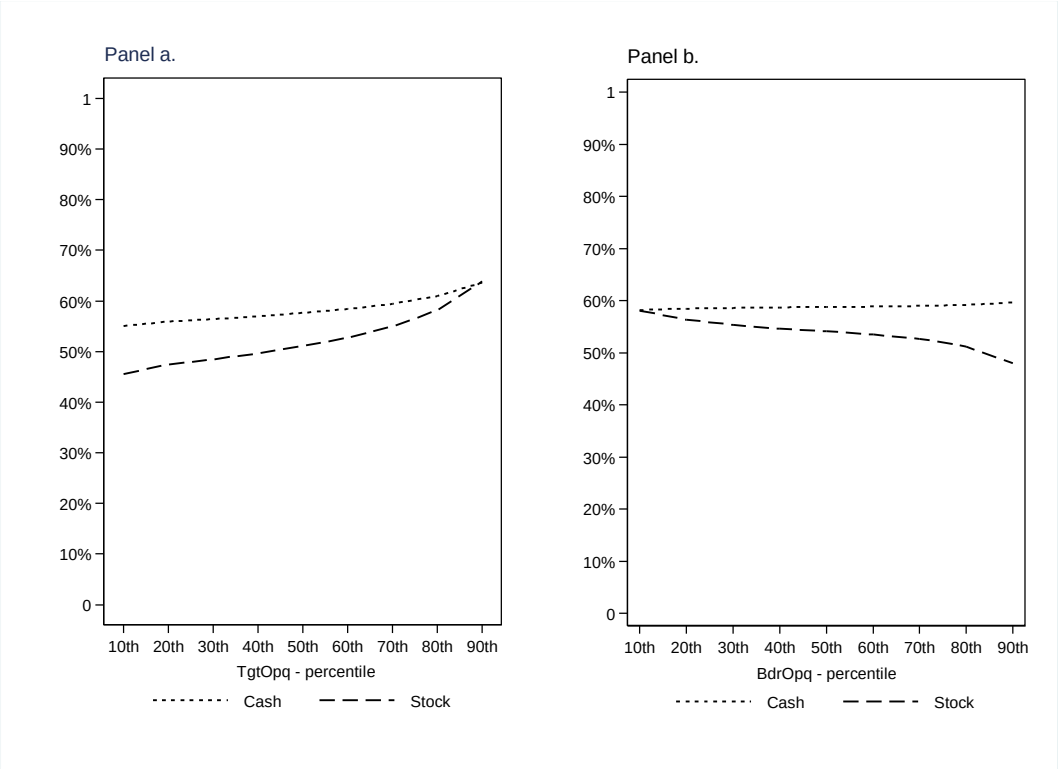


Moreover, consistent with H2, we observe across methods of payments a positive and significant coefficient for target opacity when the bid is in the form of either cash or stock. Bidders seem more willing to bid higher premiums for more opaque targets to raise the probability of bid success, despite overpayment risk, in line with the arguments of Fishman (1989) and evidence of Laamanen (2007) and Chatterjee et al. (2012). In indirect support of this interpretation, we observe a greater coefficient for TgtOpq when the bid is in stocks. In this context, in fact, bidders are less concerned with overpayment and are willing to bid even more aggressively, since stock offers are less informative than cash bids. In particular, ceteris paribus, a one standard deviation increase in target opacity would correspond, on average, to an increase in the bid premium of 5% for cash bids and 11% for stock bids, both in absolute terms. Considering the average cash and stock deal values, these premium differentials would be on the order of, respectively, $50 and $140 million. Panel a. of Figure 3 plots the fitted premiums of cash and stock bids for different levels of target opacity. Both the premium expected in case of a stock offer and a cash offer increase with target opacity, but the prediction of the former is lower than that of the latter for any value of target opacity. The differential between the two expectations tends to

close for higher levels of firm opacity, reflecting the higher and increasing rate at which a stock bidder's resolution to deter potential rival bids for more opaque targets affects the bid premium. Eventually, for bids aimed at the most opaque targets, which are those most likely to attract competition, there would be no difference between the bid premiums predicted for cash and stock deals, since in the latter case the sharing of overpayment risk and uncertainty of the value of the stock involved would induce bidders to raise the premium up to the level of a cash bid.

Regarding bidder opacity, we do not observe any significant relation in support of H3. We find no evidence in our sample that more opaque bidders strategically choose stock payments. However, consistent with H4, we observe that the bid premium in stock bids decreases with bidder opacity. According to the argument of Myers and Majluf (1984) and Rhodes-Kropf and Viswanathan (2004), targets are more likely to overestimate synergies and the ensuing increased probability of bid success allows more opaque bidders to signal their value by offering less at relatively lower cost. In particular, ceteris paribus, a one standard deviation increase in bidder opacity would result, on average, in a 6% decrease in the bid premium expected for stock bids in absolute terms, which, considering the average deal value, would be on the order of $80 million. Panel b. of Figure 3 plots the fitted premiums of cash and stock bids for different levels of bidder opacity. Again, the premium expected in the case of a cash bid is higher than that of a stock bid for any level of bidder opacity; still, while the prediction of the former is unaffected by bidder opacity, the latter is, on average, declining the more opaque the bidder is. The differential between the two expectations progressively grows for higher levels of bidder opacity, since targets are more likely to accept stock bids by more opaque firms on the grounds of their overestimation of the prospective synergies

Figure 3. Firm opacity and the bid premium in cash and stock bids
This figure plots the fitted premiums for cash and stock bids at different percentiles of the distribution of firm opacity, measured in terms of our index. Premium expectations across methods of payment are plotted in Panel a. with respect to TgtOpq, the opacity of the target, and in Panel b. with respect to for the opacity of the bidder, BdrOpq.



Evidence of the effect of control variables is generally as predicted. Preference for a stock transaction increases with deal materiality. Consistent with the evidence of Faccio and Masulis (2005), the corresponding coefficient is positive and statistically significant at the 1% level. Instead, deal materiality does not seem to drive the premium in any significant way.[23] Only for cash bids we observe lower premiums as bid size increases, but the effect is only marginally significant.

Our analysis then shows that, in line with Martin (1996), the level of the bidder's cash holdings with respect to the deal value is negatively associated with the use of stocks. In alternative (unreported) specifications we consistently observe that more leveraged bidders and those with greater ability to generate cash flows increasingly prefer cash payments. The coefficients of both these proxies of debt capacity are negative, but they are not considerably significant. The use of cash then seems

[23] In unreported results available upon request, we separately control for bidder and target size, which are not included in the current model specification to avoid multicollinearity with DealMat. The variables BdrSize and TgtSize are, respectively, negatively and positively associated with the use of stocks, while they are unrelated to the bid premium.

constrained by liquidity in terms of both borrowing capacity and cash availability. In this respect, Faccio and Masulis (2005) report that the probability of a stock offer is positively related to the bidder's financing constraints. In addition, investment opportunities are shown to decrease the bidder's willingness to use cash. The corresponding coefficient is positive and strongly statistically significant, as for Martin (1996), Zhang (2001) and Faccio and Masulis (2005).

The implicit cost of capital gains taxation makes stock payments more attractive because of different tax treatments across methods of payment. In line with Wansley et al. (1983) and Gilson et al. (1988), the coefficient of our dummy is positive and significant at the 1% level. The evidence of bidders' desire to exploit their good stock performance and use their highly valued paper to settle the transaction is very robust. The coefficient of bidders' market-to-book ratio is positive and strongly significant, confirming bidder willingness to use stock when highly valued, as for Carleton et al. (1983) and Zhang (2001). Our analysis also shows that the risk of diluting relevant control positions seems to concern bidders in stock deals, consistent with Stultz (1988) and Amihud et al. (1990). The coefficients of our proxies for ownership concentration for the bidder and the target are both negative, but only the latter is slightly statistically significant.[24] This can be explained from the perspective of Martin (1996), Ghosh and Ruland (2002), and Faccio and Masulis (2005), who confine this effect over the intermediate range of bidder ownership concentration. The extent of target ownership concentration, however, is also relevant for bidders with largely diffused or highly concentrated ownership, since for sufficient deal materiality a stock acquisition can result in a new blockholder's position in the merged entity. Preference for a stock bid is reported to be lower for bidders that already have a toehold in the target or structure the bid as a tender offer. In this respect, Officer (2003) and Gaspar et al. (2005) also document that bidders pay less if there is a toehold, while Huang and Walkling (1987) and Berkovitch and Khanna (1991) report higher premiums in tender offers. For these bids, rejection is more a concern than overpayment and the corresponding coefficients are reported as negative and statistically significant. The opposite is observed for mergers of equals, which are significantly associated with stock payments and lower bid premiums. Analogously, in line with, among others, Schwert (2002) and Faccio and Masulis (2005), a preference for stock bids is found to be significantly higher for deals classified as friendly, deals that are also associated with significantly lower bid premiums, and deals that involve firms in the same industry. These classes of deals are, in fact, more likely to include

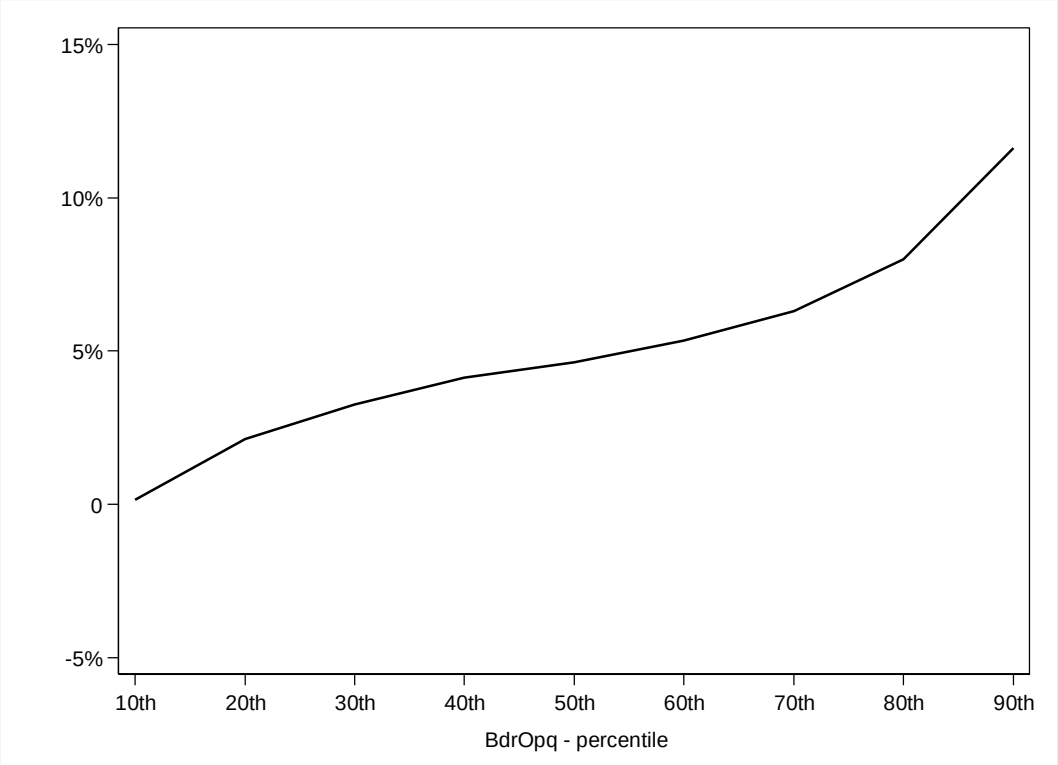
[24] In unreported results available upon request, we interact BdrOwn with DealMat and TgtOwn, since the risk of creating a new blockholder is expected to be more significant for transactions of greater materiality or involving targets with large blockholder ownership. We observe no significant relationship between the two variables.

transactions in which asymmetric information concerns are lesser and in which the target's shareholders are more likely interested in maintaining a stake in the merged entity. Then, consistent with McNamara et al. (2008), Chidambaran et al. (2010), and Chatterjee et al. (2012), our analysis suggests a significant preference for stock payments in deals that are part of a merger wave or that occur in periods of strong investment sentiment. The corresponding coefficients are positive and consistently significant. Finally, as for Chatterjee et al. (2012), when expected synergies are higher, bidders seem to consent to higher premiums in cash offers. The same occurs when a bid is challenged by a rival bid. In both cases it is possible to conjecture that the bidder would be negotiating from a weaker position. In addition, RunUp is positively associated with the bid premium, irrespective of the method of payment. The corresponding coefficient is positive and significant for both cash and stock payments. This result is again consistent with bidders being more concerned about bid rejection than overpayment, especially when the bid is in stocks.

Overall, the results above show that the factors driving the bid premium vary significantly across methods of payment. The slope coefficients of the various determinants change significantly under alternative regimes. For example, expected synergies affect the premium only for cash bids, while friendly bids are significantly related to the premium only when stocks are offered. Consequently, the decision to self-select a specific method of payment could also depend on the bidder's anticipation of different bid premiums under alternative payment regimes. From this perspective, if bidders anticipate the premium they would offer under one form of payment or the other and decide accordingly, bidder opacity can have an indirect impact on the choice of method of payment to the extent it affects the bid premium in stock bids, but not in cash bids. Since only for stock bids is greater opacity associated with lower premiums, the differential in premium expectations would increase with the opacity of the bidder and stock payments would become relatively less costly and thus more likely for more opaque bidders. Figure 4 plots the difference in the predicted premiums of cash and stock bids for different levels of bidder opacity. For more opaque bidders, the differential in premium expectations is indeed larger. For example, for a hypothetical bidder at the bottom fifth (i.e., the 20^{th} percentile) of the distribution of firm opacity, the estimated cash premium would exceed that of a stock bid by just around 2% while, ceteris paribus, for the same bidder at the top fifth (i.e., the 80^{th} percentile, approximately one standard deviation more opaque, given the distribution of bidder opacity), the difference in predicted premiums would be around 8%, which, for an average transaction, would correspond in this latter case to slightly more than $100 million.

Figure 4. Bidder opacity and cash versus stock premium expectations

This figure plots the difference in fitted premiums of cash minus stock bids at different percentiles of the distribution of bidder opacity, BdrOpq, measured in terms of our index.



Fitting estimates from the system of equations in Table 5, we compute for each observation a projection of what would have been the bid premium under alternative forms of payment. As expected, we observe a substantial difference in fitted bid premiums across methods of payment. As for the actual bid premiums, the fitted premiums for stock payments are, on average, smaller than for cash offers. The fact that the difference across methods of payment is narrower for actual premiums than for fitted premiums (4% vs. 6%, respectively) may be the first evidence of strategic bidding behavior. Gaps in premiums induce bidders to opt for one means of payment over the other and the observable differences are thus leveled. Table 6 compares, conditional on the observed form of payment, actual bid premiums with fitted estimates had the alternative form of payment been chosen.

Table 6. Structural self-selection model estimation: Bid premium predictions

*This table compares actual bid premiums with anticipated bid premiums if the alternative form of payment had been chosen and analyzes differences in fitted premiums across methods of payment. Differences in means and medians are compared with the t-test and the Wilcoxon test, respectively. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels.*

	Cash			Stock		
	Mean	Median	SD	Mean	Median	SD
Actual premium	0.54	0.45	0.40	0.50	0.42	0.39
Fitted premium under alternative MP	0.54	0.52	0.15	0.55	0.54	0.14
Change in premium	0.00	0.07***		0.05***	0.12***	
t-Test, Wilcoxon	(0.28)	(3.02)		(3.25)	(5.23)	
change is > 0		61%			63%	

Evidence shows that the actual stock bids would require a significantly higher premium if they were in the alternative form of payment. Indeed, in 63% of the cases the fitted cash premium is above the actual stock premium. Both tests of means and medians reject the null hypothesis that the change in premium is not statistically different from zero at the 1% level of significance. Actual stock bidders would pay significantly more in cash offers. Evidence on actual cash bidders is, however, less clear. While in 61% of the cases the fitted stock premium is above the actual cash premium, the results show that, on average, actual cash bids do not pay a lower premium than if they were in the alternative form of payment. In line with H5, these differences may indicate that bidders increasingly opt for stock bids as the difference in anticipated cash and stock premiums grows. However, the observed effect again depends on deal materiality. Only for larger-value transactions do the benefits of making a relatively less costly stock bid become substantial. Since the method of payment actually observed is the outcome of a multidimensional decision, to draw any significant conclusion from this effect, we need to control for other potential determinants. Table 7 reports the estimates for the choice of the method of payment, equation (1), using fitted values from the first step to determine the differential of premiums across cash or stock bids (DeltaPrm) and its interaction with deal materiality (DeltaPrmMat). Estimates for a benchmark model that does not account for bid premium expectations are reported in the first column, while estimates in the second column are for the augmented model.

Table 7. Structural self-selection model estimation: Step 2

*This table reports coefficients and t-statistics (in parentheses, based on robust standard errors clustered at the year level) for an ordered probit model. The dependent variable MP is a dummy variable that takes the value of zero if the transaction is to be settled using only cash, one if a mixture of cash and stocks is offered, and two if only an exchange of shares is intended. Independent variables are summarized in Table 3. In column (1), estimates for a baseline model specification are reported, while column (2) reports estimates of the augmented model that includes the difference in fitted premiums for cash and stock bids, DeltaPrm, and its interaction with deal materiality, DeltaPrmMat. The variables TgtOpq and BdrOpq measure, respectively, the opacity of the target and of the bidder in terms of our index; DealMat captures the materiality of the transaction, measured as the value of the transaction over the bidder's market capitalization; TgtOpqMat is an interaction term designed to capture the dynamics between deal materiality and target opacity; BdrCash is representative of a firm's financial constraints in terms of cash holdings, computed as the amount of the bidder's cash holdings over the value of the transaction; CapGain is an indicator variable for bids announced in 1989–1996 to capture the higher tax rate on capital gains; BdrMB is the bidder's market-to-book value; BdrInvOpp proxies for the bidder's investment opportunities and is computed as the industry average of capital expenditures and R&D expenses; BdrOwn and TgtOwn capture, respectively, ownership concentration and the potential risk of control dilution if the transaction is settled with stock, proxied by the cumulative top five institutional percentage ownerships; Toehold identifies bids in which the bidder owns a stake in the target in excess of 5% pre-bid; InvSentiment is an index of price earnings reflecting market-wide investor sentiment; and Tend, Moe, Focus, Friend, and Wave are dummy variables to capture, respectively, if a bid is in the form of a tender offer, if it is a merger of equals, if it is initiated for business specialization or diversification, if its attitude is friendly, and if it is part of a merger wave at the industry level. All model specifications are estimated, including bidder industry fixed effects, classified according to the Fama–French five-industry classification. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.*

	Method of Payment [Cash=0; Hybrid=1; Stock=2] (1)	Method of Payment [Cash=0; Hybrid=1; Stock=2] (2)
TgtOpq	-0.16	-0.22
	(-0.92)	(-1.18)
BdrOpq	-0.21	-0.13
	(-0.86)	(-0.44)
DealMat	0.46***	0.49***
	(3.29)	(3.43)
TgtOpqMat	0.82**	0.82**
	(2.46)	(2.42)
DeltaPrm		-0.60
		(-1.15)
DeltaPrmMat		0.63**
		(2.02)
BdrCash	-0.04***	-0.04***
	(-3.10)	(-3.14)
BdrMB	0.05***	0.05***
	(4.18)	(4.22)

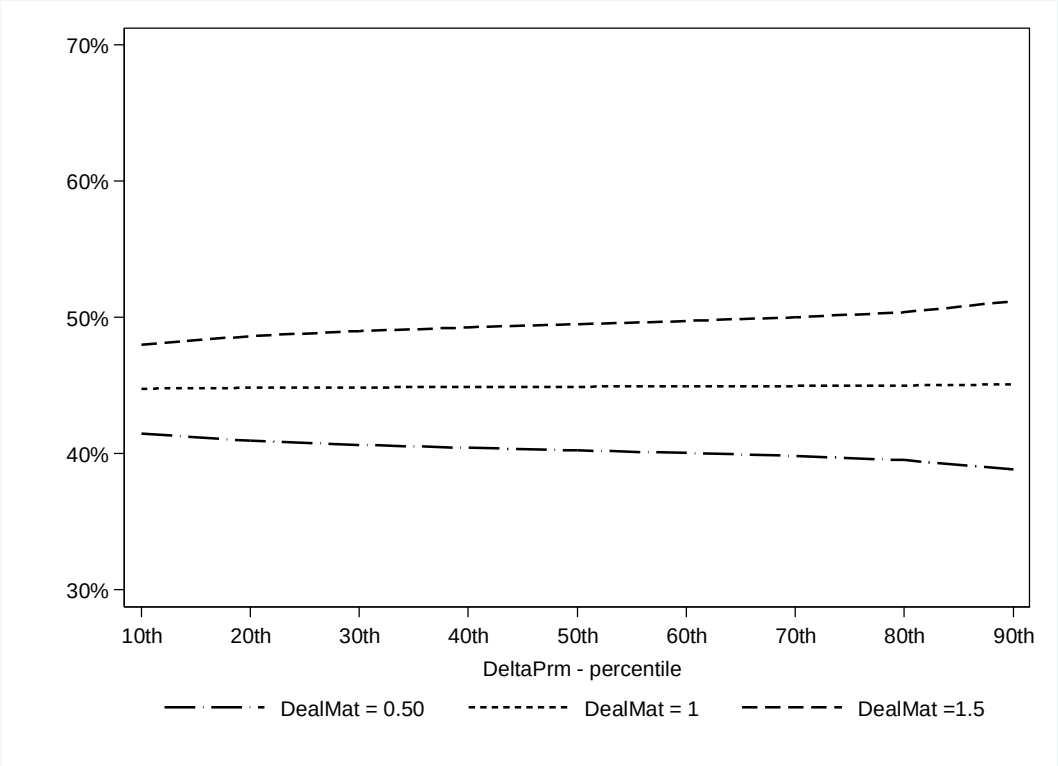
BdrInvOpp	3.06***	3.03***
	(5.28)	(5.17)
CapGain	0.75***	0.74***
	(5.78)	(5.70)
TgtOwn	-0.45	-0.47
	(-0.98)	(-1.02)
BdrOwn	-0.48	-0.47
	(-1.08)	(-1.05)
Toehold	-0.51**	-0.50**
	(-2.42)	(-2.38)
Moe	1.55***	1.44**
	(2.92)	(2.57)
Tend	-1.84***	-1.80***
	(-12.99)	(-11.39)
Friend	0.60***	0.65***
	(3.14)	(2.89)
Focus	0.17*	0.18*
	(1.88)	(1.92)
InvSentiment	1.10***	1.08***
	(3.84)	(3.98)
Wave	0.63***	0.60***
	(6.40)	(5.60)
N. Obs.	936	936
Pseudo-R^2	0.29	0.30

Evidence shows that, when deal materiality is substantial, the choice of the method of payment is indeed partly determined by bidder anticipation of different bid premiums under alternative payment regimes. In particular, the interaction term between the differential in expected premiums and deal materiality (DeltaPrmMat), which is positive and significant, captures the increasing likelihood of a stock bid as deal size grows and the amount by which the expected cash premium exceeds the expected stock premium increases. In a simulation exercise, in Figure 5 we plot what would be, on average, the predicted probability of a stock bid for different levels of DeltaPrm and deal materiality. While, on average, a one standard deviation increase in the difference between cash and stock premium expectations would not significantly increase the probability of choosing a stock payment, the magnitude of the effect varies with deal materiality. Indeed, stylized evidence shows that the rate at which the predicted probability of a stock bid increases in the premium differential is higher the more material the transaction is. For example, if the value of the deal exceeds the bidder's market capitalization, a hypothetical bid at the first quartile (i.e., the 25th percentile) of the distribution of DeltaPrm would be approximately 2% more likely in the form of stocks than a bid at the top quartile (i.e., the 75th

percentile, approximately a one standard deviation larger premium differential, given its distribution).

Figure 5. Premium expectations and the probability of a stock bid

This figure plots the predicted probability of a stock bid at different percentiles of the distribution of the differential in cash minus stock bid premium expectations, and for different levels of deal materiality. DeltaPrm is the difference in fitted predictions of premiums for cash and stock bids and DealMat captures the materiality of the transaction, measured as the value of the bid over the bidder's market capitalization.



Since bidder opacity is partly reflected in DeltaPrm, the observed significant effect is consistent with opacity having an additional indirect impact on the choice of the method of payment through its effect on the bid premium. In particular, as discussed above and consistent with H3, the opacity of the bidder would augment the differential in premiums and then eventually increase the likelihood to observe a stock bid. To gauge this indirect effect of bidder opacity, we estimate from the premium equations that a one standard deviation increase in bidder opacity would correspond to a 6% increase in the difference between cash and stock premium expectations and thus, on average, eventually in a 0.4% increase in the likelihood of a stock bid in the case the transaction exceeds the bidder's market capitalization.

Evidence in support of H1, the direct effect of target opacity, is robust to the inclusion of the differential premium in the model. The likelihood of observing a stock

bid is positively associated with target opacity when the latter is interacted with deal materiality. The overall results are then consistent with bidders addressing the concern of overpayment with the choice of the method of payment while they strategically negotiate the bid premium to affect the probability of bid success. Regarding the effects of control variables, these are mainly consistent with previous estimates of the reduced-form equation in Table 5. A closer look at the pseudo-R^2 values across model specifications, however, suggests that the effect of the differential in premium expectations is too small to improve the fit of the model considerably. The pseudo-R^2 value of the augmented model is only 1% larger and a likelihood ratio test fails to reject the null hypothesis that observed data are equally likely under the baseline and augmented models.

3.4.2. Firm opacity and the likelihood of being a bidder or a target

Selection bias is a potential concern of our empirical analysis since the choice of the method of payment and the bid premium are observable only if an offer is made. From our perspective, it could be a concern if opacity were to result in different distributions of firms not attempting an acquisition across methods of payment. This would be the case if some potential bidders might not actually bid because of their great concerns over potential overpayment or bid rejection due, respectively, to the target's opacity or their own. For example, among potential bidders, those attempting an acquisition may be only those that are relatively less opaque, which would translate into a bias against finding support that preference for stock payments increases with bidder opacity. Vice versa, among all potential targets, it may be the case that only those that are relatively less opaque attract offers by bidders, resulting, instead, in a bias against finding support that preference for stock payment increases with the opacity of the target. To control for this potential bias, which we argue would result in an underestimation of the role of opacity as a determinant of the method of payment, we propose a two-stage Heckman (1979) analysis of the linear probability model of making a stock bid.

In particular, we first estimate a probit model for the likelihood of potential bidders actually making a bid and of a potential target actually attracting an offer. Then, on the basis of these estimates, we compute the inverse Mills ratio (IMR) for each observation and include it as a control variable in a linear probability model for the choice of stocks as the method of payment.

To predict bidders and targets, we consider all actual bidders and targets in the period 1979–2011 together with a selection of year- and industry-matched (by two-digit SIC codes) inactive firms. For the dependent variable we employ a dummy,

Bid, designed to identify firms that, depending on the specification, make/receive a bid in the corresponding year. Our set of explanatory variables includes firm opacity, captured with our index, and following Comment and Schwert (1995), Harford (2002), and Faccio and Masulis (2005), measures of firm size, financial leverage, cash holdings, asset growth rate, capital expenditures and research and development expenses, the market share of industry sales, and the intensity of M&A activity in the industry.

Table 8. Selection of bidders and targets

*This table reports the estimated coefficients and t-statistics (in parentheses, based on robust standard errors clustered at year level) of a probit model of the likelihood of making a bid or receiving an offer. The dependent variable is a dummy variable that captures if the firm makes a bid or receives an offer in the following year. In the first column, it takes the value of one if an offer is made and zero otherwise, in the second column it takes the value of one if an offer is received and zero otherwise, and in the third column it takes the value of one if an offer is either made or received and zero otherwise. IndexOpq captures the opacity of the firm in terms of our index, Size is measured as the natural logarithm of a firm's total assets adjusted for inflation, Leverage is the financial leverage of the firm, Cash measures a firm's cash holdings scaled by total assets, Growth is the rate of change of total assets, MktShare captures how much of the aggregate industry sales a firm accounts for, CapexR&D represents capital expenditures and R&D expenses scaled by total assets, and IndMnA captures the intensity of M&A activity at the industry level. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.*

	Bidder	Target	Bid
IndexOpq	-0.65***	-0.15***	-0.33***
	(-6.86)	(-2.64)	(-5.42)
Size	0.13***	-0.04	0.06**
	(3.61)	(-0.16)	(2.56)
Leverage	-0.37	-0.29*	-0.40***
	(-1.56)	(-1.77)	(-2.72)
Cash	0.06	-0.13	0.06
	(0.31)	(-0.83)	(0.47)
Growth	0.47***	0.13	0.14*
	(3.11)	(1.46)	(1.70)
CapexR&D	-0.84**	-1.77***	0.58***
	(-2.47)	(-2.75)	(2.73)
MktShare	-0.75*	0.88***	-0.81***
	(-1.89)	(3.35)	(-3.03)
IndMnA	0.25***	0.18***	0.21***
	(8.95)	(8.43)	(11.30)
Constant	-1.23***	-0.57***	-0.81***
	(-9.27)	(-5.83)	(-10.19)
N. Obs.	1620	1671	3227
R^2	0.34	0.09	0.15

The estimation results of the probit models in Table 8 suggest that firm opacity is negatively and significantly related to the likelihood of bidders making a bid and of targets attracting an offer. Among all potential bidders, those attempting an acquisition are indeed relatively less opaque and, among all potential targets, only those that are relatively less opaque attract offers by bidders. Most other explanatory variables are statistically significant and of the expected sign. Specifically, we observe that the likelihood of a potential bidder actually attempting an acquisition increases in its size, consistent with the greater appetite of larger firms. The same holds for firms growing at faster rates and those operating in industries characterized by intense M&A activity. On the contrary, firms with higher capital expenditures and those already in control of larger market shares are less likely to become bidders. Bidder attention is usually concentrated among less leveraged targets with low capital expenditures and high market shares in industries of intense M&A activity.

To assess whether the likelihood of the bidder making a bid or the target receiving an offer is related to the choice of the method of payment, we use the estimates from the probit models to calculate the corresponding IMR. Table 9 then reports estimates of different specifications of a linear probability model for the choice of stock as the method of payment that include the IMR for the likelihood of, respectively, making a bid (in model (2)), receiving an offer (in model (3)), or either of the two (in model (4)) as an additional control variable to account for the potential selection bias. The dependent variable in this case is dichotomous and indicates whether any stock is used to settle the transaction. Moreover, for each model specification in which it is included (i.e. (2)-(II), (3)-(II), and (4)-(II)), DeltaPrm is first estimated by augmenting the selection equation in our simultaneous model with the corresponding IMR.

Table 9. Selection of bidders and targets and the method of payment

This table reports the estimated coefficients and t-statistics (in parentheses, based on robust standard errors clustered at the year level) for a linear probability model for the choice of the method of payment. The dependent variable MP is a dummy variable that takes the value of zero if the transaction is to be settled using only cash and one if any stock is offered. Model specification (1) is the baseline case. Alternative specifications include the IMR, computed on the basis of the estimates of a probit model for the likelihood of, respectively, making a bid (2), receiving an offer (3), and either making a bid or receiving an offer (4). The variables TgtOpq and BdrOpq measure, respectively, the opacity of the target and of the bidder in terms of our index; DeltaPrm is the difference in fitted premiums for cash and stock bids; DealMat captures the materiality of the transaction, measured as the value of the transaction over the bidder's market capitalization; TgtOpqMat is an interaction term designed to capture the dynamics between deal materiality and target opacity; DeltaPrm is the difference in fitted premiums for cash and stock bids; and DeltaPrmMat is its interaction with deal materiality. In each model specifications in which it is included (2-II, 3-II and 4-II),

*DeltaPrm is first estimated by augmenting the selection equation in our simultaneous model with the corresponding IMR. BdrCash is representative of a firm's financial constraints in terms of cash holdings, computed as the amount of the bidder's cash holdings over the value of the transaction; CapGain is an indicator variable for bids announced in 1989–1996 to capture the higher tax rate on capital gains; BdrMB is the bidder's market-to-book value; BdrInvOpp proxies for the bidder's investment opportunities and is computed as the industry average of capital expenditures and R&D expenses; BdrOwn and TgtOwn capture, respectively, ownership concentration and the potential risk of control dilution if the transaction is settled with stock, proxied by the cumulative top institutional percentage ownerships; Toehold identifies bids in which the bidder owns a stake in the target in excess of 5% pre-bid; InvSentiment is an index of price earnings reflecting market-wide investor sentiment; and Tend, Focus, Friend, and Wave are dummy variables to capture, respectively, if a bid is in the form of a tender offer, if it is initiated for business specialization or diversification, if its attitude is friendly, and if it is part of a merger wave at the industry level. All model specifications are estimated, including bidder industry fixed effects, classified according to the Fama–French five-industry classification. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.*

	Stock Bid (1)	Stock Bid (2)		Stock Bid (3)		Stock Bid (4)	
	(I)	(I)	(II)	(I)	(II)	(I)	(II)
TgtOpq	-0.18	-0.26	-0.28	-0.27	-0.22	-0.18	-0.22
	(-0.85)	(-1.18)	(-1.13)	(-1.21)	(-0.90)	(-0.85)	(-0.91)
BdrOpq	-0.07	-0.26	-0.20	0.05	-0.04	-0.10	-0.05
	(-0.25)	(-0.87)	(-0.57)	(0.17)	(-0.11)	(-0.35)	(-0.15)
DealMat	0.68***	0.54***	0.74***	0.66***	0.68***	0.62***	0.82***
	(3.31)	(2.59)	(3.51)	(3.12)	(3.11)	(2.99)	(3.89)
TgtOpqMat	1.01**	0.79*	0.80*	0.99*	0.80*	0.91*	0.88*
	(2.02)	(1.68)	(1.73)	(1.92)	(1.71)	(1.83)	(1.87)
DeltaPrm			-0.54		-0.11		-0.61
			(-0.94)		(-0.17)		(-1.07)
DeltaPrmMat			1.22***		1.06**		1.28***
			(2.92)		(2.26)		(3.02)
BdrCash	-0.05***	-0.04***	-0.04***	-0.05***	-0.05***	-0.04***	-0.04***
	(-3.21)	(-3.04)	(-3.09)	(-2.76)	(-2.80)	(-3.06)	(-3.12)
BdrMB	0.04***	0.05***	0.06***	0.05***	0.06***	0.05***	0.05***
	(3.23)	(3.56)	(3.65)	(3.30)	(3.42)	(3.39)	(3.51)
BdrInvOpp	3.73***	3.36***	3.35***	3.86***	3.86***	3.57***	3.51***
	(5.45)	(4.51)	(4.39)	(5.18)	(5.08)	(4.86)	(4.65)
CapGain	0.58***	0.56***	0.55***	0.62***	0.59***	0.56***	0.55***
	(4.33)	(4.05)	(3.90)	(4.28)	(4.04)	(4.08)	(3.91)
TgtOwn	-0.71	-0.70	-0.82	-0.90	-0.97*	-0.71	-0.84
	(-1.35)	(-1.31)	(-1.50)	(-1.59)	(-1.69)	(-1.33)	(-1.54)
BdrOwn	-0.15	-0.25	-0.19	-0.15	-0.14	-0.17	-0.12
	(-0.28)	(-0.45)	(-0.35)	(-0.28)	(-0.25)	(-0.30)	(-0.21)
Toehold	-0.33	-0.36	-0.33	-0.23	-0.21	-0.34	-0.32

	(-1.48)	(-1.61)	(-1.49)	(-1.12)	(-1.01)	(-1.53)	(-1.42)
Tend	-1.83***	-1.78***	-1.79***	-1.74***	-1.80***	-1.77***	-1.78***
	(-12.50)	(-12.17)	(-11.38)	(-11.60)	(-9.21)	(-12.13)	(-11.27)
Friend	0.64***	0.55**	0.52**	0.65***	0.50*	0.57**	0.54**
	(2.80)	(2.37)	(1.98)	(2.82)	(1.75)	(2.48)	(2.09)
Focus	0.28***	0.28***	0.27**	0.33***	0.29**	0.28***	0.28**
	(2.61)	(2.60)	(2.44)	(2.98)	(2.48)	(2.64)	(2.47)
InvSentiment	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***
	(3.24)	(3.31)	(3.36)	(2.76)	(2.73)	(3.22)	(3.31)
Wave	0.52***	0.55***	0.53***	0.48***	0.48***	0.53***	0.50***
	(4.71)	(4.90)	(4.41)	(4.16)	(3.90)	(4.66)	(4.17)
BdrIMR		0.44**	0.35**				
		(2.48)	(1.99)				
TgtIMR				0.07	0.08		
				(0.34)	(0.37)		
BidIMR						0.29	0.20
						(1.30)	(0.93)
Constant	-1.14***	-1.33***	-1.29***	-1.10**	-1.03**	-1.24***	-1.20***
	(-2.89)	(-3.10)	(-3.00)	(-2.50)	(-2.30)	(-2.87)	(-2.78)
N. Obs.	926	879	879	837	837	879	879
R^2	0.38	0.37	0.38	0.37	0.38	0.37	0.37

The estimation results are consistent with our main analysis. In all model specifications, target opacity is positively and significantly related to the use of stock bids only for material bids, while bidder opacity, however, is not related to the use of stock bids in any significant way. In addition, the differential in the expected bid premiums of cash and stock bids is still positively related to the probability of a stock payment in high-valued bids. The links we observe in our main analysis between firm opacity and the choice of the method of payment are not biased down. Controlling for the likelihood of making or receiving a bid does not affect the observed impact of the target's or bidder's opacity on the preferred method of payment. However, we observe that the coefficients of the IMR for the selection of bidders are positively significant. This finding suggests a positive correlation between the decision to make a bid and the preference for stock that is not captured by the model.

3.4.3. Firm opacity and the bid premium

In our main analysis we observe that the bid premium is positively related to target opacity and, only for stock bids, negatively associated with the opacity of

the bidder. In this section we provide additional stylized results to support these trends by studying the bid premium across subsamples of bids that vary with respect to the discretion of the choice of the method of payment.

Table 10. Firm opacity and the bid premium

Panel a. reports average frequencies across methods of payment for different subsamples of bidders. Panels b. and c. report estimates of average bid premiums overall and for several subsample of bids. In this table BB, BB+, BBB-, BBB, and BBB+ represent the S&P long-term rating class of the bidder the month before the bid announcement; MOE and TEND identify, respectively, 10 and 289 bids structured as mergers of equals and tender offers; and. LowQ includes bids by bidders ranked in the lowest quartile of the distribution of Tobin's Q.

Panel a. Method of Payment across Bidder Subsamples

	All (1060)	BB (26)	BB+ (33)	BBB- (45)	BBB (47)	BBB+ (79)	MOE (11)	LowQ (262)	TEND (289)
Cash	47.7%	65.4%	33.3%	26.7%	63.9%	41.8%	-	55.0%	90.7%
Hybrid	12.6%	11.5%	18.2%	22.2%	8.5%	21.5%	10,0%	16.4%	5.5%
Stock	39.6%	23.1%	48.5%	51.1%	27.7%	36.7%	90.0%	28.6%	3.8%

Panel b. Average Bid Premium across Levels of : Bidder Opacity

	All	BBB-	MOE	LowQ	TEND
Low	52.5%	65.7%	25.4%	57.8%	60.6%
Med	48.6%	21.2%	15.9%	49.2%	54.1%
High	55.4%	16.8%	2.1%	59.5%	63.7%

Panel c. Target Opacity

	All
Low	46.5%
Med	49.2%
High	61.9%

Firms with credit rating BBB- are on the bottom tier of investment grade. A downgrade from investment to speculative grade would result in significantly higher financing constraints, since their cost of debt would sharply increase and their accessibility to debt capital markets would shrink. Kisgen (2006), Kisgen (2007) and Kisgen (2009) provides evidence that firms model their capital structure decisions to achieve or maintain a specific rating level by issuing equity, buying back debt, or through asset sales and dividend cuts. From this perspective, we conjecture that bidders consider what would be the differential impact of the terms of the offer on their rating and that those in the lowest investment grade rating class, BBB-, would have relatively less discretion over what type of consideration to use. To avoid the costs of a downgrade to speculative grade, bidders rated BBB- will then be relatively more reluctant to use cash bids. Panel a. of Table 10 indeed shows that, for bidders rated BBB-, the fraction of cash bids observed is lower than for any of the adjacent rating classes. We exploit the reduced optionality on the method of payment to inspect the relation between the bid premium and bidder opacity in a more isolated setting. Consistent with the results of our main analysis, Panel b. of Table 10 confirms that the bid premium

is, on average, decreasing in the opacity of bidders rated BBB-, for whom stock payments are more likely, and not for other bidders in general.

Another subset of bids for which optionality on the method of payment is limited includes transactions structured as mergers of equals because of the large relative size of the target with respect to the bidder's. In these cases a cash bid would simply be unaffordable. Panel b. of Table 10 again confirms that the bid premium is, on average, decreasing in the opacity of the bidder when the transaction is structured as a merger of equals, but not otherwise.

Undervalued bidders would, instead, be reluctant to use stocks. Indeed, in Table 10 we observe that bidders ranked in the lowest quartile according to Tobin's Q use cash bids more frequently. As predictable, the level of the premium for these bids is unrelated to bidder opacity. Analogously, tender offers are mostly associated with cash bids and the bid premium is high, notwithstanding bidder opacity.

Consistent with the results of our main analysis, Panel c. of Table 10 confirms that the bid premium is, on average, increasing in the opacity of targets generally and notwithstanding the method of payment.

4. Conclusion

Our empirical tests show the joint effect of target and bidder opacity on the simultaneous determination of the method of payment and the bid premium in a sample of M&A bids by and for U.S. publicly listed firms over the period 1979–2011. Overall, our results suggest that when targets are more opaque and the value of the transaction is substantial, concern of overpayment leads bidders to select stock bids to benefit from contingent pricing and risk sharing. Bidders then use the bid premium as a signaling device of their valuation of the target, to dominate potential competitors' bids and, in stock bids, to signal their own valuation.

Our analysis, in particular, accounts for the simultaneity of the determination of the premium and the method of payment and documents that target and bidder opacity contribute to determine the difference in anticipated premiums under cash and stock payment regimes, respectively, which is positively associated with the use of stock for bids of substantial materiality. Testing jointly and directly the impact of both target and bidder opacity on bid characteristics, we observe that, in fact, premiums are higher for cash bids and increase with the opacity of the target. Only for stock bids, we report that premiums are also negatively related to bidder opacity. The first results are consistent with arguments by Fishman (1989) and Chatterjee et al. (2012), while the latter support the arguments of Myers and Majluf (1984) and Rhodes-Kropf and Viswanathan (2004). Moreover, we observe the preference for

stock bids increases with the opacity of the target for bids of substantial materiality, consistent with the adverse selection rationale of Hansen (1987).

Our direct investigation of the implications of firm opacity on the realization of an M&A deal sheds light on the rationality of the observed bidding behavior and the efficiency of the market of corporate control by quantifying the impact of the entailed informational frictions on managerial decisions and negotiation. Moreover, it reveals the motives that underlie the prominent role played by financial intermediaries acting as advisors and the continuous effort to design market devices to convey relevant information. In this respect, our results are related to those of Kesner et al. (1994), who take the agency theory perspective and evaluate how the interests of, respectively, bidders, targets, and their advisors reflect on bidding behavior. Furthermore, our results complement those of Reuer et al. (2012), who document how a target's association with a prominent investment bank, venture capitalist, or alliance partner conveys valuable information and positively affects the bid premium.

A natural extension of the analysis would then be to extend the proposed model for the choice of the method of payment and the bid premium to study the information content of a deal's announcement and show the implications of how much is paid and how for deal success and shareholder value creation.

Appendix A: Controls

The control variables include firm- and deal-specific characteristics that previous research indicates as significant determinants of the method of payment and the bid premium. Some of them are common to the method of payment and the bid premium, while others are expected to affect either one or the other dimension of the bid.

Bid size affects bidder concerns about the choice of the method of payment, since the impact of the use of stock instead of cash becomes appreciable only for deals of significant size, consistent with Hansen (1987). Deal materiality (DealMat) is measured as the ratio of the deal value to the market value of the bidder.[25]

The relative size of the target with respect to the bidder does not have a significant impact on the choice of the method of payment, according to Martin (1996), Ghosh and Ruland (2002), and Chemmanur et al. (2009). Instead, Zhang (2001) reports that the larger the target in comparison with the size of the bidding firm, the higher the probability of a stock payment. Accordingly, Faccio and Masulis (2005) document that the probability of a stock payment increases with the size of the target and decreases with the size of the bidder, since larger acquiring firms suffer from fewer debt constraints because of their higher debt capacity and lower expected bankruptcy costs. Regarding the bid premium, Schwert (2002) documents lower premiums associated with higher relative size and Moeller et al. (2004) report a negative relation between target size and bid premium. The sizes of the target and acquiring firms (BdrSize and TgtSize) are computed as the logarithmic transformations of their respective total assets reported at the end of the year prior to the announcement date.

According to Martin (1996), the more available cash the bidder firm has or the higher its debt capacity, the less likely it will prefer a stock offer. A bidder's ability to settle the transaction using cash (BdrCash) is measured by the ratio of its cash holdings to the value of the deal. However, since a cash payment may well be accompanied by a new debt issue,[26] the bidder's residual borrowing capacity is also relevant. In particular, financial leverage (BdrLev) considers both short-and long-term financial

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25 The market value of the bidder is computed on the basis of its stock price 63 days before the announcement date, since evidence of Schwert (1996) suggests that, on average, no information on the characteristics of the bid is then available to investors.

26 Faccio and Masulis (2005) argue that cash offers generally require debt financing, since the latter would dominate stocks as the funding source of a cash payment, given its lower flotation costs and loss of the deal's potential tax-free capital gains treatment. Martynova and Renneboog (2009) find empirical support for this trend in a sample of European transactions.

debt at the end of the year prior to the announcement date over total assets. Moreover, since bidder debt capacity is tightly interconnected with its ability to generate cash flows, we measure the ratio of the firm's operating cash flow to the value of the deal (BdrCF). Noronha et al. (1996) and Faccio and Masulis (2005) report that the probability of a stock offer is positively related to both the bidder's leverage and financial constraints.

Following Wansley et al. (1983) and Gilson et al. (1988), we recognize that cash deals may be relatively more costly if the implied capital gains tax on target shareholders is considered. To control for different tax treatments across methods of payment, our controls include CapGain, which captures whether a bid was announced between 1989 and 1996, when stock market performance was good and the tax rate on capital gains was temporarily higher (28%).

Martin (1996), Zhang (2001), and Faccio and Masulis (2005) argue that the more important the bidder's investment opportunities are, the higher the probability of a stock offer. The intuition is that this form of payment leaves intact liquidity and imposes no constraints on future investment opportunities. In fact, even in the case a cash payment is accompanied by debt financing, only a share of the cash flows generated can then be used to invest in new projects. A stock payment, instead, allows bidders to save borrowing capacity and stay safe from the concerns of debt overhang. Investment opportunities are primarily represented in the literature by a firm's market-to-book ratio. However, according to Dong et al. (2006), any measure of market to book is a proxy for both past stock performance and investment opportunities. In line with this argument, Carleton et al. (1983) and Zhang (2001) provide empirical evidence in support of the bidder's past stock performance, still measured by its market-to-book ratio, is positively associated with the probability of a stock offer, consistent with bidder willingness to exploit the high valuation of its stock. Although the two interpretations of market to book work in the same direction, we try to separate investment opportunities from past stock performance by using capital expenditures and R&D expenses to proxy for the firm's liquidity needs for investment. Once investment opportunities (BdrInvOpp) are controlled for, the market-to-book ratio (BdrMB) is then expected to capture just past stock performance, as for Di Giuli (2013). Analogously, regarding the bid premium, Dong et al. (2006) show that higher target valuation, in terms of market-to-book ratio (TgtMB), is associated with a lower bid premium.

Stultz (1988) and Amihud et al. (1990) document that bidders controlled by more concentrated ownership stakes are associated with the more frequent use of cash because their shareholders are reluctant to use stock and risk diluting their control. However, Martin (1996), Ghosh and Ruland (2002), and Faccio and Masulis (2005) confine this argument only to an intermediate range of ownership, since bidders with

diffuse or highly concentrated ownership are less concerned with corporate control issues and the risk of dilution is mainly driven by the extent of the target's ownership concentration and the materiality of the deal size. In fact, the more concentrated the target's ownership structure, the larger the new blockholder's position is in the merged entity resulting from stock acquisition, threatening the bidder's corporate governance. In addition, the risk of creating a new blockholder is only significant for larger deals. Our analysis controls for ownership concentration and dilution concerns by including the size of the bidder's and target's cumulative percentage stakes held by the top five institutional shareholders according to the latest SEC 13F filings before the announcement date (BdrOwn and TgtOwn, respectively).

Another interesting dimension related to the ownership structure of the firms involved in a deal may be cross-ownership. Strategic motives and the aim to reduce informational gaps may induce the bidder to obtain a toehold in the target firm before bidding. We therefore use an indicator (Toehold) to capture whether a bidder owns an interest in excess of 5% in the target pre-bid.[27] Officer (2003) and Gaspar et al. (2005) document that a bidder pays less when it has a toehold in the target. On the other hand, Chatterjee et al. (2012) document that bid premiums are higher for targets with a larger fraction of institutional ownership.

Regarding deal attributes, Martynova and Renneboog (2009) report that the deal's attitude affects the choice of the method of payment. In particular, stock payment is more likely in friendly deals in comparison to hostile deals. A dummy variable (Friend) is therefore designed and included in the analysis to identify friendly deals, which can be deals with less severe informational concerns. Accordingly, Jennings and Mazzeo (1993), Cotter and Zenner (1994), and Schwert (2002) document that the bid premium is positively related to a hostile bid.

Another dimension of difference among deals regards their scope in terms of business specialization or diversification. Faccio and Masulis (2005) document that firms in the same industry are more inclined to use stocks as a method of payment. The analysis includes a dummy variable (Focus) to identify deals that involve firms operating in the same business, on the basis of the first two digits of their SIC codes. Again, these can be deals with less severe informational concerns. Accordingly, Morck et al. (2012) find that investors respond negatively to diversifying acquisitions, reflecting eventual overpayment of the target.

Several distinct merger waves took place over the considered period. Chidambaran et al. (2010) examine the impact of merger waves on the means of payment and find that stock payments are more likely in intense merger markets. The analysis includes

[27] The 5% threshold corresponds to the minimum stake for which a bidder has to file Schedule 13D with the SEC.

a dummy variable (Wave) to identify deals that are part of a merger wave. In particular, we recognize that mergers waves can originate with different underlying forces, at the industry or a broader level, which can sensibly and differently affect the choice of the method of payment. We then design our dummy to identify deals occurring during periods in which we record an exceptional concentration of merger activity within the industry of either the target, the bidder, or both.[28] In this regard, Chatterjee et al. (2012) document that bid premiums are higher during periods of intense merger activity or in periods of more favorable investor sentiment. To capture investor sentiment (InvSentiment), the analysis of the premium includes the price-to-earnings ratio index series for S&P 500 firms.

Finally, we consider that the preference for a specific method of payment may depend on whether the deal is in the form of a tender offer with respect to a negotiated deal or configured as a merger of equals. We control for these dimensions with two indicator variables (Tend and Moe). In this regard, Berkovitch and Khanna (1991) predict a higher bid premium for tender offers. They model a merger as a bargaining game between bidders and a target, while a tender offer is an auction in which bidders arrive sequentially and compete for the target. In equilibrium, acquisitions via tender offer are associated with bidders expecting to gain synergies above a resultant threshold. The empirical evidence of Huang and Walkling (1987) confirms higher premiums in tender offers.

Additional controls for the bid premium, which, according to prior research, can significantly affect the bid premium, include the target's stock price run-up (RunUp),[29] expected synergies (Syn),[30] and the occurrence of rival bids (Competition). In particular, Edmister and Walkling (1985) and Haunschild (1994) indicate competitive bidders enhance bid price and then the premium, while Ismail (2011) and Chatterjee et al. (2012) document that a higher target's stock price run-up and higher expected synergies result in higher bid premiums.

Appendix B: Measuring firm opacity

A potential concern for our analysis is related to the measurement of firm opacity. Our methodology replicates that of Bharath et al. (2009), who form an index on the basis of several measures of adverse selection risk from market microstructure to

[28] To identify periods of unusual merger activity concentration at the industry level, we follow Harford (2005).

[29] The run-up is the cumulative return of the target's stock price in the window [-62,-1] with respect to the announcement date.

[30] The expected synergies are estimated according to Bradley et al. (1988) on the basis of the capitalization-weighted average of cumulative abnormal returns in the period [-62,126].

study the impact of a firm's private information on capital structure decisions. This section first describes in detail the constituents of our index, how it is constructed, and its main properties. Then, it presents some robustness test to validate its use in our empirical analysis.

Our index constituents include (i) the illiquidity measure of Amihud (2002), (ii) the volume–return autocorrelation of Llorente et al. (2002), (iii) the probability of informed trading of Easley et al. (1996), (iv) the adverse selection component of the proportional effective spread of Roll (1984), (v) the reversal coefficient of Pastor and Stambaugh (2003), and (v) the Amivest liquidity ratio of Cooper et al. (1985) and Amihud et al. (1997). We estimate these measures for all firms i with price and volume data available from the CRSP in any given year y from 1979 to 2011.

Amihud (2002) illiquidity measure is a market microstructure indicator that is interpreted as representative of the price impact, which is increasing in firm opacity. Price impact, in fact, is a measure designed by Kyle (1985) to capture the permanent component of price change due to trades that move a stock price toward its unobserved fundamental value. Price impact is then higher for firms whose informational gap is larger (i.e., opaque firms), since relatively more information is revealed from trades. Amihud's illiquidity measure ($ILL_{i,y}$) is computed for all firms in our sample as the daily ratio of the absolute value of the stock return to its dollar volume, averaged over all observations in the year.[31]

The return–volume coefficient of Llorente et al. (2002) exploits instead the link between volume–return dynamics and speculation. Following their methodology, for each firm in our sample we estimate the relative importance of information in determining stock return dynamics as the coefficient $C2_{i,y}$ in the time series regression:

$$r_{i,y,d} = c_{0,i,y} + c_{1,i,y} r_{i,y,d-1} + c_{2,i,y} T_{i,y,d-1} r_{i,y,d-1} + \varepsilon_{i,y,d}$$

over all daily observations in a year, where $r_{i,y}$ are daily returns and $T_{i,y}$ is the logarithm of daily turnover (detrended with respect to its mean over the previous 100 observations). The higher the estimated coefficient, the more any stock price change is driven by information and then the more opaque the firm is.

The probability of informed trading of Easley et al. (1996) is an assessment of the likelihood of an informed order. It results from imbalances in the order flow: in principle, in fact, uninformed orders to buy and sell a firm stock occur randomly and therefore imbalances signal informed trading. Then, orders for opaque firms are more

[31] Amihud (2002) shows that this measure is strongly positively related to intra-day estimates of price impact. As suggested by Amihud (2002), we rescale the values by multiplying by 10^6 and, as suggested by Hasbrouck (2009), use a square root transformation.

clustered and the probability of informed trading for opaque firms is higher. We obtain $PIN_{i,y}$ for firms with stocks traded on the NYSE or AMEX between 1983 and 2001 from Easley et al. (2010).

The adverse selection component of the proportional effective spread of Roll (1984) exploits return autocorrelation to quantify the informational nature of price dynamics. Uninformed trading is associated with the negative autocorrelation of returns, since a variation in stock price is not accompanied by a change in the market expectation of its fundamental value. On the contrary, informed trades determine the positive autocorrelation of returns as the market gradually updates its expectation of a stock's fundamental value. We then estimate the adverse selection component of the proportional effective spread of a firm's stock, filtering its realized returns with a measure of its time-varying expected return according to George et al. (1991). In particular, $RAD_{i,y}$ is computed as $1-\pi_{1,i,y}^{2}$ from the regression

$$FRS_{i,y,d} = \pi_{0,i,y} + \pi_{1,i,y} RS_{i,y,d} + \varepsilon_{i,y,d}$$

over all daily observations in a year, where $RS_{i,y}$ is the proportional effective spread of Roll (1984) calculated on the basis of 60-day rolling autocovariances of returns as

$$RS_{i,y,d} = 200\sqrt{-cov(r_{i,y,d}, r_{i,y,d-1})} \qquad \text{if } cov(r_{i,y,d}, r_{i,y,d-1}) < 0$$

$$RS_{i,y,d} = -200\sqrt{cov(r_{i,y,d}, r_{i,y,d-1})} \qquad \text{otherwise}$$

and $FRS_{i,y}$ is the filtered proportional effective spread, computed as $RS_{i,y}$ but on the basis of the autocovariances of the residuals from a regression of daily returns on their expected return series (estimated with a market model over observations of the previous year). More opaque firms are characterized by a larger fraction of the proportional effective spread due to adverse selection.

The reversal coefficient of Pastor and Stambaugh (2003) results from the interaction between a stock's return and its lagged order flow. In particular, the intuition is that the greater is the extent of a firm's private information, the lower its stock liquidity and the higher the estimated return reversal for a given dollar volume. Following their methodology, for each firm in our sample we estimate $GAM_{i,y}$ as the coefficient $\gamma_{i,y}$ of the one-period-lagged signed volume in the time series regression of daily excess returns,[32]

$$r^{e}_{i,y,d} = \theta_{i,y} + \varphi_{i,y} r_{i,y,d-1} + \gamma_{i,y} V_{i,y,d-1} + \varepsilon_{i,y,d}$$

[32] Excess returns are with respect to the value-weighted market return of all firms on CRSP in the corresponding period.

over all daily observations in a year, where $V_{i,y}$ is daily dollar volume signed according to the contemporaneous excess return. The higher the estimated coefficient, the more opaque the firm.

Finally, the Amivest liquidity ratio of Cooper et al. (1985) and Amihud et al. (1997) is used to capture the fact that liquidity mitigates the price impact of large volumes. It is computed for all firms in our sample as the square root of the ratio of a firm's stock daily dollar volume to its absolute return, averaged over all daily observations in a year and preceded by a negative sign. The higher its value, the higher the opacity of the firm.

Table B1 presents summary statistics for all our index constituents and Spearman's rank correlations among their standardized values for all firms with data available on CRSP in the period 1979–2011. Our estimates are similar to those of Bharath et al. (2009) in a partially overlapping subsample.

Table B1. Descriptive statistics of index constituents

This table reports summary statistics for the constituents of our index of firm opacity. ILL is of Amihud (2002) illiquidity measure, C2 is the volume–return autocorrelation of Llorente et al. (2002), PIN is the probability of informed trading of Easley et al. (1996), RAD is the adverse selection component of the proportional effective spread of Roll (1984), GAM is the reversal coefficient of Pastor and Stambaugh (2003), and LR is the Amivest liquidity ratio of Cooper et al. (1985) and Amihud et al. (1997). Panel a. presents cross-sectional statistics over the sample period 1979–2011. Panel b. reports the Spearman's rank correlations among the standardized values of the index constituents. The superscript [a] denotes statistical significance at the 1% level.

Panel a.	Obs.	Mean	Median	St. Dev.
ILL	192145	0.75	0.30	1.14
C2	191734	0.02	0.03	0.36
PIN	28868	0.20	0.20	0.08
RAD	192415	0.51	0.65	0.56
GAM	192142	0.06	0.01	1.12
LR	192145	-12.8	-4.08	23.4

Panel b.	ILL	C2	PIN	RAD	GAM	LR
ILL	1					
C2	0.1371[a]	1				
PIN	0.7025[a]	0.0407[a]	1			
RAD	-0.0570[a]	-0.0359[a]	0.0010	1		
GAM	0.8926[a]	0.1484[a]	0.6092[a]	-0.0565[a]	1	
LR	0.9930[a]	0.1542[a]	0.6866[a]	-0.0611[a]	0.8982[a]	1

Although all the proposed measures are linked to firm opacity, information is not their only driver. We then isolate the common informational element by

estimating the first principal component of the correlation matrix of our standardized index constituents in each year. On average, 40% of cross-sectional variance is accounted for by the first principal component and in most years only the first eigenvalue is larger than one. Moreover, the elements of the first eigenvector are mostly positive and their magnitude is stable over time, confirming that each constituent adds positively to the index.

We form the index of firm opacity (IndexOpq) by combining standardized index constituents according to the corresponding contemporaneous loadings on the first principal component. According to our index, the opacity of firm *i* in year *y* is computed on the basis of our six index constituents *x,* standardized across all firms in the given year, as

$$IndexOpq_{i,y} = \sum_{j=1}^{6} w_{j,y}\bar{x}_{i,y} \qquad \text{where} \quad w_{j,y} = PC\left(\bar{x}_{i,y}\right)$$

Higher values of the index are associated with higher opacity for the specific firm in the given year. In each year, as well as overall, the mean index value is zero by construction, the median is slightly negative, and the standard deviation is 1.31.

The literature has linked firm opacity to several firm characteristics. In Table B2 we investigate, for all firms with data available on Compustat and IBES, the distribution of these information-related characteristics across different classes of opacity formed on the basis of our index. These variables include firm size, capital expenditures, R&D expenses, accruals quality, return on equity, the number of analysts covering the firms, current fiscal year EPS forecast dispersion and error.

Table B2. Firm Characteristics across levels of firm opacity

This table reports means for alternative firm characteristics across levels of opacity. Each firm is classified each year on the basis of its index of opacity. Asset and Sales are in millions of dollars and adjusted for inflation; Capex and R&D are, respectively, capital expenditures and R&D expenses, both over total assets; Roe is return on equity; AccQlt represents accruals quality measured according to Lee and Masulis (2009), on the basis of accruals computed according to the modified Dechow and Dichev (2002) model, as applied by Francis et al. (2005); Num is the number of analysts covering the firm; Disp is the dispersion of analysts' EPS forecasts for the current fiscal year; and Err is the ex post actual forecast error. Analysts' measures are collected as reported by IBES for the last statistical period in each forecast window. Only firms with fiscal year ending in December are considered.

Opacity	Assets	Sales	Capex	R&D	AccQlt	Roe	Num	Disp	Err
Lowest	38.036	14.674	0.065	0.043	0.028	0.145	16.07	0.087	0.120
2	12.483	4.153	0.065	0.048	0.034	0.094	9.28	0.092	0.230
3	8.956	2.535	0.065	0.063	0.039	0.065	6.86	0.089	0.291
4	5.985	1.685	0.064	0.074	0.043	0.039	5.39	0.086	0.316

5	3.208	1.126	0.063	0.090	0.047	0.010	4.45	0.087	0.375
6	2.129	729	0.061	0.100	0.051	-0.039	3.49	0.087	0.431
7	1.341	513	0.061	0.110	0.054	-0.060	2.80	0.077	0.497
8	764	340	0.060	0.116	0.057	-0.085	2.27	0.085	0.541
9	375	195	0.055	0.121	0.059	-0.112	1.75	.095	0.730
Highest	173	110	0.046	0.116	0.065	-0.176	1.36	.111	1.196
No. obs.	146520	145953	134339	72246	77287	146229	71048	54869	65773

Not surprisingly, more opaque firms are, on average, smaller, in terms of both total assets and sales. Size follows a steadily decreasing trend as opacity increases. We then observe fewer capital expenditures (Capex) and lower profitability (Roe) as opacity grows. Interestingly, we find that more opaque firms report, on average, higher levels of R&D expenses (R&D). This evidence is consistent with more innovative firms being inevitably more opaque due to the uncertainty in their future prospects. Accruals quality (AccQlt) is intended to represent the overall quality of a firm's accounting information. It is measured according to Lee and Masulis (2009), on the basis of accruals computed according to the modified Dechow and Dichev (2002) model, as applied by Francis et al. (2005).[33] First, we regress total current accruals on operating cash flows, changes in sales, and property, plant, and equipment, running separate year–industry (two-digit SIC code) regressions.[34] Then we measure accruals quality for each firm as the standard deviation of the residuals resulting from the year–industry regressions over the current and four preceding years. A higher standard deviation of residuals corresponds to lower accounting quality. Table B2 indeed shows that publicly available information on more opaque firms is of relatively lower quality. Additional information on a firm comes from analysts. It is then reasonable to expect that the higher the number of analysts covering a firm, the more information is available and the better its quality in the aggregate. In line with this argument, we observe that more opaque firms are followed, on average, by fewer analysts. Moreover, we find that the dispersion of their contemporaneous EPS forecasts (Disp), which proxies for how difficult it is for outsiders to converge to a unanimous evaluation of firm prospects on the basis of the available

[33] Using the balance sheet approach, we have

$$Total\ Current\ Accruals = \Delta Curr\ Assets - \Delta Curr\ Liabilities - \Delta Cash + \Delta STDebt$$

[34] The regression model is

$$TCA_t = \beta_0 + \beta_1 OFC_{t-1} + \beta_2 OFC_t + \beta_3 OFC_{t+1} + \beta_4 \Delta Sales_t + \beta_5 PPE_t + \varepsilon_t$$

All variables are scaled by total assets. Operating cash flow is computed as

$$OCF = NetInc - \Delta CurrAssets + \Delta CurrLiabilities + \Delta Cash - \Delta STDebt + Depr$$

information, is higher, on average, for more opaque firms. Consequently, less information is likely to result in more forecast errors (Err). Indeed, we find that, ex post, analysts' forecast for more opaque firms are less accurate.

All these trends support our claim that our index of firm opacity captures the informational dimension at the core of our analysis. Still, to validate its use, we further analyze how it is related to the dispersion of analysts' EPS forecasts and accruals quality for bidders and targets in our sample of M&A bids. Table B3 reports summary statistics for accruals quality and the dispersion of analysts' EPS forecasts, overall and conditional on alternative methods of payment.

Table B3. Index of opacity: Alternative measures

*Panels a. and b. show summary statistics for alternative measures of firm opacity for bidders and targets, respectively, classified by method of payment, accruals quality, and the dispersion of analyst EPS forecasts. Accruals quality is measured according as by Lee and Masulis (2009) on the basis of accruals computed according to the modified Dechow and Dichev (2002) model, as applied by Francis et al. (2005). It is the standard deviation over the current and last four years of the residuals resulting from the regression of total current accruals on operating cash flows, changes in sales, and property, plant, and equipment, running separate year–industry (two-digit SIC code). The dispersion of analyst EPS forecasts is the IBES estimate for the last statistical period in the forecast window. Only firms with fiscal year ending in December are considered. Panel c. reports the Spearman's rank correlation of our index of opacity with standardized alternative measures. Panel d. reports the estimates from an ordinary least squares regression of our index of opacity with alternative measures. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.*

Panel a. Target Opacity—Alternative Measures

	AccQlt				Disp			
	All	Cash	Hybrid	Stock	All	Cash	Hybrid	Stock
Mean	0.053	0.047	0.045	0.062	0.05	0.05	0.06	0.05
Median	0.039	0.038	0.035	0.047	0.02	0.02	0.02	0.02
Std. Dev.	0.044	0.041	0.040	0.050	0.08	0.08	0.07	0.07

Panel b. Bidder Opacity—Alternative Measures

	AccQlt				Disp			
	All	Cash	Hybrid	Stock	All	Cash	Hybrid	Stock
Mean	0.037	0.032	0.041	0.045	0.05	0.04	0.06	0.04
Median	0.028	0.025	0.032	0.034	0.02	0.02	0.02	0.02
Std. Dev.	0.029	0.022	0.032	0.035	0.11	0.10	0.14	0.11

Panel c. Opacity —Alternative Measures: Spearman's Rank Correlations

	IndexOpq	Disp	AccQlt
IndexOpq	1		
Disp	0.07**	1	
AccQlt	0.18***	-0.06*	1

Panel d. Opacity —Alternative Measures: OLS Cross-Sectional Regression

	Constant	Disp	AccQlt		
IndexOpq	-0.56***	0.09***	0.19***	Nobs	848
	(18.78)	(2.70)	(5.85)	R^2	0.04

As for our index of opacity, bidders report, on average, better accruals quality than targets; however, the dispersion of EPS forecasts is the same. Across payment methods, evidence suggests that preference for stock bids increases as the accruals quality of the target or bidder firm deteriorates, consistent with what we observe for the index of opacity. Table B3 shows that bidders paying stocks report, on average, significantly higher values of AccQlt than those involved in cash deals and that the accruals of targets offered stock are, on average, of lower quality than those of targets offered cash. We do not find any difference across methods of payment for the dispersion of EPS forecasts. However, we observe in Panel c. of Table B3 that our index of opacity is positively correlated to both the dispersion of analysts' EPS forecasts and accruals quality at the 5% and 1% significance levels, respectively. Spearman's rank correlations are used because greater importance is given to the ability of our index to capture the ordinal dimension of opacity.[35] To control for possible spurious correlations, we also run an ordinary least squares cross-sectional regression of our index of firm opacity on analysts' EPS forecasts and accruals quality. We observe in Panel d. of Table B3 that both the coefficients of EPS forecast dispersion and accruals quality are positive and statistically significant at the 1% level.[36]

Observed bids reveal information on counterparties. If cash is used, the offer value reflects the valuation of the target. In stock bids the signal on the valuation of the target is less accurate but information on the bidder is revealed. We then exploit the different levels of bid informativeness to analyze whether and how our index responds to new information. In particular, we focus on bids eventually withdrawn and we compare pre- and post-bid firm opacity.

[35] Unreported results, available upon request, also confirm that this property holds for separate subsamples of target and bidder firms.

[36] Unreported results, available upon request, confirm that this property holds for separate subsamples of target and bidder firms.

Table B4. Index of opacity: Withdrawn bids

*Panel a. reports the mean opacity for bidders, targets, and matched inactive control firms before and after a withdrawn bid. Panels b. and c. report estimates of the difference-in-differences regression model regression, respectively, for targets and bidders. Bid is a dummy variable that isolates bidders or targets of a withdrawn bid from matched inactive control firms and Post is an indicator variable that identifies observations collected in the year following the bid. The coefficients are estimated with ordinary least squares and standard errors are clustered at the year level. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.*

Panel a. Mean Opacity before and after Withdrawn Bids

Target (n. 135)	Pre	Post	Bidder (n. 200)	Pre	Post
Inactive	0.08	0.09	Inactive	-0.75	-0.74
Bid	0.09	-0.04	Bid	-0.76	-0.79

Panel b. Target Opacity before and after Withdrawn Bids: Diff.-in-Diffs.

	Constant	Post	Bid	PostBid		
IndexOpq	-0.08	0.16	-0.01	-0.04	R^2	0.01
	(-0.59)	(1..33)	(-0.20)	(-0.26)	Nobs	540

Panel c. Bidder Opacity before and after Withdrawn Bids: Diff.-in-Diffs.

	Constant	Post	Bid	PostBid		
IndexOpq	-0.74***	0.01	-0.01	-0.04	R^2	0.01
	(7.62)	(0.07)	(-0.21)	(-0.41)	Nobs	800

Panel a. of Table B4 shows the averages of the index of opacity in the years preceding and following a withdrawn bid for actual bidders and targets and a group of inactive control firms matched on the basis of industry (two-digit SIC code), year, size (total assets), and opacity pre-bid. On average, we observe a decrease in the opacity of targets and bidders post-bid that we do not observe in inactive control firms. This evidence suggests that bids provide new information to the market that reflects on the average level of bidder and target opacity captured by our index. Difference-in-differences analysis in Panel b. and Panel c. however, fails to confirm this trend. In unreported results, available upon request, we repeat the difference-in-differences analysis focusing on bidders offering stock and on different groups of targets with respect to the type consideration offered. In fact, cash bids are more informative than stock bids on the value of the target and only stock bids provide information on the bidder. In addition we fail to observe significant differences in these conceptually more informative subsamples.

References

Alexandridis, G., Petmezas, D. and Travlos, N. (2010), "Gains from mergers and acquisitions around the world: new evidence," *Financial Management* **39**(4), 1671–1695.

Amihud, Y. (2002), "Illiquidity and stock returns: cross-section and time-series effects," *Journal of Financial Markets* **5**(1), 31–56.

Amihud, Y., Lev, B. and Travlos, N. (1990), "Corporate control and the choice of investment financing: the case of corporate acquisitions," *Journal of Finance* **45**(2), 603–616.

Amihud, Y., Mendelson, H. and Lauterbach, B. (1997), "Market microstructure and securities values: evidence from the Tel Aviv Stock Exchange," *Journal of Financial Economics* **45**(3), 365–390.

Antoniou, A., Arbour, P. and Zhao, H. (2008), "How much is too much: are merger premiums too high?" *European Financial Management* **14**(2), 268–287.

Beatty, R. and Ritter, J. (1986), "Investment banking, reputation, and the underpricing of initial public offerings," *Journal of Financial Economics* **15**(1), 213–232.

Berger, P. and Ofek, E. (1995), "Diversification's effect on firm value," *Journal of Financial Economics* **37**(1), 39–65.

Berkovitch, E. and Khanna, N. (1991), "A theory of acquisition markets: mergers versus tender offers, and golden parachutes," *Review of Financial Studies* **4**(1), 149–174.

Betton, S., Eckbo, B. and Thorburn, K. (2008), "Corporate takeovers", in Handbook of Corporate Finance: Empirical Corporate Finance, Elsevier/North-Holland, pp. 291–430.

Bharath, S., Pasquariello, P. and Wu, G. (2009), "Does asymmetric information drive capital structure decisions?" *Review of Financial Studies* **22**(8), 3211–3243.

Bradley, M., Desai, A. and Kim, E. (1988), "Synergistic gains from corporate acquisitions and their division between the stockholders of target and acquiring firms," *Journal of Financial Economics* **21**(1), 3–40.

Brown, D. and Ryngaert, M. (1991), "The mode of acquisition in takeovers: taxes and asymmetric information," *Journal of Finance* **46**(2), 653–669.

Burch, T. R., Nanda, V. and Silveri, S. (2012), "Taking stock or cashing in? Shareholder style preferences, premiums and the method of payment," *Journal of Empirical Finance* **19**(4), 558–582.

Carleton, W., Guilkey, D., Harris, R. and Stewart, J. (1983), "An empirical analysis of the role of the medium of exchange in mergers," *Journal of Finance* **38**(3), 813–826.

Chae, J. (2005), "Trading volume, information asymmetry, and timing information," *Journal of Finance* **60**(1), 413–442.

Chatterjee, S., John, K. and Yan, A. (2012), "Takeovers and divergence of investor opinion," *Review of Financial Studies* **25**(1), 227–277.

Chemmanur, T., Paeglis, I. and Simonyan, K. (2009), "The medium of exchange in acquisitions: does private information of both acquirer and target matter?" *Journal of Corporate Finance* **15**(5), 523–542.

Chen, J., Hong, H. and Stein, J. (2002), "Breadth of ownership and stock returns," *Journal of Financial Economics* **66**(2), 171–205.

Cheng, P., Li, J. and Tong, W. (2008), "Information asymmetry in the takeover market," Working Paper, EFMA.

Chidambaran, N., John, K., Shangguan, Z. and Vasudevan, G. (2010), "Hot and cold merger markets," *Review of Quantitative Finance and Accounting* **34**(3), 327–349.

Comment, R. and Schwert, G. (1995), "Poison or placebo? Evidence on the deterrence and wealth effects of modern antitakeover measures," *Journal of Financial Economics* **39**(1), 3–43.

Cooper, K. S., Groth, J. C. and Avera, W. E. (1985), "Liquidity, exchange listing, and common stock performance," *Journal of Economics and Business* **37**(1), 19–33.

Cording, M., Christmann, P. and Bourgeois Iii, L. (2002), "A focus on resources in M&A success: a literature review and research agenda to resolve two paradoxes," *Academy of Management Proceeds* .

Cotter, J. and Zenner, M. (1994), "How managerial wealth affects the tender offer process," *Journal of Financial Economics* **35**(1), 63–97.

Dechow, P. and Dichev, I. (2002), "The quality of accruals and earnings: the role of accrual estimation errors," *Accounting Review* **77**(s-1), 35–59.

Di Giuli, A. (2013), "The effect of stock misvaluation and investment opportunities on the method of payment in mergers," *Journal of Corporate Finance* **21**(1), 196–215.

Diether, K., Malloy, C. and Scherbina, A. (2002), "Differences of opinion and the cross section of stock returns," *Journal of Finance* **57**(5), 2113–2141.

Dittmar, A. and Thakor, A. (2007), "Why do firms issue equity?" *Journal of Finance* **62**(1), 1–54.

Dong, M., Hirshleifer, D., Richardson, S. and Teoh, S. (2006), "Does investor misvaluation drive the takeover market?" *Journal of Finance* **61**(2), 725–762.

Dunbar, C. (1995), "The use of warrants as underwriter compensation in initial public offerings," *Journal of Financial Economics* **38**(1), 59–78.

Easley, D., Hvidkjaer, S. and O'Hara, M. (2010), "Factoring information into returns," *Journal of Financial and Quantitative Analysis* **45**(2), 293.

Easley, D., Kiefer, N. M., O'Hara, M. and Paperman, J. B. (1996), "Liquidity, information, and infrequently traded stocks," *Journal of Finance* **51**(4), 1405–1436.

Easley, D. and O'Hara, M. (2005), "Information and the cost of capital," *Journal of Finance* **59**(4), 1553–1583.

Eckbo, B. (2009), "Bidding strategies and takeover premiums: a review," *Journal of Corporate Finance* **15**(1), 149–178.

Eckbo, E., Giammarino, R. and Heinkel, R. (1990), "Asymmetric information and the medium of exchange in takeovers: theory and tests," *Review of Financial Studies* **3**(4), 651–675.

Edmister, R. and Walkling, R. (1985), "Determinants of bid premiums in cash tender offers," *Financial Analysts Journal* **41**(1), 27–37.

Faccio, M. and Masulis, R. (2005), "The choice of payment method in European mergers and acquisitions," *Journal of Finance* **60**(3), 1345–1388.

Fishman, M. J. (1989), "Preemptive bidding and the role of the medium of exchange in acquisitions," *Journal of Finance* **44**(1), 41–57.

Francis, J., LaFond, R., Olsson, P. and Schipper, K. (2005), "The market pricing of accruals quality," *Journal of Accounting and Economics* **39**(2), 295–327.

Franks, J., Harris, R. and Mayer, C. (1988), Means of payment in takeovers: results from the United Kingdom and the United States, in Corporate Takeovers: Causes and Consequences, University of Chicago Press, pp. 221–264.

Fuller, K., Netter, J. and Stegemoller, M. (2002), "What do returns to acquiring firms tell us? Evidence from firms that make many acquisitions," *Journal of Finance* **57**(4), 1763–1793.

Gaspar, J., Massa, M. and Matos, P. (2005), "Shareholder investment horizons and the market for corporate control," *Journal of Financial Economics* **76**(1), 135–165.

George, T. J., Kaul, G. and Nimalendran, M. (1991), "Estimation of the bid-ask spread and its components: a new approach," *Review of Financial Studies* **4**(4), 623–656.

Ghosh, A. and Ruland, W. (2002), "Managerial ownership, the method of payment for acquisitions, and executive job retention," *Journal of Finance* **53**(2), 785–798.

Gillis, W. E. (2009), "Acquisition financing: does how you pay for it have implications for success?" *Academy of Management Perspectives* **23**(4), 96–97.

Gilson, R., Scholes, M. and Wolfson, M. (1988), "Taxation and the dynamics of corporate control: the uncertain case for tax-motivated acquisitions", in Knights, Raiders and Targets: the Impact of the Hostile Takeover, Oxford University Press.

Goyal, V. (2005), "Market discipline of bank risk: evidence from subordinated debt contracts," *Journal of Financial Intermediation* **14**(3), 318–350.

Haleblian, J., Devers, C. E., McNamara, G., Carpenter, M. A. and Davison, R. B. (2009), "Taking stock of what we know about mergers and acquisitions: a review and research agenda," *Journal of Management* **35**(3), 469–502.

Hansen, R. G. (1987), "The theory of the choice of exchange medium in mergers and acquisitions," *Journal of Business* **60**(1), 75–95.

Harford, J. (2002), "Corporate cash reserves and acquisitions," *Journal of Finance* **54**(6), 1969–1997.

Harford, J. (2005), "What drives merger waves?" *Journal of Financial Economics* **77**(3), 529–560.

Hasbrouck, J. (2009), "Trading costs and returns for US equities: estimating effective costs from daily data," *The Journal of Finance* **64**(3), 1445–1477.

Haunschild, P. (1994), "How much is that company worth? Interorganizational relationships, uncertainty, and acquisition premiums," *Administrative Science Quarterly* **39**(3), 391–411.

Heckman, J. (1979), "Sample selection bias as a specification error," *Econometrica* **47**(1), 153–161.

Hertzel, M. and Smith, R. (1993), "Market discounts and shareholder gains for placing equity privately," *Journal of Finance* **48**(2), 459–485.

Hovakimian, A. and Hutton, I. (2010), "Merger-motivated IPOs," *Financial Management* **39**(4), 1547–1573.

Huang, Y. and Walkling, R. (1987), "Target abnormal returns associated with acquisition announcements: payment, acquisition form, and managerial resistance," *Journal of Financial Economics* **19**(2), 329–349.

Ismail, A. (2011), "Does the management's forecast of merger synergies explain the premium paid, the method of payment, and merger motives?" *Financial Management* **40**(4), 879–910.

Jennings, R. and Mazzeo, M. (1993), "Competing bids, target management resistance, and the structure of takeover bids," *Review of Financial Studies* **6**(4), 883–909.

Kesner, I. F., Shapiro, D. L. and Sharma, A. (1994), "Brokering mergers: an agency theory perspective on the role of representatives," *Academy of Management Journal* **37**(3), 703–721.

Kisgen, D. J. (2006), "Credit ratings and capital structure," *Journal of Finance* **61**(3), 1035–1072.

Kisgen, D. J. (2007), "The influence of credit ratings on corporate capital structure decisions," *Journal of Applied Corporate Finance* **19**(3), 65–73.

Kisgen, D. J. (2009), "Do firms target credit ratings or leverage levels?" *Journal of Financial and Quantitative Analysis* **44**(6), 1323.

Koeplin, J., Sarin, A. and Shapiro, A. (2005), "The private company discount," *Journal of Applied Corporate Finance* **12**(4), 94–101.

Kyle, A. (1985), "Continuous auctions and insider trading," *Econometrica* **53**(6), 1315–1335.

Laamanen, T. (2007), "On the role of acquisition premium in acquisition research," *Strategic Management Journal* **28**(13), 1359–1369.

Lee, G. and Masulis, R. (2009), "Seasoned equity offerings: quality of accounting information and expected flotation costs," *Journal of Financial Economics* **92**(3), 443–469.

Lee, L. (1979), "Identification and estimation in binary choice models with limited (censored) dependent variables," *Econometrica* **47**(4), 977–996.

Li, K. and McNally, W. (2004), "Open market versus tender offer share repurchases: a conditional event study," Finance working paper (98-2), University of British Columbia.

Li, K. and Prabhala, N. (2005), "Self-selection models in corporate finance," Robert H. Smith School Research Paper (06–020).

Llorente, G., Michaely, R., Saar, G. and Wang, J. (2002), "Dynamic volume–return relation of individual stocks," *Review of Financial Studies* **15**(4), 1005–1047.

Loughran, T. and Schultz, P. (2008), "The impact of firm location on equity issuance," *Financial Management* **37**(1), 1–21.

Maddala, G. (1986), *Limited-Dependent and Qualitative Variables in Econometrics*, Vol. 3, Cambridge University Press.

Martin, K. (1996), "The method of payment in corporate acquisitions, investment opportunities, and management ownership," *Journal of Finance* **51**(4), 1227–1246.

Martynova, M. and Renneboog, L. (2009), "What determines the financing decision in corporate takeovers: cost of capital, agency problems, or the means of payment?" *Journal of Corporate Finance* **15**(3), 290–315.

McNamara, G. M., Haleblian, J. J. and Dykes, B. J. (2008), "The performance implications of participating in an acquisition wave: early mover advantages, bandwagon effects, and the moderating influence of industry characteristics and acquirer tactics," *Academy of Management Journal* **51**(1), 113–130.

Miller, E. (1977), "Risk, uncertainty, and divergence of opinion," *Journal of Finance* **32**(4), 1151–1168.

Moeller, S., Schlingemann, F. and Stultz, R. (2007), "How do diversity of opinion and information asymmetry affect acquirer returns?" *Review of Financial Studies* **20**(5), 2047–2978.

Moeller, S., Schlingemann, F. and Stulz, R. (2004), "Firm size and the gains from acquisitions," *Journal of Financial Economics* **73**(2), 201–228.

Morck, R., Shleifer, A. and Vishny, R. (2012), "Do managerial objectives drive bad acquisitions?" *Journal of Finance* **45**(1), 31–48.

Myers, S. and Majluf, N. (1984), "Corporate financing and investment decisions when firms have information that investors do not have," *Journal of Financial Economics* **13**(2), 187–221.

Noronha, G., Sen, N. and Smith, D. (1996), "Determinants of bidder competition in corporate takeovers," *Journal of Economics and Finance* **20**(3), 39–47.

Officer, M. (2003), "Termination fees in mergers and acquisitions," *Journal of Financial Economics* **69**(3), 431–467.

Officer, M. (2007), "The price of corporate liquidity: acquisition discounts for unlisted targets," *Journal of Financial Economics* **83**(3), 571–598.

Officer, M., Poulsen, A. and Stegemoeller, M. (2009), "Target–firm information asymmetry and acquirer returns," *Review of Finance* **13**(3), 467–493.

Pastor, L. and Stambaugh, R. (2003), "Liquidity risk and expected stock return," *Journal of Political Economy* **111**(3), 642–685.

Reuer, J. J., Tong, T. W. and Wu, C.-W. (2012), "A signaling theory of acquisition premiums: evidence from IPO targets," *Academy of Management Journal* **55**(3), 667–683.

Rhodes-Kropf, M. and Viswanathan, S. (2004), "Market valuation and merger waves," *Journal of Finance* **59**(6), 2685–2718.

Roll, R. (1984), "A simple implicit measure of the effective bid-ask spread in an efficient market," *Journal of Finance* **39**(4), 1127–1139.

Schwert, G. (1996), "Markup pricing in mergers and acquisitions," *Journal of Financial Economics* **41**(1), 153–192.

Schwert, G. (2002), "Hostility in takeovers: in the eyes of the beholder?" *Journal of Finance* **55**(6), 2599–2640.

Scruggs, J. (2007), "Estimating the cross-sectional market response to an endogenous event: naked vs. underwritten calls of convertible bonds," *Journal of Empirical Finance* **14**(2), 220–247.

Servaes, H. (1991), "Tobin's Q and the gains from takeovers," *Journal of Finance* **46**(1), 409–419.

Stultz, R. M. (1988), "Managerial control of voting rights: financing policies and the market for corporate control," *Journal of Financial Economics* **20**(1), 25–54.

Travlos, N. G. (1987), "Corporate takeover bids, method of payment, and bidding firms' stock returns," *Journal of Finance* **42**(4), 943–963.

Wansley, J. W., Lane, W. R. and Yang, H. C. (1983), "Abnormal returns to acquired firms by type of acquisition and method of payment," *Financial Management* pp. 16–22.

Zhang, P. (2001), "What really determines the payment methods in M&A deals," Working paper (2001-0103), Manchester School of Management.

Chapter 2: M&A in tough times (joint with Stefano Gatti)

Abstract

How does M&A activity change in periods of high uncertainty? This paper studies the impact of uncertainty on the timing and the quality of deals: first by tracking the volume of deals in periods of uncertainty, then by asking whether transactions announced during periods of uncertainty are fundamentally different in terms of performance from those undertaken in more quiet periods and finally exploring possible explanations. Evidence is consistent with the view that if uncertainty seems to de-incentivize external growth, it also creates opportunities. Periods of high uncertainty, which are defined on the basis of the VIX index, are associated with lower M&A activity. Yet, while deals announced in uncertain times show lower announcement return, both their long-run stock performance and operating performance are superior. Acquirers in periods of higher uncertainty benefit mainly from a more disciplined planning and execution of the deal, and to a smaller extent by negotiating from a stronger bargaining position.

JEL Classification: G34

Keywords: Uncertainty; Mergers and acquisitions; Takeovers; Merger waves

1. Introduction

A vast empirical literature has sought to uncover the forces leading to mergers and acquisitions (M&As). Evidence suggests that underlying economic fundamentals play an important role in determining the timing and the quality of a deal. Researchers have proposed neoclassical and behavioral explanations. On the one side, the neoclassical theory suggests M&A activity is primarily driven by an economic motivation. In this view, Holmstrom and Kaplan (2001) and Andrade et al. (2001) argue that transactions occur in response to an exogenous shock that triggers restructuring and consolidation of industries. Still, according to Harford (2005), crucial for M&A is that overall capital liquidity is sufficiently high to accommodate the reallocation of assets. On the other hand, the behavioral theory suggests that M&A activity is instead driven by inflated stock valuations and managerial market timing. In this view, Shleifer and Vishny (2003), and Rhodes-Kropf and Viswanathan (2004) propose different explanations: the first rests on irrationality of the stock market and self-interest of management, while the latter is based on correlated valuation errors in rational markets.

According to both neoclassical and behavioral theories year 2013 presents favorable conditions for M&A activity. The necessity to revive scant growth in earnings might well be a solid economic motivation for firms to reorganize and invest in external growth with an acquisition. Not only, capital is very liquid: stock market valuations are high, firms have abundant cash reserves and rates in debts markets are at historical low levels. Nonetheless, deal volume is limited: uncertainty about the underlying economic fundamentals, whose shifts determine the profitability of a deal, dampens M&A activity. Management is less confident about the future development of the business and more cautious about investing money in external growth for fear of changes in market fundamentals once the deal has been closed.

The aim of this paper is to study the impact of uncertainty on the timing and the quality of deals: first by tracking the volume of deals in periods of uncertainty, then by asking whether acquisitions undertaken during periods of uncertainty are fundamentally different in terms of performance from those undertaken in more quiet periods and if so, explaining why.

Existing literature has extensively analyzed timing and quality of M&A deals, still much less is known about how drivers and value creation change in times of uncertainty. In contrast to prior work which focuses on the causes and the consequences of high M&A activity, this paper contributes to shed light on M&A by considering uncertainty on economic fundamentals as the critical factor driving (low) deal volumes and from this perspective explores the specific features of transactions

in periods when uncertainty is high. The analysis encompasses both the dependence of the merger decision on economic fundamentals and strategic considerations.

Our findings are consistent with the view that if uncertainty seems to de-incentivize buyers from carrying out acquisitions, it also creates opportunities. Indeed, empirical results suggest that periods of uncertainty, which we define on the basis of the VIX index, are associated with scant M&A activity. Analysis at the aggregate level shows fewer transactions are announced in periods of uncertainty and that their value is smaller. In addition, at the micro-level, evidence shows that firms are less likely to be involved in a deal if uncertainty is high. However, the performance of transactions announced in these periods is still attractive. While they realize significantly lower announcement returns, their long-run stock performance and operating performance are significantly better. The market seems skeptical about deal announcements in uncertain times, but eventually recognizes their superior quality in the long-run. Analysis of performances and terms of transaction show that acquirers in periods of higher uncertainty benefit mainly from a more disciplined planning and execution of the deal, and to a smaller extent by negotiating from a stronger bargaining position.

The paper is organized as follows: Section 2 develops the hypotheses and presents the related literature; Section 3 describes the data and discusses the methodology and Section 4 presents the results and examines possible explanations. Robustness issues are addressed in Section 5. Section 6 summarizes and concludes.

2. Hypotheses development and related literature

It is common wisdom to consider time periods characterized by high levels of uncertainty as the least favorable for M&A. No doubt that when market conditions become less predictable, extracting value from deals becomes more difficult. Given the changed, more uncertain context, past experience in successful deals is not always replicable, a fair assessment of the value of the target and the expected synergies is more challenging and post integration steps may be more problematic.

To formalize this intuition, the decision of whether and when to embark on a deal can be viewed as the problem of optimally exercising a real option. Think the underlying economic fundamental determining merger profitability as an exogenous stochastic process. M&A occurs when the realization of this variable is such that immediate acquisition is more valuable than delaying.[1]

Delaying a transaction bears the option value of resolving uncertainty.[2] An increase in uncertainty, i.e. the volatility of the process, increases the probability mass in the

[1] See Toxvaerd (2008) for a more detailed framework.
[2] See Dixit and Pindyck (1994) for a reference on real options.

tails of the distribution. But, while making high values of the economic fundamental more likely, the downside is truncated as for some low realizations it is never optimal to place a bid. An increase in uncertainty thus raises the option value to delay – which derives entirely from the variability in the value to merge brought about the stochastic evolution of the economic fundamental. In light of these considerations, a first hypothesis from real options theory is that:

H.1. in periods of high uncertainty M&A activity is low.

Nonetheless, target heterogeneity and strategic considerations can provide strong rationales for deals also in uncertain times. In the first case, for a given state of the economy fundamental, a firm's characteristics can determine its desirability as a target. M&A activity is limited to "cherry picking". In the latter case, it is instead competition that drives strategic interdependence between firms decisions. In this respect, Akdogu (2003) develops a model that posits that M&A yields the acquirer a competitive hedge and it might be costly to lose a target to a competitor. There is value in moving first: by postponing the acquisition, a bidder may gain from resolution of uncertainty, but risks a worsening of the terms of trade. M&A activity is characterized by "easy branch picking".

In either case, both rationales suggest uncertainty not only affect whether to embark on a deal, but also the quality of the completed deals. Then, a second hypothesis is that:

H.2. transactions announced in times of higher uncertainty are of better quality and create more value.

To explain the effect of uncertainty on deal quality and value creation, three additional hypothesis are made on the possible channels by which it affects value creation: greater discipline, smaller agency pressures and stronger bargaining position. First, given that past success is hardly replicable under uncertainty, managers of acquiring firms can be considered less prone to overconfidence, and the consequences of hubris as described by Roll (1986). In uncertain times targets would selected more carefully and the terms of the transaction would be negotiated more cautiously. If this is the case, then:

H.3. greater discipline explains better performance of deals announced in periods of high uncertainty.

Second, in uncertain times pressures to pay out free cash flows to shareholders might be lower and it can be harder for managers to use the cash to finance acquisitions to their private benefit as described by Jensen (1986). If this is the case, then:

H.4. better alignment of the interests of managers and shareholders explains better performance of deals announced in periods of high uncertainty.

Finally, in times of uncertainty few acquirers could be in the position to exert stronger bargaining power on a larger set of potential targets and negotiate better terms that would leave more space for value creation. If this is the case, then:

H.5. stronger bargaining position explains better performance of deals announced in periods of high uncertainty.

These hypotheses find their natural positioning at the intersection of two fields of research. The one that links M&A activity to fundamental economic variables and the one that studies the ensuing gains and losses.

Regarding the link between M&A activity and fundamental economic variables, since uncertainty is related to economic fundamentals and affects strategic considerations, models of merger waves provide a related theoretical background. In this respect, Harford (2005) develops a framework in which the critical factor driving M&A is capital liquidity, in terms of both loan spreads and stock market valuations. Other studies, such as Jovanovic and Rousseau (2001), observe that periods of high market valuations are accompanied by intense M&A activity. Still, rather than attributing this relation to lower transaction costs these other works offer behavioral explanations. In particular, Shleifer and Vishny (2003) model the impact of market valuations on the decision to acquire, the method of payment, acquirer performance and the occurrence of merger waves in a framework in which markets are irrational and management is self-interested. In the same spirit, Rhodes-Kropf and Viswanathan (2004) develop a model in which firm-specific and market-wide valuations drive M&A activity in rational markets with correlated valuation errors. In their framework, when market valuation is high target filter out too little of the market wide-effect and hence bids appear more attractive and targets are more prone to accept them.

A relevant implication of the behavioral theory, and a point of contact with the field of research studying gains and losses from M&A, is that deals initiated when market valuation is low are better on average than deals initiated when markets are booming. Goel and Thakor (2005) predict that deals announced in bull markets involve smaller synergies than those initiated in bear markets, and hence are of lower quality on average. Rhodes-Kropf et al. (2005) find strong empirical evidence consistent with these predictions. On the same premises Bouwman et al. (2009) investigate whether transactions announced when stock markets are booming are fundamentally different from those that occur when stock markets are depressed.

They find acquirers buying in high valuation markets have significantly higher announcement returns, but lower long-run stock and operating performance than acquirers in low valuation markets. Interestingly, they explain long-run underperformance with managerial herding, and dismiss overpayment and market timing arguments.

From a more general perspective, acquisition quality can be related to intensity of M&A per-se. In this respect, Chidambaran et al. (2010) examine the impact of market activity on the method of payment and the returns to target and acquirer shareholders. They find that post acquisition performance is worse for deals that occur in periods when M&A activity is intense, especially for stock acquisitions. In these periods, stock payment is more frequent and the premium is larger. In a similar spirit, McNamara et al. (2008) study the dynamics within merger waves and show that towards the end of a wave, as the number of potential targets diminishes, competitive pressures lead bidders to overpay.

3. Data and methodology

The sample contains all completed deals by US public acquirers that were announced not earlier than 1990 and became effective not later than 2010, for which the bidder did not previously own a majority interest in the target and is indeed seeking to obtain a majority interest through the transaction. Data on M&A are collected from Thomson One Banker and complemented with firm-level stock market and accounting data from the Center for Security Prices (CRSP) and Compustat databases, respectively. An observation is included in the final sample if:

- the target is not a subsidiary, a joint venture or government owned;[3]
- acquirer stock price data are available for three days around the announcement and for two years following the acquisition. The closing share price for the month before the announcement has to be at least \$3;[4]
- the transaction value is above \$100 million;
- the transaction is not a buyback, an exchange offer, a recapitalization, or an acquisitions of partial or remaining interest.

To track the volume and compare the performance of deals announced under different market circumstances, the sample is split into deals announced in times of high and neutral uncertainty. Definition of high uncertainty is critical. The main

[3] See Fuller et al. (2002).

[4] The goal is to eliminate very small firms and those in distress as in Loughran and Vijh (1997).

classification method is based on the VIX index that captures market expectations of near-term volatility implied by listed option prices[5]. More uncertainty corresponds to higher expectations of near term volatility and a higher level of the index. A deal is categorized as occurred in a period of high uncertainty if the level of the VIX index averaged over the 40 business days preceding the announcement date lies more than 0.5 standard deviations above its historical mean.[6]

The sample period comprises several distinct intervals of recognized significant turmoil: for example, that from July 2002 to March 2003 with the plunge of the stock market due to the Tech Bubble bursting; or the one from September 2008 to July 2009 as a result of the credit crisis that followed the end of the housing boom in the U.S. and Lehman's collapse. Mapping deals along these periods confirms that the proposed classification based on the VIX index reliably tracks periods of renowned market turmoil: all deals announced between July 2002 and March 2003 or September 2008 and July 2009 correctly end up classified as occurred in times of high uncertainty.

Table 1 provides some insights on the composition of the sample. Summary statistics on deal and acquirer characteristics are presented for the whole sample and for subsamples of deals occurred in times of neutral and high uncertainty. The sample covers 2620 transactions of which 572 are announced in uncertain periods according to the proposed classification. On average deal value is about $1 bn. and materiality is substantial. The value of the transaction amounts to about one-fifth of the market capitalization of the acquirer plus the cost of the target. Different means of payment are almost evenly represented, cash and stock bids account for about one-third each. Information on the acquisition premium is limited to those transactions in which the target is a public firm. They represent a little more than half of the sample observations. On average, a considerable 45.8% premium is paid in excess of the undisturbed market capitalization of the target four weeks before the announcement, and significantly larger premiums are paid for transactions in periods of high uncertainty. Tender offers account for a minor share of the sample and are relatively more frequent in periods of uncertainty. For what concerns deal attitude, the incidence of hostile bids and mergers of equals is negligible, most transactions in the

[5] The VIX index is provided by the Chicago Board of Options and Exchange (CBOE). It is formed on the basis of a weighted average of European-style call and put options on the S&P500 that straddle the 30-day maturity and cover a wide range of strikes. For more details see Brenner and Galai (1989).

[6] Results, available upon request, are not affected under the alternative classification by which a deal is classified as occurred in a period of high uncertainty if the VIX index lies above the 75th-percentile of its historical distribution in at least 10 business days in the month before the deal is announced. In Section 5 an alternative classification based on a purely exogenous index of equity market uncertainty is discussed in detail.

sample are classified as friendly and are unrivaled. All acquirer firms are public firms and their size is indeed large. Interestingly average market capitalization is significantly larger for acquirers in times of uncertainty. Moreover, acquiring firms present substantial cash holdings normalized by total assets and moderate leverage. Their Tobin's Q is large on average and is even greater for acquirers in periods of uncertainty.

Table 1. Summary statistics

*Panel a. reports summary statistics on deal characteristics for the whole sample and for subsamples of deals announced in times of neutral and high uncertainty. Panel b. reports summary statistics on acquirer characteristics for the whole sample and for subsamples of deals announced in times of neutral and high uncertainty. A deal is considered as announced in a period of high uncertainty if the level of the VIX index averaged over 40-business-days prior to the announcement lies more than 0.5 standard deviations above its historical mean. Materiality represent deal value over the capitalization of the acquirer plus the cost of the target. Acquirer characteristics are measured at the end of the previous fiscal year. Liquidity represent a firm holdings of cash and equivalents normalized by total assets. Tobin's Q is computed as market value of equity plus the book value of short and long term debt all over total assets. Leverage computed as short and long term debt over total assets. T-tests of differences in deal and acquirer characteristics across subsamples of deals occurred in times of high and neutral uncertainty are shown in the last column. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.*

Panel a. Deal Characteristics

	All		Neutral		High		Diff.
	N	mean	N	mean	N	Mean	(H-N)
Deal Value ($ mil.)	2620	1,067.53	2048	1,009.32	572	1,275.94	-
Deal Materiality	2616	0.17	2044	0.16	572	0.16	-
Cash Offers	2620	0.32	2048	0.33	572	0.31	-
Stock Offers	2620	0.29	2048	0.29	572	0.29	-
Premium	1358	45.84	1056	42.26	302	58.37	16.11***
Tender Offer	2620	0.11	2048	0.10	572	0.14	0.04***
Hostile Bid	2620	0.01	2048	0.01	572	0.00	-0.01***
Merger of Equals	2620	0.01	2048	0.01	572	0.01	-
Private Target	2620	0.43	2048	0.43	572	0.43	-
Rival Offer	2620	0.03	2048	0.02	572	0.05	0.02***
Financial Seller Involved	2620	0.03	2048	0.04	572	0.02	-0.02**

Panel b. Acquirer Characteristics

	All		Neutral		High		Diff.
	N	mean	N	mean	N	Mean	(H-N)
Total Assets ($ mil.)	2339	16,811.80	1822	17,060.59	517	15,935.03	-
Market Cap. ($ mil.)	2616	19,181.45	2044	17,950.56	572	23,579.95	5,629.38**
Liquidity	2254	0.16	1756	0.16	498	0.17	-
Leverage	2230	0.21	1737	0.22	493	0.21	-
Tobin's Q	2023	2.18	1578	2.09	445	2.55	0.46***

4. Results

We first address the impact of uncertainty on the decision to make an acquisition to explain scant M&A activity in uncertain times. Deal volumes in high and neutral uncertainty periods are analyzed with respect to the contemporaneous number and value of acquisitions announced. Then, the quality of deals across different periods is evaluated in terms of their performance with respect to: (i) short-run stock performance in terms of cumulative abnormal return (CAR) to the acquirer; (ii) long-run stock performance in terms of two-year buy-and-hold return (BHAR) to the acquirer and calendar-time portfolios return (CTR); and (iii) long-run operating performance in terms of abnormal return on operating income (AROOI). Finally, evidence is provided on how greater discipline, smaller agency pressures, and a stronger bargaining position can explain why acquirers in uncertain periods perform better.

4.1. Deal volume

The link between merger intensity and uncertainty is first explored by tracking aggregate merger activity over 262 partially-overlapping 40-business-days windows that span the entire sample period. New intervals begin every 20 business days and each one is classified as either a period of high or neutral uncertainty depending on whether the level of the VIX index averaged over the previous 40 business days lies more than 0.5 standard deviations above its historical mean. The expectation is that periods of higher uncertainty are associated with the announcement of fewer deals. Panel a. of Table 2 presents summary statistics of merger activity across periods of different market conditions. Out of 262 intervals 63 are classified as periods of high uncertainty. M&A activity under uncertainty seems less intense but the t-test and the Wilcoxon (Mann-Whitney) rank-sum test fail to reject the equality of respectively means and medians across groups. Still, one problem with such univariate analysis is that it does not isolate uncertainty from other contemporaneous market conditions that influence M&A timing, as for example capital liquidity or stock market valuation. In this respect, Panel b. of Table 2 shows the estimates of an OLS regression of merger activity on uncertainty in the period that includes year-level fixed effects. Times of higher uncertainty are associated with significantly lower M&A intensity in terms of both the number and the aggregate value of acquisitions announced. In both cases, coefficients on the indicator variable for periods of high uncertainty are negative and strongly statistically significant, at the 1% level. Furthermore, the overall level of uncertainty is associated with fewer deals as well. The coefficient on the average level of VIX in the 40 business days prior to the beginning of the period is negative and significant at the 1% level.

Table 2. Uncertainty and M&A activity: aggregate level

*Panel a. reports summary statistics on M&A activity over 40-business-days windows that span the entire sample period. New intervals begin every 20 business days and those for which the level of the VIX index averaged over the previous 40 business days lies more than 0.5 standard deviations above the historical mean are classified as periods of high uncertainty. Deal Count measures the number of deals announced in each 40-business-days window. Deal Volume is the aggregate value of transactions in the same period. Panel b. reports coefficients and t-stats (in parentheses) for the OLS regression of Deal Count and Deal Volume on an alternative measures of uncertainty. High is an indicator variable that takes the value of one if the 40-business-days window is classified as a period of high uncertainty. Level is a continuous variable measuring the average value of VIX in the 40-business-days prior to the beginning of the period. All model specifications include year-level fixed effects. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.*

Panel a.

	Deal Count				Deal Volume ($bn.)			
Uncertainty	N	mean	med	sd	N	Mean	med	sd
All	262	19.97	20.00	11.66	262	21.33	14.15	22.84
Neutral	199	20.29	21.00	11.60	199	21.38	14.22	23.17
High	63	18.93	16.00	11.88	63	21.17	12.89	21.97
Diff. H-N		-1.35	-5.00			-0.21	-1.33	

Panel b.

	Deal Count		Deal Volume ($bn.)	
High	-3.75***		-8.19***	
	(-3.96)		(-2.81)	
Level		-0.37***		-5.63
		(-5.66)		(-0.03)
Constant	20.87***	27.45***	23.30***	21.48***
	(52.92)	(16.29)	(19.15)	(5.94)
Year f.e.	Yes	Yes	Yes	Yes
Nobs	262	262	262	262
R^2	0.06	0.12	0.03	0.00

In addition, the relation between merger intensity and uncertainty is analyzed by looking at the probability a firm is involved in a deal under uncertainty. Table 3 shows estimates of firm-level probit regressions of M&A activity on firm characteristics and in particular on an indicator variable that is set equal to one if the level of the VIX index averaged over the last 40 business days of the previous fiscal year lies more than 0.5 standard deviations above its historical mean. In the baseline specification, the dependent variable is a dummy for whether the firm announces any transaction in the first quarter of the new fiscal year. Alternative specifications broaden the evaluation period to cover the whole fiscal year and extend M&A activity to include firms involved as targets. Each regression controls for

aggregate merger activity at both year- and industry-level as well as for specific firm characteristics adjusted for industry. In particular, control variables include firm size, cash holdings, operating cash flows, Tobin's Q, market-to-book ratio, leverage, return on assets and the Herfindal index of industry concentration. Estimates across all model specifications consistently show that uncertainty negatively affects the likelihood of being involved in M&A activity. Firms are less likely to be acquirers or to be involved in M&A in the new fiscal year if the uncertainty at the beginning of the period is high. The coefficient on the indicator variable for periods of high uncertainty is negative and statistically significant in all specifications.

Table 3. Uncertainty and M&A activity: firm level

*The table reports coefficients and z-stats (in parentheses) of firm-level probit regressions. In the first two columns the dependent variable is a dummy for whether the firm announces any acquisition in respectively the first quarter of the new fiscal year (column 1) or in the new fiscal year (column 2). In the last two columns the dependent variable is a dummy for whether a deal in which the firm is involved either as the acquirer or the target is announced in respectively the first quarter of the new fiscal year (column 3) or in the new fiscal year (column 4). High is an indicator variable that is set equal to one if the level of the VIX index averaged over the last 40 business days of the previous fiscal year lies more than 0.5 standard deviations above its historical mean. Tot. Year and Tot. Ind. measure the overall number of deals in each year and each industry. Firm characteristics are measured at the end of the previous fiscal year and adjusted for industry medians. Size is the natural logarithm of total assets. Cash represent a firm holdings of cash and equivalents normalized by total assets. OCF measures operating cash flows normalized by total assets. Q represents a firm's Tobin's Q computed as market value of equity plus the book value of short and long term debt all over total assets. MB is the ratio of market to book value of equity. LEV measures leverage computed as short and long term debt over total assets. ROA is return on assets measured as net income over total assets. HI is the Herfindal index of industry concentration computed on the basis of sales. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.*

Panel a.

	Acquirer		Acquirer or Target	
	1st Qtr	F.Y.	1st Qtr	F.Y.
High	-0.07*	-0.05**	-0.10***	-0.06***
	(-1.83)	(-1.99)	(-2.91)	(-3.00)
Tot. Year ('00)	0.35***	0.35***	0.20***	0.22***
	(10.67)	(18.73)	(13.67)	(24.81)
Tot. Ind. ('00)	0.06***	0.06***	0.03***	0.03***
	(4.08)	(6.37)	(4.58)	(7.03)
Size	0.15***	0.18***	0.11***	0.13***
	(16.88)	(33.30)	(15.12)	(28.17)
Cash	-0.16	-0.22***	0.05	0.05
	(-1.23)	(-2.71)	(0.46)	(0.72)
OCF	0.85***	0.77***	0.53**	0.53***
	(2.87)	(4.44)	(2.28)	(3.77)

Q	0.12***	0.12***	0.10***	0.08***
	(7.24)	(11.14)	(6.74)	(8.51)
MB	-0.01	0.01	-0.00	0.01**
	(-0.25)	(1.53)	(-0.01)	(2.06)
LEV	0.07	0.12**	0.16*	0.22***
	(0.70)	(2.02)	(1.89)	(4.39)
ROA	-0.17	-0.15	-0.17	-0.14
	(-0.68)	(-1.04)	(-0.90)	(-1.27)
HI	0.43*	0.35**	0.18	0.07
	(1.76)	(2.31)	(0.84)	(0.55)
Constant	-4.19***	-3.82***	-3.68***	-3.23***
	(-43.29)	(-67.25)	(-48.76)	(-71.17)
Nobs	69,643	69,643	69,643	69,643
PseudoR^2	0.11	0.12	0.07	0.07

Summing up, evidence both at the aggregate and firm-level is consistent with hypothesis H.1 that periods of higher uncertainty are associated with less intense M&A markets.

4.2. Deal quality

The analysis of announcement returns provides a first assessment of whether the quality of a transactions varies across periods of neutral and high uncertainty. Following Brown and Warner (1985) and Bouwman et al. (2009) daily abnormal returns are estimated with the modified market model by deducting the equally weighted index return from the firm's return. The presence of frequent acquirers suggests in fact a high probability of other events potentially occurring in the estimation period, and any abnormal return related to these events would bias parameter estimates. Daily abnormal returns are then cumulated for 3- and 5-day event windows around the announcement date.[7] Panel a. of Table 4 reports summary statistics for 3- and 5-days CAR. Consistent with previous studies, announcement returns to the acquirer are negative on average in both the 3- and 5-days interval. Still, acquirers in period of high uncertainty are worse performers in the 3-days window around the announcement. The t-test and the Wilcoxon (Mann-Whitney) rank-sum test reject the equality of respectively means and medians across groups, at

[7] Results, available upon request, are not affected if instead CAR is computed using the CRSP value weighted market portfolio to estimate a market model parameters in -255 to -46. In this case, firms involved in other merger activity in the estimation period are excluded from the analysis.

the 10% level. The market seems to look less favorably upon acquisition announcements in periods of high uncertainty.

A more representative measure of the quality of deals is provided by acquirer long-term performance. However, measurement of long-run abnormal stock performance is disputed. BHAR accurately replicates investors experience but suffers from several biases that might cause misspecification of test statistics.[8] In addition, a significant concern is that M&As are not random events, they tend to cluster in time and industry, while Mitchell and Stafford (2000) show how BHAR does not account for the positive cross-correlation of contemporaneous event firm abnormal returns. To address these issues, long-run stock market performance is also evaluated under Fama (1998) calendar portfolio approach.

Panel b. of Table 4 reports summary statistics for long-run stock market performance in terms of BHAR and CTR. BHAR for the two years following merger completion is estimated with respect to the long-run performance of the corresponding Fama and French reference portfolio identified either on the basis of size and book-to-market or industry.[9] In either case, consistent with previous studies, long term abnormal returns to the acquirer are negative on average. Acquirers in period of high uncertainty seem to perform better, still t-tests and Wilcoxon (Mann-Whitney) rank-sum tests fail to reject the equality of respectively means and medians across groups.

Calendar-time return is estimated on the basis of high and neutral uncertainty event portfolios respectively formed by all sample firms that announced an acquisition during any high or neutral uncertainty period with-in the previous two years.[10] Panel b. of Table 4 reports OLS regressions that track the performance of event portfolios in calendar time relative to a simple asset pricing model based on Fama and French (1993) and Carhart (1997) factor realizations. A significant intercept captures the event portfolio excess return and is evidence of abnormal monthly performance. The intercept in the third column indicates that acquirers realize on average a negative excess return, that is significant at the 10% level. Cumulated over a 24-months holding period this excess return would represent an abnormal return of about -

[8] BHAR is prone to suffer from systematic biases arising from imperfect proxies of expected returns which get compounded over long horizons. Moreover, Barber and Lyon (1997) and Lyon et al. (1999) identify three limits of BHARs: the rebalancing bias, the new-listings bias and the skewness bias which are particularly severe in small samples.

[9] In June each year, each firm is assigned a reference portfolio according to its corresponding Fama and French 5x5 size and book to market classification or 48-industries classification. Data on portfolio breakpoints and returns are collected form Fama and French web site.

[10] High- and neutral- uncertainty event portfolios are formed each month, and all firms equally contribute to each portfolio monthly return.

5.8%.[11] More specifically, intercepts in the first and second columns suggest that acquirers in neutral times realize a negative abnormal return, that is significant at the 1%, while the abnormal return of acquirers in uncertain periods is not statistically different from zero. Estimates from a pooled regression that includes both event portfolio returns are reported in column 4. An indicator variable D is included to capture any difference in the performance of the transactions in periods of high uncertainty with respect to those in neutral times. The coefficient on the indicator variable equals the difference between the intercepts of the high- an neutral- event portfolios. It is positive and strongly statistically significant suggesting that acquirers in times of uncertainty perform relatively better.

Panel c. of Table 4 reports summary statistics for long-run accounting performance. In this case measurement is potentially affected by the means of payment and the accounting method.[12] To limit possible biases, performance is examined over the two fiscal years following the year of merger completion using EBITDA over average total assets.[13] Not only, in the year of merger completion each acquirer is matched with a control firm selected on the basis of size among all firms in the same industry that are not involved in a deal in the two years following the acquisition. On average, operating performance seems to improve post-M&A. Active firms perform better than their inactive peers. In addition, acquirers in periods of high uncertainty are better performers in the two years following the completion of the deal. The t-test rejects the equality of means across groups, at the 5% level. To gain a deeper understanding of long-run accounting performance Panel c. of Table 4 presents regressions of measures of industry-adjusted post-merger performance on their pre-merger level and an indicator variable for transactions announced in periods of high uncertainty. All models include fixed effects at the year level to account for the clustering of M&A activity. The intercept in each regression captures the average post-merger change in the performance measure. M&A improves operating performance, market-to-book and sales growth. Intercepts in the corresponding regressions are all positive and strongly significant. Return on assets instead suffers from M&A, post-merger change for this metric is on average negative and significant at the 1% level. The coefficient on the indicator variable High captures any additional variation in the performance measure

[11] Abnormal returns are of the same sign but not in the same order of magnitude of the corresponding BHAR. According to Loughran and Ritter (2000) this reflects the fact that the calendar portfolio approach and the buy and hold portfolio approach differ in their power to detect abnormal performance.

[12] See Healy et al. (1992).

[13] Observed differences in abnormal stock return would bias the abnormal operating performance with respect to market capitalization, e.g. lower stock performance of neutral-uncertainty deals would inflate operating performance.

common to transactions in times of uncertainty. Only in the regression of returns on assets the corresponding coefficient is significantly different from zero, at the 1% level. This effect counterbalances the generally negative effect of M&A. Then transactions in times of uncertainty are not associated with negative post-merger changes in return on assets.

Table 4. Uncertainty and performance

*Panel a. reports summary statistics on 3- and 5-days CAR. Daily abnormal returns are estimated with the modified market model by deducting the equally-weighted index return from the firm return. Daily abnormal returns are then cumulated for 3- and 5-days event windows around the announcement date (from one/two day prior to the announcement date to one/two day after the announcement date). Panel b. reports summary statistics on long-run stock market performance in terms of BHAR and CTR. BHAR for the two years following merger completion is estimated with respect to the long-run performance of the corresponding Fama and French reference portfolio identified either on the basis of the 5x5 size and book to market classification or the 48-industries classification. Rebalancing occurs in June each year. CTR is estimated on the basis of high and neutral uncertainty event portfolios respectively formed by all sample firms that announced an acquisition during any high or neutral uncertainty period with-in the previous two years. Rebalancing occurs each month. (R_{mt}-R_{ft}), SMB, HML and UMD are Fama and French (1993) and Carhart (1997) factors. D is an indicator variable for transactions announced in periods of high uncertainty. Panel c. reports summary statistics for long-run accounting performance. OOI is operating performance measured in the two fiscal years following the year of merger completion using EBITDA over average total assets. AROOI represents abnormal operating performance measured by matching in the year of merger completion each acquirer with a control firm selected on the basis of size among all firms in the same industry that are not involved in a deal in the two years following the acquisition. ROA is return on assets measured as net income over total assets. MB is the ratio of market to book value of equity. Sales is sales growth. In all panels, differences in mean and median abnormal performances across subsamples of deals announced in times of high and neutral uncertainty are tested with respectively t-tests and Wilcoxon (Mann-Whitney) rank-sum tests. A deal is considered as annunced in a period of high uncertainty if the level of the VIX index averaged over 40 business days prior to the announcement lies more than 0.5 standard deviations above its historical mean. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.*

Panel a. Announcement Returns

	3-days CAR				5-days CAR			
Uncertainty	N	Mean	med	sd	N	Mean	med	sd
All	2604	-0.6%	-0.4%	0.008	2602	-0.7%	-0.5%	0.009
Neutral	2034	-0.5%	-0.4%	0.008	2032	-0.6%	-0.4%	0.009
High	570	-1.2%	-0.6%	0.009	570	-1.2%	-0.8%	0.010
Diff. H-N		-0.7%*	-0.2%*			-0.6%	-0.4%	

Panel b.Long-run Stock Market Performance

	2-years BHAR (S-BM)				2-years BHAR (Ind)			
Uncertainty	N	Mean	med	Sd	N	Mean	med	Sd
All	2349	-11.9%	-7.7%	0.530	2610	-11.6%	-7.1%	0.560
Neutral	1832	-12.1%	.-7.8%	0.526	2042	-12.2%	.-7.5%	0.562
High	517	-11.4%	-7.7%	0.548	568	-9.2%	-4.8%	0.553
Diff. H-N		0.7%	0.1%			3.0%	2.7%	

	Event Portfolios Calendar Time Returns			
	Neutral	High	Full Sample	Pooled
(R_{mt}-R_{ft})	1.00***	1.04***	1.01***	1.00***
	(36.02)	(21.77)	(33.87)	(29.24)
D*(R_{mt}-R_{ft})				0.03
				(0.66)
SMB	0.30***	0.11*	0.22***	0.30***
	(8.29)	(1.83)	(5.82)	(6.73)
D*SMB				-0.19***
				(-2.79)
HML	-0.04	-0.04	-0.05	-0.04
	(-1.07)	(-0.70)	(-1.22)	(-0.87)
D*HML				-0.00
				(-0.03)
UMD	-0.23***	-0.15***	-0.19***	-0.23***
	(-9.73)	(-3.90)	(-7.64)	(-7.90)
D*UMD				0.08*
				(1.89)
D				0.46**
				(2.06)
Intercept	-0.38***	0.07	-0.24*	-0.39***
	(-3.35)	(0.35)	(-1.96)	(-2.72)
Nobs.	237	187	237	460
R^2	0.89	0.80	0.87	0.85

Panel c.Long-run Accounting Performance

	AROOI			
Uncertainty	N	Mean	med	sd
All	2348	3.6%	1.3%	0.111
Neutral	1829	3.4%	1.2%	0.108
High	519	4.5%	1.6%	0.122
Diff. H-N		1.1%**	0.4%	

	Industry-Adjusted Performance			
	OOI	ROA	MB	Sales
Pre-merger	0.55***	0.57***	0.26***	-0.01***
	(-44.16)	(19.26)	(18.34)	(-2.26)
High	-0.02	0.03***	0.13	0.01
	(-0.04)	(2.58)	(0.83)	(0.70)
Intercept	0.01***	-0.03***	0.70***	0.06***
	(4.61)	(-6.89)	(9.44)	(10.93)
Year f.e.	Yes	Yes	Yes	Yes
Nobs.	2,390	2,390	2,390	2,390
Adj. R^2	0.47	0.22	0.17	0.01

Overall, performance results show that while deals announced in periods of high uncertainty realize significantly lower announcement return than do deals announced in neutral times, their long-run stock performance and operating performance are significantly better. The soundness of these evidences is further assessed in a framework that controls for other deal characteristics that may influence the post-acquisition performance of the acquirer. In this respect, earlier literature has identified some robust tendencies. Chang (1998) and Fuller et al. (2002) find that firms that acquire public targets report significantly lower announcement returns. In particular, the return for the bidder when the target is a private firm is positive for stock acquisitions and null for cash acquisitions. Amihud et al. (1990), Servaes (1991), Brown and Ryngaert (1991), Martin (1996) and Travlos (1987) report the opposite for acquisitions of public targets. Moreover, Asquith et al. (1983) find greater abnormal returns for relatively larger transactions and Morck et al. (1990) show that acquiring firms realize lower abnormal returns from diversifying acquisitions. Finally, according to Schwert (2000) hostile takeovers are associated with lower gains to acquiring firm shareholders. Table 5 reports multivariate OLS regressions of short- and long-run abnormal returns on variables designed to capture these effects. The link between deal performance and uncertainty at the time of the announcement is robust to the inclusion of control variables. The coefficient on the indicator variable for deals in times of high uncertainty is negative and significant for announcement return, and positive and significant for long-run operating performance. Again, BHAR is unable to detect any significant effect. Moreover, consistent with prior literature, the market looks more favorably at transactions for private targets, tender offers and cash offers. The corresponding coefficients in the regression of announcement return are positive and strongly significant. Higher post-M&A operating performance is also associated with cash offers, while it is found lower for private targets and decreasing in deal materiality.

Table 5. Uncertainty and performance: multivariate analysis

*Panel a. reports coefficients and t-stats (in parentheses) of multivariate OLS regressions of short- and long-run abnormal returns on variables designed to capture deal characteristics that may influence post-acquisition performance. High is an indicator variable that is set equal to one if the level of the VIX index averaged over 40 business days prior to the transaction lies more than 0.5 standard deviations above its historical mean. Materiality represent deal value over the capitalization of the acquirer plus the cost of the target. Cash, Private, Tend, Hostile and Cong are indicator variables designed to capture if the transaction is settled with cash, if the target is a private firm, if the deal is structured as a tender offer, if the attitude is hostile and if acquirer and target operate in a different industries. Each regression includes year-level fixed effects. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.*

Panel a.

	CAR	BHAR (S-BM)	AROOI
High	-0.01*	0.01	0.01*
	(-1.85)	(0.45)	(1.87)
Materiality	0.01	0.06	-0.14***
	(0.57)	(0.75)	(-11.24)
Cash	0.02***	0.05*	0.01**
	(5.38)	(1.91)	(2.52)
Private	0.03***	-0.00	-0.02***
	(9.73)	(-0.11)	(-4.06)
Tend	0.01**	0.06	0.01
	(2.05)	(1.62)	(1.28)
Hostile	0.02	0.11	-0.01
	(1.11)	(0.77)	(-0.68)
Cong	0.03	0.01	-0.01
	(0.02)	(0.10)	(-0.02)
Intercept	-0.02	-0.08***	-0.01
	(-0.31)	(-3.50)	(-0.56)
Year f.e.	Yes	Yes	Yes
Nobs.	2,604	2,346	2,344
Adj. R^2	0.05	0.07	0.09

To assess whether short-term momentum followed by long-run stock price reversals as described by Jegadeesh and Titman (1993) influences BHAR results, each acquirer in high- and neutral- uncertainty periods is classified on the basis of its BHAR in the 3 months preceding the announcement. Price reversals would suggest that the best (worst) pre-M&A performers realize more (less) negative BHAR post-transaction. Table 6 shows average pre- and post-BHAR for top and bottom performers. Indeed, average BHAR is more negative for best pre-M&A performers than bottom pre-M&A performers, consistent with price reversal dynamics, but only for deals announced in periods of neutral uncertainty. Arguably, this effect could explain why BHAR fails to

detect differences in post-M&A abnormal returns across periods of neutral and high uncertainty. In neutral times, long-run reversal lifts BHAR of acquirers with worst pre-M&A performance to the point they realize a better return than peer acquirers in times of uncertainty, thus leveling differences across periods.

Table 6. Price reversals

The table presents mean BHAR for acquirers in the quarter preceding the acquisition and in the two years following the completion of the deal. Each acquirer in high- and neutral-uncertainty periods is classified on the basis of its BHAR in the 3 months preceding the announcement. (S-MB) and (Ind) indicate whether BHAR is computed with respect to the corresponding Fama and French 5x5 size and book to market classification or the 48-industries classification. A deal is considered as announced in a period of high uncertainty if the level of the VIX index averaged over 40-business-days prior to the announcement lies more than 0.5 standard deviations above its historical mean.

Panel a.

Uncertainty	Top BHAR (S-BM)			Bottom BHAR (S-BM)		
	N	Q-1	Y+2	N	Q-1	Y+2
Neutral	573	19.8%	-16.1%	574	-14.8%	-5.1%
High	159	23.9%	-10.3%	161	-18.2%	-13.3%
	Top BHAR(Ind)			Bottom BHAR(Ind)		
	N	Q-1	Y+2	N	Q-1	Y+2
Neutral	572	15.8%	-12.9%	572	-12.4%	-1.1%
High	158	19.4%	-2.8%	160	-13.9%	-8.5%

Summing up, evidence on long-run value to shareholders supports hypothesis H.2 that transactions announced in times of high uncertainty are of better quality as their performance is superior. Possible explanations can be that:

- acquirers and/or targets in times of uncertainty are inherently different;
- transaction in times of uncertainty are better executed.

To assess whether firms involved in M&A activity in periods of high uncertainty present distinctive characteristics, sample firms are split between those active in neutral and high uncertainty periods, to compare industry-adjusted financials across groups. Earlier literature has in fact identified some robust links between firm characteristics and performance. Harford (1999) provides evidence that firms with excess cash are more likely to make poor acquisitions. Maloney et al. (1993) find that firms with higher leverage earn greater abnormal returns. Lang et al. (1991) and Servaes (1991) show that high Tobin's Q acquirers get higher announcement returns. Table 7 reports summary statistics on firm characteristics for the whole sample and for subsamples of deals announced in times of neutral and high uncertainty.

Table 7. Firm characteristics

*Panel a. reports summary statistics on acquirer characteristics for the whole sample and for subsamples of deals announced in times of neutral and high uncertainty. Panel b. reports summary statistics on target characteristics for the whole sample and for subsamples of deals announced in times of neutral and high uncertainty. All variables are adjusted with respect to the industry median, according to Fama and French 48-industry classification. Operating performance is measured as EBITDA over average total assets. Return on assets is measured as net income over total assets. Liquidity represent a firm holdings of cash and equivalents normalized by total assets. Tobin's Q is computed as market value of equity plus the book value of short and long term debt all over total assets. Leverage is computed as short and long term debt over total assets. M-to-B is the ratio of market to book value of equity. Across all panels, a deal is considered as announced in a period of high uncertainty if the level of the VIX index averaged over 40 business days prior to the announcement lies more than 0.5 standard deviations above its historical mean. T-tests of differences across subsamples of deals announced in times of high and neutral uncertainty are shown in the last column. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.*

Panel a. Acquirer Characteristics – Industry Adjusted

	All		Neutral		High		Diff.
	N	mean	N	Mean	N	Mean	(H-N)
Operating Performance	2122	0.06	1662	0.05	460	0.09	0.04***
Return on Assets	2251	0.02	1754	0.02	497	0.04	0.02***
Liquidity	2254	0.02	1756	0.02	498	0.01	-
Leverage	2230	0.06	1737	0.06	493	0.05	-0.01*
M-to-B	2047	2.11	1597	1.84	450	3.10	1.36***
Tobin's Q	2023	0.96	1578	0.85	445	1.36	0.51***

Panel b. Target Characteristics – Industry Adjusted

	All		Neutral		High		Diff.
	N	Mean	N	Mean	N	Mean	(H-N)
Operating Performance	1029	0.01	795	0.01	234	0.01	-
Return on Assets	1148	0.03	893	0.03	255	0.05	0.02**
Liquidity	1144	0.05	890	0.05	254	0.06	-
Leverage	1131	0.06	878	0.05	253	0.07	-
M-to-B	878	0.98	682	0.93	196	1.17	-
Tobin's Q	861	0.47	667	0.44	194	0.60	-

Panel a. shows that acquirers in times of high uncertainty are financially stronger on average. They are significantly more profitable both in terms of operating performance and return on assets. They are significantly less leveraged and have better market valuations. Panel b. shows instead that in times of uncertainty preference goes for targets that are on average more profitable. Table 8 shows the distribution of deals across industries for the whole sample and for subsamples of deals announced in times of neutral and high uncertainty. There is no evidence of any

industry with spikes in M&A activity related to uncertainty, the distribution is quite stable.

Table 8. M&A activity industry breakdown

The table reports the distribution of deals across industries for the whole sample and for subsamples of deals announced in times of neutral and high uncertainty according to Fama and French 48-industry classification. A deal is considered as announced in a period of high uncertainty if the level of the VIX index averaged over 40 business days prior to the announcement lies more than 0.5 standard deviations above its historical mean.

Panel a.

	All	Neutral	High		All	Neutral	High
Aero	0.54	0.35	0.50	Hshld	1.32	0.70	1.18
Agric	0.15	0.35	0.19	Insur	3.86	1.40	3.32
Autos	0.93	2.10	1.18	LabEq	2.34	2.98	2.48
Banks	14.75	10.86	13.90	Mach	2.44	1.75	2.29
Beer	0.05	0.18	0.08	Meals	1.32	0.88	1.22
BldMt	1.17	0.88	1.11	MedEq	2.64	2.45	2.60
Books	1.42	0.35	1.18	Mines	0.05	0.35	0.11
Boxes	0.20	0.00	0.15	Oil	4.69	3.33	4.39
BusSv	13.92	16.29	14.44	Other	0.20	0.18	0.19
Chems	1.51	1.40	1.49	Paper	0.64	1.40	0.80
Chips	7.47	9.28	7.87	PerSv	0.88	0.88	0.88
Clths	0.59	0.88	0.65	RlEst	0.10	0.00	0.08
Cnstr	0.54	1.58	0.76	Rtail	2.69	1.93	2.52
Coal	0.05	0.18	0.08	Rubber	0.15	0.53	0.23
Comps	8.26	8.93	8.40	Ships	0.10	0.00	0.08
Drugs	3.71	5.60	4.13	Smoke	0.00	0.18	0.04
ElcEq	0.49	0.53	0.50	Soda	0.15	0.70	0.27
FabPr	0.10	0.00	0.08	Steel	1.17	1.58	1.26
Fin	2.34	2.98	2.48	Telcm	5.18	5.95	5.35
Food	1.56	1.58	1.57	Toys	0.54	0.88	0.61
Fun	1.42	1.58	1.45	Trans	0.98	0.70	0.92
Gold	0.05	0.18	0.08	Txtls	0.44	0.70	0.50
Guns	0.20	0.35	0.23	Util	1.27	1.40	1.30
Hlth	2.98	1.23	2.60	Whlsl	2.49	1.58	2.29

A fist possible hint to the fact that deals announced in period of uncertainty are better executed is in Panel c. of Table 4. Eventual overpayment would markedly reflect on return on assets,[14] and noticeably the generally negative effect of a transaction on this metric is offset if the period in which the deal is announced is one

[14] In general because assets valuations would be overstated and, for deals for which purchase accounting method is used, also because net income would be lower due to higher expenses for depreciation and amortization of goodwill.

of high uncertainty. To get a deeper understanding, Table 9 compares terms of transaction across subsamples of deals announced in times of neutral and high uncertainty to detect whether deals differ in the way they are executed in any significant way. The analysis is focused on the subsample of transactions for public targets, for which data is available on the acquisition premium paid and on transaction multiples. Median premium paid in periods of uncertainty is significantly larger. Still, median transaction multiples of enterprise value over EBITDA and deal value over net income do not differ in any significant way across periods. One issue with this results is that if target valuation tends to be low with respect to fundamental value during high uncertainty periods and high under neutral periods, then acquirers in this latter periods are paying an hidden premium that is not captured. To account for this issue, market-to-book ratio and Tobin's Q are employed to compare target industry-level valuation across periods of neutral and high uncertainty. Indeed, market-to-book ratio and Tobin's Q in the industry of the target tend to be significantly lower during periods of uncertainty. Under this circumstances, it is rational for acquirers, in particular those that offer cash, to concede larger premiums that take into account temporarily poor market valuation and recognize fundamental value in terms of transaction multiples. This evidence suggests that in times of uncertainty issues related to the winner's course and managerial hubris may be less severe.

Table 9. Transaction terms

*The table reports summary statistics on the terms of transaction for the whole sample and for subsamples of deals announced in times of neutral and high uncertainty. A deal is considered as announced in a period of high uncertainty if the level of the VIX index averaged over 40 business days prior to the announcement lies more than 0.5 standard deviations above its historical mean. Data on Premium (measured on the basis of target market capitalization four weeks before the announcement), EV/Ebitda and Deal Value/Net Inc. are collected from Thomson. Wilcoxon (Mann-Whitney) rank-sum tests of differences in medians across subsamples of deals announced in times of high and neutral uncertainty are shown in the last column. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.*

Panel a.

		All		Neutral		High		Diff.
		N	Med	N	med	N	med	(H-N)
Premium	All	1358	37.26	1056	34.99	302	44.36	9.37***
	Cash	441	40.13	341	38.10	100	46.30	8.20***
	Stock	470	39.99	370	37.79	100	45.30	-
EV/Ebitda		1242	15.78	983	16.08	259	14.69	-
Deal Value/Net Inc.		1237	27.78	998	27.49	239	28.48	-
Target Ind. M-to-B		1252	1.98	980	2.00	272	1.70	-0.30***
Target Ind. Q		1252	1.15	980	1.20	272	1.02	-0.18***

4.3. Possible explanations

In the attempt to uncover the drivers of better performance additional evidence is provided which links uncertainty to greater discipline, smaller agency pressures on the use of cash and stronger bargaining power.

First, given that past success is hardly replicable under uncertainty, managers of acquiring firms can be conceived less prone to overconfidence, and the consequences of hubris as described by Roll (1986). If this is the case, targets would be selected more carefully and terms of the transaction would be negotiated more cautiously. Table 10 reports median long-run stock market and accounting performance of acquirers that are active both in periods of neutral and high uncertainty. Acquirers are classified on the basis of their performance on transactions announced in neutral times. The group of worst performers includes acquirers most inclined to overpayment and bad selection of target. Evidence shows that worst performers significantly improve their BHAR and AROOI in times of uncertainty, while best performers are not able to replicate their success. Consistent with hypothesis H.3, greater discipline can then explain better performance of deals announced in periods of high uncertainty.

Table 10. Discipline in execution

*The table presents median BHAR and AROOI of acquirers that are active both in periods of neutral and high uncertainty. Each acquirer is classified on the basis of its performance on transactions announced in neutral times . A deal is considered as announced in a period of high uncertainty if the level of the VIX index averaged over 40 business days prior to the announcement lies more than 0.5 standard deviations above its historical mean. Wilcoxon (Mann-Whitney) rank-sum tests of differences across subsamples of deals announced in times of high and neutral uncertainty are shown in the last column. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.*

Panel a. Repetitive acquirers

	BHAR (S-MB)				AROOI		
Performance	Neutral	High	Diff.		Neutral	High	Diff.
Worst	-27.1%	-9.9%	17.2***	Worst	-1.1%	-0.2%	0.9***
Best	19.1%	3.7%	-15.4%***	Best	6.7%	6.4%	-0.3***

Second, in uncertain times pressures to pay out free cash flows to shareholders might be lower and it can be harder for managers to use the cash to finance acquisitions to their private benefit as described by Jensen (1986). If this is the case, under uncertainty the alignment of interests of managers and shareholders would improve. Table 11 reports median long-run stock market and accounting performance of acquirers classified on the basis of their cash holdings. Cash rich firms are those more prone to bad M&A performance due to agency conflicts. Evidence reported in Table

11 does not seem to capture this tendency. Median performance is better for cash rich firms. Nonetheless, in partial support of hypothesis H.4, evidence shows that cash rich firm are associated with significantly higher AROOI in times of uncertainty, while cash poor firms are not.

Table 11. Cash-related agency conflicts

*The table presents median BHAR and AROOI of acquirers in periods of neutral and high uncertainty. Each acquirer is classified on the basis of its cash holdings normalized by total assets measured at the end of the fiscal year prior to the announcement. A deal is considered as announced in a period of high uncertainty if the level of the VIX index averaged over 40 business days prior to the announcement lies more than 0.5 standard deviations above its historical mean. Wilcoxon (Mann-Whitney) rank-sum tests of differences across subsamples of deals occurred in times of high and neutral uncertainty are shown in the last column. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.*

Panel a. All Acquirers

	BHAR (S-MB)				AROOI		
Cash	Neutral	High	Diff.		Neutral	High	Diff.
Poor	-11.0%	-6.9%	-	Poor	0.5%	0.6%	-
Rich	-5.8%	-6.3%	-	Rich	3.2%	4.6%	1.4%***

Third, in times of uncertainty fewer acquirers could find themselves in the position to exert stronger bargaining power on a larger set of potential targets and negotiate better terms that would leave more space for value creation. To isolate the effect of possible shifts in bargaining power different alternative identification strategies are proposed. The plan is to delimit a framework in which a change in uncertainty affects differently the bargaining power of two groups of acquirers. To this purpose alternative methodologies respectively exploit: financial sponsors activity, competition by rival bidders, industry-level intensity of M&A activity and cross-industry structural differences in shortage of targets.

In periods of high uncertainty financial sponsors can be conceived as bargaining from a weaker position. They need to show investors sound returns while they lengthen holding periods in response to more difficult markets for exit. Then, to the extent that uncertainty affects differently the bargaining power of targets backed by a financial sponsor and industrial sellers, any observed difference in performance would be attributable to shifts in bargaining power in periods of uncertainty. Panel a. of Table 12 reports median long-run performance for transactions classified on the basis of the nature of the seller. Results are indefinite.[15] Deals in which the seller is a

[15] At this stage, a severe problem with this analysis is that the subset of transactions in which a financial sponsor is involved as a seller is limited, in particular for periods of high

financial sponsor deliver better operating performances in periods of uncertainty, in support of the argument of shifts in bargaining power. Still, evidence on stock market performance indicates the opposite. BHAR and CTR suggest deals in which the seller is a financial sponsor perform worse. Interestingly, in favor of the stronger bargaining power conjecture, the inspection of the terms of transaction across different periods and type of seller reveals that the median Ent. Value/EBITDA multiple of transactions announced in times of uncertainty with financial seller involvement is significantly lower than those of deals with respectively an industrial seller or in a period of neutral uncertainty.[16]

If bargaining power shifts favorably in times of uncertainty, rivaled transactions would be less affected anyway. Competition among bidders would reinforce target bargaining position. Panel b. of Table 12 reports median long-run performance for transactions classified on the basis of whether a deal has been challenged by a rival offer. No significant difference emerges.[17] Median premium of rivaled transactions announced in times of uncertainty is significantly higher than those of deals respectively unrivaled or announced in a period of neutral uncertainty.[18] Still, this does not seem to reflect on performance.

In the same spirit, even in periods of uncertainty the bargaining position of acquirers would be weak if M&A activity in the industry of the target is intense and the number of good quality targets shrinks. Panel c. of Table 12 reports median long-run performance for transactions classified on the basis of the intensity of merger activity in the industry of the target. Consistent with evidence in Chidambaran et al. (2010), transactions in cold markets deliver better performances. Moreover, in support of the argument of shits in bargaining power, only deals announced in cold merger markets realize a significantly higher median AROOI in periods of uncertainty.

Uncertainty affects differently the bargaining power of acquirers in different industries if the scarcity of targets or competition by rivals are driven by cross-industry structural differences. Panel d. of Table 12 reports median long-run performance for transactions classified on the basis of the Herfindal index of target industry concentration. Deals in industries where sales are more concentrated deliver better performances. Still, median AROOI is significantly higher in periods of uncertainty only if target industry is dispersed. Consistent with the bargaining power explanation, if industry concentration is high there would be fewer M&A

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uncertainty. Collection of additional data on financial sponsor investments and exits is currently in progress.

[16] Unreported result, available upon request.

[17] Again, a severe problem with this analysis is that the subset of transactions that have been challenged by a rival bid is severely limited, in particular for periods of high uncertainty.

[18] Unreported result, available upon request.

opportunities and acquirers do not benefit of stronger bargaining positions in times of uncertainty. The same rationale applies to transactions in industries where firm size is more concentrated. Panel e. of Table 12 reports median long-run performance for transactions classified accordingly. Again, deals in industries where firm size is more concentrated deliver better operating performances. Yet, in support of the bargaining power motive, median BHAR is significantly higher in periods of uncertainty only if firm size in the target industry is more dispersed. Finally, according to Rhodes-Kropf et al. (2005) the dispersion of market to book ratios and of Tobin's Q is associated with opportunities for M&A. Panel f and panel g. of Table 12 report median long-run performance for transactions classified on the basis of the dispersion of respectively market to book and Tobin's Q ratios. In this case, evidence does not support the shift in bargaining power explanation but instead suggests that only transactions in industries where dispersion of Tobin's Q is lower (i.e. those with fewer opportunities) deliver better stock market and accounting performances in periods of high uncertainty.

Table 12. Bargaining power

*The table presents median BHAR, CTR and AROOI of acquirers in periods of neutral and high uncertainty. A deal is considered as announced in a period of high uncertainty if the level of the VIX index averaged over 40 business days prior to the announcement lies more than 0.5 standard deviations above its historical mean. In panel a. each deal is classified on the basis of the nature of the seller to identify targets backed by financial sponsors. In panel b. deals are classified on the basis of whether they have been challenged by rival bids. In panel c. deals are classified on the basis of the intensity of M&A activity in the industry of the target. In panel d. deals are classified on the basis of target industry concentration measured by the Herfindal index based on sales. In panel e. deals are classified on the basis of the dispersion on firm size in the industry of the target. In panel f. deals are classified on the basis of the dispersion of firm market to book ratios in the industry of the target. In panel g. deals are classified on the basis of the dispersion of firm Tobin's Q in the industry of the target. For calendar time returns, only the coefficient and t-stat of the indicator variable for the category of interest is reported. For BHAR and AROOI, Wilcoxon (Mann-Whitney) rank-sum tests of differences across subsamples of deals announced in times of high and neutral uncertainty are shown in the last column. The superscripts *, **, and *** denote significance at the 10%, 5%, and 1% levels.*

Panel a. Financial Sponsor Seller

	BHAR (S-BM)				CTR			AROOI		
	Neutral	High	Diff.		Neutral	High		Neutral	High	Diff
No	-8.6%	-7.0%	-	Coeff.	0.58	-1.97**	No	0.5%	0.6%	-
Yes	2.2%	-12.7%	-14.9%*	t-stat	(1.33)	(-2.50)	Yes	3.2%	4.6%	1.4%***
Diff.	12.2%*	-					Diff.	-	-	

Panel b. Rival Bid

	BHAR (S-BM)				CTR			AROOI		
	Neutral	High	Diff.		Neutral	High		Neutral	High	Diff
No	-8.0%	-7.7%	-	Coeff.	0.34	-0.38	No	1.2%	1.6%	-
Yes	1.7%	12.0%	-	t-stat	(0.78)	(-0.60)	Yes	1.2%	0.6%	-
Diff.	-	-					Diff.	-	-	

Panel c. Target Industry: M&A Activity

	BHAR (S-BM)				CTR			AROOI		
	Neutral	High	Diff.		Neutral	High		Neutral	High	Diff
Cold	-5.0%	-4.6%	-	Coeff.	0.10	0.74	Cold	1.1%	3.1%	2.0%**
Hot	-18.0%	-22.3%	-	t-stat	(0.29)	(1.16)	Hot	1.0%	0.8%	-
Diff.	-13.0%**	-17.7%**					Diff.	-0.1%***	-2.3%***	

Panel d. Target Industry Concentration: Herfindal Index

	BHAR (S-BM)				CTR			AROOI		
	Neutral	High	Diff.		Neutral	High		Neutral	High	Diff
Disp	-13.3%	-0.1%	-	Coeff.	0.19	-0.05	Disp	0.4%	0.8%	0.04%*
Conc	-11.7%	-5.2%	-	t-stat	(0.68)	(-0.08)	Conc	2.4%	1.9%	-
Diff.	-	-					Diff.	2.0%**	1.1%**	

Panel e. Target Industry: Size Dispersion

	BHAR (S-BM)				CTR			AROOI		
	Neutral	High	Diff.		Neutral	High		Neutral	High	Diff
Low	-12.2%	-6.6%	-	Coeff.	-0.14	-0.03	Low	3.6%	4.2%	-
High	-13.5%	1.1%	14.6%*	t-stat	(-0.49)	(-0.05)	High	0.3%	0.7%	-
Diff.	-	-					Diff.	-3.3%***	-3.5***	

Panel f. Target Industry: M-to-B Dispersion

	BHAR (S-BM)				CTR			AROOI		
	Neutral	High	Diff.		Neutral	High		Neutral	High	Diff
Low	-13.5%	-5.2%	-	Coeff.	-0.15	-0.82	Low	0.4%	0.6%	-
High	-6.5%	-7.7%	-	t-stat	(-0.54)	(-1.32)	High	4.7%	3.4%	-
Diff.	-	-					Diff.	4.3%***	2.8%***	

Panel g. Target Industry: Tobin's Q Dispersion

	BHAR (S-BM)				CTR			AROOI		
	Neutral	High	Diff.		Neutral	High		Neutral	High	Diff
Low	-15.4%	-3.3%	13.1%*	Coeff.	0.04	-0.40	Low	0.3%	0.7%	0.4%*
High	-5.4%	-7.5%	-	t-stat	(0.14)	(-0.61)	High	5.0%	6.6%	-
Diff.	-	-					Diff.	4.7%***	5.9%***	

Overall, evidence shows that superior performance in uncertain times can be explained mainly by a more disciplined planning and execution of the deal (H.3) and in part by negotiating from a better bargaining position (H.5). No clear evidence is found on agency conflicts (H.4).

4.4. Robustness tests

To ensure the robustness of the proposed classification of high uncertainty periods based on the VIX index, the Equity Market Uncertainty index developed by Baker et al. (2013) is used as a benchmark.[19] The index has the advantage of being fully exogenous as it is constructed through the analysis of U.S. newspaper articles containing terms related to equity market uncertainty. It is based on the daily count of the total number of newspaper articles that include specific terms pertaining to uncertainty, the economy and the stock market.

The index results strongly correlated to the VIX index both at daily and monthly frequency. To compare the ability of different indexes to correctly classify periods of market uncertainty the entire sample period is split over 262 partially-overlapping 40-business-days windows. A new interval begins every 20 business days and is classified as either a period of high or neutral uncertainty depending on whether the level of the different indexes averaged over the previous 40 business days lies more than 0.5 standard deviations above its historical mean. Spearman's rank correlation confirms that the alternative classifications of each period by the two indexes tend to coincide. The two series are strongly correlated, the statistic is 0.64 and significant at the 1% level. The same is confirmed for the alternative classifications of transactions in the sample. Deal tags coincide in 84% of cases, still the Equity Market Uncertainty index seems to define periods of high uncertainty more stringently.

Finally, the link between valuation and uncertainty is explored by investigating the correspondence of high uncertainty periods with periods of high or low stock market valuation. Following Bouwman et al. (2009) such periods are identified on the basis of PE ratio index for the S&P500.[20] First monthly PE is de-trended, then each month is categorized on the basis of its level relative to the past five years average.[21] The top half of the above-average months are classified as high market valuation periods and the bottom half of the below-average months are classified as low market valuation periods. Analysis over all months in the sample period reveals uncertainty is accompanied by low market valuation in about 33% of the cases and high marker valuation in slightly less than 30% of the cases. Uncertain times seem to be periods of neither systematic low nor systematic high stock market valuations. Classification by deals reveals instead that relatively few transactions that are announced in times of uncertainty occur under poor stock market valuations, while a majority takes place in periods of rich valuations.

[19] Data are collected from www.policyuncertainty.com.

[20] Data are collected from www.irrationalexuberance.com.

[21] Following Bouwman et al. (2009), PE index is de-trended by removing the best straight line fit from the PE of the month in question and the five preceding years.

5. Conclusion

This paper contributes to the literature that studies the dynamics of M&A activity by considering the role of uncertainty in deciding whether and when to seek external growth by M&A and by exploring the specific features of the transactions announced in periods when uncertainty is high.

Evidence suggests that if uncertainty seems to de-incentivize buyers from carrying out acquisitions, it also creates opportunities. Indeed, empirical results suggest that periods of uncertainty, which are defined on the basis of the VIX index, are associated with scant merger activity. Analysis at the aggregate level shows fewer transactions are announced in periods of uncertainty and that their value is smaller. In addition, at the micro-level, evidence shows that firms are less likely to be involved in a deal if uncertainty is high. However, the performance of transactions announced in these periods is still attractive. While deals announced in periods of high uncertainty realize lower announcement return than do deals announced in neutral times, their long-run stock performance and operating performance are better. The market looks less favorably upon deal announcements in periods of high uncertainty, but eventually recognizes their superior quality in the long-run. Analysis of performances and terms of transaction show that acquirers in periods of higher uncertainty benefit mainly from a more disciplined planning and execution of the deal, and to a smaller extent by negotiating from a stronger bargaining position.

These findings are relevant to explain what is currently observed in the real economy: uncertainty can provide a solid explanation why in certain periods, like the present one, M&A activity is limited despite economic motivations would be strong and conditions in capital markets would be favorable.

References

Akdogu, E. (2003), 'Gaining a competitive edge through acquisitions: Evidence from the Telecom industry', *Available at SSRN 387922* .

Amihud, Y., Lev, B. and Travlos, N. G. (1990), 'Corporate control and the choice of investment financing: The case of corporate acquisitions', *Journal of Finance* **45**(2), 603–616.

Andrade, G., Mitchell, M. and Stafford, E. (2001), 'New evidence and perspectives on mergers'.

Asquith, P., Bruner, R. F. and Mullins Jr, D. W. (1983), 'The gains to bidding firms from merger', *Journal of Financial Economics* **11**(1), 121–139.

Baker, S., Bloom, N. and Davis, S. (2013), 'Measuring economic policy uncertainty', *Chicago Booth Research Paper* (13-02).

Barber, B. M. and Lyon, J. D. (1997), 'Detecting long-run abnormal stock returns: The empirical power and specification of test statistics', *Journal of Financial Economics* **43**(3), 341–372.

Bouwman, C. H., Fuller, K. and Nain, A. S. (2009), 'Market valuation and acquisition quality: Empirical evidence', *Review of Financial Studies* **22**(2), 633–679.

Brenner, M. and Galai, D. (1989), 'New financial instruments for hedging changes in volatility', *Financial Analysts Journal* **45**(4), 61–65.

Brown, D. T. and Ryngaert, M. D. (1991), 'The mode of acquisition in takeovers: taxes and asymmetric information', *Journal of Finance* **46**(2), 653–669.

Brown, S. J. and Warner, J. B. (1985), 'Using daily stock returns: the case of event studies', *Journal of Financial Economics* **14**(1), 3–31.

Carhart, M. M. (1997), 'On persistence in mutual fund performance', *Journal of Finance* **52**(1), 57–82.

Chang, S. (1998), 'Takeovers of privately held targets, methods of payment, and bidder returns', *Journal of Finance* **53**(2), 773–784.

Chidambaran, N., John, K., Shangguan, Z. and Vasudevan, G. (2010), 'Hot and cold merger markets', *Review of Quantitative Finance and Accounting* **34**(3), 327–349.

Dixit, A. K. and Pindyck, R. S. (1994), 'Investment under uncertainty', *Princeton UP, Princeton*.

Fama, E. F. (1998), 'Market efficiency, long-term returns, and behavioral finance', *Journal of Financial Economics* **49**(3), 283–306.

Fama, E. F. and French, K. R. (1993), 'Common risk factors in the returns on stocks and bonds', *Journal of Financial Economics* **33**(1), 3–56.

Fuller, K., Netter, J. and Stegemoller, M. (2002), 'What do returns to acquiring firms tell us? Evidence from firms that make many acquisitions', *Journal of Finance* **57**(4), 1763–1793.

Goel, A. M. and Thakor, A. V. (2005), 'Green with envy: implications for corporate investment distortions', *Journal of Business* **78**(6), 2255–2288.

Harford, J. (1999), 'Corporate cash reserves and acquisitions', *Journal of Finance* **54**(6), 1969–1997.

Harford, J. (2005), 'What drives merger waves?', *Journal of Financial Economics* **77**(3), 529–560.

Healy, P. M., Palepu, K. G. and Ruback, R. S. (1992), 'Does corporate performance improve after mergers?', *Journal of Financial Economics* **31**(2), 135–175.

Holmstrom, B. and Kaplan, S. N. (2001), Corporate governance and merger activity in the US: making sense of the 1980s and 1990s, Technical report, National Bureau of Economic Research.

Jegadeesh, N. and Titman, S. (1993), 'Returns to buying winners and selling losers: implications for stock market efficiency', *Journal of Finance* **48**(1), 65–91.

Jensen, M. C. (1986), 'Agency costs of free cash flow, corporate finance, and takeovers', *The American Economic Review* **76**(2), 323–329.

Jovanovic, B. and Rousseau, P. L. (2001), 'Mergers and technological change: 1885-1998', *Unpublished working paper, Vanderbilt University* .

Lang, L. H., Stulz, R. and Walkling, R. A. (1991), 'A test of the free cash flow hypothesis: the case of bidder returns', *Journal of Financial Economics* **29**(2), 315–335.

Loughran, T. and Ritter, J. R. (2000), 'Uniformly least powerful tests of market efficiency', *Journal of Financial Economics* **55**(3), 361–389.

Loughran, T. and Vijh, A. M. (1997), 'Do long-term shareholders benefit from corporate acquisitions?', *Journal of Finance* **52**(5), 1765–1790.

Lyon, J. D., Barber, B. M. and Tsai, C.-L. (1999), 'Improved methods for tests of long-run abnormal stock returns', *Journal of Finance* **54**(1), 165–201.

Maloney, M. T., McCormick, R. E. and Mitchell, M. L. (1993), 'Managerial decision making and capital structure', *Journal of Business* **66**, 189–217.

Martin, K. J. (1996), 'The method of payment in corporate acquisitions, investment opportunities, and management ownership', *Journal of Finance* **51**(4), 1227–1246.

McNamara, G. M., Haleblian, J. J. and Dykes, B. J. (2008), 'The performance implications of participating in an acquisition wave: early mover advantages, bandwagon effects, and the moderating influence of industry characteristics and acquirer tactics', *Academy of Management Journal* **51**(1), 113–130.

Mitchell, M. L. and Stafford, E. (2000), 'Managerial decisions and long-term stock price performance', *Journal of Business* **73**(3), 287–329.

Morck, R., Shleifer, A. and Vishny, R. W. (1990), 'Do managerial objectives drive bad acquisitions?', *Journal of Finance* **45**(1), 31–48.

Rhodes-Kropf, M., Robinson, D. T. and Viswanathan, S. (2005), 'Valuation waves and merger activity: the empirical evidence', *Journal of Financial Economics* **77**(3), 561–603.

Rhodes-Kropf, M. and Viswanathan, S. (2004), 'Market valuation and merger waves', *Journal of Finance* **59**(6), 2685–2718.

Roll, R. (1986), 'The hubris hypothesis of corporate takeovers', *Journal of Business* **59**, 197–216.

Schwert, G. W. (2000), 'Hostility in takeovers: in the eyes of the beholder?', *Journal of Finance* **55**(6), 2599–2640.

Servaes, H. (1991), 'Tobin's Q and the gains from takeovers', *Journal of Finance* **46**(1), 409–419.

Shleifer, A. and Vishny, R. W. (2003), 'Stock market driven acquisitions', *Journal of Financial Economics* **70**(3), 295–311.

Toxvaerd, F. (2008), 'Strategic merger waves: a theory of musical chairs', *Journal of Economic Theory* **140**(1), 1–26.

Travlos, N. G. (1987), 'Corporate takeover bids, methods of payment, and bidding firms' stock returns', *Journal of Finance* **42**(4), 943–963.

Chapter 3: How do financing frictions affect SMEs' finance? The interaction of country and firm characteristics.

Abstract

This paper explores the financing patterns of small and medium enterprises (SMEs) across 14 European countries in response to the severity of the frictions present in the market for external finance. Firm-level and country level data are combined in a two-level hierarchical regression model to study how the individual characteristics of SMEs interact with the legal, financial and institutional environment of the countries in which they operate to determine their financing. Evidence is consistent with a framework in which the severity of frictions in the market for external finance depends on how firm and country characteristics interact: while country level variables are not *per se* informative about SMEs' capital structure, they significantly explain SMEs' observed debt ratios in interaction with firm characteristics.

JEL Classification: G20, G32.

Keywords: SMEs, international capital structure, financing frictions.

1. Introduction

Since the seminal paper of Modigliani and Miller (1958), which established a benchmark frictionless world, corporate finance has primarily became the study of financing frictions Hennessy and Whited (2007), which originate from the imperfections in the market for external finance. In particular, they consist of transaction costs, different fiscal treatment of debt with respect to equity, and agency conflicts between shareholders, managers and lenders due to moral hazard and asymmetric information.

As opposed to large firms, small and medium enterprises (SMEs) are more contrained in their capital structure decision due to the existence of financing frictions. Beck et al. (2005) document not only that small firms are more constrained, but also that the financial and institutional development weakens the constraining effects of existing financial and legal obstacles. In addition, they find that small firms benefit the most from well-developed legal and financial institutions.

The evidence in Beck et al. (2005) suggests that the extent to which financing frictions constrain firms in their capital structure depends, in a nontrivial way, on both their characteristics and their operating environment. The aim of this paper is then to examine how the individual characteristics of SMEs interact with the legal, financial and institutional environment of the countries in which they operate to determine their capital structure in presence of financing frictions. Focusing on SMEs allows to analyze the interaction of firm- and country-level characteristics in a setting where the severity of financing frictions is most relevant. In addition, by considering SMEs, which represent the backbone of the economy of every country, this paper represents an attempt to fill a gap in the current literature. In fact, current studies do not extensively account for international differences in SMEs capital structure and for what determines them.

Consider, for example, how a firm's asset structure, defined as its tangible assets to total assets ratio, interacts with the development of the banking system to determine a firm's ability to access debt finance, which is generally constrained by the frictions related to agency conflicts between borrowers and lenders, and in particular with respect to asymmetric information and moral hazard. In countries where bank lending is more developed access to credit is generally easier because banks better implement screening and monitoring activities that alleviate adverse selection concerns. Still, in presence of such frictions, a small firm with few bank ties might well end up credit rationed, unless it is able to post sufficient collateral to provide guarantees to bank lenders. In this respect, scarce collateral, typical of SMEs, tightens financing constraints and limits their ability to fully take advantage of the lower credit rationing of a well developed banking system. Therefore, the expectation

is that, *ceteris paribus*, only SMEs with a more collateralized asset structure can raise significantly more debt in countries where the banking system is more developed. From a more general perspective, country and firm-specific characteristics are expected to interplay to determine the overall effect of financing frictions on observed capital structure.

The empirical evidence that relates country characteristics to SMEs' capital structure is scarce. Only few studies consider international differences and, to the best of my knowledge, none of them rely on a unified framework to help interpret the differences in SMEs' observed capital structures[1]. In this paper, instead, a conceptual framework is proposed in which individual firm characteristics influence, in interaction with a country's legal, financial and institutional environment, the severity of the financing frictions a firm faces. Then, on the basis of this conceptual framework, several testable hypotheses are developed with respect to the relation between SMEs' debt ratios and country and firm characteristics and their validity is assessed in a sample of European SMEs from 14 different countries over the four-year period from 2006 to 2009. More specifically, given the focus on the interaction between firm and country characteristics, the features of hierarchical regression modeling are exploited to test how financial policies of different types of SMEs are influenced by the different characteristics of the country in which they operate.

Evidence shows that country characteristics play a relevant role in explaining European SMEs' financing policy. Specifically, about 12% of total and long-term debt ratios are related to country determinants, while this figure is slightly lower when short-term debt is considered. Overall, results support the conclusion that international financing patterns are rationalizable in a framework in which firms operate in presence of financing frictions that are more or less severe depending on how firm characteristics interact with country ones. Remarkably, while country-level variables are not individually informative about SMEs capital structure, they significantly predict SMEs debt ratios in interaction with firm characteristics. This is the main contribution of the analysis as opposed to studies that do not account for firm-country interactions that are unlikely to be informative on the effect of country

[1] Data availability and comparability is a significant concern for cross-county analysis of SMEs. Beck et al. (2004), Beck et al. (2005), Clarke et al. (2006), Beck et al. (2006) and Beck et al. (2008) rely on firm-level survey data collected by the World Bank in its World Business Environment Survey. Sogorb-Mira (2005) and López-Gracia and Sogorb-Mira (2008) use data collected by local authorities. Only a few studies rely on harmonized international databases that cover SMEs such as Bureau Van Dijk's AMADEUS or Thomson Reuter's WORLDSCOPE. In particular, only more recent studies such as Daskalakis and Psillaki (2008)and Psillaki and Daskalakis (2009) use AMADEUS to collect data for a sample of SMEs across different European countries.

characteristics on firm capital structure because of the heterogeneity of the multiple underlying effects.

This study relates to two converging lines of literature: the one on capital structure in presence of frictions, and the one on international patterns in capital structure. The former generally lacks international comparisons especially for SMEs, while the latter is mostly focused on large firms. In particular, for the first line of research, Sogorb-Mira (2005) and López-Gracia and Sogorb-Mira (2008) study the financing decisions of SMEs in presence of financing frictions by testing implications of trade-off and pecking order theories. Though, being limited to Spanish firms, their analyses cannot assess how country characteristics affect the significance of the impact of financing frictions on capital structure. For what concerns research on international capital structure, instead, the significant effect of differences in country characteristics on the financing decisions of large firms is well documented in Demirgüç-Kunt and Maksimovic (1996), Booth et al. (2001), Demirgüç-Kunt and Maksimovic (2002), and Fan et al. (2010). Still, Beck et al. (2005) and in particular Beck et al. (2008) report that SMEs behave differently from large firms when financing is concerned as their typical characteristics affect the costs and benefits of financial contracting and their ability to compensate for institutional differences. This paper departs from these latter studies providing evidence on international financing patterns for SMEs from their observable capital structure, instead of survey data. In addition, in this paper the observed evidence is explicitly interpreted in a framework of financing frictions that depend on the interaction between firm-level and country-level characteristics.

The closest papers in this latter research area are Hall et al. (2004), De-Jong et al. (2008), and Psillaki and Daskalakis (2009). Hall et al. (2004)use data about SMEs from eight European countries in order to establish whether cross-country differences in SMEs capital structure are due either to country-specific factors or to differences in firm-specific factors across countries. Consistent with the results of this current study, they also find that differences in SMEs capital structures among countries are significantly related to country-specific variables. Psillaki and Daskalakis (2009) analyze the determinants of SMEs capital structure for France, Greece, Italy, and Portugal, and conclude that firm-specific rather than country-specific factors explain variations in SMEs capital structure. The current study differs from both Hall et al. (2004) and by explicitly including country characteristics rather than implementing country-by-country analyses, and Psillaki and Daskalakis (2009) by considering their interaction with firm-level determinants of capital structure. By contrast, the other two papers compare the results of restricted and unrestricted panel regression models to establish whether country-specific factors significantly influence SMEs financing choices. De-Jong et al. (2008) use a sample of publicly traded companies from 42

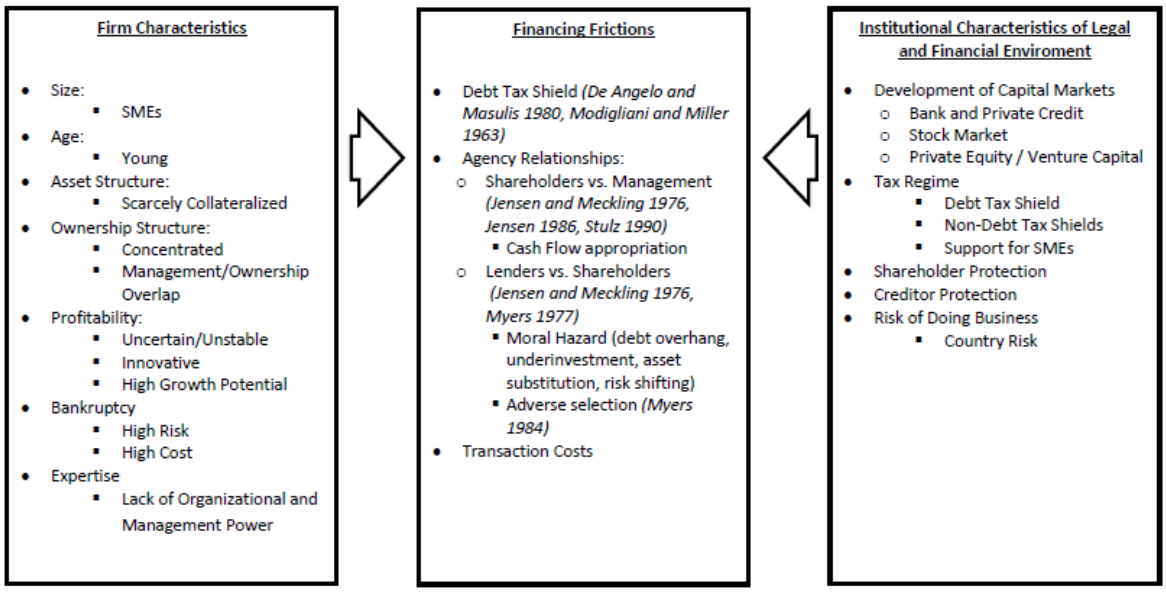
countries, and consider country-level variables with the aim of testing research hypotheses related to both firm-specific and country-specific factors and their interaction. This current study differs from theirs in two main aspects. First, from the methodological point of view, it relies on hierarchical regression models while they use a two-stage procedure to estimate the coefficients they need to evaluate their research hypotheses. Second, and more important, they focus on listed companies while the goal of this paper is to investigate the determinants of SMEs capital structure.

The remainder of the paper is organized as follows. Section 2 develops the conceptual framework and formulates the testable hypotheses. Section 3 describes the sample and the variables included in the study. Section 4 illustrates the methodology and the results of the empirical tests. Section 5 concludes.

2. Conceptual framework

It is the interaction of a firm's individual characteristics with the institutional features of the legal and financial environment that eventually determines the impact of financing frictions on firms' capital structure. This section describes how transaction costs, different fiscal treatment of debt with respect to equity, and agency conflicts between shareholders, managers and lenders are affected by the interaction of typical characteristics of SMEs with country characteristics. Figure 1 briefly summarizes financing frictions and the dimensions on which cross-sectional variation across individual firms and countries is expected.

Figure 1. A conceptual framework of financing frictions, firm and institutional characteristics.



The financing friction related to the tax deductibility of interests on debt affects the capital structure of a firm by reducing the cost of debt finance, with respect to alternative forms of external finance. This effect is well documented in Modigliani and Miller (1963)and DeAngelo and Masulis (1980). Still, the expected value of the tax shield is dependent on the tax regime and on a firm's individual characteristics. In particular, given an advantageous tax regime, in order for fiscal benefits associated with the use of debt to be attractive a firm needs to be sufficiently collateralized, and safe from risk of financial distress. A higher use of debt is expected in this case in order to take advantage of tax shields. Indeed, both a scarce ability to provide collateral and a high risk of financial distress raise the cost to exploit tax shields and erodes net benefits. In addition, small SMEs have larger incentives to raise debt capital in presence of high debt tax shields. Typically, *ceteris paribus*, small SMEs have a higher margial productivity of capital due to decreasing returns to scale in production functions. However, they generally face higher costs of issuing additional debt than large SMEs. If the tax advantage of debt over equity is high, debt tax shields are expected to lower small SMEs' cost of debt and, accordingly, to enchance their debt capacity. Hence, through the "investment channel" described by Gomes and Schmid (2010), they are expected to use debt relatively more than large SMEs do, due to their larger benefits of increasing their capital stock.

The agency relationship between lenders and shareholders represents an important friction that governs firms' access to debt finance. Conflicts arise as a consequence of the inability of lenders to control the incentives and assess the quality of borrowers.

In the first case, that of moral hazard, the potential misconduct of the borrower, for example in the form of risk shifting and asset substitution, leads to credit rationing and eventually to debt overhang and underinvestment as documented in Jensen and Meckling (1976) and Myers (1977). In the second case instead, that of adverse selection, asymmetric information obstructs the correct assessment of the quality of the borrower and raises the cost of debt finance as in Myers and Majluf (1984). Several of the attributes typical of small firms aggravate the financing constraints related to the agency relationship between lenders and shareholders. In particular, small firms, being younger on average, have usually shorter credit history and fewer bank ties. This induces lenders concerned with moral hazard and adverse selection to finance small firms' projects at worse conditions, if at all. They are scarcely collateralized and thus are limited in their ability to provide material guarantees to align agents' incentives and to reduce rationing due to moral hazard. Their profitability is more unstable and tied to growth opportunities. This weakens lenders' ability to predict and then monitor future performance of borrowers and then exacerbates the constraints imposed respectively by adverse selection and moral hazard. Finally, the higher risk of bankruptcy at relatively higher costs of small firms increasingly separates the incentives of shareholders and lenders and results in higher moral hazard. Still, simultaneously, there are institutional characteristics that affect financing frictions related to agency relationship between lenders and shareholders. These in particular are mitigated by the development of capital markets and the legislation on creditor protection, and instead increase in aggregate country risk. More specifically, the development of bank credit, stock market, private equity and venture capital delivers beneficial effects in the form of informational spillovers or financing alternatives while creditor protection alleviates moral hazard. A higher use of debt finance is therefore expected in countries with better creditor protection for firms with more collateral, and a lower use of debt is expected in countries with high aggregate risk for firms scarcely collateralized and whose fortunes are strongly tied to growth opportunities. Moreover, higher use of debt finance is expected in countries with more developed banking sector for firms that are larger, more collateralized and more distant from financial distress. The predictions on the use of debt related to the interaction of firm characteristics with the development of equity capital markets and the development of private equity and venture capital are more uncertain and depend on the conflicting considerations on information spillovers and substitution effects. On the one hand, in fact, public information on listed firms could be relevant also for private firms easing their informational constraints to access debt finance. On the other hand, however, in this context for some firms equity financing could become a viable alternative to debt. Depending on which effect dominates, in countries with more developed stock markets respectively more or less use of debt finance can then be expected. However, only larger and more mature firms can reasonably consider

equity capital as a viable substitute of long term-debt. Spillover effects are instead more relevant for firms characterized by greater realized and prospective growth. For the same reason, the use of debt finance in countries with developed market for private equity and venture capital is expected to depend on firm size, asset structure and risk of financial distress. In particular, given funds' active role in corporate restructuring, firms in financial distress can find in private equity and venture capital a substitute for short-term debt.

Agency relationships between shareholders and managers motivate the use of debt as a monitoring device according to Jensen and Meckling (1976), Jensen (1986)and Stulz (1990). Conflicts are most significant the more diffuse is the ownership structure of the firm, the higher its profitability (in terms of the ability to generate cash flows) and the weaker is the legal protection of the shareholders. Small firms are usually characterized by very concentrated ownership structures and often management and shareholders coincide. On this respect, they are less concerned with the need of monitoring manager's misuse of cash flows. Ownership concentration is however not measurable in the sample. Still a higher use of debt is expected as a monitoring device in countries with strong corporate governance legislation in favor of investor protection for more profitable firms. For larger SMEs instead, shareholder protection is expected to ease access to equity capital as a substitute of long term-debt.

Finally both institutional and firm characteristics affect financing frictions in terms of transaction costs. On this concern, raising external finance is more costly for small firms simply because they lack managerial organization and power as well as direct bank ties. More developed capital markets however alleviate these frictions and thus, consistent with the previous hypotheses, easier access to external finance is expected in countries with developed capital markets for larger and more mature firms.

Table 1 summarizes the hypothesized effect of firm-country interactions on debt finance in presence of financing frictions.

Table 1: Expected effect of firm-country interactions on debt finance

The table reports the sign of the hypothesized effect of each interaction term on firms' debt ratios, according to the conceptual framework in Section 2. A "+" symbol indicates a positive expected relationship, a "−" symbol indicates a positive expected relationship, and a "?" symbol indicates that the nature of the relationship is uncertain because the contrasting effects of financing frictions on the corresponding interaction between country- and firm-level variables. Country-level variables are reported across columns, while firm-level variables are reported along rows. For each firm, Dim is size, AS is asset structure, ROA is return on assets, Age is the number of years a firm has been operating since incorporation, RealGro is realized growth of total assets in the last fiscal year, OppGro represents firm's growth opportunities, and DistRisk is a firm's probability of bankruptcy in terms of its distance from financial distress, measured as Ohlson (1980) O-score. For each country, TaxDvsE is the advantage of debt with respect to equity, BankDev, MktDev and PEVC are respectively the

development of the banking system, of the stock market, and of private equity and venture capital market, ShrRights and CrdRights are the level of protection of respectively shareholders and creditors, CtrRating is the risk of doing business in the country, with lower rating corresponding to higher risk. All variables are measured as described in the text and summarized in Table 2.

	TaxDvsE	BankDev	MktDev	PEVC	ShrRights	CrdRights	CtrRating
Dim	–	+	?	?	–		
AS	+	+				+	+
ROA					+		
Age			–				
RealGro			–	–			
OppGro			–				+
DistRisk	–	+		–		+	

3. Data and sample

Data on SMEs are collected from the AMADEUS database over a period of four years, from 2006 to 2009. Only firms in EU-27 countries that fulfill the criteria of the SME definition of the European Commission as from January 2005 are considered. Specifically, an enterprise qualifies as small- and medium-sized if its number of employees is between 10 and 250, and either it reports a total turnover between 2 million and 50 million or total assets between 2 million and 43 million[2]. An additional filter is imposed on total assets, which need to be greater than 2 million to get rid of the problems concerning the micro firms that populate AMADEUS database as well described in Klapper et al. (2002). To be included in the sample it is also required a firm is active, not involved in bankruptcy process, independent, non-public and does not belong to the financial and insurance sector. Finally, firm-year observations that report values inconsistent with theoretical limits and those with missing values on firm-level variables are excluded.

As in Hall et al. (2004), a balanced panel is formed by randomly selecting each year 100 firms from each country. Absence of enough firms that fulfill all selection criteria in each country limits the cross-country scope of the analysis. Final sample contains 5600 firm-year observations across 14 European countries. Specifically, the analysis covers SMEs operating in Belgium, Bulgaria, Czech Republic, Finland, France, Germany, Grece, Italy, Poland, Portugal, Slovakia, Slovenia, Spain and United Kingdom.

[2] As of Recommendation 2003/361/EC adopted on 6 May 2003.

3.1. Dependent variables

A list of the variables employed in the empirical analysis and their formulation is reported in Table 2.

Following Hall et al. (2004)and Sogorb-Mira (2005) the debt level is used as a proxy of the financial structure of a firm. Dependent variables are defined as debt ratios with respect to total assets, and a distinction is made between total debt, DR, long-term debt, LTDR, and short-term debt, STDR. In particular, short-term debt is defined as the fraction of total debt that is due within one year. It includes commercial loans, overdrafts and short-term loans. Long-term debt instead is the fraction of debt repayable beyond one year and it includes bank loans, renting and leasing.

3.2. Independent variables

Independent variables belong either to the class of firm-level or country-level characteristics. The first group includes firm size, asset structure, profitability, age, realized growth, growth opportunities and risk of financial distress. Following Hall et al. (2004) a firm's size, Dim, is measured as the book value of total assets and its logarithmic transformation, log(Dim), is used in the analysis. Consistent with Hall et al. (2004), Sogorb-Mira (2005) and Daskalakis and Psillaki (2008) a firm's asset structure, AS, is defined as the proportion of tangible assets over total assets and its profitability, ROA, as the return on assets. Age is computed in terms of years since incorporation, and is introduced in the analysis as its logarithmic transformation, log(1+Age). Realized growth, RealGro, is the growth rate of total assets in the last fiscal year. A firm's growth opportunities, OppGro, are captured by the growth rate of its intangible assets in the last fiscal year. A firm's probability of bankruptcy, DistRisk, is measured in terms of its distance from financial distress assessed by means of its O-score as in Ohlson (1980)[3]. Finally, to control for potential unobservable effects common to the macro-sector in which a company operates,

[3] Specifically, O-score is computed as:

$$
\begin{aligned}
&O-score = -1.32 - 0.407\ log\ (Total\ Assets)\\
&+6.03\ \left(\frac{Total\ Liab.}{Total\ Assets}\right) - 1.43\ \left(\frac{Working\ Capital}{Total\ Assets}\right) + 0.076\ \left(\frac{Current\ Liab.}{Current\ Assets}\right)\\
&-1.72\ (1\ if\ Total\ Liab. > Total\ Assets,\ 0\ otherwise)\\
&-2.37\ \left(\frac{Net\ Income}{Total\ Assets}\right) - 1.83\ \left(\frac{Funds\ From\ Operations}{Total\ Liab.}\right)\\
&+0.285\ (1\ if\ Net\ Loss\ for\ the\ last\ two\ years,\ 0\ otherwise)\\
&-0.521\ \left(\frac{Net\ Income_t - Net\ Income_{t-1}}{|Net\ Income_t| + |Net\ Income_{t-1}|}\right)
\end{aligned}
$$

dummy variables are included to classify firms on the basis of SIC codes according to Fama and French five-industry classification. Namely, the macro-sectors in which firms are categorized are either High Technology, Consumer Goods, Manufacturing, Healthcare or Others, the residual class.

Country level-variables refer to the tax regime, the development of capital markets and the legal and institutional environment. Following Overesch and Voeller (2010), the tax advantage of debt over equity in each country, TaxDvsE, is defined as the sum of the corporate tax rate on company profits with the additional tax burden on distributed profits due to dividend taxation at the shareholder level, minus the effective tax rate on interest income. All relevant tax rates are collected from from Deloitte International Tax Source.

The development of capital markets is measured in terms of a country's GDP, as in Demirgüç-Kunt and Maksimovic (1996). In particular, the development of the banking system, BankDev, and the stock market, MktDev, are defined respectively as the ratio between the amount of domestic bank credit and total stock market capitalization over a country's gross domestic product. All relevant data are collected from World Bank Indicators. In a similar vein, for the development of private equity and venture capital, PEVC, the total investment over a country's gross domestic product is considered. Data on investment by private equity and venture capital is from Thomson One Banker and the European Private Equity and Venture Capital Association.

The level of protection of shareholders, ShrRights, and creditors, Crdrights, is measured using the anti-director rights index and the creditor rights index as described in La-Porta et al. (1998)and Harper and McNulty (2008). For countries for which these values are not available, they are replaced with the mean of the countries in the sample with the same legal origin.

Country ratings, CtrRatings, are included in the analysis as a proxy of country risk. They are designed as a categorical variable that codes alphanumerical COFACE ratings. The highest rating A1 is associated to lowest country risk and the highest value of the numerical scale, 7, while the lowest rating D corresponds to highest country risk and the lowest value of the numerical scale, 1.

Table 2: Variables formulation

The table reports the definitions and the metrics for the variables used in the analysis. Panel A describes dependent variables. Panel B presents firm-level independent variables. All firm-level data is collected from Amadeus Database. O-score is representative of the probability of bankruptcy and is computed as in Ohlson (1980). Panel C describes country-level variables. The tax advantage of debt over equity is computed with respect to tax treatment of corporate profits (τ^C), dividends (τ^D), and interest income (τ^I). Data on tax rates is collected from Deloitte International Tax Source. Data on GDP, domestic credit and stock market capitalization is from World Bank Indicators. Data on investment by private equity and venture capital is from Thomson One Banker and the European Private Equity and Venture Capital Association. The level of protection of shareholders and creditors is measured using the anti-director rights index and the creditor rights index as described in La-Porta et al. (1998) and Harper and McNulty (2008). Country ratings is a categorical variable that codes alphanumerical COFACE ratings. The highest rating A1 is associated to the highest value of the numerical scale, 7, while the lowest rating D corresponds to the lowest value of the numerical scale, 1. All variables are winsorized at the 1% level.

Panel A: Dependent Variables

Variable	*Description*	*Formulation*
DR	Total Debt Ratio	$\frac{Long\ Term\ Debt + Short\ Term\ Debt}{TotalAssets}$
LTDR	Long Term Debt Ratio	$\frac{Long\ Term\ Debt}{TotalAssets}$
STDR	Short Term Debt Ratio	$\frac{Short\ Term\ Debt}{TotalAssets}$

Panel B: Firm-Level Independent Variables

Variable	*Description*	*Formulation*
Dim	Firm Size	Total Assets
AS	Asset Structure	$\frac{TangibleAssets}{TotalAssets}$
ROA	Return on Assets	$\frac{EBIT}{TotalAssets}$
Age	Years since Incorporation	-
RealGro	Realized Growth	$\frac{TotalAssets_t - TotalAssets_{t-1}}{TotalAssets_{t-1}}$
OppGro	Growth Opportunities	$\frac{Int.FixedAssets_t - Int.FixedAssets_{t-1}}{Int.FixedAssets_{t-1}}$
DistRisk	Risk of Bankruptcy	O-Score

Panel C: Country-Level Independent Variables

Variable	*Description*	*Formulation*
TaxDvsE	Tax Advantage of Debt	$\Delta = \tau_C + \tau_D - \tau_I$
BankDev	Development of Banking System	$\frac{Domestic\ Credit}{GDP}$
MktDev	Development of Stock Market	$\frac{Market\ Capitalization}{GDP}$
PEVC	Private Equity and Venture Capital	$\frac{Investment}{GDP}$
ShrRights	Protection of Shareholders	Anti-director Rights Index
CrdRights	Protection of Creditors	Creditor Rights Index
CtrRating	Country Risk	COFACE Country Rating

3.3. Summary statistics

Table 3 shows the main descriptive statistics about firm- and country-level variables. Firms in the sample have a debt stock that represent about 22% of their total assets, almost equally split between short- and long-term. French firms report on average the lowest debt ratios while those of German, Greek and Portuguese firms are among the highest. Average firms' size is around 10 million. This figure however is characterized by high variability, mainly because of a small number of companies with a high amount of assets. More specifically, significant variability within and across countries is observed, with German firms being on average significantly larger. The asset structure is on average 30% of total assets. Scarce collateralization typical of SMEs is observable especially in France, Italy, Spain, Portugal and Greece. This suggest that SMEs in central and eastern Europe operate in more tratitional and tangible sectors. Firm in the sample are on avarage profitable as they report almost 7% of return on assets. Still, firms that operate in central and Baltic Europe seem on average more profitable than those in the Mediterranan area. Firms in the sample are also quite mature even though there is significant cross-sectional variability along this dimension. The sample is significantly heterogeneous with respect to realized and potential growth and on average, one out of five firms in the sample is expected to end up in financial distress. This is quite a high probability and reflects the typical concerns upon the uncertainty of SMEs. Again, firms in central and eastern European countries seem safer from financial distress.

Descriptive statistics on country-level variables document that there is indeed a significant tax advantage of debt over equity, exception made for Slovakia. Fiscal benefits are lowest in United Kingdom and Bulgaria, and highest in Germany, France and Italy. Moreover, for what concerns the development of capital markets, on average the greatest fraction of external financing is provided in the form of bank

credit. Stock market and private equity and venture capital cover a significant but residual part. Countries in which the banking system is more developed include Germany, Italy, Portugal, Spain and United Kingdom. Stock market and private equity and venture capital are more developed in France, Finland, Spain, and United Kingdom. Legal and institutional characteristics assure on average high protection of shareholders and creditors. Country risk is generally low. Consistent with European integration, observed differences across countries are small in this respect.

Table 3: Descriptive statistics

The table reports descriptive statistics for both firm- and country-level variables used in the analysis. Only firms satisfying the criteria adopted by the European Commission in its 2005 definition of small and medium-sized enterprises are considered in the sample. Financial firms and utilities are excluded. The sample consists of 5600 firm-year observations clustered across 14 European countries. For each country and each year between 2006 and 2009, 100 SMEs are randomly selected. Panel A refers to firm-level variables. Dim is size, AS is asset structure, ROA is return on assets, Age is the number of years a firm has been operating since incorporation, RealGro is realized growth of total assets in the last fiscal year, OppGro represents firm's growth opportunities, and DistRisk is a firm's probability of bankruptcy in terms of its distance from financial distress, measured as ohlson:80 O-score. Panel B refers to country-level variables. TaxDvsE is the advantage of debt with respect to equity, BankDev, MktDev and PEVC are respectively the development of the banking system, of the stock market, and of private equity and venture capital market, ShrRights and CrdRights are the level of protection of respectively shareholders and creditors, CtrRating is the risk of doing business in the country, with lower rating corresponding to higher risk. All variables are measured as described in the text and summarized in Table 2 and winsorized at the 1% level.

Panel A: Firm-Level Variables

Variable	Mean	Std. Dev.	Median
DR	0.22	0.19	0.17
STDR	0.10	0.12	0.05
LTDR	0.12	0.15	0.05
Dim	10233	30041	5281
AS	0.30	0.24	0.25
ROA	0.07	0.10	0.05
Age	21.00	13.60	17.00
RealGro	1.07	3.14	0.06
OppGro	0.51	3.13	-0.15
DistRisk	0.17	0.22	0.08

Panel B: Country-Level Variables

Variable	Mean	Std. Dev.	Median
TaxDvsE	0.28	0.19	0.24
BankDev	1.10	0.53	1.11
MktDev	0.55	0.38	0.49
PEVC	0.18	0.27	0.12
ShrRights	1.71	0.95	2.00

CrdRisghts	1.92	1.03	2.00
CtrRating	5.35	0.89	5.00

Remarkably, substantial cross-country variation is observable across most of the proposed statistics. This evidence, in particular, is important for the employed empirical methods that assume a hierarchically structured population, with sampling of countries and observations within countries. Table 4 reports correlations across firm- and country level variables.

Table 4: Cross-sectional correlations

The table reports cross-sectional correlations for firm-level and county-level variables. Panel A refers to firm-level variables. Dim is size, AS is asset structure, ROA is return on assets, Age is the number of years a firm has been operating since incorporation, RealGro is realized growth of total assets in the last fiscal year, OppGro represents firm's growth opportunities, and DistRisk is a firm's probability of bankruptcy in terms of its distance from financial distress, measured as Ohlson (1980) O-score. Panel B refers to country-level variables. TaxDvsE is the advantage of debt with respect to equity, BankDev, MktDev and PEVC are respectively the development of the banking system, of the stock market, and of private equity and venture capital market, ShrRights and CrdRights are the level of protection of respectively shareholders and creditors, CtrRating is the risk of doing business in the country, with lower rating corresponding to higher risk. All variables are measured as described in the text and summarized in Table 2 and winsorized at the 1% level.

Panel A: Firm-Level Variables

	log(Dim)	AS	ROA	log(1+Age)	RealGro	OppGro	DistRisk
log(Dim)	1.00						
AS	0.15	1.00					
Roa	-0.10	-0.10	1.00				
log(1+Age)	0.14	0.03	-0.11	1.00			
RealGro	0.01	0.01	0.03	-0.01	1.00		
OppGro	0.03	-0.02	0.01	0.00	0.03	1.00	
DistRisk	-0.13	-0.03	-0.34	-0.08	-0.01	0.01	1.00

Panel B: Country-Level Variables

	TaxDvsE	BankDev	MktDev	PEVC	ShrRights	CrdRights	CtrRating
TaxDvsE	1.00						
BankDev	0.22	1.00					
MktDev	0.26	0.47	1.00				
PEVC	-0.05	0.58	0.63	1.00			
ShrRights	-0.48	0.16	0.31	0.63	1.00		
CrdRights	-0.35	0.11	0.03	0.38	0.26	1.00	
CtrRating	0.63	-0.01	0.24	0.04	-0.13	-0.04	1.00

4. Empirical analysis

4.1. Methodology

To test the impact of country-level effects resort is made to hierarchical modeling[4]. This methodology, in fact, well matches the structure of the data and is tailored to test hypotheses identified at different levels. In particular, a two-levels hierarchical regression model is designed. Each firm in the sample belongs to a specific country, and observations within each country are hardly independent. The first level of the hierarchy is therefore the country level. Random-effects allow to think about countries as if they are drawn from the same distribution. The second level of the hierarchy then models the extent to which differences among countries affect capital structure at firm level, either individually or in interaction with firm-level determinants of capital structure. This framework is therefore particularly well fit to reveal whether country conditions reinforce or weaken the link between firms' characteristics and their capital structure, very well matching the focus on interactions.

Two recent examples of studies that apply hyerarchical modeling to corporate finance are Griffin et al. (2009) and Engelen and Essen (2010). They adopt this methodology in a similar framework to analyze respectively the impact of cultural values on firm risk-taking, and the impact of firm, issue and country characteristics on IPO underpricing.

First, in order to examine the relative importance of country-level and firm-level characteristics in explaining the variation in debt ratios, the nature of the sample is exploited by estimating the following random-effect hierarchical "empty" model without predictors:

$$D_{i,j} = \gamma_{0,0} + u_{0,j} + \varepsilon_{i,j} \quad (1)$$

The dependent variable $D_{i,j}$ is alternatively the total debt ratio, DR, the long-term debt ratio, LTDR, and the short-term debt ratio, STDR, of firm i in country j. $\gamma_{0,0}$ is a constant term and $u_{0,j}$ and $\varepsilon_{i,j}$ are normally distributed error terms respectively at the country level and at the firm level.

Then, in order to allow for both country-level fixed and random effects, the random effect hierarchical model is filled with country- and firm-variables, to estimate:

$$D_{i,j} = \beta_{0,j} + \beta_{1,j}^{T} X_{i,j}^{F} + \varepsilon_{i,j} \quad (2)$$

[4] As a reference see, for example, Gelman and Hill (2007)

with,

$$X_{i,j}^{F} = [log(Dim)_{i,j}\ AS_{i,j}\ ROA_{i,j}\ log(1+Age)_{i,j}\ RealGro_{i,j}$$
$$OppGro_{i,j}\ \ DistRisk_{i,j}\ HiTech_{i,j}\ Cnsmr_{i,j}\ Manuf_{i,j}\ Hlth_{i,j}];$$
$$\beta_{0,j} = \gamma_{0,0} + \gamma_{0,1}^{T} X_{i,j}^{C} + u_{0,j}\ ;$$
$$\beta_{1,j} = \gamma_{1,0} + \gamma_{1,1}^{T} X_{i,j}^{C}\ ;\ and,$$
$$X_{i,j}^{C} = [TaxDvsE_j\ BankDev_j\ MktDev_j\ PEVC_j\ ShrRights_j$$
$$CrdRights_j\ CtrRating_j]$$

Again, the dependent variable $D_{i,j}$ is alternatively the total debt ratio, DR, the long-term debt ratio, LTDR, and the short-term debt ratio, STDR, of firm i in country j. $X_{i,j}^{F}$ and $X_{i,j}^{C}$ are respectively the vectors of firm- and country-level variables for firm i in country j. $u_{0,j}$ and $\varepsilon_{i,j}$ are normally distributed error terms at the country level and at the firm level respectively, and $\gamma_{0,0}$ and $\gamma_{1,0}$ are constant terms.

In particular, two model specifications are estimated. In the first, [1], interaction terms are excluded, that is equivalent to restricting $\beta_{1,j} = \gamma_{1,0}$. Then the second, [2], includes the subset of the interaction terms suggested by the conceptual framework in Section 2 and reported in Table 1.

Both models are estimated by restricted maximum likelihood (REML) because, in comparison with full-information maximum likelihood (FIML), it takes into account the degrees of freedom from the fixed effects and hence yields less biased estimates of variance components in finite samples. However, Snijders and Bosker (1999) claim that in large samples the differences between the estimates using the two methods is negligible.

4.2. Empirical Results

The results of the empirical analysis support the conclusion that international financing patterns are rationalizable in a framework in which SMEs operate in presence of financing frictions that are more or less severe depending on how firm characteristics interact with country ones. Table 5 documents that while most of the variability in debt ratios is associated with firm-level variables, a remarkable part of the variation in debt ratios is still explained at the country level. More precisely, about 12% of the variability in total and long-term debt ratios is expalained at the country level. This figure is slightly lower when short-term debt is considered.

Table 5: Hierarchical regression analysis results: "Empty" model

The table reports the estimated variance of country- and firm-level effects resulting from the estimation of a random-effect hierarchical "empty" model in the form $D_{i,j} = \gamma_{0,0} + u_{0,j} + \varepsilon_{i,j}$*, where* $u_{0,j}$ *and* $\varepsilon_{i,j}$ *are normally distributed error terms at the country level and at the firm level respectively, and* $\gamma_{0,0}$ *is a constant term. The dependent variable* $D_{i,j}$ *is alternatively the total debt ratio (DR) the long-term debt ratio (LTDR) and the short-term debt ratio (STDR) of firm* i *in country* j*. These are computed as described in Table 2. The regression model is estimated by restricted maximum likelihood (REML) for a sample of 5600 firm-year observations clustered across 14 European countries that includes, for each country and each year between 2006 and 2009, a random selection of 100 SMEs. The table then reports the fraction of the variance explained at the country- and firm-level as a percentage of total estimated variance. Finally the table reports the Likelihood-Ratio (LR) test of the fit of the model. P-values are in parentheses. For ease of presentation of estimation results variables DR, LTDR, STDR, AS, DistRisk and TaxDvsE are transformed multiplying by a factor of 100.*

Random-Effects Parameters	DR	LTDR	STDR
Estimated Variance of $u_{0,i}$	47.00	29.67	16.22
Estimated Variance of $\varepsilon_{i,j}$	353.78	223.44	152.28
Country-Level Variation (%)	11.7	11.7	9.6
Firm-Level Variation (%)	88.3	88.3	90.4
LR TEST	599.58	599.24	479.36
	(0.00)	(0.00)	(0.00)

Table 6 reports the estimates for the hierarchical model. Specification [1], in columns (1) to (3), considers firm and country characteristics individually, while specification [2], in columns (4) to (6), introduces interaction terms. Marginal effects of firm-level variables, reported in Panel A, confirm their prevalent role in explaining the variability of firms'debt ratios. Evidence is robust to the inclusion of interaction variables and is in line with previous research on capital structure of SMEs. Firm size has a positive impact on debt ratios, consistent with larger firms being less concerned by the fixed costs of raising debt as in Hennessy and Whited (2007) and Kurshev and Strebulaev (2007). In particular, the marginal effect of size on debt ratios is postitive and strongly significant for total debt, as well as for long-term debt and short-term debt. Inclusion of interaction terms in specification [2] of the model does not affect these results. A similar argument applies to firm's asset structure. It is observed in fact that SMEs with a higher proportion of tangible assets report higher total and long-term debt ratios. A positive and reliably significant marginal effect is reported on both total debt and long-term debt. Using their assets as collateral for debt, firms with more tangible asset structure reduce lenders' concerns on moral hazard and have access to more credit at better conditions. This effect eventually has an impact also on their use of short-term debt, which is significantly lower. The observed marginal effect on short-term debt, that is less often secured by collateral, is in fact negative

and significant. Evidence is robust to the inclusion of interaction terms in specification [2] of the model. The marginal effect on debt associated with return on assets is also negative. More specifically, this effect is significant with respect only to total and short-term debt, consistent with a pecking-order interpretation in which more profitable SMEs need relatively less debt capital as they can rely on larger supplies of internal fund. The magnitude of these effects is even stronger after the inclusion of interaction terms in specification [2] of the model, showing the relevance of the interplay beteween firm and country characteristics. For a similar reason, a lower use of debt finance is observed for mature SMEs whose financing needs are generally lower and can be covered with internal funds. Marginal effects on debt ratios are negative and reliably significant for total debt, as well as for long-term debt and short-term debt. Inclusion of interaction terms in specification [2] of the model does not affect these results. The marginal effect of growth opportunities on total debt ratio, which is positive and significant, suggests that SMEs that have greater growth potential match the duration of debt to the realization of their growth prospects. Marginal effects on short- and long-term debt are in fact not statistically significant and evidence is robust to the inclusion of interaction terms in specification [2] of the model. All the marginal effects of realized growth on debt ratios are instead insignificant in both specifications of the model. Finally, the positive effect of distress risk on debt ratios reflects the typically strong correlation between risk of default and no residual debt sustainability. In particular, the reported marginal effect is positive and reliably significant for total debt, as well as for long-term debt and short-term debt.

Concerning country characteristics, consistent with the hypotheses, results suggest they are significant determinants of capital structure. Still, marginal effects, reported in Panel B of Table 6, document that the role of country-level variables in explaining SMEs' debt ratios is significant mainly in interaction with firm characteristics. In model specification [1], reported in columns (1) to (3), the contrasting impacts of different underlying effects results in marginal effects of country variables that are not individually informative about SMEs capital structure. In support of this claim, the only reported marginal effect that is significant is, in fact, the one for the development of the banking system for which, according to Table 1, all the underlying interactions are expected to work in the same direction. In particular the marginal effect of the development of the banking sector is positive and significant for total debt, as well as for short-term debt. Remarkably, only after the inclusion of interaction terms in model specification [2], a significant and positive marginal effect is observed for long term-debt. The only other country-level marginal effect that is found individually significant is that of the development of the stock market on long-term debt. Consistent with an interpretation of a substitution effect, the marginal effect is negative and significant. All other country-level effects are reported

insignificant. It is only in interaction with firm-variables that the impact of country characteristics on capital structure becomes indeed observable, as reported for model specification [2] in Panel C across columns (4) to (6).

For what concerns fiscal treatment of debt with respect to equity, in countries where the fiscal regime is more favorable, debt tax shields are reported to interact significantly with firm characteristics. The interaction between fiscal benefits and a firm's asset structure is positively related to observed debt ratio. In particular, the slope coefficient in the regression is positive and significant for total debt, as well as for long-term debt. These results are consistent with higher debt ratios for more collateralized SMEs, and support the prediction that firms with a scarce ability to provide collateral are unable to exploit the tax benefits of debt with respect to equity in countries where these benefits are large. This result appears to be valid only for the use of long-term debt, which is more often secured by collateral, rather than short-term debt. On the contrary, for larger SMEs, lower debt ratios are observed in countries where the tax treatment of debt is more advantageous. In particular, the coefficient on the interaction of a country's tax regime with firm-size is negative and significant for total debt, as well as for long-term debt and short-term debt. This evidence is consistent with small SMEs taking advantage of their improved debt capacity in countries where the tax advantage of debt over equity is high, by exploiting their larger benefits of increasing their capital stock. Finally, a negative and significant effect on debt ratios is reported with respect to the fiscal advantage of debt in interaction with a firm's risk of distress. In particular the slope in the regression is negative and significant for total debt, as well as for long-term debt and short-term debt. A firm ability and willingness to take advantage of the favorable tax treatment of debt is in fact limited by its debt capacity. For firms close to financial distress, fiscal benefits do not trade-off the conditions at which these firms can access additional debt.

The development of capital markets affects SMEs capital structure especially with respect to the development of the banking system. All proposed interactions have a positive and significant effect. In particular, larger SMEs benefit of a developed banking system and report higher debt ratios, consistent with their lower transaction cost and their longer bank relationships that mitigate asymmetric information. The slope of the regression for the interaction term between the development of the banking system and firm size is positive and significant for total debt, as well as for long-term debt and short-term debt. In the same way, a more developed banking system results in higher debt ratios for SMEs that can post more collateral to solve moral hazard concerns. Interestingly, the effect of the interaction with asset structure is significant only with respect to total and long-term debt, whose slope coefficients are respectively positive and significant. Short-term debt instead is not affected since

it is generally not collateralized. Finally, higher debt ratios are oberved in a more developed banking system for SMEs closer to financial distress, which benefit the most from better bank monitoring and would otherwise be constrained. Consistent with the financing needs of firms in financial distress, the effect of the interaction is limited to the short-term, that is when these firms are most constrained. The slope coefficients for total and short term debt are in fact positive and significant. With respect to the development of the stock market, a significant substitution effect of total and long-term debt emerges for mature SMEs. In particular, when stock market development is interacted with firm age, negative and weakly significant regression slopes are reported with respect to both total debt and long-term debt. This effect can be interpreted in light of the lower adverse selection concerns of an equity issue by a firm that has a longer history. In a similar way, it is observed that the development of private equity and venture capital interacts significantly with firm's risk of distress. In particular a substitution effect emerges with respect to total and short-term debt. The corresponding regression coefficients are negative and weakly significant. This temporary effect is perfectly consistent with the role and the investment horizon of private equity and venture capital in corporate restructuring.

Concerning the legal and institutional systems, evidence supports the conclusion that the level of shareholder and creditor protection concur in the determination of capital structure. In particular, estimates show how the level of protection of minority shareholders, when interacted with firm profitability, results in a higher use of debt. Debt in fact can be used as a monitoring device to limit managers' discretionality in the use of cash flows and solve their agency conflicts with shareholders. Interestingly, the effect is limited to the short-term, consistent with a dynamic monitoring interpretation. Specifically, the corresponding regression slopes are positive and reliably significant. In interaction with firm's size, the effect of higher shareholder protection on debt ratios is instead negative. Higher shareholder protection in fact translates in more efficient corporate governance legislation in favor of investors and, for larger SMEs, results in easier access to equity finance. In these countries, equity capital becomes a substitute of long term-debt for a broader set of otherwise constrained firms. In particular, the slope coefficients are negative and significant for total debt, as well as for long-term debt. In a similar vein, the level of creditors' protection has a positive and significant effect on long-term debt ratios in interaction with asset structure. The slope coefficient is positive and significant for total debt, as well as for long-term debt. Creditors' rights in fact typically increase the expected recovery value of the collateral, and hence mitigate moral hazard issues. Finally, the analysis shows that in countries with lower business risk, firms with higher growth opportunities have access to more debt finance. The impact of the interaction term is limited to total and long-term debt, whose corresponding coefficients are posititive and significant. This evidence is consistent with the interpretation that a more

favorable environment mitigates the constraints of firms with higher growth opportunities that would otherwise be rationed due to the uncertainty of future realization of present growth opportunities.

Table 6: Hierarchical regression analysis results

The table reports estimates for the random-effect hierarchical regression model $D_{i,j} = \beta_{0,j} + \beta_{1,j}^T X_{i,j}^F + \varepsilon_{i,j}$, *with* $\beta_{0,j} = \gamma_{0,0} + \gamma_{0,1}^T X_{i,j}^C + u_{0,j}$, *and* $\beta_{1,j} = \gamma_{1,0} + \gamma_{1,1}^T X_{i,j}^C$. $X_{i,j}^F$ *is a vector of firm-level variables for firm* i *in country* j *and includes Dim (size), AS (asset structure), ROA (return on assets), Age (the number of years a firm has been operating since incorporation), RealGro (realized growth of total assets in the last fiscal year), OppGro (firm's growth opportunities), and DistRisk (a firm's probability of bankruptcy in terms of its distance from financial distress, measured as Ohlson (1980) O-score).* $X_{i,j}^F$ *also includes HiTech, Cnsmr, Manuf and Hlth, which are dummy variables computed on the basis of firm SIC codes to classify firms according to Fama and French five-industry classification. They represent respectively High-Tech, Consumer Goods, Manufacturing and Healthcare industries. The residual class is not included in the analisis to avoid multicollinearity.* $X_{i,j}^C$ *is the vector of country-level variables for firm* i *in country* j *and includes TaxDvsE (the advantage of debt with respect to equity), BankDev (the development of the banking system), MktDev (the development of the stock market) and PEVC (the development of the private equity and venture capital market), ShrRights (the level of protection of shareholders) and CrdRights (the level of protection of creditors), CtrRating (the risk of doing business in the country, with lower rating corresponding to higher risk).* $u_{0,j}$ *and* $\varepsilon_{i,j}$ *are normally distributed error terms at the country level and at the firm level respectively, and* $\gamma_{0,0}$ *and* $\gamma_{1,0}$ *are constant terms. Columns (1)-(3) refer to the model specification [1] where interaction terms are excluded, that is* $\beta_{1,j} = \gamma_{1,0}$. *Columns (4)-(6) refer to the model specification [2], in which the subset of interaction terms suggested by the conceptual framework in Section 2 and reported in Table 1 are included. The dependent variable* $D_{i,j}$ *is alternatively the total debt ratio (DR) the long-term debt ratio (LTDR) and the short-term debt ratio (STDR) of firm* i *in country* j. *The regression model is estimated by restricted maximum likelihood (REML) for a sample of 5600 firm-year observations clustered across 14 European countries that includes, for each country and each year between 2006 and 2009, a random selection of 100 SMEs. All variables are computed as described in Table 2 and winsorized at the 1% level. Panel A reports marginal effects for firm-level variables, Panel B reports marginal effects on country-level variables, and Panel C reports coefficients on a selected set of interaction terms. Corresponding z-stats are in parenthesis. The table reports the Likelihood-Ratio (LR) test of the fit of the model, and the Wald test for the joint significance of country-level effects. For these two test, p-values are in parenthesis. For ease of presentation of estimation results variables DR, LTDR, STDR, AS, DistRisk and TaxDvsE are transformed multiplying by a factor of 100.*,**, and *** denote respectively significance of marginal effects at the 10%, 5% and 1% levels.*

Panel A: Firm-Level Variables (marginal effects)

	[1]			[2]		
	DR	**LTDR**	**STDR**	**DR**	**LTDR**	**STDR**
log(Dim)	1.93***	1.13***	0.80***	1.79***	0.98***	0.80***
	(5.58)	(4.15)	(3.33)	(5.20)	(3.64)	(3.80)
AS	0.20***	0.23***	-0.03***	0.19***	0.23***	-0.03***
	(19.83)	(29.07)	(-4.31)	(19.43)	(28.37)	(-4.32)
ROA	-6.96***	-1.25	-5.77***	-9.69***	-2.00	-7.74***
	(-2.97)	(-0.68)	(-3.53)	(-4.07)	(-1.07)	(-4.63)
log(1+Age)	-2.24***	-1.55***	-0.68**	-2.09***	-1.48***	-0.60*
	(-4.98)	(-4.40)	(-2.17)	(-4.57)	(-4.12)	(-1.87)
RealGro	0.07	0.07	-0.00	0.04	0.04	-0.01
	(0.90)	(1.15)	(-0.01)	(0.58)	(0.85)	(-0.12)
OppGro	0.15**	0.08	0.07	0.14**	0.08	0.06
	(2.02)	(1.42)	(1.30)	(1.98)	(1.43)	(1.23)
DistRisk	0.23***	0.14***	0.09***	0.24***	0.14***	0.09***
	(21.30)	(16.05)	(12.51)	(21.70)	(16.60)	(12.34)
HiTech	-2.99**	-2.17*	-0.81	-2.63*	-1.97*	-0.64
	(-2.02)	(-1.87)	(-0.78)	(-1.80)	(-1.72)	(-0.63)
Cnsmr	3.15***	-0.26	3.42***	3.13***	-0.24	3.38***
	(5.33)	(-0.56)	(8.31)	(5.34)	(-0.54)	(8.22)
Manuf	0.63	-1.22**	1.86***	0.85	-1.01**	1.87***
	(0.93)	(-2.30)	(3.96)	(1.27)	(-1.94)	(3.99)
Hlth	-2.56	-1.43	-1.12	-2.39	-1.25	-1.13
	(-1.55)	(-1.10)	(-0.98)	(-1.47)	(-0.98)	(-0.99)

Panel B: Country-Level Variables (marginal effects)

	[1]			[2]		
	DR	**LTDR**	**STDR**	**DR**	**LTDR**	**STDR**
TaxDvsE	0.10	0.21	-0.11	0.08	0.19	-0.10
	(0.54)	(1.35)	(-1.12)	(0.51)	(1.33)	(-1.10)
BankDev	5.13***	1.95	3.29***	5.67***	2.29*	3.47***
	(3.03)	(1.46)	(2.90)	(3.40)	(1.73)	(3.06)
MktDev	-1.52	-2.05**	0.57	-1.34	-1.99**	0.67
	(-1.36)	(-2.34)	(0.75)	(-1.21)	(-2.28)	(0.87)
PEVC	-5.67	-2.14	-3.76	-7.66	-3.26	-4.58
	(-0.51)	(-0.23)	(-0.62)	(-0.74)	(-0.37)	(-0.77)
ShrRights	0.58	1.53	-0.93	0.48	1.31	-0.82
	(0.17)	(0.54)	(-0.52)	(0.16)	(0.50)	(-0.46)
CrdRights	1.35	1.07	0.28	1.41	1.09	0.32
	(0.59)	(0.57)	(0.23)	(0.68)	(0.62)	(0.38)
CtRrating	-1.72	-1.88	0.19	-1.78	-1.90	(0.13)
	(-0.58)	(-0.76)	(0.12)	(-0.66)	(-0.83)	(0.09)

Panel C: Interaction Terms (coefficients)

	[1]			[2]		
	DR	**LTDR**	**STDR**	**DR**	**LTDR**	**STDR**
TaxDvsE X log(Dim)				-0.12***	-0.09***	-0.04**
				(-5.06)	(-4.55)	(-2.12)
TaxDvsE X AS				0.3e-2***	0.3e-2***	-0.2e-3
				(3.91)	(5.35)	(-0.44)
TaxDvsE X DistRisk				-0.3e-2***	-0.2e-2***	-0.2e-2***
				(-5.77)	(-3.98)	(-3.74)
BankDev X log(Dim)				3.77***	2.22***	1.55***
				(4.41)	(3.31)	(2.58)
Bank Dev X AS				0.06***	0.05***	0.8e-2
				(2.86)	(3.10)	(0.58)
BankDev X DistRisk				0.09***	0.01	0.08***
				(3.43)	(0.60)	(4.18)
MktDev X log(Dim)				0.69	0.28	0.42
				(0.57)	(0.29)	(0.50)
MktDev X log(1+Age)				-2.00*	-1.55*	-0.49
				(-1.88)	(-1.85)	(-0.65)
MktDev X RealGro				0.14	0.23	-0.09
				(0.61)	(1.24)	(-0.52)
MktDev X OppGro				-0.24	-0.15	-0.09
				(-1.10)	(-0.88)	(-0.58)
PEVC X log(Dim)				1.37	0.96	0.43
				(0.57)	(0.50)	(0.26)
PEVC X RealGro				-0.56	-0.43	-0.13
				(-1.33)	(-1.58)	(-0.55)
PEVC X DistRisk				-0.10*	-0.03	-0.07*
				(-1.93)	(-0.79)	(-1.90)
ShrRights X log(Dim)				-1.24**	-1.24***	-0.01
				(-2.23)	(-2.83)	(-0.03)
ShrRights X ROA				6.44***	1.04	5.36***
				(2.74)	(0.57)	(3.25)
CrdRights X AS				0.03***	0.05***	-0.01
				(2.63)	(4.09)	(-0.81)
CrdRights X DistRisk				-0.01	-0.01	0.3e-2
				(-0.71)	(-1.25)	(0.44)
CtrRating X AS				0.3e-3	-0.02	0.02
				(0.02)	(-1.41)	(1.63)
CtrRating X OppGro				0.15*	0.14**	0.1e-2
				(1.69)	(2.11)	(0.04)

Intercept	-0.25	-3.41	2.88	-1.93	-16.30	14.02
	(-0.02)	(-0.29)	(0.38)	(-0.11)	(-1.10)	(1.20)
LR Test	412.00	473.49	238.95	331.25	402.31	220.03
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Wald Test	1147.07	1303.68	338.35	1328.24	1475.91	448.02
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

5. Conclusion

Overall, empirical results support the conclusion that country characteristics play a relevant role in explaining the differences in the financing policy of SMEs across different European countries. Most important, evidence suggests that international financing patterns are rationalizable in a framework in which firms operate in presence of financing frictions that are more or less severe depending on how firm characteristics interact with country characteristics, as conjectured in Section 2. To test the hypotheses resort is made to hierarchical modeling, that well matches both the structure of the data and the goals of the study. This allows to test hypotheses identified at different levels to reveal whether country conditions reinforce or weaken the link between firms' characteristics and their capital structure. In this framework, it is possible to document that the interaction of the institutional features of the legal and financial environment with a firm's individual characteristics eventually determines the impact of financing frictions on firms' capital structure. The analysis shows, in fact, that while country-level variables are not individually informative about SMEs capital structure, they significantly predict SMEs debt ratios in interaction with firm characteristics. This is the main contribution of the analysis as opposed to studies that do not account for firm-country interactions that are unlikely to be informative on the effect of country characteristics on firm capital structure because of the heterogeneity of the multiple underlying effects.

References

Beck, T., Demirgüc-Kunt, A., Laeven, L. and Maksimovic, V. (2006), 'The determinants of financing obstacles', *Journal of International Money and Finance* **25**(6), 932–952.

Beck, T., Demirgüç-Kunt, A. and Maksimovic, V. (2004), 'Bank competition and access to finance: international evidence', *Journal of Money, Credit, and Banking* **36**(3), 627–648.

Beck, T., Demirgüç-Kunt, A. and Maksimovic, V. (2005), 'Financial and legal constraints to growth: does firm size matter?', *Journal of Finance* **60**(1), 137–177.

Beck, T., Demirgüç-Kunt, A. and Maksimovic, V. (2008), 'Financing patterns around the world: are small firms different?', *Journal of Financial Economics* **89**(3), 467–487.

Booth, L., Aivazian, V., Demirguc-Kunt, A. and Maksimovic, V. (2001), 'Capital structures in developing countries', *Journal of Finance* **56**(1), 87–130.

Clarke, G., Cull, R. and Peria, M. M. (2006), 'Foreign bank participation and access to credit across firms in developing countries', *Journal of Comparative Economics* **34**(4), 774–795.

Daskalakis, N. and Psillaki, M. (2008), 'Do country or firm factors explain capital structure? Evidence from SMEs in France and Greece', *Applied Financial Economics* **18**(2), 87–97.

De-Jong, A., Kabir, R. and Nguyen, T. (2008), 'Capital structure around the world: the roles of firm-and country-specific determinants', *Journal of Banking & Finance* **32**(9), 1954–1969.

DeAngelo, H. and Masulis, R. (1980), 'Leverage and dividend irrelevancy under corporate and personal taxation', *Journal of Finance* **35**(2), 453–464.

Demirgüç-Kunt, A. and Maksimovic, V. (1996), 'Stock market development and financing choices of firms', *The World Bank Economic Review* **10**(2), 341–369.

Demirgüç-Kunt, A. and Maksimovic, V. (2002), 'Funding growth in bank-based and market-based financial systems: evidence from firm-level data', *Journal of Financial Economics* **65**(3), 337–363.

Engelen, P. and Essen, M. V. (2010), 'Underpricing of IPOs: firm-, issue-and country-specific characteristics', *Journal of Banking & Finance* **34**(8), 1958–1969.

Fan, J., Titman, S. and Twite, G. (2010), 'An international comparison of capital structure and debt maturity choices', *National Bureau of Economic Research* .

Gelman, A. and Hill, J. (2007), *Data analysis using regression and multilevel/hierarchical models*, Vol. 648, Cambridge University Press New York.

Gomes, J. and Schmid, L. (2010), 'Levered returns', *Journal of Finance* **65**(2), 467–494.

Griffin, D., Li, K., Yue, H. and Zhao, L. (2009), 'Cultural values and corporate risk-taking', *University of British Columbia and Peking University Working Paper* .

Hall, G., Hutchinson, P. and Michaelas, N. (2004), 'Determinants of the capital structures of European SMEs', *Journal of Business Finance & Accounting* **31**(5-6), 711–728.

Harper, J. and McNulty, J. (2008), 'Financial system size in transition economies: the effect of legal origin', *Journal of Money, Credit and Banking* **40**(6), 1263–1280.

Hennessy, C. and Whited, T. (2007), 'How costly is external financing? Evidence from a structural estimation', *Journal of Finance* **62**(4), 1705–1745.

Jensen, M. (1986), 'Agency costs of free cash flow, corporate finance, and takeovers', *The American Economic Review* **76**(2), 323–329.

Jensen, M. and Meckling, W. (1976), 'Theory of the firm: managerial behavior, agency costs and ownership structure', *Journal of Financial Economics* **3**(4), 305–360.

Klapper, L., Sarria-Allende, V. and Sulla, V. (2002), 'Small-and medium-size enterprise financing in Eastern Europe', *World Bank Policy Research Working Paper* **2933**.

Kurshev, A. and Strebulaev, I. (2007), 'Firm size and capital structure', *Journal of Financial Economics* p. 2.

La-Porta, R., de Silanes, F. L., Shleifer, A. and Vishny, R. (1998), 'Law and finance', *Journal of Political Economics* **106**, 1131–1150.

López-Gracia, J. and Sogorb-Mira, F. (2008), 'Testing trade-off and pecking-order theories financing SMEs', *Small Business Economics* **31**(2), 117–136.

Modigliani, F. and Miller, M. (1958), 'The cost of capital, corporation finance and the theory of investment', *American Economic Review* **48**(3), 655–669.

Modigliani, F. and Miller, M. (1963), 'Corporate income taxes and the cost of capital: a correction', *The American Economic Review* **53**(3), 433–443.

Myers, S. (1977), 'Determinants of corporate borrowing', *Journal of Financial Economics* **5**(2), 147–175.

Myers, S. and Majluf, N. (1984), 'Corporate financing and investment decisions when firms have information that investors do not have', *Journal of Financial Economics* **13**(2), 187–221.

Ohlson, J. (1980), 'Financial ratios and the probabilistic prediction of bankruptcy', *Journal of Accounting Research* **18**(1), 109–131.

Overesch, M. and Voeller, D. (2010), 'The impact of personal and corporate taxation on capital structure choices', *FinanzArchiv: Public Finance Analysis* **66**(3), 263–294.

Psillaki, M. and Daskalakis, N. (2009), 'Are the determinants of capital structure country or firm specific?', *Small Business Economics* **33**(3), 319–333.

Snijders, T. and Bosker, R. (1999), *Multilevel analysis: an introduction to basic and advanced multilevel modeling*, SAGE publications Ltd.

Sogorb-Mira, F. (2005), 'How SME uniqueness affects capital structure: evidence from a 1994–1998 Spanish data panel', *Small Business Economics* **25**(5), 447–457.

Stulz, R. (1990), 'Managerial discretion and optimal financing policies', *Journal of Financial Economics* **26**(1), 3–27.

Conclusion

Whether and how to invest in external growth -through M&A, or whether to raise external finance in the form of debt or equity are among the most complex decisions a firm's management has to take. In absence of frictions, which originate from market imperfections, stock and cash bids would be equivalent forms of payment for an acquisition, as well as debt and equity would be alike for corporate financing. The findings of this dissertation contribute to the assessment of the efficiency of the markets for respectively corporate control and external finance, by showing how frictions affect decision-making at the firm level.

In Chapter 1 and Chapter 2 it is shown how limited information both at firm level, in the form of opacity, and at the aggregate level, in the form of fundamental uncertainty, impacts on M&A activity and negotiation.

The analysis in Chapter 1, in particular, accounts for the simultaneity of the determination of the premium and the method of payment and documents that when targets are more opaque and the value of the transaction is substantial, concern of overpayment leads bidders to select stock bids to benefit from contingent pricing and risk sharing. Moreover, evidence suggest the choices of how much to pay and how are complementary. Bidders in fact use the bid premium as a signaling device of their valuation of the target, as well as to signal their own valuation when stock is involved, to manage the likelihood of bid acceptance. Testing jointly and directly the impact of both target and bidder opacity on bid premiums, the analysis shows in fact that observed bid premiums are higher for cash bids and increase with the opacity of the target; while only for stock bids, premiums are also negatively related to bidder opacity. Target and bidder opacity then contribute to determine the difference in anticipated premiums under cash and stock payment regimes, respectively, which in turn is positively associated with the use of stock for bids of substantial materiality.

The analysis in Chapter 2, instead documents the role of uncertainty in deciding whether and when to seek external growth by M&A and shows the specific features of the transactions announced in periods when uncertainty is high. Evidence suggests that if uncertainty seems to de-incentivize buyers from carrying out acquisitions, it also creates opportunities. Indeed, empirical results suggest that periods of uncertainty, which are defined on the basis of the VIX index, are associated with scant merger activity. Analysis at the aggregate level shows fewer transactions are announced in periods of uncertainty and that their value is smaller. In addition, at the micro-level, evidence shows that firms are less likely to be involved in a deal if uncertainty is high. However, the performance of transactions announced in these periods is still attractive. While deals announced in periods of high uncertainty

realize lower announcement return than do deals announced in neutral times, their long-run stock performance and operating performance are better. The market looks less favorably upon deal announcements in periods of high uncertainty, but eventually recognizes their superior quality in the long-run. Analysis of performances and terms of transaction show that acquirers in periods of higher uncertainty benefit mainly from a more disciplined planning and execution of the deal, and to a smaller extent by negotiating from a stronger bargaining position.

In Chapter 3 instead it is shown how international financing patterns of firms are rationalizable in a framework in which firms operate in presence of financing frictions that are more or less severe depending on how firm characteristics interact with country characteristics. The empirical analysis supports the conclusion that country characteristics play a relevant role in explaining the differences in the financing policy of SMEs across different European countries. More specifically, by reinforcing or weakening the link between firms' characteristics and their capital structure, country characteristics account for circa 12% of the cross-sectional variation of observed debt ratios. It is in fact the interaction of the institutional features of the legal and financial environment with a firm's individual characteristics that eventually determines the impact of financing frictions on firms' capital structure. The analysis shows, indeed, that while country-level variables are not individually informative about SMEs capital structure, they significantly predict SMEs debt ratios in interaction with firm characteristics.