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Abstract

Earnouts are contracts used in acquisitions that link part of the deal's consideration to the performances of the target after the closing. The extant literature on this topic highlights the benefits provided by these contracts, related to the reduction of information asymmetries and valuation risk that they entail. This dissertation instead is focused on the risks specifically associated with earnouts.

The first chapter illustrates how earnout agreements can be affected by counterparty risk and litigation risk, and provides a valuation model that captures these features, previously ignored by the literature. Indeed, the payments related to earnouts will be made only if, and up to the point to, the bidder is creditworthy. Moreover, the earning figures on which earnouts are based could be managed by the bidder, so to reduce, or even avoid, additional payments to the sellers. Counterparty risk is modelled by explicitly describing the processes that drive the value of the assets and the liabilities of the bidder, and thus the likelihood and consequences of its bankruptcy. Litigation risk is modelled by comparing the incentives of the acquirer to reduce the earnout consideration with the expected payment that could be obtained by the sellers if they seek the protection of courts. The sensitivity analysis performed and the case study presented show that including counterparty risk and litigation risk might have a significant impact on the value of these contracts, thus highlighting the relevance of the model. The model's relevance is also established by recently issued accounting standards, which now require contingent payments to be valued at fair value.

The second chapter delves deeper in the relation between litigation risk and the use of earnouts. Absent an effective legal protection for their holders, the potential benefits of these contracts may turn out to be empty promises, thus limiting the incentives to include them in acquisition agreements. Using an international sample of 22,693 deals completed between 2000 and 2012, we study the relation between a country's enforcement quality and the use of earnouts. After controlling for the determinants of the use of earnouts described in the previous literature, we show that the inclusion of these contracts in M&As is strongly related to the country's level of enforcement quality, which we proxy with the level of investor protection, the average length of contract enforcement trials, the recovery rate of insolvency procedures and the perceived quality of legal environment. Furthermore, we show that the proportion of earnout payments with respect to total consideration is positively related to enforcement quality proxies.

The third chapter examines a sample of 5,584 deals completed in US between 2005 and 2013, in order to assess if there is a relation between the use of earnouts and past earnings quality of the bidder. Since earnout payments will depend on the performances of the target, as reported by the bidder, the sellers might prefer to close deals that include contingent payments with acquirers that they deem trustworthy. The past reporting behavior of the bidder could be a valuable signal in this screening process. This leads to the hypothesis that past earnings quality is positively associated with the use of earnouts. Earnings quality is captured using an inverse proxy, that is earnings management, computed using the modified Jones' model. The analysis is performed, at first, by comparing the levels of earnings management between bidders that uses earnouts and bidders that did not. Propensity score matching techniques are used to ensure the comparability of bidders in the two groups. As a next step, past earnings management is included among the explanatory variables of a logit model, which is meant to capture the determinants of the use of these contracts. The results obtained corroborate the hypothesis made.

Chapter 1: Earnouts: a valuation model in the light of the new accounting standards

1. Introduction

Merger and acquisition (M&A) transactions always involve complex negotiations regarding each single detail of the agreement. The crucial point of such negotiation is the value of the company to be acquired, and thus the price that bidder has to pay to the target company's shareholders. However, divergence in opinions between the parties can prevent the deal from closing. Earnouts are contracts that could smooth this tension, by linking part of the acquisition payment to the target's performances following the closing of the deal. Earnouts are generally used in transactions where substantial uncertainties exist about the acquired entity's future performance. They help reduce information asymmetry and valuation risk for both the bidder and the target, by closing the expectation gap between them, and allowing both to share the risk associated with the future of the business.

Earnouts are often structured as real options on a predetermined parameter related to the profitability of the acquired company (for example, earnings before interest, taxes, depreciation, and amortization (EBITDA) or revenues) or to the achievement of certain targets or milestones (e.g. successful completion of specified contracts or US Food and Drug Administration (FDA) trial passage).[1] If the realization of the parameter exceeds a given threshold, or the agreed milestones are achieved, additional payments are made to the former shareholders of the target entity.

[1] Cain, Denis and Denis (2011) show that, out of a sample of 498 earnouts, 86% are based on accounting measures, 12.2% are structured on non financial milestones, 1.2% are linked to stock prices, and the 0.6% to other parameters.

Unlike most real options studied in corporate finance, earnouts are affected by two peculiar sources of risk that could influence their final payoff: counterparty risk and litigation/measurement risk. However, these have been neglected in the literature on contingent payments. Counterparty risk concerns the fact that earnouts will be honored only if and up to the point that the bidder is creditworthy. Earnouts are options that expire several years after they are written, that is, at deal closing.[2] For this reason, the risk of bidder's default may not be negligible. Litigation/measurement risk arises because, after the closure of the deal, the former shareholders of the target lose control over the target company and the measurement of its performance. They then have to trust the evidence produced by the bidder regarding the target's realized performance and the fact that best efforts were made to realize the conditions triggering the earnout payment. Since the performance indicators used in designing earnout agreements are mainly accounting figures, there is always a certain degree of risk related to earnings management. This does not necessarily imply the bidder's opportunistic intent, since subjectivity and flexibility are natural characteristics of accounting figures. The problem is that earnout agreements are often based on measures that are not perfectly measurable. In addition, such agreements are incomplete by nature. No contract can provide for every possible dispute that could arise on the meaning or the enforcement of the contract itself.[3] This implies that the parties may be forced to settle disputes on their own or to

[2] Cain, Denis and Denis (2011) show that the average horizon is 3 years.

[3] In this sense note the words of Judge Trevis Laster who settled a dispute on the payments related to an earnout: "An earnout often converts today's disagreement over price into tomorrow's litigation over outcome". Airborne Health, Inc. and Weil, Gotshal & Manges LLP v. Squid Soap, LP, C.A. No. 4410-VCL (Del. Ch. Nov. 23, 2009). Airborne acquired Squid

take legal steps. This is clearly costly, and these costs should be properly taken into consideration in the valuation of earnouts.

In this chapter, we propose a valuation model for earnout liabilities that explicitly considers the characteristics of these contracts, including counterparty and litigation risk. Arzac (2005), Bruner (2001, 2004) and Caselli, Gatti and Visconti (2006), recognize the optionality structure of these contracts, and claim that earnouts should be valued as ordinary European calls. However, their models do not consider all the risks associated with earnout agreements.

Since they are effectively part of the acquisition's upfront payment, an accurate valuation of these contracts is useful and necessary for the parties involved in the transaction. In addition, the model we propose is relevant and timely because the recently revised accounting standards on business combinations (i.e. the Financial Accounting Standards Board (FASB) ASC 805 in the United States and International Financial Reporting Standards (IFRS) 3 in Europe) require contingent payments to be estimated on the acquisition date and recorded at fair value.[4]

Fair value is defined as the price that would be received for selling an asset or paid to transfer a liability in an orderly transaction between market participants on the measurement date,

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Soap in 2007, paying 1 million dollars upfront and including an earnout capped at 26.5 million dollars. This case is discussed later in this chapter.

[4] According to the current version of FASB ASC 805-30-25-5 and IFRS 3 (p. 39), that affects financial reports starting in fiscal year 2009, "the acquirer shall recognize the acquisition-date fair value of contingent consideration as part of the consideration transferred in exchange for the acquiree". If the contingency is classified as a liability, it will be remeasured at fair value each reporting date until the contingency is resolved, with the change in value reported in the income statement and, therefore, affecting earnings.

based on the same assumptions that market participants would use when pricing the asset or the liability in their economic best interest (FASB ASC 820 and IFRS 13). The standards add that, when measuring the fair value of a liability, an entity should take into account the effects of counterparty risk and any other factors that could influence the likelihood of the obligation being fulfilled.

There has been significant diversity in practice and lively debate among practitioners in search of the best practices to valuate earnouts. While some experts seem to recognize to some extent the need to consider counterparty risk (e.g., Ernst&Young, 2010; Thompson and Schnorbus, 2011), litigation risk has largely been ignored. Moreover, no clear guidance has been provided so far by either academics or practitioners on how to estimate the fair value of earnout liabilities. Consequently, best practices on how to measure earnout at fair value are still to be developed. A survey we carried out among US companies engaged in M&As that included an earnout agreement in the period 2009-2011, that is after the implementation of the new standards, shows that, in 48% of cases, there is no information on how the fair value of earnout is estimated. Among those who provide such information, the large majority estimate the fair value through a very basic discounted-cash-flow (DCF) model (34% of cases) or a probability-weighted DCF model (57% of cases). Only a very small percentage (9%) employ more sophisticated models. Unfortunately, even in these cases, the financial reports do not clearly indicate how the model parameters are defined; therefore, it is impossible to know whether and to what extent counterparty risk and litigation/measurement risk are considered. Somewhat similar results are found on a survey conducted among European companies applying IFRS 3(R). In this case, 82% of acquirers do not specify the model utilized to estimate the fair value of earnouts. Only 4% use a DCF model, while only 16% declare that they use option models or other models for the valuation.

To build our model, we use the pricing of European calls as a baseline but we enrich this framework by capturing the remaining sources of uncertainty associated with these contracts. The picture includes counterparty risk by explicitly modeling the possibility of the bidder going bankrupt and thus being unable to pay in full the liability arising from the earnout. We model the joint dynamics of the bidder's assets and liabilities and the target's performance parameter via correlated geometric Brownian motions. To include litigation risk, we explicitly model the choice of the sellers between 1) accepting the bidder's payment based on the reported target performance and 2) taking legal steps if the reported performance is believed to be the result of earnings management. The payoff following the second choice depends on the decision of the courts, with a number of implications in terms of uncertainty and legal costs. The sellers decide to go to court if they expect to gain more from the trial than from the initial offer of the bidder.

We show that the reduction in value that results from considering counterparty risk and litigation risk can be dramatic. The more the bidder is leveraged and the lower the correlation between the profitability of the bidder and the target, the higher the impact of counterparty risk on the value of the earnout. The relevance of litigation risk will be higher the easier it is for the bidder to manage earnings, the more uncertain the outcome of the trial, and the longer its duration. Similarly, higher direct costs of litigation, such as attorney fees, reduce the value of earnouts. We perform sensitivity analyses on the initial values of the data used to put our model at work, and to show how changes to the inputs of the model impact our results.

In addition to the literature on earnout valuation, this work is related to the literature on vulnerable options, which deals with the valuations of options for which the payment of the final payoff is affected by counterparty default (e.g., Johnson and Stulz, 1987; Hull and White, 1995; Jarrow and Turnbull, 1995; Klein, 1996; Klein and Inglis, 2001). We add to this

literature by proposing a method to include and value litigation risk. This chapter also contributes to the literature on the determinants and effects of the risk of litigation (e.g., Brown, Hillegeist, and Lo, 2005; Francis, Philbrick, and Schipper, 1994; Kim and Skinner, 2011; Rogers and Stocken, 2005) and to the literature related to litigation risk and managerial reporting behavior (e.g., Caskey, 2010; Evans and Sridhar, 2002; Laux andStocken, 2012; Trueman, 1997).

The rest of the chapter is organized as follows. Section 2 reviews the relevant literature, Section 3 briefly describes the structure of earnouts, Section 4 presents the model, while Sections 5 and 6 present evidence of the relevance of our model and a case study, respectively. Section 7 concludes.

2. Literature on earnouts

The literature on M&A is extremely vast and diverse (e.g., Beltratti and Paladino, 2013; de La Bruslerie, 2013; Lian and Wang, 2012; Owen and Yawson, 2010; Shim and Okamuro, 2011). Our work is related to the literature that focuses on earnouts. Datar, Frankel, and Wolfson (2001) and Kohers and Ang (2000) show that these contracts are used in around 4% of M&A deals[5], mainly to reduce information asymmetries. If a portion of the payment is made contingent on the target's performance, an agreement will be easier to reach because part of the uncertainty related to the actual value of the acquired company will be resolved at the time

[5] Kohers and Ang (2000) focus on M&As that took place between 1984 and 1996 in which the target was a US company. The authors find that, in their sample of 9,784 deals retrieved from the SDC, 5.61% of them are structured using an earnout. Datar, Frankel, and Wolfson (2001) use the same dataset but focus on M&A deals worldwide during 1990 – 1996. Of 39,706 transactions, 1,637, that is, 4.12%, involve the use of earnouts.

the payment is due. The reason for this is clear: Earnouts allow one to switch from an ex ante to an ex post valuation of the target. These contracts, indeed, are mainly present in acquisitions affected by a great deal of uncertainty on the target's side, such as in the case of firms with strong growth opportunities (e.g. start-ups) or relevant information asymmetry issues. This could be the case, for example, of the acquisition of private companies, companies with high levels of intangible assets, and firms working in an industry other than that in which the bidder operates. Ragozzino and Reuer (2009) find similar results, focusing on privately held targets: Earnouts are part of the payment for 5% of the deals in their sample and are mainly used in cross-industry acquisitions.

Kohers and Ang (2000) discuss an additional purpose that earnouts sometimes serve. In case the target's managers are also shareholders, these contracts could induce them to not only keep their position, but also make their best effort to boost the company's performance.

Cain, Denis, and Denis (2011) delve deeper into the contractual specifications of earnouts. They find that the proportion of the earnout payment with respect to the total consideration is positively related to measures of the importance of managerial effort on the target's growth (and therefore value) and negatively related to the precision with which those efforts can be measured. In addition, the authors find evidence that the choice of the underlying parameter is made to maximize the ability to track the target's value and effort put into boosting its business. Furthermore, the length of these contracts is positively associated with the importance of research and development in the target's industry, in line with the intuition that these contracts are meant to solve uncertainties affecting the target company, while the volatility of returns in the target industry shows the opposite relation.

Since earnouts are helpful in reducing information asymmetry on the bidder's side, their use is expected to have a positive effect on the post closing returns on the shares of acquirers. This

is, indeed, as Barbopulos and Sudarsanam (2012) and Kohers and Ang (2000) find when analyzing a sample of UK and US acquisitions, respectively.

Allee and Wangerin (2013) focus on the impact of the issuance of Statement of Financial Accounting Standards (SFAS) 141(R)[6] on the use of these contracts by US public firms. SFAS 141(R) requires the valuation of contingent liabilities related to earnouts at fair value. The authors show that the introduction of the new accounting standards had a negative impact on the use of these contracts by public firms, due to the fact that these contracts could increase earnings volatility. Since the market seems to price earning predictability at a premium (Barth, Elliot, and Finn, 1999; De Angelo, De Angelo, and Skinner, 1996; Graham, Harvey, and Rajgopal, 2005), an increase in earnings volatility might reduce the acquirer's market valuation. Cadman, Carrizosa, and Faurel (2014), who also study US acquisitions, claim instead that the percentage of deals including earnouts did not change significantly after the issuance of SFAS 141(R).

Finnerty, Jiao and Yan (2012) show that convertible securities used as means of payment can substitutes for earnouts, in that they can reduce information asymmetry about the bidder's value while mitigating the information asymmetry about the target's value.

The literature on the valuation of earnouts is scant. To the best of our knowledge, Arzac (2005), Bruner (2001, 2004), and Caselli, Gatti, and Visconti (2006) are the only contributors to this issue. However, they all consider earnout agreements as "vanilla" European calls.

Given our aim to consider the effect of counterparty and litigation risk on the value of these contracts, our work is related to other streams of the literature that never cross the literature focused on earnouts. The study of the effect of counterparty risk on the value of options generated the literature on vulnerable options. The seminal paper by Johnson and Stulz (1987)

[6] Renamed FASB ASC 805 shortly after its issuance.

provides a model that links the value of an option not only to the realizations of the underlying security, but also to the value of its writer. The basic idea is that, since the final payment of the option cannot exceed the wealth of the writer of the option itself, its value will be a function of the writer's creditworthiness. Further extensions of this work are provided by Hull and White (1995), Jarrow and Turnbull (1995), Klein (1996), and Klein and Inglis (2001). The model proposed in this chapter shows similarities to that presented by Klein (1996), in that it takes explicitly into account the impact of the correlation between the value (and thus the creditworthiness) of the writer and the value of the underlying and it explicitly defines the event of default.

With respect to litigation risk, previous studies have already shown its impact on the value of securities or on the pricing of services. A relevant example is the literature related to initial public offering (IPO) underpricing. The model of Hughes and Thakor (1992) explains how the risk of litigation related to a stock's potential underperformance and the associated costs could explain the underpricing of IPOs: underpricing is insurance against litigation. The lower the issue price, the lower the risk of future underperformance and the less the potential damage to buyers and thus the lower the probability of litigation. Lowry and Shu (2002) empirically confirm this idea, showing the impact of litigation costs in IPOs: the average settlement payment to investors of cases brought to court corresponds to 11% of the total proceeds raised by the IPO. Others have empirically studied the probability of litigation. For example Krishnan, Masulis, Thomas, and Thompson (2011) find that, between 1999 and 2000, 12% of deals led to litigation. Their study, however, as well as the preceding research, focuses on litigation related to the closing of the deal, not to the ones that may follow. Brown, Hillegeist, and Lo (2005), Francis, Philbrick, and Schipper (1994), Kim and Skinner (2011), and Rogers and Stocken (2005) focus on the determinants of litigation risk and consistently

show that the highest risk of litigation occurs in the technology, services, and healthcare sectors, exactly the same sectors in which earnouts are used more frequently.

Our work is also related to the theoretical literature on the relation between litigation risk and managerial reporting behavior. Trueman (1997) shows that managers change their reporting behavior in response to the risk of lawsuit arising from disclosure obligations, being less biased toward good news if litigation risk is relevant. Evans and Sridhar (2002) show how potential shareholder litigation can interact with the incentives provided by capital and product markets to make company disclosures more credible. Caskey (2010) provides an analytical model that shows how the price of securities can be affected by the risk of class action lawsuits arising from the release of news that contradicts a manager's earlier report. Laux and Stocken (2012) model the reporting behavior of managers in the presence of litigation risk and overoptimism about the company's future prospects.

3. How do earnouts work?

This section provides an overview of the features of earnout contracts to ease the exposition of the model in the following section.

3.1 Benchmark parameters

Earnouts can be written based on many different benchmark parameters. These should be identified clearly and be measurable with precision to avoid future disputes. Moreover, they should capture the key point that was at the origin of the difference in valuation that divided the parties.

One parameter can be given by sales. For example, the earnout could provide for the former target's shareholders to receive, for a given number of years, a payment corresponding to the difference between the realized sales and an established threshold. Sales can be suitable, for

example, for cases in which the disagreement between the buyer and seller is about the target's capability to expand its activity in new markets. The advantage of this parameter is that it is easy to compute and is less prone than other accounting figures to earnings management, while the disadvantage lies in the fact that it can produce the wrong incentives, that is, to increase revenues without caring about profits. Other parameters can be net or gross profits, EBIT or EBITDA, or free cash flow. The pros of these parameters lie in the fact that they can reflect the target's ability to contribute to the profitability of the group of firms in which it has been integrated; the con is clearly the ease with which they can be subject to earnings management.

It is important to note that, besides performance indicators, earnouts can also be linked to the realization of specific events (in which case they are known as cash or nothing). For example, the uncertainty about the target's value could be related to the development of a new product, to obtainment of a patent, or to FDA trial passage. Under this hypothesis, the earnout could make part of the payment for the acquisition contingent on the realization of these events. These kinds of parameters are mostly suitable for the acquisition of pharmaceutical or high-tech companies.

Our work focuses on earnouts linked to performance indicators, which are the most prevalent (e.g., Kohers and Ang, 2000), because we want to highlight the impact of counterparty and litigation risk on real option valuation. Earnouts linked to specific events are simpler to valuate[7], and our analysis can be easily extended to them.

[7] Using DCF, for example.

3.2 Time horizon

Earnouts specify a horizon over which the target's performance should be measured or in which the objectives set in the contract must be reached. According to Cain, Denis, and Denis (2011), the average horizon is three years but the variability in time span is huge. It is usually claimed (Arzac, 2005; Bruner, 2004) that, since earnouts have an optionality structure, the longer the horizon, the higher the value of these contracts. This is true only if we ignore counterparty risk. As we will show, the longer the horizon, the higher the probability that the bidder will go into default. This risk clearly has the opposite effect on the value of the earnout; thus the effect of time on the value of this contract depends on the net effect of these two elements.

3.3 Amount of and limits to payments

Having defined the parameter upon which the earnout is structured and the horizon over which it is going to be measured, we finally need to specify the link between the measure of performance and the contingent payment. The contingent payment can be proportional to the performance indicators chosen. Normally, a threshold is fixed and the payment is set to be a multiple of the difference between the realization of the parameter and the threshold. Otherwise, the earnout can provide for a fixed amount to be paid if the parameter chosen reaches a given level. This makes the earnout resemble more a binary option. To avoid the risk of unexpected high payments to be made by the bidder, caps on the maximum possible payout are frequently set.

3.4 Earnouts with multiple objectives

The basic structure of earnouts involves the case in which one performance objective is defined and one payment is made according to the realization of the parameter chosen.

However, earnouts can be more complex and can provide for different objectives to be reached at different time horizons, each one implying a potential future payment.

3.5 Means of payment

The most common means of payment in earnouts is cash. This is consistent with the aim of these contracts, which is to resolve issues arising from information asymmetry. Therefore, other means of payment, such as stocks – which, in contrast, involve the problem of information asymmetry in their value – would undermine the benefit of these instruments. Nevertheless, earnouts can be paid using shares.

4. The model

As stated in the introduction, we start by taking the perspective of the option holder to value earnouts. To be as general as possible, we characterize earnouts as generic derivatives on the parameter chosen in the contract. Thus, we set X as the earnout value at maturity, with $X = F\big(S(T)\big)$, where F is a deterministic function of the realization of the underlying parameter S at T, the time in which the target company's performance has to be measured.

This approach accommodates the various specifications of earnouts. If the earnout is structured as an ordinary option on the parameter chosen, with strike price K, F would take the following form:

$$X = F\big(S(T)\big) = (S(T) - K)^+ = \begin{cases} S(T) - K & if \quad S(T) > K \\ 0 & if \quad S(T) \leq K \end{cases}$$

Two other examples can be earnouts structured as binary options or as piecewise linear functions of the underlying parameter, respectively:

$$X = F\big(S(T)\big) = \begin{cases} a & if \quad S(T) > K \\ 0 & if \quad S(T) \leq K \end{cases}$$

$$X = F\big(S(T)\big) = \begin{cases} a_1 S(T) & if \quad K_1 \leq S(T) < K_2 \\ a_2 S(T) & if \quad K_2 \leq S(T) < K_3 \\ a_3 S(T) & if \quad K_3 \leq S(T) < K_4 \\ a_4 & if \quad K_4 \leq S(T) \end{cases}$$

with $a, K_i, a_i > 0$ for $i = 1, \ldots, 4$.

Clearly, the earnout would be fully paid out only if the bidder has not gone bankrupt by time *T* or if the earnout and/or other liabilities contracted by the bidder do not trigger default at time *T*. We therefore need to also model the bidder's ability to pay its debts. To do this, we compare the value of the bidder's assets and its outstanding liabilities.

4.1 Primitives of the model

In our model, uncertainty is described by the historical probability space $(\Omega, \mathbb{P}, (\mathcal{F}_t)_t)$, by a three dimensional standard Brownian motion $W^{\mathbb{P}}$. The three independent components of the Brownian $W^{\mathbb{P}}$ represent the diffusive risk that affects the fundamental variables of our problem: the performance process S, the debt process D, and the value of the assets of the bidder V. The processes are lognormally distributed, according to the following stochastic differential equation:

$$\frac{dS(t)}{S(t)} = \mu_S dt + \sigma_S dW^{\mathbb{P}}(t),$$

$$\frac{dV(t)}{V(t)} = \mu_V dt + \sigma_V dW^{\mathbb{P}}(t),$$

$$\frac{dD(t)}{D(t)} = \mu_D dt + \sigma_D dW^{\mathbb{P}}(t),$$

where μ_V, μ_S, and μ_D, the drift of the processes, are real positive constants, and σ_S, σ_V, and σ_D are volatility vectors belonging to $\Re_+^3$. The reason we also want to model debt as a stochastic process will become clear in the next section.

The correlation of these processes is represented in the following matrix:

Correlation	*S*	*V*	*D*
S	1	$\rho_{V,S}$	$\rho_{D,S}$
V		1	$\rho_{D,V}$
D			1

where $\rho_{i,j} = \frac{\sigma_i \cdot \sigma_j}{|\sigma_i| \cdot |\sigma_j|}$ with $i, j = S, V, D$.

The management of the acquired firm selects a *subjective stochastic discount factor* to evaluate future risky cash-flows. Given the subjective prices of risk, collected in the vector $\theta \in \Re^3$, the management selects an equivalent probability measure $\widehat{\mathbb{P}}$, the *valuation measure*, and a discount rate $\hat{r}$. The Girsanov results for diffusion processes (e.g., Protter (2004)) allow to write the dynamics of fundamental processes with respect to the valuation measure $\widehat{\mathbb{P}}$ as follows:

$$\begin{aligned} \frac{dS(t)}{S(t)} &= (\mu_S - \sigma_S\theta)dt + \sigma_S d\widehat{W}(t), \\ \frac{dV(t)}{V(t)} &= (\mu_V - \sigma_V\theta)dt + \sigma_V d\widehat{W}(t), \\ \frac{dD(t)}{D(t)} &= (\mu_D - \sigma_D\theta)dt + \sigma_D d\widehat{W}(t), \end{aligned} \tag{1}$$

where $\widehat{W}$ is a three dimensional standard Brownian motion[8] with respect to the valuation measure $\widehat{\mathbb{P}}$.

The parameter θ captures the attitude toward risk of the former target shareholders. If $\theta = 0$, all the subjective prices of risk are null and the acquired firm is risk-neutral ($\widehat{\mathbb{P}} = \mathbb{P}$). If $\theta \in \mathfrak{R}^3_+$, the firm is averse to the diffusive risk.

If all the primitive processes S, V and D are *spanned by traded assets*, the prices of risk θ correspond to the market prices, the discount rate $\hat{r}$ equals the risk-free rate r, and $\widehat{\mathbb{P}}$ becomes an *equivalent martingale measure*. However, this does *not* imply that the discounted processes $\{S(t)e^{-rt}\}$, $\{V(t)e^{-rt}\}$, and $\{D(t)e^{-rt}\}$ are $\widehat{\mathbb{P}}$-martingales. Indeed, this is true if and only if S, V, and D coincide with the values of *traded* self-financing portfolios on *any* date t, which is seldom the case for real asset values (see Battauz, De Donno and Sbuelz, 2011). It follows that, even under the spanning condition, the risk-adjusted percentage drifts of S, V, and D

$$\hat{\mu}_S = \mu_S - \sigma_S\theta$$

$$\hat{\mu}_V = \mu_V - \sigma_V\theta$$

$$\hat{\mu}_D = \mu_D - \sigma_D\theta$$

typically differ from the discount rate $\hat{r}$.

4.2 Valuing earnout as ordinary European options

If we do not consider counterparty and litigation risk and stick to common valuation models, we can value the earnout as an ordinary European call:

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[8] The density of the probability $\widehat{\mathbb{P}}$ with respect to $\mathbb{P}$ is $L(T) = \frac{d\widehat{\mathbb{P}}}{d\mathbb{P}}$ given by $L(t) = \exp\left(-\frac{1}{2}|-\theta|^2 t - \theta W^{\mathbb{P}}(t)\right)$.

$$E_{ord}(0) = e^{-\hat{r}T}\widehat{\mathbb{E}}[X] \quad (2)$$

where $\widehat{\mathbb{E}}[\cdot]$ denotes the expectation under the valuation measure $\widehat{\mathbb{P}}$. But doing this conflicts with common sense. It would be hard to believe that someone would attribute the same value to a promise of payment made by a large, unlevered company as to that made by a small and highly levered firm. So we need to augment the model in such a way that it enables us to capture the effect of the writer's creditworthiness on the value of the option.

4.3 Step 1: Including counterparty risk

To include counterparty risk, we have to differentiate between cases in which the bidder is creditworthy at time T from those in which it is not. Since the earnout is going to add itself to the bidder's liabilities, the bidder's ability to repay its debt will also depend on that .

We want to consider two sources of counterparty risk. The first is that related to the asset side: There is always a risk that the bidder's business will experience periods of financial distress. This aspect is captured by the bidder's assets being modeled as a stochastic process. The second source of counterparty risk is related to the liability side. Once the deal is closed, there is nothing to prevent the bidder from increasing its leverage. The former shareholders of the target have no influence on the bidder's financing decisions; on the contrary, they are subject to them. This is why debt is also modeled as a stochastic process.

To tackle this issue, we define the event of default as follows:

$$\{\text{default}\} = \{V(T) < X + D(T)\}$$

That is, the bidder defaults if the value of assets is lower than the value of liabilities, which also includes the payment due for the earnout. Then we can define an indicator function for distress, $\mathbb{I}_{def}$, and an indicator function for creditworthiness, $\mathbb{I}_{def^c}$. These indicator functions allow us to distinguish between the payment the sellers can obtain if the bidder remains solid

and the payment in case of default. We call $\hat{X}$ the final payoff of the earnout that considers the possibility of bidder default:

$$\hat{X} = X \cdot \left(\mathbb{I}_{def^C} + rec \cdot \mathbb{I}_{def}\right)$$

$$rec = \left(\frac{(1-\alpha)V(T)-\delta_S D(T)}{X+(1-\delta_S)D(T)}\right)$$

where rec is the fraction of the earnout the former shareholders of the target receive in case of default, δ_S is the fraction of total debt that is senior with respect to the earnout and α is the value lost in the liquidation process in case of distress.

Therefore, in the case in which the bidder is creditworthy the former shareholders of the target receive the full payment arising from the contract. In case of default, however, their payment is reduced by the factor $\left(\frac{(1-\alpha)V(T)-\delta_S D(T)}{X+(1-\delta_S)D(T)}\right)$.

The ratio $\frac{V(T)-\delta_S D(T)}{X+(1-\delta_S)D(T)}$ captures the fact that in case of default the portion of the earnout that can be paid out depends on the importance of the claim with respect to the others, in terms of both seniority and relative dimensions. Indeed, the claim related to the earnout will be paid after the satisfaction of senior debt (expressed in the numerator) and in proportion to the value of the claim with respect to other, junior creditors (expressed in the denominator).

The factor $(1-\alpha)$ captures the cost of distress. It is well known that, in case of default, the value of a company's assets is further reduced by the costs of liquidation and the fact that the procedure could last years, thus reducing the actual value of the creditors' claim (e.g., Almeida and Philippon, 2007; Andrade and Kaplan, 1998). This effect is captured by α.

Under these conditions, the value of the earnout is:

$$E_{\text{vuln}}(0) = e^{-\hat{r}T}\hat{\mathbb{E}}\left[\hat{X}\right] = e^{-\hat{r}T}\hat{\mathbb{E}}\left[X \cdot \left(\mathbb{I}_{def^C} + rec \cdot \mathbb{I}_{def}\right)\right]$$

$$= e^{-\hat{r}T}\hat{\mathbb{E}}\left[X \cdot \left(\mathbb{I}_{def^C} \pm \mathbb{I}_{def}\right) + rec \cdot X \cdot \mathbb{I}_{def}\right]$$

$$= e^{-\hat{r}T}\hat{\mathbb{E}}\left[X \cdot 1 - X \cdot \mathbb{I}_{def} + rec \cdot X \cdot \mathbb{I}_{def}\right]$$

$$= e^{-\hat{r}T}\hat{\mathbb{E}}\left[X \cdot 1 - X \cdot \mathbb{I}_{def}(1 - rec)\right]$$

$$= \hat{\mathbb{E}}\left[e^{-\hat{r}T}X\right] - \hat{\mathbb{E}}\left[e^{-\hat{r}T}X \cdot \mathbb{I}_{def}(1 - rec)\right].$$

Denoting

$$CVA = \hat{\mathbb{E}}\left[e^{-\hat{r}T}X \cdot \mathbb{I}_{def}(1 - rec)\right] \tag{3}$$

we obtain

$$E_{\text{vuln}}(0) = \hat{\mathbb{E}}\left[e^{-\hat{r}T}X\right] - CVA \tag{4}$$

That is, including counterparty risk in the picture entails correcting the value of the earnout for the bidder's potential inability to fully pay what is due. Equation (4), indeed, shows that the value of the earnout, including counterparty risk, is equal to the valuation of the earnout using the simple option pricing method minus a credit value adjustment, CVA defined in equation (3), which reflects the creditworthiness of the bidder.

The valuation of an earnout using the simple option pricing method, that is, not considering counterparty risk, is an upper bound of the valuation obtained by considering it a vulnerable option. If the bidder's value is very high compared to the target's, if leverage is very low, and if the correlation between the two companies is perfect or almost perfect, the risk of the bidder not being able to pay the additional payment for the acquisition would be very small; thus the CVA would be negligible.

This model better describes the forces driving the final payoff and thus the value of earnouts than considering them as ordinary options. The only minor disadvantage of this model is that it has no closed-form solution. It needs to be solved numerically.

4.3.1 Effect of parameters on the value of the earnout

In order to show the impact of the parameters on the value of earnouts, we refer to an actual contract, stipulated for the acquisition of The Center for Pain Management by PainCare Holdings. To obtain the information needed on the earnout, we retrieved the acquisition contract from the SEC filings database.

In December 2004, PainCare Holdings, a company that provides highly specialized health services, acquired the Center for Pain Management, a company that owned several hospitals in Maryland. There was considerable uncertainty about the profitability of the Center for Pain Management since it was a private company. Therefore, the final agreement provided for an upfront payment of $6.37 million in cash and $10.69 million in stocks, plus an earnout, linked to EBITDA, providing for three contingent payments, one for each of the three years following the acquisition. The total payment for the earnout was capped at $13.75 million. The earnout formula was the following:

$$E(t) = \begin{cases} \$4.58 \text{ million} & if \quad EBITDA_t \geq 5.5 \\ \$4.12 \left(\frac{EBITDA_t}{5{,}5}\right) & if \quad 5.5 > EBITDA_t \geq 4.8 \\ \$3.20 \left(\frac{EBITDA_t}{5{,}5}\right) & if \quad 4.8 > EBITDA_t \geq 4.1 \\ \$2.30 \left(\frac{EBITDA_t}{5{,}5}\right) & if \quad 4.1 > EBITDA_t \geq 3.5 \end{cases} \quad \text{with } t = 1{,}2{,}3$$

As a base case for our analysis, we focus on the option structured on the third year after the acquisition. We use the actual parameters of the two companies involved, which are summarized in Table 1. We obtained these data from Compustat and the Center for Research in Security Prices (CRSP) and provide more details on these later.

Table 1: Relevant parameters					
V	160	$\rho_{S,V}$	0.41	$\|\sigma_V\|^2$	0.3
D	47	$\rho_{S,D}$	0.6	$\|\sigma_D\|^2$	0.3
S	3.5	$\rho_{D,V}$	0.3	$\|\sigma_S\|^2$	0.3
K	5.5	δ_S	0.02	r_f	0.03

The cost of distress, α, is obtained from Moody's Ultimate Recovery Database: The average cost of distress on senior unsecured bonds computed over all the observations in the database is 51.6%. Thus, we set α to 0.5.

Given these parameters, we run Monte Carlo simulations to assess the value of the earnout on the EBITDA obtained three years after the closing. Table 2 shows the result of the application of the vanilla option pricing method and the one that includes counterparty risk. The numbers in parentheses represent the radius of the confidence interval of the estimation, corresponding to a confidence level of 95%.

Table 2: Earnout values		
	Vanilla	Counterparty risk
Earnout value	899.9	782.8
	(3.0)	(2.8)

Note that, in our valuation, for comparison with the literature, we use the risk-neutral valuation measure, that is $\widehat{\mathbb{P}} = \mathbb{Q}$, the discount rate is the risk-free rate, that is $\hat{r} = r_f$, and assume the risk-neutral drift of each of the processes V, D, and S coincides with the risk-free interest rate.

The following tables show how the value of the earnout, including counterparty risk, changes in relation to parameter modifications. All the parameters, apart from those specified in the tables, are set to our base case.

Let us first study the effect of (initial) debt and time.

Table 3: Sensitivity analysis – Debt/Horizon						
Debt\Horizon	1y	2y	3y	4y	5y	6y
10	660.2	853.5	891.6	892.4	869.4	836.7
	(2.7)	(2.9)	(3.0)	(3.0)	(2.9)	(2.9)
47	643.3	737.5	782.8	713	671.2	623
	(2.6)	(2.8)	(2.8)	(2.7)	(2.7)	(2.6)
90	570.8	650.6	644.8	624.6	595.2	566.2
	(2.4)	(2.5)	(2.5)	(2.4)	(2.4)	(2.3)

Table 3 shows that the value of the earnout decreases as debt increases. Clearly, this is because the likelihood of the bidder experiencing default increases with it, thus, the probability that the payoff gets reduced by the factor rec grows. With respect to time, it is easy to provide the intuition why its impact on the value of the contract can be either positive or negative. The longer the horizon, the higher the probability that the earnout will be in the money at expiry. However, time might increase also the likelihood of the bidder going default. Thus, the net impact of time on the value of the earnout depends on which of the two conflicting effects is stronger. Since the second effect grows stronger with the level of debt, as this parameter increases, the horizon at which time ceases to have a positive influence on the value of the earnout shortens.

Table 4: Sensitivity analysis - Correlations				
$\rho_{S,V}$ \ $\rho_{D,V}$	0	0.3	0.7	1
0	647.9	681.6	782.6	785.3
	(2.5)	(2.5)	(2.7)	(2.7)
0.2	699.7	733.0	834.9	889.9
	(0.0026)	2.7)	(2.9)	(3.0)
0.41	748.6	782.8	866.5	899.5
	(2.7)	(2.8)	(2.9)	(3.0)
0.6	787.1	821.1	882.4	899.6
	(2.8)	(2.8)	(3.0)	(3.0)
0.8	807.8	855.1	894.4	899.8
	(2.8)	(2.8)	(3.0)	(3.0)

In table 4 we can see that the correlation between the parameter and the value of the bidder has a positive impact on the value of the earnout. This is because the lower the correlation, the higher the probability that when S is high, V is low and thus the higher the probability of the bidder being in financial distress when the earnout payoff is high. In addition, the correlation between the bidder's assets and liabilities has the same influence on the contract value. This implies that when the value of assets is low, debt is likely to be high and thus the portion of the earnout payment that will be satisfied, captured by rec, decreases.

Table 5: Sensitivity analysis - Variances				
$\frac{\|\sigma_D\|^2}{\|\sigma_V\|^2}$	0.1	0.2	0.3	0.4
0.1	880.4	844.2	803.5	761.2
	(3.0)	(2.9)	(2.8)	(2.7)
0.2	863.2	833.8	793.3	759.5
	(2.9)	(2.9)	(2.8)	(2.7)
0.3	848.9	816.1	782.8	756.4
	(2.9)	(2.8)	(2.8)	(2.7)
0.4	831.3	803.7	778.4	751.3
	(2.9)	(2.8)	(2.8)	(2.7)

Table 5 captures the fact that the volatility of both the bidder's assets and liabilities are factors of risk. While the volatility of the underlying has a positive impact on the value of an option, because unfavorable realizations of the parameter have a limited effect on the final payoff, which is bounded at zero, while favorable realizations increase the payoff, the opposite happens for the volatility of the option writer. Positive realizations of the value of V will have a limited impact on the payoff, because the payoff is bounded to the realization of X, while negative realizations of V, which lead to default, do have a negative impact on the payoff. Figuratively, we can say that, while $|\sigma_S|^2$ is good variance, $|\sigma_V|^2$ is bad variance. Analogous reasoning holds for $|\sigma_D|$: In the case in which assets and liabilities are less than perfectly correlated, a high variance of liabilities reduces what is left to creditor satisfaction in the case of default.

4.4 Step 2: Including litigation risk

As stated in the introduction, after the closing of the deal, the former shareholders of the target lose both control over their company and the ability to directly verify its performance.

In our option pricing framework, this means that earnouts are options structured on an underlying that cannot be precisely measured. For this reason, disagreement could arise at the moment at which the earnout has to be paid out.

Disagreement can have two origins. The first is when the sellers mistrust the accounting reports provided by the bidder, since it is possible that the figures were subject to earnings management to reduce the earnout payment. The second is related to the fact that, if the target's performance is disappointing, the sellers are unable to distinguish whether the bidder did not put forth enough effort to manage the target's business or whether they were overconfident in estimating the future profitability of their company.

Thus, if the performance of the target company at the end of the earnout period, as reported by the bidder, is lower than what the sellers expected, the sellers might blame the bidder and decide to go to court to obtain what they think they deserve. Clearly, doing so is costly, mainly for three reasons. The first is that the trial has direct and indirect costs, such as lawyers' fees, time spent to arrange the trial, and the cost of the trial itself. The second reason relates to the fact that the proportion of the claim that the judge will grant is not known in advance and even a correct allegation does not guarantee the former shareholders of the target will win the case.[9] This is understandable, since, in assessing the target company's profitability, the judge suffers from an asymmetry of information with respect to the bidder that is even stronger than that affecting the sellers, despite requests for documents, opinions, and appraisals. Hence the proportion of the claim that the judge will grant is deemed uncertain. Finally, the length of the trial must be considered. If the judge grants, at least in part, the plaintiff's claim, the payment will be postponed to the end of the trial and the length

[9] Whether merit matters in trials on M&A is a topic of debate in the literature. See for example Alexander (1991) or Romano (1991).

of the trial itself will have a negative influence on the present value of the payment to be received. Thus, the target's former shareholders will take legal steps only if what they expect to gain from the trial, net of its related costs, is higher than what the bidder is willing to pay.

We model these issues by defining two functions: $\lambda_{notrial}$, which we call the mistrust function, captures the fact that the sellers expect the bidder to try to lower the payment due for the earnout, and λ_{trial}, which we call the litigation function, describes the fraction of the earnout that could be granted by the judge in a trial.

Before specifying the form taken by these functions, we model the decision of the sellers to go to court and see how this affects the value of the earnout. The actual earnout payout, that is, the earnout payout as proposed by the bidder's management, is

$$\tilde{X} = \lambda_{notrial} \cdot \hat{X} \leq \hat{X},$$

with $\lambda_{notrial} \in (0,1)$. If the case goes to trial on date T, the shareholders obtain

$$\lambda_{trial} \cdot \hat{X}$$

Therefore, the former shareholders of the target go to trial on date T if it is convenient, that is if

$$\lambda_{trial} \cdot \hat{X} > \lambda_{notrial} \cdot \hat{X} \quad \text{iff } \lambda_{trial} > \lambda_{notrial}$$

The indicator function of going to trial is $\mathbb{I}_{trial} = \mathbb{I}_{\lambda_{trial} > \lambda_{notrial}}$. Therefore, the earnout payoff, adding to counterparty risk any issues arising from lack of measurability, is

$$\lambda_{trial} \cdot \hat{X} \cdot \mathbb{I}_{trial} + \lambda_{notrial} \cdot \hat{X} \cdot \mathbb{I}_{trial^C}$$

Thus, the value of the earnout is:

$$E_{lit}(0) = e^{-\hat{r}T}\hat{\mathbb{E}}\left[\lambda_{trial} \cdot \hat{X} \cdot \mathbb{I}_{trial} + \lambda_{notrial} \cdot \hat{X} \cdot \mathbb{I}_{trial^C}\right]$$

$$= e^{-\hat{r}T}\hat{\mathbb{E}}\left[\pm\hat{X} + \lambda_{trial} \cdot \hat{X} \cdot \mathbb{I}_{trial} + \lambda_{notrial} \cdot \hat{X} \cdot \mathbb{I}_{trial^C}\right]$$

$$= e^{-\hat{r}T}\hat{\mathbb{E}}\left[\hat{X} - \hat{X}\left(\mathbb{I}_{trial^C} + \mathbb{I}_{trial}\right) + \lambda_{trial} \cdot \hat{X} \cdot \mathbb{I}_{trial} + \lambda_{notrial} \cdot \hat{X} \cdot \mathbb{I}_{trial^C}\right]$$

$$= e^{-\hat{r}T}\hat{\mathbb{E}}\left[\hat{X} - \hat{X}\cdot \mathbb{I}_{trial}(1-\lambda_{trial}) - \hat{X}\cdot \mathbb{I}_{trial^C}(1-\lambda_{notrial})\right]$$

From the last equation we see that the risk of litigation diminishes the earnout value:

$$E_{lit}(0) = e^{-\hat{r}T}\hat{\mathbb{E}}\left[\hat{X}\right] - e^{-\hat{r}T}\left(\hat{\mathbb{E}}\left[(1-\lambda_{trial})\cdot\hat{X}\cdot\mathbb{I}_{trial}\right] + \hat{\mathbb{E}}\left[(1-\lambda_{notrial})\cdot\hat{X}\cdot\mathbb{I}_{trial^C}\right]\right) \quad (5)$$

The quantity

$$LitVA = e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\lambda_{trial})\cdot\hat{X}\cdot\mathbb{I}_{trial}\right] + e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\lambda_{notrial})\cdot\hat{X}\cdot\mathbb{I}_{trial^C}\right] \quad (6)$$

can be thought as a *litigation value adjustment.* The term $LitVA$ includes two elements: the adjustment for the costs and risks of going to trial, $e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\lambda_{trial})\cdot\hat{X}\cdot\mathbb{I}_{trial}\right]$, and the risk of having to accept a reduced payment $\lambda_{notrial}\hat{X}$ instead of $\hat{X}$, when going to trial is not convenient, that is $e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\lambda_{notrial})\cdot\hat{X}\cdot\mathbb{I}_{trial^C}\right]$.

4.4.1 Specifications of the mistrust and the litigation functions

Let us now address the specifications of $\lambda_{notrial}$ and λ_{trial}. The fraction of the earnout $\hat{X}$ the bidder is willing to pay depends on the outcome of the earnout. The higher the outcome, the more significant the temptation for the bidder to pursue a lower outflow. For simplicity, for $\lambda_{notrial}$ we select a piecewise linear function:

$$\lambda_{notrial}(x) = \begin{cases} 1-\alpha_\lambda x \ \text{ for} x \in [0; x_{cap}] \\ \lambda_{\min} \quad \text{for} x > x_{cap} \end{cases}$$

where x_{cap} is the cap usually set in earnout contracts as a limit to future payments[10].

[10] If the contract does not provide an upper bound for the payoff of the earnout, as in the case of a standard call option, x_{cap} can be set, for example, equal to the $95\%-$quantile of the earnout payoff.

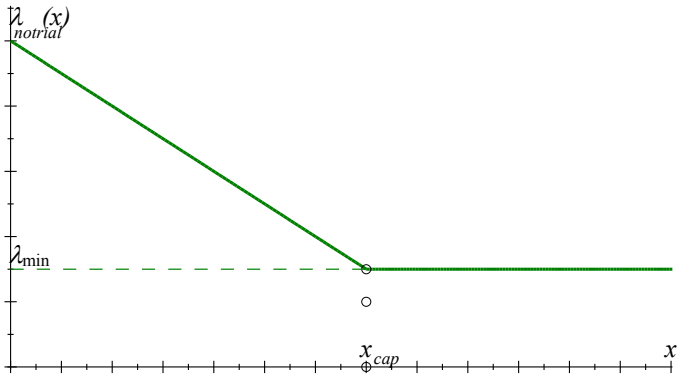

Figure 1: $\lambda_{notrial}(x)$

The parameters to be chosen are:

$$\alpha_\lambda > 0$$

$$\lambda_{\min} \in (0; 1)$$

that is, what needs to be chosen is how the bidder will try to reduce the earnout payment, in terms of percentage and maximum reduction.

We need a further restriction to guarantee that the received payoff is increasing with respect to x:

$$\alpha_\lambda < \frac{1}{2x_{cap}}. \tag{7}$$

While it is reasonable to think that the bidder's incentive to reduce the outflow is *marginally* increasing in the realized payoff, it would be less reasonable to imagine that an increase in the actual payoff would lower the *total* outflow that the bidder is willing to bear. The derivation of condition (7) can be found in the appendix.

In the spirit of Beyer (2009), we propose linking the ability of the bidder to manage performance measures to the volatility of this measure and its distance from the threshold of the earnout, which represents the bidder's expectation for the realization of the parameter[11].

[11] Which can be more conservative if compared to the expectations of the sellers.

The intuition behind this is the following: If the measure is noisy, and its realization was higher than expected, the bidder can lower it without the sellers being able to infer this. A possible choice is therefore[12]:

$$\alpha_\lambda = \frac{|\sigma_S|\sqrt{T}}{x_{cap}} \qquad (8)$$

$$\lambda_{\min} = 1 - |\sigma_S|\sqrt{T}$$

The function λ_{trial} can instead be specified in this way:

$$\lambda_{trial} = \left(\Gamma e^{-\hat{r}L_{trial}} - c\right)$$

where Γ is the proportion of the claim that the sellers expect the judge to grant, L_{trial} is the length of the trial, and c is the upfront proportional cost of litigation (e.g.: lawyers' fees). The parameter Γ, assumed to be less than one, captures the fact that going to court does not guarantee one will obtain in full what was requested. This is because the judge suffers from the same information asymmetry on the realization of the parameter that affects the sellers, to which should be added the fact that there is always a degree of discretion in determining an accounting figure. Therefore, the judge could decide to only partially indemnify the plaintiff. In addition, it is possible that the former shareholders of the target were overconfident in their expectations of their company's profitability. So it is also possible that the judge, recognizing this, will deny their request. The other issue with going to court is that the trial could last

[12] If the owners/managers of the target company are retained after the closing, the possibilities of earnings management faced by the bidder are reduced. To incorporate this, it is possible to reduce the factors α_λ and $\lambda_{\min}$ by a parameter $k \in (1, +\infty)$:

$$\alpha_\lambda = \frac{|\sigma_S|\sqrt{T}}{k \cdot x_{cap}}$$

$$\lambda_{\min} = \frac{1 - |\sigma_S|\sqrt{T}}{k} \qquad (9)$$

several years. Thus, discounting is necessary to determine the current value the judge will grant.

Using a specific value for λ_{trial} is a choice that simplifies the exposition. It would be easy to extend the model to capture the fact that λ_{trial} is indeed a random variable. Since the proportion of the claim that the judge will grant is likely to be uncertain, λ_{trial} can be thought to as an *independent*[13] random variable, with realizations $0 < \lambda^L_{trial} \leq \lambda^M_{trial} \leq \lambda^H_{trial}$, occurring with probability $\hat{p}^L_{trial} = \widehat{\mathbb{P}}[\lambda_{trial} = \lambda^L_{trial}]$, $\hat{p}^M_{trial} = \widehat{\mathbb{P}}[\lambda_{trial} = \lambda^M_{trial}]$, $\hat{p}^H_{trial} = 1 - \hat{p}^L_{trial} - \hat{p}^M_{trial}$. Because of the independence assumption, formula (5) with a constant λ_{trial} can be immediately extended obtaining

$$E_{lit}(0) = \sum_{l=L,M,H} [E_{lit}(0)]_{\lambda_{trial}=\lambda^l_{trial}} \hat{p}^l_{trial}$$

where $[E_{lit}(0)]_{\lambda_{trial}=\lambda^l_{trial}}$ is the value of the earnout, adjusted for the risk of litigation, with a constant $\lambda_{trial} = \lambda^l_{trial}$ in equation (5).

For simplicity, we maintain the use of a specific average value of λ_{trial}, the results however are clearly robust to this extension.

In order to see the model at work, we apply it to the case study previously mentioned. The function $\lambda_{notrial}$ is completely specified by the parameters already presented. To define the function λ_{trial} we carry on as follows. In a survey of M&A litigations between 1996 and 2011, Cornerstone Research[14] shows that the related settlements are strongly heterogeneous: The median clustered by deal value varies widely, from 2% to slightly over 53% of the damage that is the subject of the lawsuit. Since a settlement is somewhat like the plaintiff's

[13] The random variable λ_{trial} is assumed to be independent of all the processes V, S, D with respect to the valuation measure $\widehat{\mathbb{P}}$.

[14] A company specialized in research and consulting on litigations in the field of business.

expectation of what it will receive and will therefore be rejected only if the plaintiff thinks it will be better off continuing the trial, we use the settlement as a proxy for Γ. Although the survey clearly does not focus on litigation related to earnouts, it can nonetheless be a good indicator of what a seller might expect to receive if it initiates a trial. To be conservative in our estimations, we set Γ equal to 53%. The length of the procedure leading to settlement typically varies between two years and more than five years. We therefore set L_{trial} to two years. We set c, the upfront cost of the litigation (i.e., the attorneys' fees), at 5%, as we were advised in a private discussion with a law firm.

For our base case, the value of the earnout including litigation risk is shown in Table 6, which, for comparison, replicates the results previously shown.

Table 6: Earnout values

	Vanilla	Counterparty risk	Litigation risk
Earnout value	899.9	782.8	405.2
	(3.0)	(2.8)	(1.7)

As we can see, the value of the earnout, under our specifications, is dramatically reduced.

As before, we want to check how the valuation varies in relation to changes in λ_{trial} and $\lambda_{notrial}$. For each of these parameters, we make an element vary. For λ_{trial}, we make Γ vary between 0.3, 0.53, and 0.8. For $\lambda_{notrial}$ we make $\alpha_\lambda = \frac{|\sigma_S|\sqrt{T}}{x_{cap}}$ vary between one-half, one and 1.5 times its size.

The results of the valuation procedure are clearly sensitive to the parameters chosen, but even under the most favorable conditions the value of the contracts is strongly reduced in the presence of litigation risk.

Table 7: Sensitivity analysis - $\lambda_{trial}/\lambda_{notrial}$			
$\lambda_{notrial}$ \ λ_{trial}	$\Gamma = 0.3$	$\Gamma = 0.53$	$\Gamma = 0.8$
$2\alpha_\lambda$	251.4	369.3	519.9
	(1.2)	(1.5)	(2.0)
α_λ	317.6	405.2	532.6
	(1.5)	(1.7)	(2.1)
$\frac{1}{2}\alpha_\lambda$	405.7	461.5	550.6
	(1.8)	(1.9)	(2.1)

4.4.2 Litigation risk and counterparty risk combined

In the previous section, to express the value of earnouts, we considered effect of litigation risk on $\hat{X}$, that is the value of the final payoff that already includes counterparty risk. In order to see the determine of both sources of risk, we can plug the expression for $\hat{X}$ in the valuation formula previously derived:

$$E_{lit}(0) = e^{-\hat{r}T}\widehat{\mathbb{E}}\left[\hat{X}\right] - e^{-\hat{r}T}\left(\widehat{\mathbb{E}}\left[(1-\lambda_{trial})\cdot\hat{X}\cdot\mathbb{I}_{trial}\right] + \widehat{\mathbb{E}}\left[(1-\lambda_{notrial})\cdot\hat{X}\cdot\mathbb{I}_{trial^C}\right]\right)$$

$$with$$

$$\hat{X} = X\cdot\left(\mathbb{I}_{def^C} + rec\cdot\mathbb{I}_{def}\right)$$

This allows us to express the value of the earnout as follows way (the explicit derivation of the formula is given in the Appendix):

$$\begin{aligned} E_{lit}(0) = {} & e^{-\hat{r}T}\widehat{\mathbb{E}}[X] - e^{-\hat{r}T}\widehat{\mathbb{E}}\left[X\cdot\mathbb{I}_{def}\cdot\mathbb{I}_{trial}\cdot(1-rec\cdot\lambda_{trial})\right] \\ & -e^{-\hat{r}T}\widehat{\mathbb{E}}\left[X\cdot\mathbb{I}_{def}\cdot\mathbb{I}_{trial^C}\cdot(1-rec\cdot\lambda_{notrial})\right] \\ & -e^{-\hat{r}T}\widehat{\mathbb{E}}\left[X\cdot\mathbb{I}_{def^C}\cdot\mathbb{I}_{trial}(1-\lambda_{trial})\right] - e^{-\hat{r}T}\widehat{\mathbb{E}}\left[X\cdot\mathbb{I}_{def^C}\cdot\mathbb{I}_{trial^C}(1-\lambda_{notrial})\right] \quad (10) \end{aligned}$$

This equation shows that there are four terms that correct the value of the earnout computed as an ordinary call. Indeed, the two events that we consider, default and litigation, divide the state space into four partitions. In all these partitions the value of the final payoff is reduced, as shown in Table 8:

Table 8: Payoff		
EO payout	No default	default
No trial	$\lambda_{notrial} \cdot X$	$rec \cdot \lambda_{notrial} \cdot X$
Trial	$\lambda_{trial} \cdot X$	$rec \cdot \lambda_{trial} \cdot X$

Thus the four terms that correct the value of the earnout arise as the composition of the litigation value adjustment, discussed in the previous section, and the credit value adjustment, discussed in the section before.

5 Does the model capture reality?

Our model shows that the valuation methods that do not include counterparty risk tend to overestimate the value of earnouts. The overestimation is stronger the lower the correlation between the bidder and the target, the greater the bidder's leverage, and the lower the relative value of the bidder with respect to the target. As for litigation risk, indirect evidence of its significance can be provided by the proportion of deals that involve the bidder and target operating in sectors prone to litigation: technology, services, and healthcare.[15] In addition, we provide evidence of relevant cases in which earnouts ended in disputes.

The data used in this empirical section come from different sources. We obtained from Thomson One Banker information on deals between US-incorporated bidders and targets

[15] See Brown, Hillegeist, and Lo (2005), Francis, Philbrick, and Schipper (1994), Kim and Skinner (2011), and Rogers and Stocken (2005).

completed from 2001 to 2011 that involved an earnout agreement. This dataset comprises a total of 1,947 acquisitions. To obtain information on the capital structure of the companies involved in the acquisitions and on the returns of the firms that were publicly traded, we merged this dataset with those of the CRSP and Compustat.

We aim to show that our model has an impact in general on the valuation of earnouts because no bidder is perfectly correlated with the target *and* is unlevered *and* has very deep pockets. We also want to show that there are cases in which the use of our model could dramatically reduce the valuation of these contracts, because more than one of the conditions previously stated could be met simultaneously.

Table 9: Differences in SIC codes

Year	N °Obs	N ° Diff 4-digits	% Diff 4-digits	N ° Diff 3-digits	% Diff 3-digits	N ° Diff 2-digits	% Diff 2-digits
2001	148	116	78.37%	105	70.94%	88	59.46%
2002	185	129	69.73%	97	52.43%	83	44.86%
2003	149	106	71.14%	85	44.97%	70	46.98%
2004	189	120	63.49%	97	51.32%	75	39.68%
2005	216	142	65.74%	108	50.00%	87	40.28%
2006	204	146	71.57%	115	56.37%	97	47.55%
2007	234	167	71.37%	138	58.97%	113	48.29%
2008	180	110	61.11%	89	49.44%	74	41.11%
2009	123	75	60.98%	57	46.34%	49	38.84%
2010	135	95	70.37%	76	56.30%	54	40.00%
2011	184	114	61.96%	91	49.46%	80	43.48%
Total	1,947	1,320	67.80%	1,058	54.34%	870	44.68%

5.1 Correlation

A first indicator of the correlation between bidders and targets can be given by a comparison of their Standard Industrial Classification (SIC) codes. Table 9 shows, both by year and overall, the proportion of deals for which the bidder and target operate in different industries or sectors according to four-, three-, and two-digit SIC codes.

As Table 9 shows, the overall percentage of deals involving the bidder and target operating in different sectors or industries is relevant. Even in terms of the broadest definitions, that is, considering two-digit SIC codes, almost half of the deals in which earnouts are used are cross-industry acquisitions. These results are consistent with the evidence of Cain, Denis, and Denis (2011), Datar, Frankel, and Wolfson (2001), and Kohers and Ang (2000). It is reasonable to believe that different industries are not perfectly correlated; so this is already evidence of the fact that our model captures the features of actual deals.

However, to obtain a more direct measure of correlation, we adopt the following procedure. Starting from information on the returns of traded stocks from the CRSP, we built a proxy for cross-industry correlation. We compute the average return for each month in the years between 2001 and 2011, for each group of firms defined by four-digit SIC codes. Then we obtain the cross-industry correlation for each pair of SIC codes and each month by computing the correlation of the average returns over the previous 36 months. For each deal in the sample for which we are able to compute this information, we associate the correlation between the bidder's and the target's industry in the month in which the deal was effective.

Over the 1,320 deals involving bidders and targets operating in different industries, we have data to compute the cross-industry correlations for 1,126. Table 10 reports the results.

Table 10: Correlations			
Correlation by year		Details on the distribution of correlations	
Year	Average correlation	over the whole sample	
2001	0.4959	Mean	0.5489
2002	0.5156	Median	0.5840
2003	0.5831	Std. Dev.	0.2556
2004	0.5723	Min	-0.3395
2005	0.5604	Max	0.9549
2006	0.4513		
2007	0.4807		
2008	0.5129		
2009	0.6687		
2010	0.6326		
2011	0.6648		

This table shows that the correlation between the bidder and target, given that they operate in different industries, is, on average, 0.55, significantly less than one. Moreover, it reaches very low, sometimes negative values. This again shows that the model that we are proposing could do a better job in valuing earnouts than those currently used.

5.2 Leverage

Using the information obtained from Compustat on the financial structure of the bidders, we compute both their book and market leverage, defined as $\frac{\text{Liabilities}}{\text{Assets}}$. We have sufficient information for 1,032 deals in our dataset. The average (median) book leverage is 45% (42%), and the average (median) market leverage is 29% (25%). These levels are not to high, yet they are sufficient to have an impact on the valuation using our model. What is more interesting however is that 84 (149) companies, that is 8.2% (14.5%) of the bidders for which we have this information, has a market (book) leverage equal or higher than 70%.

Table 11 provides more details on market leverage.

Table 11: Market leverage

		Percentiles	
Mean	29.44%		
Std Dev	21.48%	1%	1.76%
Min	0.06%	5%	4.16%
Max	99.79%	10%	6.08%
		25%	12.52%
		50%	24.87%
		75%	39.82%
		90%	61.02%
		95%	73.48%
		99%	92.18%

Table 11 shows us that a number of bidders of deals involving earnouts are extremely leveraged. In these cases, it would be extremely important to use our model to avoid being swayed by promises made by bidders facing a high risk of default.

5.3 Relative size

Our model converges to an ordinary European call if the value of the bidder, relative to that of the target, goes to infinity. So, if the size of the bidder is not greatly higher than the size of the target, our model would imply a lower value for earnout contracts. Table 12 compares the market value of the bidder one month prior to the acquisition to the price paid for the target, including the maximum payment that could arise from the earnouts, by their ratios.

Table 12: Relative size

		Percentiles	
Mean	101		
Std Dev	1018	1%	0.30
Min	0.024	5%	1.24
Max	27374	10%	2.35
		25%	5.45
		50%	13.37
		75%	39.12
		90%	118.16
		95%	202.96
		99%	1023.58

As the percentiles show, in a significant portion of deals, the size of the bidder is not extremely higher than the size of the target. Again, this is evidence of the fact that our model could be useful in the valuation of most earnout agreements.

5.4 Litigation risk

A first, indirect way of demonstrating litigation risk is to show that the majority of earnouts are used in deals in which the target is in an industry with a high likelihood of litigation.

According to Kim and Skinner (2011), these are the technology, service, pharmaceutical/chemical, and financial industries. In our dataset, 63.48% of the deals involve a target in one of these industries. Table 13 provides the details of this percentage.

Table 13: Deals by target sector	
Technology	13.30%
Services	41.86%
Pharmaceutical /chemical	8.32%
Financial	6.83%
Total	63.48%

To obtain a more direct feel of the fact that litigation is a possible result of earnouts, we discuss a few significant cases in which these contingent payments ended in litigation. The sources of information on these cases vary and include Factiva and the cases' publicly available verdicts, accessible via the Internet (mainly from the websites of law firms).

The first case relates to the acquisition by 3M, the well-known multinational company, of Acolyte, a UK-based company that developed BacLite, a test for methicillin-resistant Staphylococcus aureus, more commonly known as MRSA. The acquisition took place in 2007. Apart from an upfront payment of £ 10.5 million, the former shareholders of Acolyte were entitled to receive additional payments capped at £ 41 million. The payments were made contingent on the revenues of the acquired company over the next three years. 3M should have obtained the FDA's approval to sell this product in the United States but never passed the trials. Moreover, other competing products arrived on the market, a few of them cheaper than BacLite. For these reasons, 3M discontinued the production of BacLite in 2008, offering the former shareholders $1 million in settlement of the earnout contract. The ex-shareholders of Acolyte refused the offer and decided instead to sue 3M, alleging that it breached its contractual obligations to actively market the product, diligently seek regulatory approval, and provide the technology with the necessary level of financial resources. After a trial that lasted until 2011, the claimants received damages for $1.3 million, just slightly more than

what they would have obtained had they accepted 3M's offer but surely a lot less than the maximum earnout payment.

Another case is the acquisition of Indeck Capital by Black Hills Corporation. The acquisition took place in 2000 and the parties agreed upon an upfront payment of $38 million in Black Hills shares and an earnout capped at $35 million. According to the bidder, only a portion of the earnout, that is, $11.3 million, was due and thus paid. In 2004, the former shareholders of the target went to court, claiming that the bidder did not provide audited documentation of the target's performance during the earnout period and thus they did not believe in the prospectuses the bidder provided. They believed, instead, that the actual target performance was better than what the acquirer had claimed and thus they had the right to higher earnout payments. In 2008, the court denied all the plaintiff's motions.

Another interesting case is that involving Squid Soap and Airborne Health. Airborne acquired Squid Soap in 2007 with an upfront payment of $1 million and an earnout capped at $26.5 million. Shortly after acquisition, the bidder's business began to deteriorate for reasons that were independent of the acquisition. After the deal, the bidder was therefore distracted by the need to resolve these issues and did not extend its best efforts to manage the acquired company. This case was settled in 2009 with a partial grant of the plaintiff's allegations.

These are just three examples of earnouts that ended in litigation to show that the lack of monitoring of the target by its former shareholders plays a crucial role in these contracts. There are plenty more. Earnouts are contracts that lay their foundation in disagreement and, given the difficulties affecting the verification of their outcomes, they likely have disagreements as their epilogue.

6 An example of valuation

This section returns to our case study, the earnout used in the acquisition of the Center for Pain Management by PainCare Holdings. As stated before, the final agreement provided for an upfront payment of $6.37 million in cash and $10.69 million in stocks, plus an earnout, linked to EBITDA, providing for three contingent payments, one for each of the three years following the acquisition. The total payment for the earnout was capped at $13.75 million.

The earnout formula was:

$$E(t)\begin{cases}\$4.58\text{million} & if \quad EBITDA_t \geq 5.5 \\ \$4.12\left(\frac{EBITDA_t}{5{,}5}\right) & if \quad 5.5 > EBITDA_t \geq 4.8 \\ \$3.20\left(\frac{EBITDA_t}{5{,}5}\right) & if \quad 4.8 > EBITDA_t \geq 4.1 \\ \$2.30\left(\frac{EBITDA_t}{5{,}5}\right) & if \quad 4.1 > EBITDA_t \geq 3.5 \end{cases} \text{ with } t = 1{,}2{,}3$$

In the previous sections we focused on the earnout structured over the third year. Now we consider the contract in its entirety. Table 14 shows the value of the earnout when using our valuation method, compared to vanilla option pricing models.

Table 14: Earnout valuation

	Ordinary option	Vulnerable option	With litigation risk
Earnout first year	657.8	643.3	522.3
Proportion to ordinary option		97%	80%
Earnout second year	803.9	737.5	471.8
Proportion to ordinary option		92%	59%
Earnout third year	899.9	782.8	405.2
Proportion to ordinary option		88%	49%
Overall	2361.6	2163.6	1399.3
Proportion to ordinary option		92%	59%

As the table shows, even with a conservative choice of parameters, the difference in the valuation of the earnout, both including only counterparty risk and including also litigation risk, is significant using our model. Overall, the value of the earnout is reduced by more than 40%.

7 Conclusions

Earnouts can be valuable instruments that allow the closing of deals even in the presence of disagreement between the parties with respect to the company to be acquired. The valuation of these contracts, however, is far from straightforward. It would be easy, indeed, to be fooled by the optionality value of these contracts, and to value only this aspect. However, two additional sources of risk, counterparty risk and litigation risk, play an important role that should be taken into account, because they reduce the benefits arising from the option structure of these contracts. Since the recently revised US and European accounting standards impose to the valuation of these contracts at fair value, having a model that correctly identifies their sources of risk and thus their value is of primary importance. Taking an income approach, we build a model that includes the potential losses arising from the event in which the bidder goes defaults before the expiration of the earnout and the costs of litigation that could arise in connection to these contracts. The sensitivity analysis performed and the case study presented show that including counterparty risk and litigation risk could have a dramatic impact on the value of these contracts: Not including them can significantly distort the information provided in financial statements.

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Appendix

In the following appendix we denote $\lambda = \lambda_{notrial}$ and $\psi = \lambda_{trial}$.

Derivation of the valuation formula (10)

Taking into account the counterparty risk embedded in $\hat{X}$, we obtain:

$$E_{lit}(0) = e^{-\hat{r}T}\hat{\mathbb{E}}\left[\hat{X}\right] - e^{-\hat{r}T}\left(\hat{\mathbb{E}}\left[(1-\psi)\cdot\hat{X}\cdot\mathbb{I}_{trial}\right] + \hat{\mathbb{E}}\left[(1-\lambda)\cdot\hat{X}\cdot\mathbb{I}_{trial^C}\right]\right)$$

The three addends can be rewritten as

$$e^{-\hat{r}T}\hat{\mathbb{E}}\left[\hat{X}\right] = e^{-\hat{r}T}\hat{\mathbb{E}}\left[X\cdot\left(\mathbb{I}_{def^C} + rec\cdot\mathbb{I}_{def}\right)\right] = e^{-\hat{r}T}\hat{\mathbb{E}}\left[X\cdot\left(\mathbb{I}_{def^C} \pm \mathbb{I}_{def} + rec\cdot\mathbb{I}_{def}\right)\right]$$

$$= e^{-\hat{r}T}\hat{\mathbb{E}}[X] - e^{-\hat{r}T}\hat{\mathbb{E}}\left[X\cdot\mathbb{I}_{def}\cdot(1-rec)\right]$$

$$e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\psi)\cdot\hat{X}\cdot\mathbb{I}_{trial}\right] = e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\psi)\cdot\left(X\cdot\left(\pm\mathbb{I}_{def} + \mathbb{I}_{def^C} + rec\cdot\mathbb{I}_{def}\right)\right)\cdot\mathbb{I}_{trial}\right]$$

$$= e^{-\hat{r}T}\hat{\mathbb{E}}[(1-\psi)\cdot X\cdot\mathbb{I}_{trial}] - e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\psi)\cdot(1-rec)X\cdot\mathbb{I}_{def}\cdot\mathbb{I}_{trial}\right]$$

$$e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\lambda)\cdot\hat{X}\cdot\mathbb{I}_{trial}\right] = e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\lambda)\cdot\left(X\cdot\left(\pm\mathbb{I}_{def} + \mathbb{I}_{def^C} + rec\cdot\mathbb{I}_{def}\right)\right)\cdot\mathbb{I}_{trial^C}\right]$$

$$= e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\lambda)\cdot X\cdot\mathbb{I}_{trial^C}\right] - e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\lambda)\cdot(1-rec)X\cdot\mathbb{I}_{def}\cdot\mathbb{I}_{trial^C}\right]$$

so that

$$E_{lit}(0) = e^{-\hat{r}T}\hat{\mathbb{E}}\left[\hat{X}\right] - e^{-\hat{r}T}\left(\hat{\mathbb{E}}\left[(1-\psi)\cdot\hat{X}\cdot\mathbb{I}_{trial}\right] + \hat{\mathbb{E}}\left[(1-\lambda)\cdot\hat{X}\cdot\mathbb{I}_{trial^C}\right]\right)$$

$$= \underbrace{e^{-\hat{r}T}\hat{\mathbb{E}}[X] - e^{-\hat{r}T}\hat{\mathbb{E}}\left[X\cdot\mathbb{I}_{def}\cdot(1-rec)\right]}_{e^{-\hat{r}T}\hat{\mathbb{E}}[\hat{X}]}$$

$$- \left(\underbrace{e^{-\hat{r}T}\hat{\mathbb{E}}[(1-\psi)\cdot X\cdot\mathbb{I}_{trial}] - e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\psi)\cdot(1-rec)X\cdot\mathbb{I}_{def}\cdot\mathbb{I}_{trial}\right]}_{e^{-\hat{r}T}\hat{\mathbb{E}}[(1-\psi)\cdot\hat{X}\cdot\mathbb{I}_{trial}]}\right)$$

$$- \left(\underbrace{e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\lambda)\cdot X\cdot\mathbb{I}_{trial^C}\right] - e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\lambda)\cdot(1-rec)X\cdot\mathbb{I}_{def}\cdot\mathbb{I}_{trial^C}\right]}_{e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\lambda)\cdot X\cdot\mathbb{I}_{trial^C}\right] - e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\lambda)\cdot(1-rec)X\cdot\mathbb{I}_{def}\cdot\mathbb{I}_{trial^C}\right]}\right)$$

$$E_{lit}(0) = e^{-\hat{r}T}\hat{\mathbb{E}}[X] - e^{-\hat{r}T}\hat{\mathbb{E}}\left[X \cdot \mathbb{I}_{def} \cdot (1 - rec)\right] - e^{-\hat{r}T}\hat{\mathbb{E}}[(1-\psi) \cdot X \cdot \mathbb{I}_{trial}]$$
$$+e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\psi) \cdot (1 - rec)X \cdot \mathbb{I}_{def} \cdot \mathbb{I}_{trial}\right]$$
$$-e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\lambda) \cdot X \cdot \mathbb{I}_{trial^C}\right] + e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\lambda) \cdot (1 - rec)X \cdot \mathbb{I}_{def} \cdot \mathbb{I}_{trial^C}\right]$$

In details:

$$E_{lit}(0) = e^{-\hat{r}T}\hat{\mathbb{E}}[X] - e^{-\hat{r}T}\hat{\mathbb{E}}\left[X \cdot \mathbb{I}_{def} \cdot (1 - rec) \cdot \left(\mathbb{I}_{trial} + \mathbb{I}_{trial^C}\right)\right]$$
$$-e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\psi) \cdot X \cdot \mathbb{I}_{trial} \cdot \left(\mathbb{I}_{def} + \mathbb{I}_{def^C}\right)\right]$$
$$+e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\psi) \cdot (1 - rec)X \cdot \mathbb{I}_{def} \cdot \mathbb{I}_{trial}\right]$$
$$-e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\lambda) \cdot X \cdot \mathbb{I}_{trial^C} \cdot \left(\mathbb{I}_{def} + \mathbb{I}_{def^C}\right)\right]$$
$$+e^{-\hat{r}T}\hat{\mathbb{E}}\left[(1-\lambda) \cdot (1 - rec)X \cdot \mathbb{I}_{def} \cdot \mathbb{I}_{trial^C}\right]$$
$$= e^{-\hat{r}T}\hat{\mathbb{E}}[X] - e^{-\hat{r}T}\hat{\mathbb{E}}\left[X \cdot \mathbb{I}_{def} \cdot \mathbb{I}_{trial}\left(1 - rec + 1 - \psi - (1-\psi) \cdot (1 - rec)\right)\right]$$
$$-e^{-\hat{r}T}\hat{\mathbb{E}}\left[X \cdot \mathbb{I}_{def} \cdot \mathbb{I}_{trial^C}\left(1 - rec + 1 - \lambda - (1-\lambda) \cdot (1 - rec)\right)\right]$$
$$-e^{-\hat{r}T}\hat{\mathbb{E}}\left[X \cdot \mathbb{I}_{def^C} \cdot \mathbb{I}_{trial}(1-\psi)\right] - e^{-\hat{r}T}\hat{\mathbb{E}}\left[X \cdot \mathbb{I}_{def^C} \cdot \mathbb{I}_{trial^C}(1-\lambda)\right]$$
$$= e^{-\hat{r}T}\hat{\mathbb{E}}[X] - e^{-\hat{r}T}\hat{\mathbb{E}}\left[X \cdot \mathbb{I}_{def} \cdot \mathbb{I}_{trial} \cdot (1 - rec \cdot \psi)\right]$$
$$- e^{-\hat{r}T}\hat{\mathbb{E}}\left[X \cdot \mathbb{I}_{def} \cdot \mathbb{I}_{trial^C} \cdot (1 - rec \cdot \lambda)\right]$$
$$-e^{-\hat{r}T}\hat{\mathbb{E}}\left[X \cdot \mathbb{I}_{def^C} \cdot \mathbb{I}_{trial}(1-\psi)\right] - e^{-\hat{r}T}\hat{\mathbb{E}}\left[X \cdot \mathbb{I}_{def^C} \cdot \mathbb{I}_{trial^C}(1-\lambda)\right]$$

Derivation of condition (7) *on* α_λ

In order $\lambda_{notrial}(x) \cdot x$ to be an increasing function of x we require $(1 - \alpha_\lambda \cdot x) \cdot x$ to have positive derivative for $x \in [0; x_{cap}]$. This is equivalent to:

$$-\alpha_\lambda \cdot x + 1 - \alpha_\lambda \cdot x > 0 \text{ for all } x \in [0; x_{cap}]$$
$$-2\alpha_\lambda \cdot x + 1 > 0 \text{ for all } x \in [0; x_{cap}]$$

$$-2\alpha_\lambda \cdot x_{cap} + 1 > 0$$

$$\alpha_\lambda < \frac{1}{2x_{cap}}$$

Chapter 2: The Impact of Enforcement Quality on the Use of Earnouts in M&A Transactions: International Evidence

1. Introduction

Earnouts are contractual clauses used in mergers and acquisitions (M&As) that link part of the acquisition price (i.e., consideration) to the performance of the target company subsequent to the closing of the deal. Prior empirical studies have emphasized earnouts' role in reducing adverse selection and valuation risk in M&As. According to Kohers and Ang (2000) and Datar et al. (2001), if a portion of the payment is made contingent on the performance of the company to be acquired (i.e., target), it is possible for the involved parties to reach an agreement and close the deal even when there is significant divergence of opinions on the future prospects of the target, because part of the uncertainty related to the latter's actual value will be resolved at the time the payment is due. Moreover, these clauses act as a self-selection mechanism for the target. Indeed, only if the target's shareholders believe in the future profitability of their company will they accept a payment that involves earnouts.

Earnouts, however, are not free of drawbacks. They are clearly beneficial for bidders, but they increase the uncertainty faced by the sellers. Earnouts are often based on accounting figures,[16] which are subject to discretion and may be managed by the bidder to reduce the payment. Moreover, the effort exerted by the bidder in boosting the business of the target may be crucial for the performance of the latter to reach the level that triggers additional payments and the interests of bidder and sellers may not be perfectly aligned in this respect. Indeed,

[16] Cain et al. (2011), focusing on US deals in 1994–2003, report that, out of a sample of 498 earnouts, 86% are based on accounting measures, 12.2% are structured on non-financial milestones, 1.2% are linked to stock prices, and 0.6% are linked to other parameters.

after the closing of the deal, the sellers lose direct control and monitoring of the target thus they may not be able to verify the performance of their company. In case the conditions triggering the earnout payments are not (fully) met, they may object to the figures provided by the bidder and decide to go to court to file their claim. Trevis Laster, a judge who had to rule on a dispute over an earnout payment, stated, "An earnout often converts today's disagreement over price into tomorrow's litigation over outcome."[17]

A survey conducted by the law firm Morrison & Foerster LLP (2012) on a sample of acquisitions in the high-tech sector—an industry where earnouts are frequently used[18]—with over 300 respondents among professionals and managers finds that almost three-quarters of firms who used earnouts claimed that such clauses led to subsequent disputes or litigation and nearly one-fifth of the respondents estimated there had been post-deal conflicts over earnouts up to half of the times.

The risk of litigation that affects earnout agreements, however, has been neglected by the literature. To the best of our knowledge, no academic article has directly addressed this issue so far, although it is well known to practitioners.[19]

In this chapter, we attempt to fill this gap in the literature by analyzing the effect of litigation risk on the decision to use earnout agreements in M&As. In particular, we test the relation

[17] Airborne Health, Inc. and Weil, Gotshal & Manges LLP v. Squid Soap, LP, C.A. No. 4410-VCL (Del. Ch. Nov. 23, 2009). Airborne acquired Squid Soap in 2007, with an upfront payment of $1 million dollars and an earnout capped at $26.5 million dollars.

[18] Datar et al. (2001) report that earnouts in the high-tech sector comprise more than one-third of total earnouts.

[19] For example, Crimmins et al. (2010), Fox and Wolf (2010), and Shannon and Reilly (2011) recognize that earnouts are complex to design and prone to end in litigation.

between a country's enforcement quality and the use of earnouts in an international setting. As discussed previously, in case of misbehavior of the bidder (actual or alleged), the target's former shareholders might want to seek the protection of the court. For this reason, an effective and efficient enforcement system that is able to protect them can be reassuring and thus can induce the sellers to be more willing to accept these contracts.

The concept of the quality of an enforcement system is complex and is influenced by many different features. Since we are interested in the enforcement of earnout contracts related to M&A deals, first we try to measure the extent to which a judge can grant protection to the holders of an earnout by reducing the information asymmetry with respect to the bidder. In particular, we attempt to capture the judge's ability to obtain information on how the target company was managed by the bidder and how the performance metric that triggers the earnout payment was computed. To this purpose, we employ the measure of investor protection developed by Djankov et al. (2008b). As an alternative proxy, we use the Rule of Law Index, which captures citizens' and firms' subjective perceptions of the quality of the legal environment. Through this proxy, we try to capture the quality of the enforcement system as it is perceived by the parties involved in a deal. Indeed, their decision to use an earnout is influenced by the extent to which they trust the protection offered by the enforcement system. Since both the objective quality of the enforcement system and its subjective perception may influence the decision of the parties involved in a deal, as a third proxy we build a composite index of the two aforementioned proxies. Finally, to further validate our results, we rely on the measures of efficiency of the enforcement system developed by the World Bank's Doing Business Reports, namely, the time needed to enforce a contract and the recovery rate in insolvency procedures. Details on these variables are provided in Section 4.

We hypothesize that earnouts are more frequent in countries where the quality of the enforcement system is higher. Furthermore, we posit that enforcement quality not only affects the decision to use earnouts, but also positively influences the proportion of earnout payments on total consideration.

We test these relations on a sample of 22,693 M&A deals that took place in 26 countries between 2000 and 2012. Using logit regression models, we show that the quality of a country's enforcement system plays a significant role in the decision to use earnouts: The use of these contracts is positively related to the level of investor protection, the perceived quality of the legal environment, and the recovery rate of insolvency procedures, while it is inversely related to the length of trials. Furthermore, using Tobit and linear models, we show that the proportion of earnout payments with respect to total consideration is positively related to enforcement quality variables. This suggests that the higher the uncertainties affecting future conditional payments, the higher the proportion of the total consideration that the seller will ask to be paid upfront.

Our results also corroborate, in an international setting, prior findings on the determinants of the use of earnouts. We find that these clauses are mainly used when the target is a private company or a subsidiary and if it operates in the service or high-tech sector. Moreover, an increase of the relative size of the target with respect to the bidder has a positive impact on the likelihood of including an earnout in the deal, due to the higher overpayment risk for the bidder. Interestingly, we also find that the likelihood of using contingent payments is positively related to cross-border acquisitions, probably due to the more acute information asymmetry issues. This result is consistent with what Datar et al. (2001) posited, who, however, did not find a positive association between cross-border acquisitions and the likelihood of using earnouts.

Our work contributes to the literature in law and economics by showing how law and institutions influence the design of financial contracts. In addition, we contribute to the literature on contingent payments in M&As by highlighting the importance of the efficiency of the enforcement system in the decision to implement them: Absent an effective legal protection for their holders, the potential benefits of these contracts may turn out to be empty promises. Our findings on the relevance of the litigation risk and associated costs help to explain why earnouts are not widespread in M&A deals.

Finally, our findings have implications in terms of the valuation of earnouts. Indeed, valuation models of such contingent payments should take into consideration the litigation risk and the quality of the enforcement system, which influence the likelihood of obtaining future payments, hence the present value of these contracts. This issue is of particular relevance for financial reporting purposes, due to the fact that recently both International Financial Reporting Standards (IFRS) and US Generally Accepted Accounting Principles (GAAP) have introduced the requirement of recognizing the liability associated with these contracts at fair value.[20]

The chapter proceeds as follows. Section 2 reviews the relevant literature. Section 3 develops our hypotheses, while Section 4 describes the data used for the analysis. The results are presented in Section 5. Section 6 presents additional analyses and checks the robustness of our results. The final section draws conclusions and indicates venues for further research.

[20] Both Financial Accounting Standards Board ASC 805 and IFRS 3 were revised in 2007. The valuation of earnouts at fair value became mandatory starting in 2009.

2. Literature review

Our work is positioned at the intersection of two main research streams, that is, the one related to the use of earnouts in M&As and the one focused on the relation between the legal system and the design of financial contracts or, more generally, the financial environment. Within the first research stream, a seminal paper on the use of earnout agreements in M&As is that by Kohers and Ang (2000). Focusing on acquisitions that took place from 1984 to 1996 where the target was a company incorporated in the United States, they show that earnouts are mainly used to overcome information asymmetries and to share the risks affecting the future prospects of the target between the parties. In particular, these contracts are used the most if the target is a private company, for which no market price is available to use as a benchmark for its value, or if the target operates in the service or high-tech industry, strongly affected by uncertainties related to intangible assets, growth opportunities, and human capital. In addition, the authors show that the size of the acquirer (target) impacts negatively (positively) on the choice to use earnouts: They claim that smaller buyers may seek the extra protection provided by earnouts to compensate for their lesser information-gathering resources and to reduce valuation error, whose relevance is positively related to the size of the target.

A subsequent paper by Datar et al. (2001), based on acquisitions that took place worldwide between 1990 and 1996, confirms the previous findings, except for the positive impact of the size of the target on the likelihood of using earnouts in the deal, which was found to be weakly negative. The authors also hypothesize that earnouts are more frequent in cross-border acquisitions, since these tend to be characterized by stronger information asymmetries. However, they do not find evidence supporting this hypothesis.

The results of Kohers and Ang (2000) and Datar et al. (2001) were recently confirmed by Ragozzino and Reuer (2009), who focus on the acquisitions of privately held targets in the

United States between 1993 and 2000, and by Barbopulos and Sudarsanam (2012), for takeovers announced by UK firms between 1986 and 2008.

Within the same research stream, Cain et al. (2011) provide evidence on the features of earnouts and their determinants for a sample of US deals in 1994–2003. Consistently with the hypothesis that these contracts are meant to reduce the valuation risk in a deal, they show that the choice of the performance metric is meant to maximize its capability to track the value of the acquired company and the effort exerted to boost its business. Moreover, the length of the horizon over which the performances of the target are measured increases with the importance of research and development and decreases with the volatility of returns in the industry of the acquired company. Furthermore, the size of the earnout increases with the importance of managerial effort to develop the target's business, while it decreases with the precision with which the effort can be measured.[21]

The second research stream related to our study focuses on legal systems and their effect on the design of financial contracts and on the financial environment. This research stream finds its roots in the work of LaPorta et al. (1997, 1998, 2000). In their seminal papers, these authors relate the origins of legal systems to the level of investor protection, showing that common law countries offer a better environment for investors than civil law ones and that investor protection positively influences the size of capital markets and negatively the level of ownership concentration.

Subsequent papers delve deeper into different aspects and implications of enforcement quality. For example, Djankov et al. (2003) built an index of procedural formalism of dispute

[21] Earnout agreements are also studied with respect to their valuation (Bruner 2001, 2004; Arzac 2005; Caselli et al. 2006; Cadman et al. 2014). This stream of literature, however, is not directly related to our study.

resolution and show that it is associated with a longer duration of judicial proceedings; greater corruption; reduced consistency, honesty, and fairness in judicial decisions; and inferior access to justice. Djankov et al. (2008a) study the quality of debt enforcement around the world and how it influences the development of debt markets. Djankov et al. (2008b) constructed a measure of protection of minority shareholders against self-dealing transactions that benefit controlling ones and show that it performs better in predicting financial development than other anti-director variables.

The enforcement quality indices developed in the papers mentioned above were used in subsequent research to show how they impact the contracting and reporting behaviors of firms and institutions. Leuz et al. (2003) show that earnings management in financial statements decreases with investor protection. They relate this finding to insiders' limited ability to acquire private control benefits in the presence of strong protection, which reduces their incentives to mask firm performance. The development of the financial sector and the protection of minority investors also imply higher efficiency in the allocation of capital, as Wurgler (2000) argues. Similarly, Dittmar et al. (2003) show that, consistent with agency cost explanations, cash holdings are higher in countries with weak investor protection, while Reese and Weisbach (2002) show that, after cross-listing in the United States, the increase in equity issuance is greater for firms located in countries with weak protection. Esty and Megginson (2003) and Qian and Strahan (2007) describe how legal and institutional differences shape the terms of bank loans and syndicated loans around the world: Under strong creditor protection, loans have less fragmented ownership in terms of the number of lenders forming the syndicate, longer maturities, and lower interest rates.

Closer to the focus of our analysis, Rossi and Volpin (2004) and Bris and Cabolis (2008) study the impact of law and regulation on M&A transactions. The former authors show that

the volume of M&A activity and the use of cash as a form of payment are higher in countries with better accounting standards and stronger shareholder protection. In addition, cross-border deals frequently involve targets located in countries with poorer investor protection than in their acquirers' countries, which suggests that these transactions could play a governance role by improving the degree of investor protection within target firms. Bris and Cabolis (2008) build on this intuition, showing that the merger premium is higher when shareholder protection and accounting standards in the acquirer's country are better than in the target's country.

Our work aims to contribute to the literature that links M&A activity to enforcement quality. Earnouts are contracts that have their origin in disagreement and in disagreement they can end, given the complexity of the verification of their outcome. For this reason, the quality of the enforcement system can play a crucial role in the decision to implement them. Our work is aimed at shedding light on this relation.

3. Hypothesis development

From a seller's point of view, an earnout agreement is risky. This is true not only because it delays part of the deal's payment and links it to the future performance of the target company, but also because such a delayed payment is affected by the effort exerted by the bidder in fostering the activity of the target company and on the reliability of the reported performance. From a strictly rational perspective, since the bidder obtains control of the target company at the closing and, with it, the right to benefit from its profitability, there may be an incentive to avoid the payment of the contingent consideration by constraining the profitability of the target (e.g., through a delay in sales, an increase in research and development expenses and other discretionary costs, or accounting policies). For their part, the sellers have no direct leverage to align the interest of the bidder with their own. If the sellers suspect that the

accounting figure on which the earnout was structured were managed, or that the bidder did not exert the best effort in the management of the acquired company, the only option they have to defend their claim is to go to court. For this reason, when deciding whether to accept an earnout as part of the consideration for a deal, the sellers will likely ponder on the level of the protection granted by the judicial system. If this protection is deemed to be weak, in case of disagreement on the earnout payment, the sellers may expect to recover, if anything, a small fraction of their claim. Thus, they might be unwilling to include these clauses in an acquisition contract. On the other hand, if such protection is strong, in case of disagreement on the earnout payment, the sellers will feel more confident that they will obtain what is due. For this reason, they might be more willing to use an earnout in a deal.

These arguments lead us to formulate our first hypothesis as follows:

H1: The likelihood of using an earnout in an acquisition agreement is positively related to the quality of the enforcement system in which the acquisition takes place.

To capture a country's enforcement quality, we rely on different proxies, presented here briefly and discussed in more depth in the following section. These indicators allow us to articulate our first hypothesis more precisely.

The first proxy we use is the anti–self-dealing index developed by Djankov et al. (2008b), an indicator of investor protection that captures, in relation to disputes arising from corporate transactions, the ease of bringing such matters to court and reaching a verdict, as well as the ease with which the judge in charge of the decision can access evidence to prove wrongdoings. Therefore, our first hypothesis can be better specified in the following way:

H1a: The stronger a country's investor protection as captured by the anti–self-dealing index, the higher the likelihood of using an earnout in an acquisition agreement.

The second proxy that we use is the Rule of Law Index, developed by the World Bank, which captures citizens' and firms' subjective perceptions on the quality of the legal environment. Using this proxy, we can articulate the first hypothesis in the following way:

H1b: The higher the perceived quality of a country's legal system, the higher the likelihood of using earnout agreements in acquisitions.

Since the decision of the parties involved in an acquisition may be influenced by both the objective quality of the enforcement system and the trust they put in it, we build a composite index based on the Rule of Law Index and the anti–self-dealing index (as defined later in Table 2) to capture the overall assessment of the quality of the enforcement system. This leads us to the following description of our hypothesis:

H1c: The higher the overall assessment of the quality of a country's enforcement system, the higher the likelihood of using earnout agreements in acquisitions.

Two additional proxies are taken from the enforcement quality indicators developed by the World Bank and released in the Doing Business Reports. In particular, we use the time needed to enforce a contract in a commercial dispute to capture the burden of formalism of a country's judicial system and, to capture its efficiency, we use the average recovery rate of insolvency procedures. Our hypothesis then becomes the following:

H1d: The shorter the length of trials (the higher the recovery rates in insolvency procedures), the higher the likelihood of using earnout agreements in acquisitions.

We believe that the risk of litigation influences not only the decision whether to use these contracts in acquisitions, but also the magnitude of earnout payments with respect to total consideration, which we name earnout materiality. If the legal protection granted by a country is weak, the parties (and especially the sellers) might prefer to have a limited portion of the consideration affected by litigation risk. This motivates our second hypothesis as follows:

H2: Earnout materiality in a deal is positively related to the quality of the enforcement system of the country in which the acquisition takes place.

Based on the different proxies of enforcement quality described above, this hypothesis can be articulated as follows:

H2a: The stronger a country's investor protection as captured by the anti–self-dealing index, the greater the earnout materiality in an acquisition agreement.

H2b: The higher the perceived quality of a country's legal system, the higher the earnout materiality in an acquisition agreement.

H2c: The higher the overall assessment of the quality of a country's enforcement system, the higher the earnout materiality in an acquisition agreement.

H2d: The shorter the length of trials or the higher the recovery rates in insolvency procedures, the higher the earnout materiality in an acquisition agreement.

The following section describes the data and methodology employed to test our hypotheses.

4. Data and descriptive statistics

4.1 Sample description

Our sample consists of completed acquisitions announced between January 1, 2000, and December 31, 2012, that took place in 26 countries, as detailed in Table 1. The source of the data is SDC, provided by Thomson Financial.

We focus on transactions that involve the acquisition of the majority interest in a company. In particular, to be included in our sample, the acquirer must own less than 50% of the target company before the deal and at least 90% afterward. The reason for this choice is twofold. On one hand, we aim to study acquisitions characterized by a clear change in the target's control. On the other hand, as pointed out by Rossi and Volpin (2004), the identification of transfers of minority stakes could be affected by cross-country differences in disclosure requirements. By requiring a minimum transfer of 40% of shares, we aim to minimize this source of bias, since sizable deals are more likely to face reporting obligations. For similar reasons, we limit our attention to deals in which the acquirer is a public company. We exclude observations for which the form of the consideration paid, the value of the transaction, and the value of the bidder four weeks prior to the deal are not available. Finally, we exclude markets that are too inactive from the point of view of M&As; thus we consider only observations belonging to countries in which at least 15 deals were completed during the period of the analysis.

Since our aim is to relate the likelihood of using an earnout in an acquisition to the quality of the enforcement system, we have to relate each deal to a specific nationality. For domestic deals, that is, acquisitions in which both the target and the bidder are incorporated in the same country, the choice is relatively simple, that is, the nationality of the deal follows the country of the parties involved. For cross-country acquisitions, it is uncertain which is the jurisdiction elected by the parties to decide on potential disputes arising from the deal. The parties might favor the country of the acquirer, the country of the target, or even choose, as governing law, a country different from the previous two. To prevent this source of uncertainty from biasing our results, in our main analysis we limit our attention to domestic deals. In Section 6, dedicated to robustness checks, we remove this limitation and extend our analysis to include cross-border deals.

The final sample comprises 22,693 deals completed in 26 different countries. Of these deals, 2535 (about 11% of the total) involve an earnout.[22] The majority of the observations refer to the United States, Canada, and the United Kingdom.

Table 1 shows, for each country, the total number of acquisitions, the number of deals that involve an earnout, and the earnout ratio, that is, the ratio between these two values. The

[22] Since our study focuses on completed deals, one could wonder whether any relation between enforcement quality and the use of earnout emerges only because we do not consider deals that do not close. In other words, earnouts could be part of the consideration offered in unsuccessful deals and the frequency of these observations could be higher in countries with a low quality of enforcement. We checked for this issue and this is not the case: The proportions of unsuccessful deals that included an earnout across countries are in line with those regarding completed deals. The results are not reported here but are available upon request.

countries in which contingent payments are used the most are the United Kingdom and Ireland: The former shows an earnout ratio of 27.56% and the latter has a ratio of 33.33%. As we will see, these countries have the highest investor protection and are among the best with respect to the quality of the enforcement system. North American and Northern European countries include these contracts in a significant number of deals. The United States, for instance, shows an earnout ratio of 10.42%. The opposite holds for South America and Southern Europe. Earnouts were never used among the sample acquisitions in countries such as Greece, Chile, Colombia, and Peru.

Table 1 also compares countries by the average sizes of bidders and targets that use earnout agreements versus the average sizes of bidders and targets that do not. In the vast majority of countries included in the sample—although with variable differences across countries—the bidders that make use of contingent payments tend to be significantly smaller than those that do not. The same relation holds for target companies. This is probably due to the fact that earnouts tend to be used for the acquisition of private companies and/or startups, which are affected by relevant uncertainties regarding their value and are characterized, on average, by a smaller size.

Table 1: Descriptive statistics on the number of acquisitions, earnout frequency, and bidder and target size

This table describes the acquisitions included in our sample, which were announced between 2000 and 2012 and completed by 2013 and that took place in one of the 26 countries listed. Only domestic acquisitions are considered. The acquirer must not have held less than 50% of the shares of the target prior to the acquisition and participation after the deal must be at least 90%. Only acquisitions by public companies are considered and the information on the form of payment, the value of the transaction, and the market value of the acquirer must be available. Panel A describes the total number of acquisitions, the acquisitions that involved an earnout, and the percentage of earnouts in the total number of deals. Panel B provides descriptive statistics on the mean value of bidders and targets across countries. The value of the bidder is defined as its market value four weeks prior to the acquisition. The value of the deal is the total consideration paid in the acquisition, including the earnout if such a clause is used. Information is provided separately for deals that do not involve an earnout (no earnout) and those that do (earnout). The difference, as a percentage, between the average values of the bidders belonging to these two groups is computed for each country in which at least one deal that uses an earnout agreement took place. The significance of these differences is assessed via t-tests that allow for heterogeneous variances, with ***, **, and * indicating significance at the 1%, 5%, and 10% levels, respectively. Bidder and deal values are in millions of dollars.

Panel A

Country	No. Acquisitions	No. deals involving earnouts	% of deals involving earnouts	Country	No. Acquisitions	No. deals involving earnouts	% of deals involving earnouts
United States	14,641	1526	10.42%	Belgium	57	1	1.75%
Canada	3242	115	3.55%	Greece	48	0	0.00%
United Kingdom	2896	798	27.56%	Ireland	39	13	33.33%
Sweden	273	22	8.06%	Turkey	38	1	2.63%
France	226	6	2.65%	Switzerland	35	2	5.71%
Brazil	218	9	4.13%	Denmark	31	0	0.00%
Italy	170	4	2.35%	Mexico	31	1	3.23%
Germany	128	9	7.03%	Chile	27	0	0.00%
Spain	109	6	5.50%	Argentina	25	0	0.00%
Norway	104	7	6.73%	Portugal	21	0	0.00%
Russian Fed	96	1	1.04%	Peru	18	0	0.00%
Poland	85	4	4.71%	Colombia	15	0	0.00%
Finland	62	3	4.84%				
Netherlands	58	7	12.07%	TOTAL	22,693	2535	11.17%

Panel B

Country	Mean Bidder Value - No earnout	Mean Bidder Value - earnout	Difference (%)		Mean Deal Value - No earnout	Mean Deal Value - earnout	Difference (%)	
United States	7392	3721	-49.66%	***	396	102	-74.28%	***
Canada	891	246	-72.37%	***	95	50	-46.90%	**
United Kingdom	2524	1977	-21.70%		153	23	-85.26%	***
Sweden	853	101	-88.12%	***	81	51	-36.51%	
France	6467	1816	-71.91%	***	917	403	-56.01%	*
Brazil	16,066	2026	-87.39%	***	593	350	-41.05%	
Italy	5708	333	-94.17%	***	821	112	-86.41%	***
Germany	9542	322	-96.63%	***	908	15	-98.33%	***
Spain	6951	903	-87.01%	***	467	109	-76.61%	***
Norway	2293	280	-87.80%	***	459	9	-98.08%	**
Russian Fed	65,391	1223	-98.13%		384	45	-88.23%	
Poland	456	179	-60.82%	*	71	6	-91.79%	***
Finland	740	78	-89.41%	***	87	15	-82.45%	***
Netherlands	5078	3721	-26.73%		407	536	31.72%	
Belgium	2188	174	-92.05%		624	7	-98.88%	
Greece	1240				96			
Ireland	410	341	-16.76%		59	24	-59.41%	***
Turkey	879	23	-97.40%		63	3	-95.05%	
Switzerland	14,170	19,692	38.97%		1080	390	-63.90%	**
Denmark	2010				371			
Mexico	8725	158	-98.19%		2115	13	-99.39%	
Chile	2068				130			
Argentina	1351				60			
Portugal	1749				170			
Peru	1285				127			
Colombia	1429				241			

4.2 Proxies for the quality of the enforcement system

The data on the quality of the enforcement systems are obtained from various sources. The first source is the study by Djankov et al. (2008b), who developed for 72 countries the so-called anti–self-dealing index, a measure of investor protection that captures the ability of corporate insiders to expropriate minority shareholders of a company by carrying out transactions that favor another company in the same group. This measure focuses on enforcement mechanisms that prevent such transactions, such as the obligation to disclose them, which is a good proxy for the transparency of company management, the ease with which evidence to prove wrongdoings can be accessed, and the ease of bringing such a matter to court by suing the insiders. We believe that this index is particularly suitable to proxy for those aspects of a country's judicial and enforcement system that matter for the holders of an earnout. Indeed, after the closing of an acquisition that includes an earnout, the sellers hold a claim to the earnout payment that might be triggered by the performance of the company they sold, now under the bidder's control. This makes the sellers' position similar to that of minority shareholders. Like the latter, the sellers are exposed to the exploitative behavior of the bidder.

A second proxy to assess of the quality of the enforcement system is provided by the Rule of Law Index developed within the framework of the World Bank's Worldwide Governance Indicators project, which captures the perception of a wide variety of agents, including firms and households, on the quality of the enforcement of contracts and property rights, the courts, and the police.[23] Based on the subjective perception of agents, this indicator offers a different perspective on enforcement quality from the other variables, which instead try to assess objectively the quality of the enforcement system and the effectiveness of its procedures. This

[23] Kaufmann et al. (2010) provide additional details on this indicator.

different perspective can prove useful, since the trust that agents have in the protection offered by the enforcement system should play a relevant role in their decision to accept exposure to the risk of litigation, which might affect earnouts.

Table 2: Variable definitions

Variable	Source	Definition	Reference year
AntiSelf	Djankov et al. (2008b)	The anti–self-dealing index is the average of the scores of several variables related to disclosure requirements, the ease with which the responsible insider can be held liable, and to the ease of access to evidence to prove wrongdoings for an intragroup transaction that favors the holding company at the expense of the minority shareholders of the subsidiary. The range is from zero to one, with higher values indicating better quality of the enforcement system.	2003
RuleOfLaw	World Bank, World Governance Indicators (1996–2012)	Perceptions of the extent to which agents have confidence in and abide by the rules of society and, in particular, the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. The range is from -1 to 2, with higher values indicating stronger trust in the enforcement system.	2000–2012
CompInd	Our calculation based on the Rule of Law Index and the anti–self-dealing index	Computed as the average between the normalized Rule of Law Index and the anti–self-dealing index. The normalized Rule of Law is obtained adding one to the index and then dividing by three, to set the range of the index from zero to one. Higher values indicate better quality of the enforcement system.	
EnfTime	World Bank, Doing Business (2004–2013)	Time, expressed in days, needed to enforce a contract in a commercial dispute.	2003–2012
RecRate	World Bank, Doing Business (2004–2013)	Average recovery rate related to an insolvency procedure, expressed as a percentage of the initial value of the assets.	2003–2012

Table 3: Descriptive statistics for enforcement variables

Panel A of this table describes the enforcement quality variables by country. The source of these variables is described in Table 2. We have yearly data for the variables EnfTime and RecRate for the period between 2003 and 2012. We have data for the Rule of Law Index for the years between 2000 and 2012. For those variables for which we also have a time series dimension, we provide the average values along with their standard deviations (in italics). Panel B provides the correlations between the enforcement quality variables.

Panel A: Mean and standard deviations of country indicators

Country	AntiSelf	Rule of Law	CompInd	EnfTime	RecRate
United States	0.65	1.56	0.75	307.00	79.18
		0.05	*0.01*	*22.14*	*2.31*
Canada	0.64	1.74	0.78	570.00	89.75
		0.06	*0.01*	*0.00*	*0.90*
United Kingdom	0.95	1.67	0.92	402.00	86.07
		0.06	*0.01*	*2.58*	*1.83*
Sweden	0.33	1.88	0.65	430.40	75.66
		0.07	*0.01*	*100.18*	*2.25*
France	0.38	1.41	0.59	390.00	46.32
		0.08	*0.01*	*0.00*	*1.39*
Brazil	0.27	-0.29	0.26	735.00	11.26
		0.16	*0.03*	*8.43*	*7.76*
Italy	0.42	0.52	0.46	1264.00	58.17
		0.17	*0.03*	*86.95*	*8.62*
Germany	0.28	1.65	0.58	395.80	81.30
		0.06	*0.01*	*3.79*	*1.57*
Spain	0.37	1.18	0.55	514.50	72.52
		0.11	*0.02*	*1.58*	*3.05*
Norway	0.42	1.90	0.69	298.00	90.52
		0.06	*0.01*	*15.49*	*1.80*
Russian Fed	0.44	-0.90	0.23	279.90	41.16
		0.12	*0.02*	*3.48*	*1.38*
Poland	0.29	0.56	0.40	879.50	35.34
		0.14	*0.02*	*105.05*	*6.87*
Finland	0.46	1.94	0.72	295.20	88.54
		0.03	*0.01*	*69.86*	*0.85*
Netherlands	0.20	1.76	0.56	514.00	86.18
		0.05	*0.01*	*0.00*	*2.65*
Belgium	0.54	1.32	0.66	505.00	86.72
		0.06	*0.01*	*0.00*	*0.92*

Greece	0.22	0.73	0.40	819.00	44.41
		0.15	*0.03*	*0.00*	*1.27*
Ireland	0.79	1.64	0.83	542.00	87.36
		0.11	*0.02*	*56.92*	*0.53*
Turkey	0.43	0.06	0.39	420.00	17.07
		0.08	*0.01*	*0.00*	*6.79*
Switzerland	0.27	1.85	0.61	411.60	47.04
		0.07	*0.01*	*11.38*	*0.37*
Denmark	0.46	1.91	0.72	389.00	78.77
		0.06	*0.01*	*14.49*	*11.23*
Mexico	0.17	-0.50	0.17	415.00	65.04
		0.11	*0.02*	*0.00*	*1.57*
Chile	0.63	1.28	0.69	480.00	27.68
		0.05	*0.01*	*0.00*	*5.78*
Argentina	0.34	-0.62	0.23	590.00	31.08
		0.20	*0.03*	*0.00*	*4.74*
Portugal	0.44	1.11	0.57	565.00	72.70
		0.12	*0.02*	*15.49*	*2.11*
Peru	0.45	-0.65	0.28	476.30	27.71
		0.08	*0.01*	*53.12*	*2.79*
Colombia	0.57	-0.60	0.35	1362.40	57.76
		0.23	*0.04*	*51.86*	*10.62*

Panel B: Correlations

	AntiSelf	Rule of Law	CompInd	EnfTime	RecRate
AntiSelf	1.000				
Rule of Law	0.236***	1.000			
CompInd	0.635***	0.901***	1.000		
EnfTime	-0.063	-0.377***	-0.327***	1.000	
RecRate	0.321***	0.685***	0.686***	-0.236***	1.000

The two indicators mentioned above are also used as constituents of a composite index that is meant to capture the parties' overall assessment, from both a subjective and an objective perspective, of the enforcement quality of the country in which the acquisition takes place. To compute this composite index, we first normalize the Rule of Law Index so that it ranges from zero to one, like the anti–self-dealing index.[24] Then, we take the average of these two indicators.

An additional source of data is the Doing Business survey that the World Bank carries out on a yearly basis to assess the quality of business regulation around the world. Doing Business analyzes 185 economies with respect to various areas of business regulation. We consider two of them: Enforcing Contracts and Resolving Insolvency. Enforcing Contracts investigates the efficiency of each country's judicial system in solving a commercial dispute. The main indicator of efficiency in this area, which is the one that we use for our analysis, is the time needed to enforce the contract, that is, the time lag from the moment at which the lawsuit is filed till the payment is made. Resolving Insolvency analyzes the efficiency of bankruptcy law in each country, to capture how much creditors are actually protected. The main indicator developed in this part of the survey is the expected recovery rate. We use this variable as a proxy of the value of a claim that is lost, in a generic lawsuit, due to a country's procedural formalism. Table 2 provides a more detailed description of these variables.

Table 3 provides information on the quality of the judicial system, as captured by the variables that we discussed, in the countries in which our analysis is carried out. It shows that the countries with the best judicial systems are in North America and Northern Europe. The two countries in which earnouts are used the most, that is, the United Kingdom and Ireland,

[24] The Rule of Law Index ranges from -1 to two. To normalize it, we add one to its value and then divide by three.

have the highest scores with respect to the anti–self-dealing index and prove to be efficient with respect to contract enforcement and bankruptcy as well. The country that provides the best protection to creditors, if we focus on recovery rates, is Norway, while, surprisingly, the Russian Federation is where enforcing a contract takes the least although, with regard to all the other enforcement quality variables, Russia performs poorly. Regarding the Rule of Law Index, the countries with the highest level of perceived enforcement quality are in Northern Europe, namely Finland, Denmark, Norway, and Sweden, which show high proportions of deals involving earnouts with respect to the total. In addition, for the composite index, the countries with the highest levels of enforcement quality are in Northern Europe and North America.

Panel B of Table 3 reports the correlations between the enforcement quality variables in our analysis. The Rule of Law Index shows a high correlation with the measure of recovery rate in bankruptcy procedures. A similar pattern, even if mildly weaker, is exhibited by the anti–self-dealing index. The correlation between the time to enforce a contract, taken from Doing Business, and all the other variables is negative. This is understandable, since the time needed to enforce a contract is a measure of the inefficiency of enforcement procedures, while the other variables are increasing in the quality of enforcement. The correlation with the anti–self-dealing index, however, is not distinguishable from zero, while those with the Rule of Law Index and the recovery rates are significantly negative. As expected, the composite index is significantly correlated with the Rule of Law Index and the anti–self-dealing index. It shows also a high level of correlation with the recovery rate, which is even higher than that with the anti–self-dealing index.

5. Empirical analyses

5.1 Impact of enforcement quality on the likelihood of using earnouts

To test our first hypothesis on the relation between the choice of using earnout agreements and the quality of the enforcement system, we first employ a simple univariate regression. For the 26 countries in our main sample, we relate the earnout ratio, that is, the percentage of deals involving earnouts with respect to the total, to each indicator of the quality of the enforcement system.

Table 4: Univariate analysis, earnout ratio

This table reports the univariate regression results of each country's earnout ratio, that is, the number of deals that include an earnout divided by the total number of deals, on different enforcement quality variables. Standard errors are provided in parentheses, with ***, **, and * indicating significance at the 1%, 5%, and 10% levels, respectively.

	Expected sign	(1)	(2)	(3)	(6)	(7)
AntiSelf	+	0.238***				
		(0.075)				
RuleOfLaw	+		0.035**			
			(0.016)			
CompInd	+			0.230***		
				(0.068)		
EnfTime	-				-0.000	
					(0.000)	
RecRate	+					0.001**
						(0.001)
Constant		-0.048	0.020	-0.073*	0.080**	-0.035
		(0.036)	(0.022)	(0.040)	(0.035)	(0.043)
Observations		26	26	26	26	26
R^2		0.295	0.167	0.326	0.022	0.174

The results illustrated in Table 4 show that the coefficients of all the enforcement quality variables are in line with expectations and all the variables, with the only exception of EnfTime, significantly predict the use of earnouts. The use of earnouts is positively related with the level of protection offered to minority shareholders, as captured by the anti–self-dealing index (AntiSelf) and with the perceived level of enforcement quality, as proxied by

the Rule of Law Index (RuleOfLaw). In addition, the composite index (CompInd) shows a positive and strongly significant relation with the use of earnouts. Moreover, the higher the efficiency of a country's insolvency procedures, the more likely it is to observe earnout agreements in M&A deals; that is, earnouts are positively associated with recovery rates (RecRate).

However, as discussed in Section 2, prior studies suggest that there are other factors related to the characteristics of the deal and of the companies involved that are associated with the use of earnouts. The relative presence of these factors in the deals completed in each country could affect the univariate results. Therefore, we perform a multivariate analysis to control for these additional determinants.

Kohers and Ang (2000), Datar et al. (2001), and Barbopulos and Sudarsanam (2012) show that the use of earnouts is positively related to the size of the deal and negatively related to the value of the bidder. If the target operates in the service or high–tech sector, earnouts are used more frequently, due to higher growth opportunities and higher uncertainties related to the relevance of human capital. Similarly, earnouts are more likely in the acquisition of private companies and subsidiaries, which are significantly affected by information asymmetry issues. A toehold in the target company instead reduces the probability of observing an earnout.

In addition to the above-mentioned controls, which are deal specific, we control for country-specific factors that could drive the decision of using earnouts. In particular, we control for the M&A expertise of each country, which we proxy for using the number of deals that take place in a given country each year, and for the development of the financial market, which we

proxy for using the ratio of stock market capitalization over the gross domestic product (GDP).[25]

Since the presence of an earnout agreement in a deal or the lack thereof is a dichotomous variable, inquiries on the use of these contracts are best addressed by binary response models. In line with previous research, we use a logit model to link both deal characteristics and enforcement quality variables to the likelihood of including an earnout in a deal. However, our results remain robust to the use of the probit model instead of the logit model.

We estimate the following equation:[26]

$$\text{Logit}(\text{Prob}(\text{Earnout}_{it}=1)) = \beta_0 + \beta_1 \text{Mv}_{it} + \beta_2 \text{Tv}_{it} + \beta_3 \text{Priv}_{it} + \beta_4 \text{Sub}_{it} + \beta_5 \text{Toehold}_{it}$$
$$\beta_6 \text{TarSR}_{it} + \beta_7 \text{TarHT}_{it} + \beta_8 \text{Exp}_{it} + \beta_9 \text{MktGDP}_{it} + \beta_{10} \text{EnfQual}_{it} + \varepsilon_{it} \quad (1)$$

where

Earnout is a dummy variable that takes the value one if an earnout agreement is used in the deal;

Mv is the natural logarithm of the market value, expressed in dollars, of the bidder four weeks prior to the acquisition;[27]

[25] We retrieve this variable from the World Bank. To avoid confounding factors related to the financial crisis, for each country, we keep this ratio constant for the years following 2007.

[26] As an alternative, we replace the variables Tv and Mv with their ratio, which is used as a different specification of deal materiality. The results are robust to this specification.

[27] Considering the market price of the bidder four weeks prior to the deal announcement provides a valuation of the bidder that is unlikely to be influenced by information spillover on the deal itself.

Tv is the natural logarithm of the value of the deal, measured as the value of the consideration received by the sellers in the deal;

Priv is a dummy that takes the value one if the target company is private;

Sub is a dummy that takes the value one if the target is a subsidiary;

Toehold is a dummy that takes the value one if the bidder owned a fraction of the shares in the target company before the acquisition;

TarSR is a dummy that takes the value one if the target is in the service industry;

TarHT is a dummy that takes the value one if the target is in the high-tech sector;

Exp is the number of deals that take place in each country in each year;

MktGDP is the ratio between a country's market capitalization and its GDP; and

EnfQual is one of the (set of) enforcement quality variables discussed in Section 4.

Our results are illustrated in Table 5. In this table, and in the following ones, we report the results obtained using robust standard errors in Panel A, while in Panel B standard errors are clustered at country level. We start by retracing the steps of previous work on the use of earnouts. Model 1 includes variables that are related to the use of earnouts in the literature and excludes enforcement quality variables and country-specific variables. Target characteristics such as being a private company (Priv) or a subsidiary (Sub) or operating in the service industry (TarSR) or high-tech industry (TarHT) have a positive and strongly significant effect on the likelihood of including an earnout in a deal. The variable Toehold has a negative and significant coefficient, meaning that having a stake in the target company before the deal reduces the likelihood of using earnouts. The value of the deal (Tv) shows a positive and significant effect on the use of earnouts, while the market value of the acquirer (Mv) impacts negatively on this likelihood, yet showing statistical significance only when using robust

Table 5: Determinants of the use of earnouts, with a focus on domestic deals

This table provides the results of logistic regressions of the use of earnouts on deal-specific and country-specific variables. We focus on domestic deals, that is, deals in which the nationalities of the target and the bidder are the same. The dependent variable takes the value one when the deal involves an earnout and zero in the opposite case. The variable Tv is the log of the deal value, that is, the acquisition price, while Mv is the log of the market value of the bidder four weeks prior to the acquisition; Priv, Sub, TarSR, and TarHT are dummy variables that take the value one if the target is a private company or a subsidiary or operates in the service or high-tech industry, respectively; Toehold is a dummy variable that takes the value one if the bidder owned a fraction of the shares in the target company before the acquisition; Exp is the log of the number of deals that took place in a given country/year; and MktGDP is the ratio of the stock market capitalization over the GDP. The enforcement quality variables are described in Table 2. In panel A, robust standard errors are provided in parentheses, while in Panel B, standard errors are clustered at country level, with ***, **, and * indicating significance at the 1%, 5%, and 10% levels, respectively.

Panel A

VARIABLES	Exp.Sign	(1)	(2)	(3)	(4)	(5)
Tv	+	0.0365***	0.0615***	0.0365***	0.0585***	0.0450***
		(0.0122)	(0.0134)	(0.0124)	(0.0133)	(0.0137)
Mv	-	-0.0356***	-0.0449***	-0.0275***	-0.0391***	-0.0306***
		(0.00927)	(0.00977)	(0.00947)	(0.00980)	(0.0105)
Priv	+	3.007***	2.979***	3.020***	2.985***	3.200***
		(0.191)	(0.193)	(0.192)	(0.193)	(0.237)
Sub	+	2.098***	2.114***	2.123***	2.120***	2.270***
		(0.194)	(0.196)	(0.195)	(0.196)	(0.239)
Toehold	-	-0.469**	-0.349	-0.414*	-0.342	-0.292
		(0.233)	(0.239)	(0.234)	(0.239)	(0.272)
TarSR	+	0.832***	0.712***	0.825***	0.717***	0.842***
		(0.0498)	(0.0516)	(0.0507)	(0.0514)	(0.0561)
TarHT	+	0.991***	1.006***	0.994***	1.004***	1.075***
		(0.0623)	(0.0644)	(0.0632)	(0.0643)	(0.0705)
Exp			0.190***	0.0222	0.238***	-0.222***
			(0.0401)	(0.0245)	(0.0432)	(0.0441)
MktGDP			-0.0141***	0.00218	-0.0205***	0.00375*
			(0.00265)	(0.00170)	(0.00292)	(0.00228)
AntiSelf	+		4.428***			
			(0.227)			
RuleOfLaw	+			0.607***		
				(0.121)		
CompInd	+				7.856***	
					(0.479)	
EnfTime	-					-0.00362***
						(0.000586)
RecRate	+					0.0317***
						(0.00601)
Constant		-5.793***	-8.282***	-7.308***	-10.81***	-5.126***
		(0.227)	(0.396)	(0.360)	(0.538)	(0.542)
Year fixed effects		Yes	Yes	Yes	Yes	Yes
Observations		22,693	22,693	22,693	22,693	18,157
pseudo R^2		0.0952	0.133	0.0984	0.131	0.111

Panel B

VARIABLES	Exp.Sign	(1)	(2)	(3)	(4)	(5)
Tv	+	0.0365*	0.0615*	0.0365**	0.0585	0.0450**
		(0.0200)	(0.0366)	(0.0166)	(0.0359)	(0.0204)
Mv	-	-0.0356	-0.0449*	-0.0275	-0.0391	-0.0306
		(0.0321)	(0.0269)	(0.0204)	(0.0264)	(0.0235)
Priv	+	3.007***	2.979***	3.020***	2.985***	3.200***
		(0.322)	(0.296)	(0.335)	(0.299)	(0.378)
Sub	+	2.098***	2.114***	2.123***	2.120***	2.270***
		(0.204)	(0.187)	(0.208)	(0.192)	(0.237)
Toehold	-	-0.469***	-0.349***	-0.414***	-0.342***	-0.292
		(0.162)	(0.0972)	(0.127)	(0.0931)	(0.233)
TarSR	+	0.832***	0.712***	0.825***	0.717***	0.842***
		(0.177)	(0.0930)	(0.139)	(0.0952)	(0.101)
TarHT	+	0.991***	1.006***	0.994***	1.004***	1.075***
		(0.219)	(0.122)	(0.145)	(0.120)	(0.223)
Exp			0.190	0.0222	0.238	-0.222
			(0.133)	(0.212)	(0.163)	(0.241)
MktGDP			-0.0141*	0.00218	-0.0205**	0.00375
			(0.00737)	(0.00842)	(0.00818)	(0.00715)
AntiSelf	+		4.428***			
			(0.680)			
RuleOfLaw	+			0.607***		
				(0.229)		
CompInd	+				7.856***	
					(1.519)	
EnfTime	-					-0.00362
						(0.00297)
RecRate	+					0.0317
						(0.0222)
Constant		-5.793***	-8.282***	-7.308***	-10.81***	-5.126**
		(0.473)	(0.822)	(0.886)	(1.589)	(2.069)
Year fixed effects		Yes	Yes	Yes	Yes	Yes
Observations		22,693	22,693	22,693	22,693	18,157
pseudo R^2		0.0952	0.133	0.0984	0.131	0.111

standard errors. These results are in line with the evidence provided by Kohers and Ang (2000), Datar et al. (2001), and Barbopulos and Sudarsanam (2012) and consistently hold across the other specifications of the model, in which we include the country-specific variables of enforcement quality.

In Models 2 to 5, we control for other country-specific characteristics, such as expertise in M&A deals (Exp) and the development of the financial sector (MktGDP), which may influence the use of earnouts, and we introduce our measures of enforcement quality. In particular, in Model 2 we introduce the anti–self-dealing index. As argued in the previous section, this is, in our opinion, the measure that better captures the tension that lies between the acquirer and the sellers in a deal that involves an earnout. The bidder, having already obtained the control of the target company, may have an incentive to reduce the payment related to the earnout, possibly managing the performance figure on which the earnout is structured, for example, choosing a suitable intragroup allocation of expenses or delaying the closing of contracts. The ability of a legal system to reduce, ex ante, the opacity of the management of the target company and to access evidence to prove wrongdoings ex post can provide the protection that induces the sellers to accept an earnout agreement. The anti–self-dealing index is meant to capture this kind of protection for minority shareholders, whose position is similar to that of holders of an earnout. Model 2 confirms that this legal protection matters in the decision of including an earnout in the deal. The anti–self-dealing index (AntiSelf) shows a positive and significant coefficient both in Panel A and in Panel B, indicating that higher values of this index, which mean better enforcement quality, imply an increase in the odds of using these contracts.

In Model 3, the Rule of Law Index is used instead of the anti–self-dealing index, proxying for the subjective perception of enforcement quality. Indeed, the decision to use an earnout

agreement in a deal may depend on what the involved parties believe is the quality of the legal protection they can count on in case of disputes. Differently from the anti–self-dealing index, this variable is not as focused on issues related to corporate disputes, but it captures more broadly the confidence of citizens and firms in all the various aspects of their country's legal system. Model 3 in Table 5 shows that the Rule of Law Index (RuleOfLaw) significantly predicts the use of earnouts: The higher the perceived quality of the legal environment, the more likely contingent payments will be observed in M&As.

The results of Model 4 show that also the composite index (CompInd), which combines the previous two indexes, is positively and significantly associated with the use of earnouts. It is interesting to note that the magnitude of this coefficient is higher than that of the anti–self-dealing index. It could be argued that considering both the subjective and objective quality of the enforcement system better captures the driver of the preferences of the parties involved in an acquisition.

The variables included in the Doing Business survey by the World Bank provide an alternative to the aggregate indicators previously introduced. We describe the efficiency of the various enforcement systems in relation to two dimensions: the average length of trials in commercial disputes and recovery rates in cases of insolvency. It is in the interest of both parties to have a dispute decided upon quickly: Apart from the opportunity cost of the time spent to follow the trial, the inconvenience of being kept in a state of uncertainty for a long period should also be considered. As for the recovery rate, it proxies for how useful it is to go to court to file a claim: If the value lost in the procedure is relevant, there may be no point in taking legal steps, since the enforcement system would be of no help. Model 5 includes these two variables to measure the efficiency of the enforcement system. The signs on the coefficients on EnfTime and RecRate are in accordance with our expectations, however, they

Table 6: Determinants of the use of earnouts, with a focus on domestic deals, excluding the United States

This table provides the results of logistic regressions of the use of earnouts on deal-specific and country-specific variables. Observations related to deals that took place in the United States were excluded from the sample. The variable Tv is the log of the deal value, that is, the acquisition price, while Mv is the log of the market value of the bidder four weeks prior to the acquisition; Priv, Sub, TarSR, and TarHT are dummy variables that take the value one if the target is a private company or a subsidiary or operates in the service or high-tech industry, respectively; Toehold is a dummy variable that takes the value one if the bidder owned a fraction of the shares in the target company before the acquisition; Exp is the log of the number of deals that took place in a given country/year; and MktGDP is the ratio of the stock market capitalization over the GDP. The enforcement quality variables are described in Table 2. In panel A, robust standard errors are provided in parentheses, while in Panel B, standard errors are clustered at country level, with ***, **, and * indicating significance at the 1%, 5%, and 10% levels, respectively.

Panel A

VARIABLES	Exp.Sign	(1)	(2)	(3)	(4)	(5)
Tv	+	0.0950***	0.129***	0.106***	0.123***	0.123***
		(0.0189)	(0.0221)	(0.0205)	(0.0218)	(0.0222)
Mv	-	-0.0365**	-0.0864***	-0.0495***	-0.0676***	-0.0850***
		(0.0154)	(0.0181)	(0.0174)	(0.0181)	(0.0181)
Priv	+	4.322***	4.149***	4.231***	4.176***	4.436***
		(0.583)	(0.587)	(0.585)	(0.586)	(0.719)
Sub	+	3.069***	3.041***	3.064***	3.062***	3.252***
		(0.587)	(0.590)	(0.588)	(0.590)	(0.721)
Toehold	-	-0.814**	-0.526	-0.542	-0.503	-0.665
		(0.387)	(0.410)	(0.409)	(0.414)	(0.441)
TarSR	+	1.109***	0.770***	0.921***	0.789***	0.784***
		(0.0770)	(0.0835)	(0.0806)	(0.0829)	(0.0855)
TarHT	+	0.732***	0.669***	0.710***	0.676***	0.556***
		(0.133)	(0.145)	(0.139)	(0.144)	(0.147)
Exp			0.0656	1.355***	0.350***	0.776***
			(0.121)	(0.150)	(0.123)	(0.111)
MktGDP			-0.0138***	-0.0153***	-0.0228***	-0.00824**
			(0.00349)	(0.00273)	(0.00337)	(0.00371)
AntiSelf	+		4.729***			
			(0.342)			
RuleOfLaw	+			0.422***		
				(0.137)		
CompInd	+				7.501***	
					(0.756)	
EnfTime	-					-0.00552***
						(0.000869)
RecRate	+					0.0152***
						(0.00564)
Constant		-6.195***	-8.206***	-14.53***	-11.35***	-9.221***
		(1.045)	(1.135)	(1.409)	(1.171)	(1.033)
Year fixed effects		Yes	Yes	Yes	Yes	Yes
Observations		8,052	8,052	8,052	8,052	7,655
pseudo R^2		0.134	0.220	0.182	0.213	0.202

Panel B

VARIABLES	Exp.Sign	(1)	(2)	(3)	(4)	(5)
Tv	+	0.0950***	0.129***	0.106***	0.123***	0.123***
		(0.0294)	(0.0320)	(0.0385)	(0.0353)	(0.0293)
Mv	-	-0.0365	-0.0864*	-0.0495	-0.0676	-0.0850*
		(0.0709)	(0.0508)	(0.0638)	(0.0605)	(0.0501)
Priv	+	4.322***	4.149***	4.231***	4.176***	4.436***
		(0.134)	(0.202)	(0.187)	(0.195)	(0.388)
Sub	+	3.069***	3.041***	3.064***	3.062***	3.252***
		(0.0702)	(0.138)	(0.120)	(0.130)	(0.255)
Toehold	-	-0.814***	-0.526***	-0.542***	-0.503**	-0.665***
		(0.236)	(0.198)	(0.197)	(0.200)	(0.213)
TarSR	+	1.109***	0.770***	0.921***	0.789***	0.784***
		(0.302)	(0.260)	(0.314)	(0.267)	(0.278)
TarHT	+	0.732***	0.669**	0.710***	0.676**	0.556***
		(0.225)	(0.269)	(0.246)	(0.264)	(0.212)
Exp			0.0656	1.355**	0.350*	0.776***
			(0.177)	(0.681)	(0.208)	(0.255)
MktGDP			-0.0138**	-0.0153	-0.0228***	-0.00824
			(0.00665)	(0.0111)	(0.00761)	(0.00856)
AntiSelf	+		4.729***			
			(0.924)			
RuleOfLaw	+			0.422		
				(0.322)		
CompInd	+				7.501***	
					(2.060)	
EnfTime	-					-0.00552**
						(0.00263)
RecRate	+					0.0152
						(0.0181)
Constant		-6.195***	-8.206***	-14.53***	-11.35***	-9.221***
		(0.630)	(0.690)	(3.548)	(1.207)	(1.798)
Year fixed effects		Yes	Yes	Yes	Yes	Yes
Observations		8,052	8,052	8,052	8,052	7,655
pseudo R^2		0.134	0.220	0.182	0.213	0.202

are significant only in Panel A: When clustering standard errors at county level, they do not appear to be significant.

In the sample used in our main analyses, the largest number of observations is for the United States. To check whether our results are driven by these observations, we also perform our analysis on a subsample that excludes US observations.

The results provided in Table 6 show that our results are robust to the exclusion of US observations. As in the previous table, the higher the anti–self-dealing index (AntiSelf), the higher the likelihood of observing earnouts. Similarly, the composite index (CompInd) is positive and strongly significant both in Panel A and in Panel B. The Rule of Law Index (RuleOfLaw) does not seem significant in this subsample when clustering standard errors at country level. The time needed to enforce a contract (EnfTime) instead, in this subsample, appears to be significant also in Panel B.

These results confirm the validity of our hypothesis that a high quality of the legal system makes earnout agreements more attractive for the parties involved in an acquisition because they are less costly to enforce in case of disputes.

5.2 Relation between enforcement quality and earnout materiality

As a next step, we check if a similar relation holds when we look at earnout materiality, that is, the relevance of earnout payments on the total consideration paid, measured as the sum of up-front payments and earnout payments, as posited in H2. Out of 2535 deals that include an earnout, we were able to obtain detailed payment information for 2113, that is, approximately 83% of the total. Table 7 provides descriptive statistics, aggregated at the country level, on earnout materiality. Excluding countries in which fewer than 10 deals including earnouts are observed, it seems that the mean and median earnout materiality ratios are less dispersed than

the incidence of earnout deals on total acquisitions presented in Table 1. In the United States, for example, such a ratio is, on average, 33%, while it is 41% in the United Kingdom.

Table 7: Descriptive statistics on earnout materiality

This table shows, across countries, the total number of earnouts included in our sample and the number of these deals for which the information on the earnout payment is available. It also provides details on the mean, median, and standard deviations of earnout materiality for deals that use these contracts and for which the payment information is available.

Country	No. deals involving earnouts - Total	No. deals involving earnouts - Info on earnout materiality	Earnout materiality - Mean	Earnout materiality - Median	Earnout materiality - Standard deviation
United States	1526	1153	32.99%	27.93%	22.56%
Canada	115	94	33.40%	26.50%	25.07%
United Kingdom	798	779	40.98%	38.76%	24.85%
Sweden	22	18	38.14%	32.89%	22.91%
France	6	5	18.60%	15.85%	11.37%
Brazil	9	9	39.64%	37.51%	25.07%
Italy	4	4	28.58%	26.83%	22.23%
Germany	9	8	22.08%	15.01%	15.69%
Spain	6	6	26.30%	24.54%	8.85%
Norway	7	7	28.43%	15.65%	19.96%
Russian Fed	1	1	15.27%	15.27%	
Poland	4	3	36.47%	49.26%	22.83%
Finland	3	3	43.99%	45.85%	7.12%
Netherlands	7	6	27.41%	11.82%	36.36%
Belgium	1	1	66.05%	66.05%	
Greece	0	0			
Ireland	13	13	31.32%	24.49%	20.60%
Turkey	1	1	37.06%	37.06%	
Switzerland	2	2	75.36%	75.36%	1.17%
Denmark	0	0			
Mexico	1	0			
Chile	0	0			
Argentina	0	0			
Portugal	0	0			
Peru	0	0			
Colombia	0	0			
TOTAL	2535	2113			

To assess if earnout materiality is affected by the quality of the enforcement system, we use a Tobit model, since the dependent variable is censored at zero. The value of earnout materiality is higher than zero only for deals that include an earnout. However, the decision to not include this kind of contract in a deal carries valuable information for the question at hand. For this reason we run the regression both on deals that include an earnout and on deals that do not. For the latter, earnout materiality is clearly zero. In all specifications, we include the same control variables used in the logit regression.[28]

We estimate the following equation:[29]

$$EarnMateriality_{it} = \beta_0 + \beta_1 Mv_{it} + \beta_2 Tv_{it} + \beta_3 Priv_{it} + \beta_4 Sub_{it} + \beta_5 Toehold_{it}\ \beta_6 TarSR_{it} + \beta_7 TarHT_{it} + \beta_8 Exp_{it} + \beta_9 MktGDP_{it} + \beta_{10} EnfQual_{it} + \varepsilon_{it} \quad (2)$$

Table 8 shows that enforcement quality positively affects earnout materiality. The weight given to contingent payments on total consideration increases with investor protection and the perceived quality of the legal environment, as proxied by the anti–self-dealing index (AntiSelf) and the Rule of Law Index (RuleOfLaw), respectively. When considered together (using the composite index, CompInd), their effect seems to be even stronger. As expected, the length of trials (EnfTime) shows the opposite effect, while there is a positive relation between the recovery rate (RecRate) and earnout materiality. However, the latter results are

[28] Since they proxy for the presence of higher information asymmetries and higher valuation risk, it is reasonable to assume that they could influence not only the decision to use contingent payments, but also their relevance with respect to total consideration.

[29] In addition, in this case, as an alternative, we replace the variables Tv and Mv with their ratio. The results are robust to this specification.

significant only in Panel A, and not in Panel B. As for the logit regression, we performed the same analysis excluding US deals. Unreported results, available upon request, are robust to this exclusion.

Since we include deals that use contingent payments as well as deals that do not, the analysis presented above is an unconditional assessment of the determinants of earnout materiality, which considers both the decision of using an earnout and the weight assigned to it by the parties with respect to total payments. However, it may be interesting also to check if the quality of the enforcement system influences earnout materiality given that the parties have decided to use contingent payments in their deal. To do this, we need to focus only on deals that include earnouts. However, to prevent our results from being affected by countries with a limited number of earnout deals (which could poorly depict the relation we want to address), we exclude countries with fewer than 10 acquisitions involving contingent payments. Unreported results, available upon request, are qualitatively similar if we remove this constraint or if we increase the threshold.

Five countries are eventually included in such analysis: the United States, the United Kingdom, Canada, Sweden, and Ireland. As for the main sample, the United States and the United Kingdom are the countries in which earnouts are used the most. The country with the highest mean and median earnout materiality is the United Kingdom, which is also a country with very high level of enforcement quality. Table 9 presents the results of ordinary least squares regressions structured on the same models we used for the Tobit analysis. However, our results remain robust when using a Tobit model in this case as well. This additional analysis is available upon request.

Table 8: Determinants of the earnout materiality, with a focus on domestic deals

This table provides the results of Tobit regressions of earnout materiality (payment related to the earnout on the total deal payment) on deal-specific and country-specific variables. The variable Tv is the log of the deal value, that is, the acquisition price, while Mv is the log of the market value of the bidder four weeks prior to the acquisition; Priv, Sub, TarSR, and TarHT are dummy variables that take the value one if the target is a private company or a subsidiary or operates in the service or high-tech industry, respectively; Toehold is a dummy variable that takes the value one if the bidder owned a fraction of the shares in the target company before the acquisition; Exp is the log of the number of deals that took place in a given country/year; and MktGDP is the ratio of the stock market capitalization over the GDP. The enforcement quality variables are described in Table 2. In panel A, robust standard errors are provided in parentheses, while in Panel B, standard errors are clustered at country level, with ***, **, and * indicating significance at the 1%, 5%, and 10% levels, respectively.

Panel A

VARIABLES	Exp.Sign	(1)	(2)	(3)	(4)	(5)
Tv	+	0.0241***	0.0384***	0.0275***	0.0373***	0.0281***
		(0.00455)	(0.00466)	(0.00459)	(0.00467)	(0.00498)
Mv	-	-0.0254***	-0.0258***	-0.0208***	-0.0231***	-0.0216***
		(0.00370)	(0.00368)	(0.00375)	(0.00372)	(0.00408)
Priv	+	0.894***	0.848***	0.902***	0.858***	0.907***
		(0.0530)	(0.0529)	(0.0532)	(0.0529)	(0.0612)
Sub	+	0.599***	0.593***	0.614***	0.601***	0.612***
		(0.0541)	(0.0539)	(0.0543)	(0.0539)	(0.0624)
Toehold	-	-0.124	-0.0813	-0.119	-0.0855	-0.0957
		(0.0825)	(0.0810)	(0.0826)	(0.0811)	(0.0966)
TarSR	+	0.292***	0.250***	0.298***	0.256***	0.300***
		(0.0180)	(0.0179)	(0.0182)	(0.0179)	(0.0197)
TarHT	+	0.335***	0.352***	0.350***	0.352***	0.374***
		(0.0233)	(0.0233)	(0.0236)	(0.0234)	(0.0262)
Exp			0.0135	-0.0311***	0.0251	-0.102***
			(0.0140)	(0.00862)	(0.0153)	(0.0161)
MktGDP			-0.00371***	-0.00179***	-0.00573***	0.00139*
			(0.000976)	(0.000582)	(0.00111)	(0.000751)
AntiSelf	+		1.572***			
			(0.0771)			
RuleOfLaw	+			0.192***		
				(0.0405)		
CompInd	+				2.639***	
					(0.176)	
EnfTime	-					-0.00103***
						(0.000191)
RecRate	+					0.00871***
						(0.00164)
Constant		-1.954***	-2.495***	-2.280***	-3.285***	-1.429***
		(0.0711)	(0.122)	(0.113)	(0.173)	(0.172)
Year fixed effects		Yes	Yes	Yes	Yes	Yes
Observations		22,271	22,271	22,271	22,271	17,840
pseudo R^2		0.0977	0.152	0.102	0.145	0.113

Panel B

VARIABLES	Exp.Sign	(1)	(2)	(3)	(4)	(5)
Tv	+	0.0241***	0.0384***	0.0275***	0.0373***	0.0281***
		(0.00849)	(0.00535)	(0.00230)	(0.00506)	(0.00191)
Mv	-	-0.0254**	-0.0258***	-0.0208***	-0.0231***	-0.0216***
		(0.0103)	(0.00660)	(0.00702)	(0.00711)	(0.00575)
Priv	+	0.894***	0.848***	0.902***	0.858***	0.907***
		(0.110)	(0.0727)	(0.113)	(0.0777)	(0.117)
Sub	+	0.599***	0.593***	0.614***	0.601***	0.612***
		(0.0594)	(0.0422)	(0.0603)	(0.0470)	(0.0634)
Toehold	-	-0.124**	-0.0813***	-0.119***	-0.0855***	-0.0957
		(0.0540)	(0.0294)	(0.0429)	(0.0301)	(0.0741)
TarSR	+	0.292***	0.250***	0.298***	0.256***	0.300***
		(0.0664)	(0.0365)	(0.0589)	(0.0390)	(0.0400)
TarHT	+	0.335***	0.352***	0.350***	0.352***	0.374***
		(0.0791)	(0.0480)	(0.0546)	(0.0480)	(0.0774)
Exp			0.0135	-0.0311	0.0251	-0.102
			(0.0446)	(0.0808)	(0.0570)	(0.0847)
MktGDP			-0.00371	0.00179	-0.00573*	0.00139
			(0.00267)	(0.00319)	(0.00318)	(0.00236)
AntiSelf	+		1.572***			
			(0.233)			
RuleOfLaw	+			0.192**		
				(0.0817)		
CompInd	+				2.639***	
					(0.570)	
EnfTime	-					-0.00103
						(0.000952)
RecRate	+					0.00871
						(0.00598)
Constant		-1.954***	-2.495***	-2.280***	-3.285***	-1.429*
		(0.192)	(0.253)	(0.390)	(0.529)	(0.810)
Year fixed effects		Yes	Yes	Yes	Yes	Yes
Observations		22,271	22,271	22,271	22,271	17,840
pseudo R^2		0.0977	0.152	0.102	0.145	0.113

Table 9: Determinants of earnout materiality - earnout users

This table provides the results of ordinary least squares regressions of earnout materiality (payment related to the earnout on the total deal payment) on deal-specific and country-specific variables. The variable Tv is the log of the deal value, that is, the acquisition price, while Mv is the log of the market value of the bidder four weeks prior to the acquisition; Priv, Sub, TarSR, and TarHT are dummy variables that take the value one if the target is a private company or a subsidiary or operates in the service or high-tech industry, respectively; Toehold is a dummy variable that takes the value one if the bidder owned a fraction of the shares in the target company before the acquisition; Exp is the log of the number of deals that took place in a given country/year; and MktGDP is the ratio of the stock market capitalization over the GDP. The enforcement quality variables are described in Table 2. In panel A, robust standard errors are provided in parentheses, while in Panel B, standard errors are clustered at country level, with ***, **, and * indicating significance at the 1%, 5%, and 10% levels, respectively.

Panel A

VARIABLES	(1)	(2)	(3)	(4)
Tv	-0.0233***	-0.0248***	-0.0232***	-0.0220***
	(0.00447)	(0.00445)	(0.00446)	(0.00502)
Mv	-0.00379	-0.00307	-0.00378	-0.00602
	(0.00365)	(0.00365)	(0.00365)	(0.00412)
Priv	0.00130	0.00406	0.00154	-0.0171
	(0.0464)	(0.0454)	(0.0465)	(0.0544)
Sub	0.00682	0.00579	0.00701	-0.00245
	(0.0475)	(0.0465)	(0.0475)	(0.0556)
Toehold	0.0644	0.0576	0.0636	0.0718
	(0.0597)	(0.0595)	(0.0596)	(0.0619)
TarSR	0.0418***	0.0423***	0.0418***	0.0439***
	(0.0116)	(0.0117)	(0.0116)	(0.0127)
TarHT	0.0979***	0.0951***	0.0978***	0.106***
	(0.0153)	(0.0153)	(0.0153)	(0.0172)
Exp	-0.00255	-0.0351**	0.00359	-0.0426**
	(0.00880)	(0.0156)	(0.00958)	(0.0176)
MktGDP	0.000556	0.00184**	0.000342	0.00162*
	(0.000654)	(0.000822)	(0.000670)	(0.000831)
AntiSelf	0.194***			
	(0.0472)			
RuleOfLaw		-0.114		
		(0.170)		
CompInd			0.399***	
			(0.0953)	
EnfTime				-0.000634***
				(0.000218)
RecRate				0.00820**
				(0.00380)
Constant	0.207*	0.614*	0.0109	0.0928
	(0.120)	(0.330)	(0.144)	(0.346)
Year fixed effects	Yes	Yes	Yes	Yes
Observations	2,057	2,057	2,057	2,057
Adj-R^2	0.0751	0.0676	0.0752	0.0713

Panel B

VARIABLES	(1)	(2)	(3)	(4)
Tv	-0.0233**	-0.0248**	-0.0232**	-0.0220**
	(0.00524)	(0.00548)	(0.00517)	(0.00579)
Mv	-0.00379	-0.00307	-0.00378	-0.00602
	(0.00767)	(0.00763)	(0.00766)	(0.00850)
Priv	0.00130	0.00406	0.00154	-0.0171
	(0.0195)	(0.0166)	(0.0197)	(0.0191)
Sub	0.00682	0.00579	0.00701	-0.00245
	(0.0279)	(0.0274)	(0.0280)	(0.0200)
Toehold	0.0644	0.0576	0.0636	0.0718*
	(0.0421)	(0.0410)	(0.0420)	(0.0289)
TarSR	0.0418***	0.0423***	0.0418***	0.0439***
	(0.00626)	(0.00598)	(0.00628)	(0.00697)
TarHT	0.0979**	0.0951**	0.0978**	0.106**
	(0.0261)	(0.0278)	(0.0261)	(0.0360)
Exp	-0.00255	-0.0351	0.00359	-0.0426**
	(0.0135)	(0.0233)	(0.0143)	(0.0126)
MktGDP	0.000556	0.00184	0.000342	0.00162
	(0.000605)	(0.00123)	(0.000634)	(0.000788)
AntiSelf	0.194**			
	(0.0450)			
RuleOfLaw		-0.114		
		(0.117)		
CompInd			0.399**	
			(0.0888)	
EnfTime				-0.000634**
				(0.000182)
RecRate				0.00820***
				(0.00134)
Constant	0.207*	0.614**	0.0109	0.0928
	(0.0843)	(0.203)	(0.110)	(0.102)
Year fixed effects	Yes	Yes	Yes	Yes
Observations	2,057	2,057	2,057	2,057
Adj-R^2	0.0751	0.0676	0.0752	0.0713

While the dummies for private targets, subsidiaries, or toehold lose significance, the target being a high-tech or service company plays a significant role in determining earnout materiality. Apparently, the higher the uncertainties related to the acquisition due to growth opportunities or the relevance of human capital, the higher the portion of contingent payments. As regards enforcement quality variables, we can see that both the anti–self-dealing index (AntiSelf) and the composite index (CompInd) are positively related to earnout materiality and show high statistical significance, both in Panel A and in Panel B. If we look at the variables obtained from the Doing Business survey of the World Bank, both the coefficients of the length of trials (EnfTime) and the recovery rate (RecRate) show the predicted sign and are strongly significant, also when clustering standard errors at country level. The coefficient of the Rule of Law Index, however, is not distinguishable from zero. Despite the weaker results for this last indicator, we can state that the efficiency of the enforcement system is an important determinant of the extent to which contingent payments are used in acquisitions.

We can conclude that the quality of the enforcement system plays a significant role not only in the decision to use earnouts in acquisition agreements, but also in their materiality with respect to total deal consideration.

6. Additional analysis and robustness tests

6.1 Including cross-border deals

In our main analysis, to avoid the uncertainty related to the relevant jurisdiction in cross-border acquisitions, we focused our attention on domestic deals. In this section, we extend our investigation to cross-border deals to understand if the likelihood of including earnout agreements is higher for these acquisitions.

Table 10: Descriptive statistics on the number of acquisitions and frequency of earnouts, comparing between domestic and cross-border deals

This table describes and compares domestic and cross-border deals. The nationality of a deal is defined according to the country of the target. The statistics on the number of deals and the frequency of earnouts is provided with respect to domestic deals and cross-border deals and at the aggregate level.

Target Nation	No. Total Acquisitions	No. deals involving earnouts - Total	% of deals involving earnouts - Total	No. Domestic Acquisitions	No. deals involving earnouts - Domestic	% of deals involving earnouts - Domestic	No. Cross-Border Acquisitions	No. deals involving earnouts	% of deals involving earnouts - Cross-Border
United States	16,647	1840	11.05%	14,641	1526	10.42%	2,006	314	15.65%
Canada	3958	173	4.37%	3242	115	3.55%	716	58	8.10%
United Kingdom	3826	938	24.52%	2896	798	27.56%	930	140	15.05%
Sweden	475	44	9.26%	273	22	8.06%	202	22	10.89%
France	569	45	7.91%	226	6	2.65%	343	39	11.37%
Brazil	353	24	6.80%	218	9	4.13%	135	15	11.11%
Italy	318	18	5.66%	170	4	2.35%	148	14	9.46%
Germany	590	64	10.85%	128	9	7.03%	462	55	11.90%
Spain	250	16	6.40%	109	6	5.50%	141	10	7.09%
Norway	214	27	12.62%	104	7	6.73%	110	20	18.18%
Russian Fed	167	5	2.99%	96	1	1.04%	71	4	5.63%
Poland	131	6	4.58%	85	4	4.71%	46	2	4.35%
Finland	149	14	9.40%	62	3	4.84%	87	11	12.64%
Netherlands	274	32	11.68%	58	7	12.07%	216	25	11.57%
Belgium	134	13	9.70%	57	1	1.75%	77	12	15.58%
Greece	60	2	3.33%	48	0	0.00%	12	2	16.67%
Ireland	142	33	23.24%	39	13	33.33%	103	20	19.42%
Turkey	74	1	1.35%	38	1	2.63%	36	0	0.00%
Switzerland	159	22	13.84%	35	2	5.71%	124	20	16.13%
Denmark	141	13	9.22%	31	0	0.00%	110	13	11.82%
Mexico	206	6	2.91%	31	1	3.23%	175	5	2.86%
Chile	80	1	1.25%	27	0	0.00%	53	1	1.89%
Argentina	92	2	2.17%	25	0	0.00%	67	2	2.99%
Portugal	43	3	6.98%	21	0	0.00%	22	3	13.64%
Peru	74	1	1.35%	18	0	0.00%	56	1	1.79%
Colombia	62	3	4.84%	15	0	0.00%	47	3	6.38%
TOTAL	29,188	3346	11.46%	22,693	2535	11.17%	6495	811	12.49%

Datar et al. (2001) hypothesize that the likelihood of using earnouts is positively associated with cross-border acquisitions because they entail stronger information asymmetries and higher costs of due diligence. Their analysis, however, did not find support for their claim. The international framework of our study allows us to test this hypothesis as well. To do this, we include cross-border deals in our original sample. As discussed in Section 4, for such deals the jurisdiction elected to solve possible disputes is uncertain. However, to carry out our analysis, we need to assign a specific jurisdiction to cross-border deals. For this purpose, we choose the country of the target. Indeed, absent a specific provision in the contract, the location of the assets of the target company may drive the choice of the relevant jurisdiction according to the principle of *lex situs*, which states that, in case of conflict of law, the relevant jurisdiction is decided in relation to the geographical location of the object of the dispute. Moreover, extensive discussions with law firms point out that the parties might find it convenient to choose as the relevant jurisdiction the one of the country of the target because, in case of disputes, it is easier for the local court to obtain documents and to conduct direct examinations without the burden of international requests for evidence.

We can provide anecdotal evidence supporting our choice. For example, the trial meant to settle the dispute on the payment of the earnout stipulated for the acquisition of Acolyte Biomedica, a UK-based company, by 3M, incorporated in Delaware, in the United States, was held in the United Kingdom.[30] In addition, the contract for the acquisition of Playfish, a

[30] In 2007, 3M acquired Acolyte Biomedica, then owned by Porton Capital, in a deal that provided for an up-front payment of £10.4 million and an earnout based on net sales of products of up to £41 million. In December 2008, a lawsuit was filed against 3M in relation to the poor performance of Acolyte that prevented the earnout payment; the claimants ascribed

London-based social gaming startup, by Electronic Arts, located in the United States, elects as governing law that of the United Kingdom.[31]

Table 10 reports for each country the total number of acquisitions, the number of those that include an earnout, and the ratio of the two. The same information is provided for the subsets of domestic deals and cross-border deals.

In the vast majority of countries, the frequency of earnout agreements with respect to total deals is higher for cross-border deals than for domestic deals, which is in line with the hypothesis at hand. For instance, in the United States, the earnout ratio in domestic deals is 10.42%, while that in cross-border deals is 15.65%.

On this extended sample, we run the logit model presented in the previous section, including, among the regressors, a dummy that takes the value one if the deal is transnational (DiffNat) and zero otherwise. The results of this analysis are presented in Table 11.

In all models the coefficient of the dummy for cross-border deals (DiffNat) is positive, consistently with our expectation. However, it is significant only in Panel A. When clustering standard errors at country level, the significance of this variable vanishes. The reason why this relation is not clear cut could be that despite on one hand the increased uncertainty related to cross-border deals induces the parties involved to be more prone to using earnout agreements, on the other hand it could be more complex to structure these agreements if the parties are incorporated in different countries, due to the differences among legal environments.

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this to 3M's poor management. The trial was decided in 2011 and the appeal in 2012, both in favor of 3M.

[31] Electronic Arts acquired Playfish in 2009, paying £300 million up front and an additional earnout worth up to £100 million.

Table 11: Determinants of the earnout materiality, including cross-border deals

This table provides the results of logistic regressions of the use of earnouts on deal-specific and country-specific variables. In these regressions, we include cross-border deals, to check if the likelihood of using earnouts is higher for these acquisitions. The variable of interest is DiffNat, which is a dummy variable that takes the value one if the bidder and the target are incorporated in different countries. As in Table 6, the dependent variable takes the value one when the deal involves an earnout and zero otherwise. The variable Tv is the log of the deal value, that is, the acquisition price, while Mv is the log of the market value of the bidder four weeks prior to the acquisition; Priv, Sub, TarSR, and TarHT are dummy variables that take the value one if the target is a private company or a subsidiary or operates in the service or high-tech industry, respectively; Toehold is a dummy variable that takes the value one if the bidder owned a fraction of the shares in the target company before the acquisition; Exp is the log of the number of deals that took place in a given country/year; and MktGDP is the ratio of the stock market capitalization over the GDP. The enforcement quality variables are described in Table 2. In panel A, robust standard errors are provided in parentheses, while in Panel B, standard errors are clustered at country level, with ***, **, and * indicating significance at the 1%, 5%, and 10% levels, respectively.

Panel A

VARIABLES	Exp.Sign	(1)	(2)	(3)	(4)	(5)
Tv	+	0.0494***	0.0586***	0.0425***	0.0552***	0.0532***
		(0.0106)	(0.0112)	(0.0109)	(0.0112)	(0.0118)
Mv	-	-0.0449***	-0.0446***	-0.0392***	-0.0394***	-0.0394***
		(0.00804)	(0.00824)	(0.00818)	(0.00827)	(0.00886)
Priv	+	2.988***	2.995***	2.997***	3.003***	3.176***
		(0.167)	(0.168)	(0.168)	(0.168)	(0.202)
Sub	+	2.023***	2.062***	2.041***	2.066***	2.187***
		(0.169)	(0.171)	(0.170)	(0.170)	(0.204)
Toehold	-	-0.361*	-0.266	-0.286	-0.247	-0.207
		(0.191)	(0.193)	(0.192)	(0.194)	(0.215)
DiffNat	+	0.114**	0.286***	0.209***	0.259***	0.210***
		(0.0453)	(0.0490)	(0.0487)	(0.0494)	(0.0517)
TarSR	+	0.880***	0.809***	0.841***	0.798***	0.886***
		(0.0440)	(0.0449)	(0.0444)	(0.0448)	(0.0483)
TarHT	+	0.993***	1.006***	0.957***	0.986***	1.035***
		(0.0533)	(0.0543)	(0.0536)	(0.0543)	(0.0586)
Exp			0.0443	0.0582***	0.0541**	-0.0430
			(0.0278)	(0.0203)	(0.0273)	(0.0304)
MktGDP			-0.00374**	0.00102	-0.00602***	0.00188*
			(0.00168)	(0.000949)	(0.00175)	(0.00101)
AntiSelf	+		2.511***			
			(0.158)			
RuleOfLaw	+			0.394***		
				(0.0709)		
CompInd	+				3.991***	
					(0.291)	
EnfTime	-					-0.00128***
						(0.000296)
RecRate	+					0.0135***
						(0.00229)
Constant		-5.788***	-7.319***	-7.067***	-8.444***	-5.720***
		(0.202)	(0.275)	(0.276)	(0.317)	(0.385)
Year fixed effects		Yes	Yes	Yes	Yes	Yes
Observations		29,188	29,188	29,188	29,188	24,023
pseudo R^2		0.0983	0.118	0.101	0.116	0.107

Panel B

VARIABLES	Exp.Sign	(1)	(2)	(3)	(4)	(5)
Tv	+	0.0494**	0.0586**	0.0425**	0.0552**	0.0532***
		(0.0230)	(0.0263)	(0.0184)	(0.0256)	(0.0194)
Mv	-	-0.0449*	-0.0446*	-0.0392*	-0.0394*	-0.0394*
		(0.0268)	(0.0242)	(0.0211)	(0.0237)	(0.0208)
Priv	+	2.988***	2.995***	2.997***	3.003***	3.176***
		(0.288)	(0.273)	(0.295)	(0.281)	(0.321)
Sub	+	2.023***	2.062***	2.041***	2.066***	2.187***
		(0.197)	(0.184)	(0.200)	(0.194)	(0.215)
Toehold	-	-0.361***	-0.266***	-0.286***	-0.247***	-0.207
		(0.0821)	(0.0912)	(0.0950)	(0.0910)	(0.141)
DiffNat	+	0.114	0.286	0.209	0.259	0.210
		(0.203)	(0.245)	(0.256)	(0.240)	(0.243)
TarSR	+	0.880***	0.809***	0.841***	0.798***	0.886***
		(0.147)	(0.116)	(0.124)	(0.117)	(0.107)
TarHT	+	0.993***	1.006***	0.957***	0.986***	1.035***
		(0.182)	(0.133)	(0.162)	(0.139)	(0.203)
Exp			0.0443	0.0582	0.0541	-0.0430
			(0.128)	(0.140)	(0.137)	(0.136)
MktGDP			-0.00374	0.00102	-0.00602	0.00188
			(0.00740)	(0.00301)	(0.00749)	(0.00297)
AntiSelf	+		2.511***			
			(0.600)			
RuleOfLaw	+			0.394**		
				(0.199)		
CompInd	+				3.991***	
					(1.184)	
EnfTime	-					-0.00128
						(0.00141)
RecRate	+					0.0135
						(0.0107)
Constant		-5.788***	-7.319***	-7.067***	-8.444***	-5.720***
		(0.423)	(0.780)	(0.860)	(1.003)	(1.203)
Year fixed effects		Yes	Yes	Yes	Yes	Yes
Observations		29,188	29,188	29,188	29,188	24,023
pseudo R^2		0.0983	0.118	0.101	0.116	0.107

Table 12: determinants of earnouts - reducing filters

This table presents the results of the logistic regression of the use of earnouts on the same variables as in Table 6, with the exception of Tv and Mv, which cannot be computed for the full sample considered. In all models, only domestic deals are considered. In all deals, the acquirer is a public company, the toehold in the target cannot be higher than 40%, and at least 90% of the shares of the target must be owned by the bidder after the acquisition. In panel A, robust standard errors are provided in parentheses, while in Panel B, standard errors are clustered at country level, with ***, **, and * indicating significance at the 1%, 5%, and 10% levels, respectively.

Panel A

VARIABLES	Exp.Sign	(1)	(2)	(3)	(4)	(5)
Priv	+	2.318***	2.296***	2.321***	2.300***	2.384***
		(0.174)	(0.176)	(0.174)	(0.176)	(0.216)
Sub	+	1.612***	1.613***	1.633***	1.625***	1.711***
		(0.178)	(0.180)	(0.178)	(0.180)	(0.220)
Toehold	-	-0.379*	-0.228	-0.247	-0.192	-0.0656
		(0.202)	(0.211)	(0.205)	(0.210)	(0.256)
TarSR	+	0.729***	0.673***	0.725***	0.676***	0.714***
		(0.0422)	(0.0440)	(0.0429)	(0.0436)	(0.0512)
TarHT	+	0.950***	1.100***	0.967***	1.094***	1.137***
		(0.0544)	(0.0570)	(0.0550)	(0.0567)	(0.0640)
Exp			-0.00963	-0.0201	0.0666**	-0.150***
			(0.0316)	(0.0189)	(0.0338)	(0.0297)
MktGDP			-0.00210	0.00890***	-0.00548***	0.00669***
			(0.00184)	(0.000633)	(0.00186)	(0.00128)
AntiSelf	+		5.456***			
			(0.174)			
RuleOfLaw	+			0.841***		
				(0.128)		
CompInd	+				9.869***	
					(0.371)	
EnfTime	-					-0.00213***
						(0.000479)
RecRate	+					0.0543***
						(0.00697)
Constant		-5.415***	-8.812***	-7.855***	-12.82***	-8.553***
		(0.182)	(0.343)	(0.350)	(0.476)	(0.578)
Year fixed effects		Yes	Yes	Yes	Yes	Yes
Observations		49,665	49,665	49,665	49,665	36,603
pseudo R^2		0.0502	0.128	0.0627	0.124	0.0712

Panel B

VARIABLES	Exp.Sign	(1)	(2)	(3)	(4)	(5)
Priv	+	2.318***	2.296***	2.321***	2.300***	2.384***
		(0.449)	(0.420)	(0.449)	(0.422)	(0.464)
Sub	+	1.612***	1.613***	1.633***	1.625***	1.711***
		(0.240)	(0.203)	(0.250)	(0.212)	(0.245)
Toehold	-	-0.379	-0.228	-0.247	-0.192	-0.0656
		(0.258)	(0.173)	(0.169)	(0.163)	(0.293)
TarSR	+	0.729***	0.673***	0.725***	0.676***	0.714***
		(0.131)	(0.0773)	(0.124)	(0.0831)	(0.0810)
TarHT	+	0.950***	1.100***	0.967***	1.094***	1.137***
		(0.269)	(0.136)	(0.230)	(0.137)	(0.218)
Exp			-0.00963	-0.0201	0.0666	-0.150
			(0.105)	(0.189)	(0.145)	(0.238)
MktGDP			-0.00210	0.00890	-0.00548	0.00669
			(0.00454)	(0.00610)	(0.00475)	(0.00679)
AntiSelf	+		5.456***			
			(0.493)			
RuleOfLaw	+			0.841		
				(0.547)		
CompInd	+				9.869***	
					(1.217)	
EnfTime	-					-0.00213
						(0.00305)
RecRate	+					0.0543
						(0.0362)
Constant		-5.415***	-8.812***	-7.855***	-12.82***	-8.553***
		(0.205)	(0.865)	(1.313)	(1.737)	(2.869)
Year fixed effects		Yes	Yes	Yes	Yes	Yes
Observations		49,665	49,665	49,665	49,665	36,603
pseudo R^2		0.0502	0.128	0.0627	0.124	0.0712

Looking at the enforcement quality variables, in all models and in both specifications of the error terms, they retain, in this extended sample, the same signs and levels of significance described in the main analysis. This shows that our results on the relation between enforcement quality and the use of earnouts are robust to the inclusion of cross-border deals in the sample acquisitions.

6.2 Reducing filters in our sample selection

To verify that our results are not driven by the sample selection procedure, we rerun our logit model after including the acquisitions for which the payment method was undisclosed and acquisitions with no available data on the market value of the acquirer or the consideration paid. We rerun our analysis still maintaining the focus on transactions in which the acquirer is a public company that owns less than 50% of the target company before the deal and at least 90% afterward, but removing all other filters. This implies that we do not have enough data to compute the variables that describe the materiality of the deal. However, we still have enough information on the characteristics of the target, which are a proxy for the information asymmetry and the valuation risk that affects the deal and that has been proven, in our previous results and in previous literature, to be the most important drivers of the decision to use an earnout in a deal. The results of the logit regression performed on domestic deals after removing the above-mentioned filters are reported in Table 12.

All the variables, for both deal characteristics and the quality of the enforcement system, show the same signs and levels of significance as in the previous regressions. The likelihood of the use of earnouts is positively associated with the legal protection offered by a country's enforcement system to minority shareholders, as described by the anti–self–dealing index (AntiSelf), with the perception of the quality of the legal environment captured by the Rule of Law Index (RuleOfLaw) and with the overall assessment of the quality of the enforcement

system as captured by the composite index (CompInd). The coefficient of the recovery rates is positive and significant (RecRate), while it is negative for the length of enforcement procedures (EnfTime).

The analysis of the enlarged sample confirms that the efficiency of the enforcement system is a relevant issue in the decision to use earnouts and that our results are not driven by the sample selection procedure.

7. Conclusions

The literature on earnout agreements has focused mainly on the advantages of these contractual clauses, highlighting their ability to reduce information asymmetry and valuation risk in M&As. Earnouts allow the parties involved in an acquisition to "agree to disagree" on the value of the deal yet reach its closing by verifying the performance of the target at a future time. However, these contracts are not free from drawbacks. Indeed, they are affected by litigation risk, since verification of the target company's performance is not straightforward. The accounting figures on which earnouts are usually structured may be managed and the effort expended by the bidder in boosting the business of the target cannot be directly observed. In case of the bidder's misbehavior, actual or alleged, the holder of these contracts could seek the protection of the court. For this reason, having an efficient enforcement system may be reassuring and may thus induce sellers to be more willing to accept these contracts.

Our work focuses on the relation between enforcement quality and the use of earnouts from an international perspective. We show that earnouts are used more frequently in countries in which the quality of the enforcement system is higher, with different proxies used to measure such quality. Similar relations hold for earnout materiality, that is, the ratio of contingent payment to total consideration; therefore, enforcement quality affects not only the choice to

include these clauses in the contract, but also their proportion with respect to the total payment.

We contribute to the literature on law and economics by providing evidence that, in the field of M&As as well, the quality of the judicial and enforcement system shapes the form of financial contracts, promoting or impeding the use of contracts that allow risk sharing between the parties involved.

Our findings also contribute to the literature on earnout valuation. Litigation risk is a driver that should be properly taken into consideration when estimating the value of contingent liabilities (or assets). This issue is of particular relevance for financial reporting purposes, due to the fact that recently both IFRS and US GAAP introduced the requirement to recognize the liability associated with these contracts at fair value. However, to the best of our knowledge, no valuation model among those proposed in the literature takes this additional source of risk into account. For example, Bruner (2001, 2004), Arzac (2005), and Caselli et al. (2006) focus on the similarity of earnouts with options, yet they do not consider how the different incentives faced by buyers and sellers can shape the outcome of earnouts: Their models could be extended to assess the effect of litigation risk on the value of these clauses.

Additional research remains to be done in this area. Apart from the decision to use these contracts or not, it would be interesting to check whether the quality of the enforcement system shapes the design of these contracts, for example, inducing a preference for reference parameters that are less prone to manipulation or shorter horizons for the measurement period. We leave these avenues to future research.

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Chapter 3: Should I trust you? The relevance of earnings quality in acquisitions involving earnouts

1. Introduction

Earnouts are contracts used in acquisitions to bridge the valuation gap between the bidder and the sellers. If the parties are unable to reach an agreement on the value of the target company, because the sellers ask for a price that is considered too high by the bidder, earnouts can prevent the failure of the deal by linking part of the payment to the future performances of the acquired company.

These contracts are very beneficial for bidders because they reduce the information asymmetry issues that affect acquisitions. They allow to share a portion of the valuation risk with the sellers, and they act as a selection mechanism on the quality of the company that will be acquired. Indeed, the sellers will accept a payment that is made contingent on the performances of the company they want to sell only if they believe that it will meet the requirements that trigger the additional payments.

These contracts are beneficial also for the sellers. Since they reduce the risk for the target company to be pooled with low quality peers, they allow the sellers to obtain, in expectation, an higher payment. This, however, comes at a price: the sellers will still be exposed, after the closing, to part of the risk of the company they sold and to the risk that the bidders will manage earnings to reduce, or even avoid, the payment related to the earnout.

Disputes on the actual realization of the performance parameter chosen for the earnout do not seem to be uncommon[32], and practitioners warn those who want to structure an earnout in an

[32] Some of these disputes even ended in litigation, see, for example, Comet Systems Inc Shareholders' Agent v. MIVA Inc, 980 A.2d 1024 (Del. Ch. 2008); Chambers v. Genesee &

acquisition to define as carefully as possible which accounting entries should be included or excluded from its computation[33]. In a recent case[34] decided in 2011 in UK, 3M was sued by the sellers of Acolyte Biomedica, a pharmaceutical company acquired in 2007[35], who asked for an higher earnout payment with respect to the one 3M was willing to pay. During the trial, it was disclosed that 3M requested a "conservative" estimate of net sales, the parameter on which the earnout was based, to provide to the sellers of Acolyte in support of the earnout computation[36].

The position of the sellers, after having accepted an earnout, is inconvenient for two main reasons. The first one is that the incentives of the bidder, with respect to earnout payments, are not aligned with theirs. The bidder, at the closing, obtain the ownership and the control of the target company: the payment related to the earnout is not rewarded by any additional benefit in this respect. On the contrary, it is the bidder's interest to reduce the share of profits that, due to the earnout, are to be assigned to the sellers. The second is that the earnout is not

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Wyoming Inc, 2005 WL 2000765 (Del. Ch. Aug. 11, 2005); William J. LaPoint v. AmerisourceBergen Corp, 2007 WL 2565709 (Del. Ch. Sept. 4, 2007), aff'd, 956 A.2d 642 (Del. 2008).

[33] See, for example, Fox and Wolf (2010), Crimmins, Gray, Waller, Brown (2010) or Shannon and Reilly (2011).

[34] Porton Capital Technology Funds & Ors v 3M UK Holdings Ltd & Anor [2011] EWHC 2895 (Comm), 07 November 2011.

[35] 3M completed the acquisition of Acolyte Biomedica, owned by Porton Capital, in 2007. The consideration for the acquisition comprised an upfront payment of £10.4m and an earnout, based on net sales, of up to £41m.

[36] The trial, however, ended largely in favor of 3M.

straightforward to enforce in case of disagreement, between bidder and sellers, on the payment due. If the sellers decide to go to court to lay their claim, they would face the uncertainty of a trial in which the judge would have only partial access to the information regarding the management of the target company, and would be called to decide on matters, like the determination of an earning figure, that could be very much discretionary. In addition to this, the sellers would need to bear the cost of litigation.

Given the limited possibilities of ex post enforcement of these contracts, the sellers that decide to use these contracts would need to engage in an accurate ex-ante screening of their counterparties. To assess if the bidder is trustworthy in its reporting obligations, the quality of the bidder reported earnings would be a valuable signal.

We hypothesize that the decision of using earnout agreements in positively influenced by the extent to which bidders are perceived to be trustworthy by the sellers. We test this hypothesis on a sample of 5,584 deals completed in US between 2005 and 2013.

In order to capture the quality of earnings of the bidder, we rely on an inverse proxy: past earnings management, computed using the modified Jones' abnormal accrual measure. Since we are not interested in a specific direction of earnings management, but rather in its presence and its relevance, we take the absolute value of this measure.

Comparing bidders that use earnouts with those who do not, we show that the former are characterized by a lower level of earnings management. Furthermore, we analyze the determinants of the use of earnouts via logit regressions. Controlling for the variables that the previous literature have associated with these contingent payments, we can show that there is a negative and significant relation between earnings management and the likelihood of observing an earnout in a deal.

Our work contributes to the literature on the determinants of earnouts by showing the relevance of the trust of the bidder by the sellers in the decision to implement them. If the bidder shows relevant past earnings management, it can generate in the sellers the doubt that this behavior will be repeated in the future, this time to their detriment. Moreover, it contributes to the literature on the relation between M&As and earnings management, that is mainly focused on stock for stock deals, and on the managerial incentives to manage earnings on specific corporate events. If an acquisition includes an earnout in the consideration, the incentive of the bidder to reduce the cash outflow related to this contingent payment is apparent.

The remainder of the chapter is organized as follows. The next section provides a review of the relevant literature. In Section 3 we develop our hypotheses, and in section 4 we describe the data we use in the analysis. Section 5 provides the results, while section 6 is meant to check their robustness. The final section concludes, also introducing venues for further research.

2. Literature review

2.1 Literature on earnouts

The two seminal papers on earnouts, namely Kohers and Ang (2000) and Datar, Frankel and Wolfson (2001), emphasized the role of these contracts in reducing information asymmetry issues. The former looks at acquisitions of US companies that took place between 1984 and 1996, and shows that earnouts are mainly used in acquisitions of private companies and subsidiaries, for which the absence of a market price increases the uncertainties on the value of the target, and of companies operating in the service or high tech sector, for which the

uncertainties are mainly related to the relevance of human capital and growth opportunities. The likelihood of using these contracts, moreover, is increasing in the size of the target while it is decreasing in the size of the acquirer. It is also increasing if the target operates in an industry that is different from the one of the bidder. Furthermore, it shows that earnouts seem to be associated with higher announcement and post acquisition gains for the bidder if compared to acquisitions not using them. The paper also provides evidence that earnouts can also be used to retain and incentivize former owners/managers of the target. The results presented in the latter paper, which is focused on acquisitions that took place worldwide between 1990 and 1996, are in line with the ones of the former.

More recently, Ragozzino and Reuer (2009), focusing on acquisitions of private targets, showed that earnouts are used more frequently if the target is very young and if it operates in an industry that requires an expertise which is different from the one that the bidder possesses. Barbopulos and Sudarsanam (2012) focused instead on acquisitions performed in UK, showing that, if earnouts are optimally used, that is if used to solve information asymmetry issues, as proxied by the variables discussed above, the returns enjoyed bidders are higher than the ones obtained by bidders using other payment methods.

Cain, Denis and Denis (2011), using a sample of US deals that took place in the period 1994-2003, show that the performance parameter is chosen in order to maximize its capability to track the value of the acquired company and the effort exerted to boost its business. In addition to this, the measurement horizon of the performances of the acquired company increases with the relevance of R&Ds and decreases with the volatility of returns in the industry of the target. Moreover, the importance of managerial effort to develop the business of the target has a positive impact on the size of the earnout, while, if effort cannot be measured precisely, the size of the earnout decreases.

The relation between disclosure requirements of accounting standards and the use of earnout has been studied by Allee and Wangerin (2013). The motivation of the paper is the revision of US accounting standards on business combinations, namely FASB ASC 805, formerly SFAS 141(R). The revision was undertaken in 2007[37], and changed the method of recognition of contingent payments. While there was no obligation to recognize earnouts in financial statements before the revision, starting from the fiscal year beginning after December 15, 2008, it became mandatory to value them at fair value, and to re-measure them each year until their expiration. Consistent with a financial reporting cost hypothesis, they find that earnouts are used less frequently under the new standards. However, the presence of a high-quality auditor seems to reduce this effect.

Cadman, Carrizosa, and Faurel (2014) using a sample of deals that were completed period from July 1, 2006 to June 30, 2011, show instead that the percentage of deals including earnouts did not change sensibly after the introduction of the new standards. Furthermore, focusing on the deals for which the new standards made available the details on earnout valuations, they show that there is a relation between the ratio of the estimated fair value of the earnout and its maximum payment and the underlying reason for which the earnout was structured, i.e. adverse selection, valuation risk, moral hazard, or retaining the management of the target. Moreover, they document that fair value adjustments are negatively associated with contemporaneous and future goodwill impairments, and show that these adjustments provide useful information for market participants for the valuation of acquirers[38].

[37] An analogous revision, in the same year, affected IFRS 3.

[38] Other authors analyzed the issues related to earnout valuation (Arzac 2005; Bruner 2001, 2004; Caselli, Gatti and Visconti, 2006). This topic however is not directly related to ours.

2.2 Literature on earnings management

The relation between M&As and earnings management has been the subject of several empirical studies. Erickson and Wang (1999), using a sample of stock for stock deals completed between 1985 and 1990, show that earnings are managed upward by acquirers in the quarters preceding the deal, and the extent of this is proportional to the economic benefit for the bidder, as captured by the relative size of the deal with respect to the value of the acquirer's capitalization. The rationale of this behavior is that, by managing earnings, they attempt to increase the stock price of their company, and thus to reduce the cost of acquiring the target. These results are confirmed by Botsari and Meeks (2008) in the framework of UK acquisitions.

Louis (2004) expands this analysis showing, using a sample of US acquisitions completed between 1992 and 2000, that the effect of pre-acquisition earnings management on the bidder's stock prices are reversed afterwards. There is indeed a negative correlation between the level earnings management and the post-acquisition returns of the bidder, both short and long term.

Shivakumar (2000) studies instead the incentive to manage earnings in the case of a SEO. Using a sample of SEOs performed in US between 1983 and 1992, he finds that firms do manage earnings before SEOs, yet he shows that the effects of this behavior are correctly inferred and undone by investors, because there is no significant relation between post-SEOs returns and earnings management. This is in contrast with prior literature. Teoh, Welch and Wang (1998), on a sample spanning between 1970 and 1989, show instead that earnings management is correlated with post issue and long run stock returns in SEOs. DuCharme, Malatesta and Sefcik (2004) contribute to this analysis by showing, studying both SEOs and IPOs that took place in US between 1988 to 1997, that not only earnings management is

negatively related to post-offer stock returns and it is likely to reverse after these events, but it is also positively correlated with the probability of a lawsuit. Moreover, also settlement amounts are significantly related to the extent of earnings management.

Our work is also related to the literature on the information value of financial reports, and specifically of the discretion that might affect earnings, on pricing and investor decisions. Subramanyam (1996) shows that discretionary accruals are priced by the market. Despite this could be consistent with inefficient pricing, he shows evidence supporting the idea that managers use their discretion to reveal fundamental value. Balsam, Bartov, and Marquardt (2002) provide evidence that unexpected discretionary accruals are negatively associated with cumulative abnormal returns over a short window around the 10-Q filing date, showing that investors use the information contained in financial statements to guide their trading decisions. In addition to this, this association is explained by investor sophistication: the more sophisticated investors are, the more financial information is impounded in stock prices. Similarly, we believe that the sellers of the target company, when deciding whether to trust the bidder and accept an earnout, will try to infer from financial reports if the latter is trustworthy.

3. Hypothesis development

If the consideration of an acquisition includes an earnout, part of the payment to the sellers will be postponed to a future time, and will depend on the performances of the target company over the estimation horizon of the earnout. At the closing, however, the ownership and the control of the target company changes from the hands of the sellers to the ones of the bidder. This implies an inversion of the information asymmetry issues that were affecting the two parties of the deal. Before the closing, the sellers have perfect monitoring over their company, while for the bidder the only way to gain access to private information of the target

is the due diligence process, which, however, cannot unveil it completely. The situation is reversed afterwards.

Moreover, the bidder will be the one in charge of measuring and reporting the performances of the target. It should be noted, however, that it faces no direct incentive of reporting truthfully the performance of the acquired company: by reducing it, through real activities or accounting policies, it can limit the share of profits that, due to the earnout, should be diverged to the sellers. The risk that the bidder will engage in opportunistic behavior is increased by the sellers' limited monitoring ability and absence of leverage to influence the decisions of the bidder itself. In case of a lack of good faith on the side of the latter, the sellers can only count on the protection of courts. They, however, are affected by a possibly stronger information asymmetry, that the discovery process cannot completely solve. Thus, among all the other factors on which the sellers ponder when deciding whether to accept an earnout agreement, they will also take into consideration the uncertainties on the outcome of a trial and its cost.

The limited ex-post monitoring and enforcement possibilities will induce the sellers to engage in a rigorous and accurate ex-ante screening of their counterparties. The quality of the bidder reported earnings would be an important element to evaluate whether it is trustworthy.

In order to capture earnings quality, we rely on what can be seen as its inverse proxy: earnings management.

An high level of earnings management reduces the information quality of financial statement, in their ability to provide a true and fair representation of the financial and economic results of a company, and thus limits their ability to reduce information asymmetries with respect to their readers. Furthermore, an higher transparency of accounting reports would imply a reduced expected enforcement cost in case of litigation. In addition to this, if the bidder

applied significant discretion in the determination of earnings figures, this could be taken as a signal of an higher risk that such discretion will be applied again in the future.

Thus, the sellers would be more prone to accept an earnout agreement if their counterparty showed low level of earnings management in the past.

This leads us to formulate our hypothesis in the following way:

H1a: Acquirers that used earnout agreements in their deals show lower levels of past earnings management if compared to acquirers that did not include them.

Our hypothesis can be alternatively expressed as:

H1b: The likelihood of using earnouts in acquisition agreements is negatively related to the level of past earnings management on the side of the bidder.

In the next section we provide a description of the data and the measure of earnings management that we use to test the stated hypothesis.

4. Data and descriptive statistics

We collect data on acquisitions from Thomson ONE Banker, provided by SDC. The time span considered goes from January 1st, 2005 to September 30th, 2013. These data are then merged with Compustat, in order to retrieve the relevant accounting information on the bidder. In order to be included in the sample, the deal must be completed in the interval considered, and the acquirer must be a public company. We further require, for a deal to be included in the sample, to have information on the total consideration paid, on the market value of the bidder prior to the acquisition, and on the accounting figures needed to compute

the modified Jones' abnormal accrual measure, that we use as our earnings management variable.

Dechow, Sloan and Sweeney (1995) proposed a modification of the model meant to detect abnormal accruals originally suggested by Jones (1991): accruals are considered as a function of the excess of the change in revenues with respect to the change in account receivables, and of the level of property, plants and equipment. The authors show that this specification improves the power in detecting earnings management.

Instead of using the time series version of the model, however, we rely on a cross sectional specification, in which the abnormal accruals of a given firm are determined using as reference the level of accruals of the firms in the same industry. As discussed by Peasnell, Pope and Young (2000) and Jeter and Shivakumar (1999), cross sectional models seem to be better specified and have an even higher power with respect to its time series counterpart. In addition to this, they allow to use larger samples, because they impose less restrictions on data requirements.

The model used to estimate accruals, then, is the following:

$$ACCR_{j,t}/TA_{j,t-1} = \alpha[1/TA_{j,t-1}] + \beta[(\Delta REV_{j,t} - \Delta REC_{j,t})/ TA_{j,t-1}] + \gamma[PPE_{j,t}/TA_{j,t-1}] + \varepsilon_{j,t} \quad (1)$$

Where $ACCR_{j,t}$ refers to total accruals of firm j in quarter t, $\Delta REV_{j,t}$ refers to the change in revenues, $\Delta REC_{j,t}$ refers to the change in accounts receivable, $PPE_{j,t}$ refers to property, plants and equipment, and $TA_{j,t}$ refers to total assets.

Table 1: Descriptive statistics - nr deals

This table provides descriptive statistics on the deals included in our main sample. In panel A deals are classified according to the industry of the acquirer, in panel B according to the industry of the target. Since we study the impact of bidder's past earnings management on the likelihood of using earnouts in acquisitions, we exclude deals in which the acquirer operates in the financial sector: traditional earnings management measures are not suitable for financial companies. This is the reason why in panel A no observations refer to financial companies.

Panel A: Acquirer's industry

Industry	Nr deals	Nr deals including earnouts	%
Consumer NonDurables	233	24	10.3%
Consumer Durables	111	18	16.2%
Manufacturing	683	37	5.4%
Oil, Gas, and Coal Extraction and Products	501	14	2.8%
Chemicals and Allied Products	124	6	4.8%
Computers, Software, and Electronic Equipment	1581	254	16.1%
Telephone and Television Transmission	211	13	6.2%
Utilities	147	1	0.7%
Services and Retail	424	51	12.0%
Healthcare, Medical Equipment, and Drugs	694	164	23.6%
Other (Mines, Constr, Entertainment, Transp)	775	127	16.4%
Total	5484	709	12.9%

Panel B: Target's industry

Industry	Nr deals	Nr deals including earnouts	%
Consumer NonDurables	214	21	9.8%
Consumer Durables	99	13	13.1%
Manufacturing	556	43	7.7%
Oil, Gas, and Coal Extraction and Products	471	12	2.5%
Chemicals and Allied Products	139	6	4.3%
Computers, Software, and Electronic Equipment	1592	254	16.0%
Telephone and Television Transmission	187	12	6.4%
Utilities	147	2	1.4%
Services and Retail	372	33	8.9%
Healthcare, Medical Equipment, and Drugs	727	169	23.2%
Financial	83	4	4.8%
Other (Mines, Constr, Entertainment, Transp)	897	140	15.6%
Total	5484	709	12.9%

Table 2: Descriptive statistics - variables

This table provides descriptive statistics on the main variables used in the analysis. TargetHightech and TargetService are dummy variables that take value 1 if the target operates in the high tech or the service sector, respectively. LogDealValue is the log of the transaction price of the deal. LogMKTvalueacquiror is the log of the market value of the acquirer prior to the deal announcement. TargetSubsidiary and TargetPrivate are dummy variables that take value 1 if the target is a private company or a subsidiary, respectively. Interindustry is a dummy variable that takes value 1 if bidder and target have the same two-digits SIC code. Toehold is a dummy variable that takes value 1 if the bidder holds a stake in the target before the acquisition. StockUpfr is a dummy that takes value 1 if the upfront payment is at least partly in stocks. LagMeanEMJ is the mean of the modified Jones's abnormal accrual measure in the four quarters preceding the deal. Panel A provides, for each variable, mean and standard deviation, detailed for the subsample of earnout users, non earnout users, and in the whole sample. Panel B provides correlations. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: means and standard deviations

	Non earnout users		Earnout users		Total	
	Mean	SD	Mean	SD	Mean	SD
TargetHightech	23.10%	*42.20%*	38.60%	*48.70%*	25.10%	*43.40%*
TargetService	30.60%	*46.10%*	37.00%	*48.30%*	31.40%	*46.40%*
logDealValue	4.024	*1.916*	3.620	*1.543*	3.972	*1.877*
logMKTvalueacquiror	7.236	*2.149*	6.427	*1.980*	7.132	*2.145*
TargetSubsidary	36.50%	*48.10%*	20.50%	*40.40%*	34.40%	*47.50%*
TargetPrivate	47.40%	*49.90%*	78.00%	*41.50%*	51.30%	*50.00%*
Interindustry	59.60%	*49.10%*	65.60%	*47.50%*	60.40%	*48.90%*
Toehold	6.20%	*24.00%*	2.40%	*15.30%*	5.70%	*23.10%*
StockUpfr	16.50%	*37.10%*	23.10%	*42.20%*	17.30%	*37.80%*
LagMeanEMJ	0.042	*0.066*	0.041	*0.049*	0.042	*0.064*

Panel B: correlations

	Target Hightech	Target Service	logDeal Value	logMKT value acquiror	Target Subsidary	Target Private	Interind	Toehold	Stock Upfr	LagMean EMJ
TargetHightech	1.000									
TargetService	-0.392***	1.000								
logDealValue	0.023*	-0.121***	1.000							
logMKTvalueacquiror	0.031**	-0.044***	0.603***	1.000						
TargetSubsidary	-0.047***	-0.161***	0.068***	0.030**	1.000					
TargetPrivate	-0.003	0.193***	-0.285***	-0.182***	-0.743***	1.000				
Interindustry	0.075***	-0.045***	0.020	-0.045***	0.007	-0.006	1.000			
Toehold	-0.040***	-0.076***	-0.019	0.055***	-0.045***	-0.077***	0.025*	1.000		
StockUpfr	-0.013	0.051***	0.024*	-0.240***	-0.137***	0.057***	0.041***	-0.033**	1.000	
LagMeanEMJ	-0.038***	-0.008	-0.195***	-0.301***	-0.017	0.041***	0.010	-0.004	0.131***	1.000

The model is estimated using quarterly data and defining the industries using the Fama-French 12 industries classification. Abnormal accruals are the accruals not explained by the previous model. As our earnings management variable, for each bidder, we employ the absolute abnormal accruals averaged over the four quarters preceding the acquisition, that we label LagMeanEMJ. We decided to use an absolute measure because we are more interested in the general reliability of earnings rather than in the direction of their management. We take the average of over four quarters in order to capture a behavior that is consistent in time, and not sporadic. In the robustness section, we show that our results do not depend on this specific choice.

As an additional filter, we exclude the acquisitions in which the bidder is a financial company, because the structure of their financial reports and the meaning of their items are essentially different from industrial companies, and earnings management measures are not suitable for them.

Our final sample comprises 5,584 deals. Among them, 709 include an earnout, that is, 12.9% of the total. This ratio is slightly higher than the 9% reported in Cadman, Carrizosa, and Faurel (2014).

Table 1 provides some descriptive statistics on the composition of the dataset. In panel A, the sample is classified according to the industry of the bidder, as specified by the Fama-French 12 industries classification: the industry with the strongest presence of earnouts is healthcare, followed by consumer durables and IT. In panel B we have the classification according to the industry of the target. Again, the sector in which earnouts are used the most is healthcare, followed by IT. This is in line with the findings of Kohers and Ang (2000) and Datar, Frankel and Wolfson (2001).

Table 2 provides, instead, descriptive statistics on the variables used in the analysis. Panel A compares the deals in which earnouts are used with the ones in which they are not. The proportion of deals in which the target is an high tech or a service company is much higher in the former group. Looking at the value of the deal and the market value of the bidder instead, we can see that deals in which earnouts are used tend to be characterized by smaller considerations paid by smaller bidders. Moreover, when the acquisition involves contingent payments, the frequency of private companies is much higher than in the other group. The opposite seems to hold if we look at the proportion of subsidiaries. However, if we filter out the relative presence of private companies, we can see that, among non-private companies, the frequency of subsidiaries is higher in deals involving earnouts. Earnout deals seem also to be characterized by an higher frequency of intra-industry transactions, and by an higher proportion of deals that include, in the upfront payment, also common stocks. The frequency of bidders having a toehold in the target company, instead, is much lower for earnout deals. Finally, if we compare the average value of our earnings management variable, we can see that it is lower in earnout deals. However, this difference does not seem to be striking. The analysis needs to be deepened, yet. In the next section, we will provide the results of matching procedures and multivariate analyses that will show the significance of this difference and the relevance of earnings management in the decision to use earnouts.

The correlation structure of the variables that we use is presented in panel B. No variable seems to be strongly correlated with another one, with the only exception of logDealValue and logMKTvalueacquiror. The earnings management variable is mildly correlated with the target being in the high tech sector, but not significantly correlated with the target operating in the service sector. It shows negative correlation with the deal value and the market value of

the acquirer, while it has a small yet positive correlation with the target being private and the upfront payment including common stocks.

5. Results

In order to check the validity of our hypothesis, the first step that we make is computing a t-test for the differences in the mean level of earnings management for the group of deals in which earnouts are present and for those in which they are not. To take into consideration the characteristics of the deals that might influence this comparison, we employ a propensity score matching technique, as described in Becker and Ichino (2002). The idea behind this methodology is to carry out the comparison of an outcome variable, in this case the level of earnings management, between a group of treated subjects (earnout users) and a group of non-treated subjects (non earnout users) chosen in such a way to be as similar as possible to the treated. This in order to avoid the possibility that the comparison of subjects that are inherently different could bias the results.

The propensity score is computed taking into consideration several deal characteristics: the size of the bidder, defined in terms of total assets, the value of the deal, that is the total consideration paid for the target, the fact that the target operates in the high tech or service sector, and a dummy variable for the period before the financial crisis of 2007[39]. The model is

[39] The size of the bidder and the size of the deal are defined in terms of terciles of their sample distribution. Each observation is assigned to one of three groups: high, medium or small bidder size, and high, medium or small deal size. This partitioning is used for the computation of the propensity score.

parsimonious yet it satisfies the balancing hypothesis[40]. Moreover, in order to improve the quality of the match, only the observations belonging to the common support of the treated and non treated are used in the comparison.

Table 3: Propensity score matching

This table provides the results of the ATT procedure performed on our sample. The analisys is performed on the observations belonging to the region of common support, so to improve the quality of the matching. Standard errors are computed analytically. T-stats are reported with the associated significance level, with ***, **, and * indicating significance at the 1%, 5%, and 10% levels, respectively.

Nr. Treated	709
Nr. Controls	4670
ATT	-0.007
Std. Err.	0.002
t-stat	-3.178***

The results of the match, performed using the nearest neighbor method, are shown in table 3. The level of earnings management is defined accordingly to our main variable, lagMeanEMJ. Consistently with our hypothesis, the bidders of deals in which earnouts are used show a lower level of earnings management with respect to their comparable peers that do not use them. This difference is strongly significant.

To provide further evidence supporting our claim, we performed a multivariate analysis to control for the factors that have been associated, in the previous literature, with the use of earnouts. Kohers and Ang (2000), Datar, Frankel and Wolfson (2001), Barbopulos and Sudarsanam (2012), and Cadman, Carrizosa, and Faurel (2014) show that earnouts are more frequently used in deals involving private companies and subsidiaries, for which the problem

[40] If the balancing hypothesis is satisfied, treated observations and non treated observations with the same propensity score share the same distribution of observable and unobservable characteristics.

of asymmetry of information is relevant, also in relation to the absence of a market pricing of their assets. Similarly, earnouts are more likely used for the acquisitions of targets operating in the service or high tech sector, due to the high growth opportunities and relevant uncertainties related to the importance of human capital that characterizes these industries. The existence of a toehold in the target company instead reduces the probability of observing an earnout. Moreover, the likelihood of observing an earnout in a deal is positively associated with the size of the deal itself, and negatively associated with the value of the bidder. There is a lack of consensus on the association between diversifying acquisitions, that is deals in which the bidder and the target operate in different industries, and the use of earnouts. Focusing on the US market, Kohers and Ang (2000) and Datar, Frankel and Wolfson (2001), who both focus on acquisitions that took place between the 80s and the 90s, show that there is a positive association between cross industry deals and the use of earnouts. Cadman, Carrizosa, and Faurel (2014), who focus on a more recent sample, find instead opposite results.

Since the decision to include an earnout in a deal is a dichotomous variable, the investigation on the determinants of this choice are performed using a logit model.

We estimate the following equation:

$$\text{Logit}(\text{Prob}(\text{Earnout}_{it}=1)) = \beta_0 + \beta' \text{Controls}_{it} + \gamma_2 \text{lagMeanEMJ}_{it} + \varepsilon_{it} \quad (2)$$

Where the controls are the following:

Earnout is a dummy variable that takes value one if an earnout agreement is used in the deal;

TargetHightech is a dummy variable that takes value 1 if the target operates in the high tech sector;

TargetService is a dummy variable that takes value 1 if the target operates in the service sector;

logDealValue is the log of the transaction price of the deal;

logMKTvalueacquiror is the log of the market value of the acquirer prior to the deal announcement;

TargetSubsidary is a dummy variable that takes value 1 if the target is a subsidiary;

TargetPrivate is a dummy variable that takes value 1 if the target is a private company;

Interindustry is a dummy variable that takes value 1 if bidder and target have the same two-digits SIC code;

Toehold is a dummy variable that takes value 1 if the bidder holds a stake in the target before the acquisition;

StockUpfr is a dummy that takes value 1 if the upfront payment is at least partly in stocks.

In all the specification we include year fixed effects, which, if compared to event specific dummies, is a more general way of controlling for changes through time of the environment in which acquisitions take place. Thus, we do not include dummies for the crisis or for the change in accounting standards, as they are already implicitly controlled for by year fixed effects.

Table 4: Logit regression

This table provides the result of logistic regressions of the use of earnouts on the average earnings management in the four quarters preceding the deal and other deal specific covariates. The dependent variable takes value 1 when the deal involves an earnout, and 0 in the opposite case. TargetHightech and TargetService are dummy variables that take value 1 if the target operates in the high tech or the service sector, respectively. LogDealValue is the log of the transaction price of the deal. LogMKTvalueacquiror is the log of the market value of the acquirer prior to the deal announcement. TargetSubsidiary and TargetPrivate are dummy variables that take value 1 if the target is a private company or a subsidiary, respectively. Interindustry is a dummy variable that takes value 1 if bidder and target have the same two-digits SIC code. Toehold is a dummy variable that takes value 1 if the bidder holds a stake in the target before the acquisition. StockUpfr is a dummy that takes value 1 if the upfront payment is at least partly in stocks. LagMeanEMJ is the mean of the modified Jones's abnormal accrual measure in the four quarters preceding the deal. Robust standard errors are provided in parentheses with ***, **, and * indicating significance at the 1%, 5%, and 10% levels, respectively.

	Model 1	Model 2	Model 3	Model 4
TargetService	0.656***	0.645***	0.628***	0.615***
	(0.109)	(0.109)	(0.110)	(0.110)
TargetHightech	1.172***	1.159***	1.147***	1.144***
	(0.108)	(0.108)	(0.109)	(0.109)
logDealValue	0.155***	0.153***	0.148***	0.138***
	(0.0303)	(0.0304)	(0.0306)	(0.0313)
logMKTvalueacquiror	-0.211***	-0.228***	-0.224***	-0.209***
	(0.0249)	(0.0260)	(0.0261)	(0.0277)
TargetSubsidary	1.912***	1.894***	1.861***	1.903***
	(0.320)	(0.321)	(0.317)	(0.318)
TargetPrivate	2.912***	2.897***	2.867***	2.891***
	(0.315)	(0.315)	(0.312)	(0.313)
Interindustry	0.191**	0.195**	0.201**	0.198**
	(0.0888)	(0.0888)	(0.0888)	(0.0889)
Toehold			-0.432*	-0.427
			(0.262)	(0.263)
StockUpfr				0.195*
				(0.112)
lagMeanEMJ		-1.796**	-1.787**	-1.899**
		(0.745)	(0.740)	(0.744)
Constant	-3.628***	-3.381***	-3.344***	-3.448***
	(0.562)	(0.565)	(0.563)	(0.570)
Observations	5,484	5,484	5,484	5,484
Pseudo R^2	0.118	0.119	0.120	0.120
χ^2	382.4	387.7	385.3	388.2
p	<0.0001	<0.0001	<0.0001	<0.0001

The results of the logit regressions are shown in table 4. In model 1, we exclude the earnings management variable and we only consider a set of controls, so to show that our results are in line with prior literature. The likelihood of observing earnouts is positively and significantly associated with the target operating in the service sector or the high tech sector. Similarly, if the deal involves a private company or a subsidiary, the probability of using an earnout is significantly higher. Moreover, the use of earnouts is positively associated to the value of the deal, while it is negatively related to the market value of the bidder. These results are in line with the evidence provided by Kohers and Ang (2000), Datar, Frankel and Wolfson (2001), Barbopulos and Sudarsanam (2012), and Cadman, Carrizosa, and Faurel (2014). In addition to this, our result on the relation between the use of earnouts and cross industry acquisitions are in line with the ones of Cadman, Carrizosa, and Faurel (2014): the variable Interindustry shows a positive and significant association with the likelihood of including an earnout in a deal.

In model 2 we include the variable lagMeanEMJ, our measure of earnings management. Consistently with our hypothesis, the relationship is negative and strongly significant. The more bidder's earnings show signs of management in the four quarters preceding the deal, the less it is likely that the sellers will accept an earnout agreement for the transaction. In model 3 we control also for the presence of a toehold, and we find that it is negatively associated with the use of earnouts, while in model 4 we include the variable StockUpfr, that captures the fact that part of the upfront payment is made in common stocks. The latter variable shows a positive coefficient, suggesting the idea that common stocks and earnouts can be used as complements by the bidder for risk sharing purposes. Both in model 3 and 4, the coefficient on the earnings management variable remains negative and significant, showing the robustness of our results. This evidence provides confirmation to the idea that the sellers

Table 5: Robustness - Average EM on eight quarters

This table provides the result of logistic regressions of the use of earnouts on the average earnings management in the eight quarters preceding the deal and other deal specific covariates. The dependent variable takes value 1 when the deal involves an earnout, and 0 in the opposite case. TargetHightech and TargetService are dummy variables that take value 1 if the target operates in the high tech or the service sector, respectively. LogDealValue is the log of the transaction price of the deal. LogMKTvalueacquiror is the log of the market value of the acquirer prior to the deal announcement. TargetSubsidiary and TargetPrivate are dummy variables that take value 1 if the target is a private company or a subsidiary, respectively. Interindustry is a dummy variable that takes value 1 if bidder and target have the same two-digits SIC code. Toehold is a dummy variable that takes value 1 if the bidder holds a stake in the target before the acquisition. StockUpfr is a dummy that takes value 1 if the upfront payment is at least partly in stocks. LagMeanEMJ8q is the mean of the modified Jones's abnormal accrual measure in the eight quarters preceding the deal. Robust standard errors are provided in parentheses with ***, **, and * indicating significance at the 1%, 5%, and 10% levels, respectively.

	Model 1	Model 2	Model 3	Model 4
TargetService	0.663***	0.655***	0.639***	0.625***
	(0.115)	(0.115)	(0.116)	(0.116)
TargetHightech	1.165***	1.158***	1.146***	1.142***
	(0.113)	(0.114)	(0.114)	(0.114)
logDealValue	0.164***	0.163***	0.159***	0.148***
	(0.0316)	(0.0317)	(0.0319)	(0.0326)
logMKTvalueacquiror	-0.214***	-0.227***	-0.223***	-0.210***
	(0.0259)	(0.0271)	(0.0272)	(0.0288)
TargetSubsidary	1.809***	1.801***	1.772***	1.813***
	(0.323)	(0.323)	(0.319)	(0.320)
TargetPrivate	2.859***	2.852***	2.826***	2.848***
	(0.317)	(0.317)	(0.313)	(0.314)
Interindustry	0.207**	0.209**	0.214**	0.210**
	(0.0934)	(0.0934)	(0.0935)	(0.0935)
Toehold			-0.376	-0.369
			(0.265)	(0.266)
StockUpfr				0.193
				(0.118)
lagMeanEMJ8q		-1.527*	-1.505*	-1.690**
		(0.844)	(0.838)	(0.837)
Constant	-2.731***	-2.576***	-2.555***	-2.658***
	(0.659)	(0.666)	(0.666)	(0.678)
Observations	4,961	4,961	4,961	4,961
Pseudo R^2	0.121	0.122	0.122	0.123
χ^2	357.9	360.9	359.4	362.1
p	<0.0001	<0.0001	<0.0001	<0.0001

Table 6: Robustness - EM in the previous quarter

This table provides the result of logistic regressions of the use of earnouts on the level of earnings management in the quarter preceding the deal and other deal specific covariates. The dependent variable takes value 1 when the deal involves an earnout, and 0 in the opposite case. TargetHightech and TargetService are dummy variables that take value 1 if the target operates in the high tech or the service sector, respectively. LogDealValue is the log of the transaction price of the deal. LogMKTvalueacquiror is the log of the market value of the acquirer prior to the deal announcement. TargetSubsidiary and TargetPrivate are dummy variables that take value 1 if the target is a private company or a subsidiary, respectively. Interindustry is a dummy variable that takes value 1 if bidder and target have the same two-digits SIC code. Toehold is a dummy variable that takes value 1 if the bidder holds a stake in the target before the acquisition. StockUpfr is a dummy that takes value 1 if the upfront payment is at least partly in stocks. PrevQtrEMJ is the level of the modified Jones's abnormal accrual measure in the quarter preceding the deal. Robust standard errors are provided in parentheses with ***, **, and * indicating significance at the 1%, 5%, and 10% levels, respectively.

	Model 1	Model 2	Model 3	Model 4
TargetService	0.696***	0.690***	0.674***	0.661***
	(0.104)	(0.103)	(0.104)	(0.104)
TargetHightech	1.202***	1.193***	1.181***	1.177***
	(0.104)	(0.104)	(0.104)	(0.104)
logDealValue	0.153***	0.151***	0.146***	0.137***
	(0.0286)	(0.0286)	(0.0288)	(0.0293)
logMKTvalueacquiror	-0.206***	-0.218***	-0.214***	-0.200***
	(0.0237)	(0.0245)	(0.0246)	(0.0262)
TargetSubsidary	1.930***	1.916***	1.881***	1.921***
	(0.306)	(0.307)	(0.302)	(0.304)
TargetPrivate	2.907***	2.895***	2.862***	2.884***
	(0.301)	(0.302)	(0.298)	(0.299)
Interindustry	0.194**	0.196**	0.201**	0.200**
	(0.0846)	(0.0846)	(0.0847)	(0.0847)
Toehold			-0.455*	-0.449*
			(0.255)	(0.256)
StockUpfr				0.179*
				(0.105)
PrevQtrEMJ		-1.490*	-1.484*	-1.549*
		(0.796)	(0.790)	(0.793)
Constant	-3.880***	-3.720***	-3.653***	-3.766***
	(0.521)	(0.523)	(0.518)	(0.528)
Observations	6,036	6,036	6,036	6,036
Pseudo R^2	0.116	0.117	0.118	0.119
χ^2	415.1	416.4	413.7	416.5
p	<0.0001	<0.0001	<0.0001	<0.0001

perform a sort of reverse due diligence on the acquirers, in order to screen those that they can trust more from those that they can trust less. In the next section, we show that these results do not depend on our decision to look at a four month average of the earnings management measures, and that they remain unchanged if we add stricter constraints to our sample selection process.

6. Robustness tests

6.1 Changing the horizon of past earnings management

In our main analysis we use, as a measure for earnings management, the average over the four quarters preceding the acquisition of the absolute value of the bidder's abnormal accruals, computed using the modified Jones' model. Our choice is motivated by the desire of capturing a general trend in the earnings management behavior of the acquirer, so that it can be representative of the information that the sellers try to obtain on the bidder. A narrower perspective could be not as informative, capturing what could be an isolated phenomenon rather than a characteristic of the acquirer, while a broader horizon could include stale information.

However, in this section we provide evidence that considering a longer or a narrower perspective on the earnings management behavior of the bidder do not alter the results presented in the main analysis.

We rerun our analysis considering the bidder's average abnormal accrual over the eight months preceding the deal, and limiting the attention to the quarter immediately before the announcement[41].

Table 5 provides the results of the tests carried out using the eight months average of the bidder's abnormal accruals as a measure of earnings management. The coefficients on the controls are in line with the ones presented in the previous table. More importantly, however, the coefficient of our earnings management variable retains its sign unaltered and remains statistically significant.

Table 6, instead, considers only the abnormal accruals in the quarter preceding the deal. Also in this case, the earnings management variable shows a negative and significant coefficient, in line with the evidence provided in our main analysis.

6.2 Introducing additional filters

In our main analysis, in line with Datar, Frankel and Wolfson (2001) and Cadman, Carrizosa, and Faurel (2014), we did not impose any restriction on the percentage of shares acquired in the deal. By imposing more restrictive filters on the data, however, our results do not change.

Table 7 shows the results we obtain if we consider only deals in which at least 20% of the shares of the target is acquired in the deal, which, in a country like US, in which ownership is usually fragmented, is sufficient to obtain the control of a company. The coefficients of both the control variables and our earnings management variable retain their sign and their level of significance.

[41] By increasing (decreasing) the horizon of the average of the earnings management variable, the data requirements increase (decrease). Thus, the number of observations decreases (increases).

Table 7: Robustness - Filter on the % of shares acquired

This table provides the result of logistic regressions of the use of earnouts on the average earnings management in the four quarters preceding the deal and other deal specific covariates. With respect to the main analysis, we consider only deals in which at least 20% of the capital of the target company is acquired. The dependent variable takes value 1 when the deal involves an earnout, and 0 in the opposite case. TargetHightech and TargetService are dummy variables that take value 1 if the target operates in the high tech or the service sector, respectively. LogDealValue is the log of the transaction price of the deal. LogMKTvalueacquiror is the log of the market value of the acquirer prior to the deal announcement. TargetSubsidiary and TargetPrivate are dummy variables that take value 1 if the target is a private company or a subsidiary, respectively. Interindustry is a dummy variable that takes value 1 if bidder and target have the same two-digits SIC code. Toehold is a dummy variable that takes value 1 if the bidder holds a stake in the target before the acquisition. StockUpfr is a dummy that takes value 1 if the upfront payment is at least partly in stocks. LagMeanEMJ is the mean of the modified Jones's abnormal accrual measure in the four quarters preceding the deal. Robust standard errors are provided in parentheses with ***, **, and * indicating significance at the 1%, 5%, and 10% levels, respectively.

	Model 1	Model 2	Model 3	Model 4
TargetService	0.612***	0.602***	0.609***	0.596***
	(0.110)	(0.110)	(0.110)	(0.110)
TargetHightech	1.136***	1.125***	1.133***	1.131***
	(0.109)	(0.109)	(0.110)	(0.110)
logDealValue	0.136***	0.134***	0.134***	0.123***
	(0.0310)	(0.0311)	(0.0311)	(0.0317)
logMKTvalueacquiror	-0.199***	-0.214***	-0.214***	-0.200***
	(0.0255)	(0.0265)	(0.0265)	(0.0280)
TargetSubsidary	1.821***	1.804***	1.829***	1.872***
	(0.322)	(0.322)	(0.313)	(0.315)
TargetPrivate	2.826***	2.811***	2.837***	2.862***
	(0.317)	(0.318)	(0.308)	(0.309)
Interindustry	0.187**	0.191**	0.187**	0.184**
	(0.0892)	(0.0892)	(0.0893)	(0.0894)
Toehold			0.320	0.321
			(0.320)	(0.320)
StockUpfr				0.199*
				(0.112)
lagMeanEMJ		-1.706**	-1.698**	-1.812**
		(0.725)	(0.726)	(0.730)
Constant	-3.506***	-3.269***	-3.298***	-3.405***
	(0.567)	(0.570)	(0.565)	(0.572)
Observations	5,244	5,244	5,244	5,244
Pseudo R^2	0.112	0.113	0.113	0.114
χ^2	366.0	370.8	390.4	393.2
p	<0.0001	<0.0001	<0.0001	<0.0001

Table 8: Robustness - Filter on the initial toehold and the % of shares acquired

This table provides the result of logistic regressions of the use of earnouts on the average earnings management in the four quarters preceding the deal and other deal specific covariates. With respect to the main analysis, we consider only deals in which the toehold in the target is lower than 50% and the shares of the target owned by the bidder after the acquisition must be at least 90%. The dependent variable takes value 1 when the deal involves an earnout, and 0 in the opposite case. TargetHightech and TargetService are dummy variables that take value 1 if the target operates in the high tech or the service sector, respectively. LogDealValue is the log of the transaction price of the deal. LogMKTvalueacquiror is the log of the market value of the acquirer prior to the deal announcement. TargetSubsidiary and TargetPrivate are dummy variables that take value 1 if the target is a private company or a subsidiary, respectively. Interindustry is a dummy variable that takes value 1 if bidder and target have the same two-digits SIC code. Toehold is a dummy variable that takes value 1 if the bidder holds a stake in the target before the acquisition. StockUpfr is a dummy that takes value 1 if the upfront payment is at least partly in stocks. LagMeanEMJ is the mean of the modified Jones's abnormal accrual measure in the four quarters preceding the deal. Robust standard errors are provided in parentheses with ***, **, and * indicating significance at the 1%, 5%, and 10% levels, respectively.

	Model 1	Model 2	Model 3	Model 4
TargetService	0.607***	0.597***	0.601***	0.587***
	(0.112)	(0.112)	(0.112)	(0.113)
TargetHightech	1.141***	1.130***	1.135***	1.131***
	(0.111)	(0.111)	(0.111)	(0.111)
logDealValue	0.123***	0.121***	0.120***	0.109***
	(0.0316)	(0.0316)	(0.0316)	(0.0322)
logMKTvalueacquiror	-0.199***	-0.212***	-0.213***	-0.198***
	(0.0264)	(0.0272)	(0.0272)	(0.0287)
TargetSubsidary	2.328***	2.312***	2.322***	2.373***
	(0.423)	(0.423)	(0.424)	(0.424)
TargetPrivate	3.323***	3.311***	3.317***	3.348***
	(0.420)	(0.420)	(0.420)	(0.420)
Interindustry	0.171*	0.175*	0.172*	0.169*
	(0.0906)	(0.0906)	(0.0907)	(0.0907)
Toehold			0.392	0.378
			(0.434)	(0.436)
StockUpfr				0.202*
				(0.114)
lagMeanEMJ		-1.545**	-1.541**	-1.665**
		(0.714)	(0.713)	(0.719)
Constant	-3.959***	-3.746***	-3.750***	-3.864***
	(0.633)	(0.635)	(0.635)	(0.641)
Observations	4,914	4,914	4,914	4,914
Pseudo R^2	0.113	0.114	0.115	0.115
χ^2	357.6	361.9	363.6	366.8
p	<0.0001	<0.0001	<0.0001	<0.0001

In table 8 we apply an even more stringent filter, we consider only deals in which the toehold in the target is lower than 50% and the shares of the target owned by the bidder after the acquisition are at least 90%. Also in this subsample, our results are robust: past earnings management is negatively associated with the use of earnouts.

7. Conclusions

Earnout agreements, in the context of M&As, can be very helpful for sellers because they allow to reach the closing of a deal even in the presence of disagreement on the value of the target company. Moreover, they allow good quality target to be screened from low quality ones, and thus to obtain an higher consideration in the acquisition.

However, despite solving some issues, they set the stage for new problems. After the closing, the bidder faces no direct incentive to pay what it is due in relation to the earnout, because this is unrelated to any increase in the ownership of the target, or to additional rights. Yet, it is the bidder who is in charge of measuring and reporting the profitability of the target in the horizon of the earnout. Thus, it might try to manage the earnings of the target in order to reduce, or even avoid, the earnout payment. The only enforcement mechanism the sellers can count on is the protection of the judicial system, which, however, it is costly and uncertain in its outcome.

Given the week ex post enforcement possibility, the sellers that have to decide on including an earnout in a deal might implement an ex ante screening on the trustworthiness of the bidder. Its past earnings management behavior can be an informative signal on the reliability of the bidder itself.

In order to assess if this idea finds confirmation in reality, we carried out a study on a sample of 5,584 deals completed in US between 2005 and 2013. To capture earnings management, we used the modified Jones' abnormal accruals measure. Using propensity score matching

techniques we show that earnings management is lower among bidders that acquired a company using earnouts if compared to those that did not use contingent payment. Furthermore, using logit regressions to identify the determinants of the use of earnouts, we show that there is a negative association between past earnings management on the side of the bidder and the likelihood of earnouts.

Our results confirm the idea that the sellers engage in a sort of reverse due diligence when they have to decide whether to accept an earnout as part of the consideration for an acquisition, meant to distinguish trustworthy bidders from less reliable ones.

This chapter contributes to the literature on the determinants of the use of earnouts by showing the importance of trust in deals for which the bidder-seller relationship does not end at the closing. Whether the attempt to discriminate between trustworthy bidders and non-trustworthy bidders ensures the achievement of the desired results is a question left for future research.

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