

The relation between equity misvaluation and stock payment in mergers is spurious ♦

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Abstract: This paper shows that the widely cited empirical relation between equity misvaluation and the choice of merger currency (Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2005; Rhodes-Kropf et al., 2005) is spurious. We argue that before its abolishment in 2001, pooling accounting was the accounting method of choice for highly valued acquirers and that failing to control for this regulatory incentive leads to invalid inference (likely because the choice of pooling accounting is an endogenous omitted variable). We confirm these arguments with new empirical results: (i) the relation between acquirer valuation and the choice of mode of payment disappears in analysis of U.S. mergers with post-2001 data; (ii) this relation also fails in examination of data from Europe and Australia, environments where pooling was either not allowed or almost never used; (iii) this relation is absent even in analyses of pre-2001 subsamples of U.S. mergers that did not use pooling.

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1. Introduction

Overvalued acquirers have strong incentives to use their own mispriced shares as the method of payment in a merger or acquisition, and for more than a decade, academics and practitioners have widely accepted the fact that overvalued acquirers are able to do so. Andrei Shleifer and Robert Vishny (2003) (hereafter: SV), introduce a behavioral theory of equity misvaluation and its use as an acquisition currency, while Matthew Rhodes-Kropf and S. Vishwanathan (2004) (hereafter: RV) show that we can ex-post observe misvalued acquirers paying in stock in acquisitions even in a model in which everyone is rational and has unbiased expectations (but bidders and targets have, potentially correlated, valuation errors).¹

Matthew Rhodes-Kropf, David Robinson, and S. Vishwanathan (2005) (hereafter: RRV) report empirical evidence supporting the RV misvaluation-based model.² RRV has had a considerable impact on the finance (and mergers and acquisitions, M&A) literature. Part of this impact is due to the introduction by RRV of a procedure to isolate the so-called misvaluation component of firm value, which has been widely applied in the finance literature since the publication of that paper. But the results in RRV relating misvaluation to the method of payment in M&A deals itself have been long treated in the M&A literature as stylized facts.

Recent contributions in the empirical M&A literature challenge however the SV (behavioral) and RV (rational) theories of equity misvaluation and stock payment in M&A deals. In particular, Espen Eckbo, Tanakorn Makaew, and Karin Thorburn (2018) strongly reject the notion of bidder opportunism. The authors argue that the more the target knows about the bidder, the lower should be its propensity to accept overvalued stock as compensation in an M&A deal. Their test of this simple and intuitive prediction generates results incompatible with the misvaluation-based explanation of stock as a method of payment: the better the target knows the acquirer (according to the proxies used by the authors), the

¹ In the RV model, markets price securities correctly on average, but because there is a systematic component to the deviation from fundamental values (in addition to an idiosyncratic component), when one party mistakenly overstates their private value, they will make stock-financed offers that the target will be more likely to accept because of this correlated misvaluation component. We thank David Robinson for helping us to understand the intricacies of the SV and RV models, and the subtle differences between them.

² Ming Dong, David Hirshleifer, Scott Richardson, and Siew Hong Teoh (2006) and James Ang and Yingmei Cheng (2006) offer substantially similar empirical evidence, without necessarily relying on fundamentals of the RV or SV models to motivate their tests.

higher the probability that equity is used as a medium of payment. The authors also report results of an instrumental variable-based approach, again rejecting the misvaluation-based argument. This raises an important question: if misvaluation does *not* drive RRV's empirical results, how can we explain the observed positive correlation between full stock payment in acquisitions and acquirer misvaluation? This is the central topic that we address in this paper, and we do so by providing direct evidence that the positive correlation in the historical data (pre-2001) appears to be driven by the available accounting choice set (a choice variable that was omitted from the original RRV specification).

We proceed by directly confronting the empirical relation between proxies for acquirer overvaluation and the use of stock in an M&A deal. We argue that omitting to take into account the dramatic change in accounting regulations in the U.S. in the middle of 2001 led the academic finance community to misinterpret the positive correlation between bidder misvaluation and the use of stock as mode of payment as evidence of opportunistic behavior. Before June 30th 2001, the “pooling of interests” method of accounting for stock-swap M&A transactions was allowed in the U.S. by the Accounting Principles Board under APB 16. APB 16 was released in 1970 and allowed two alternative methods of accounting for business combinations. Under the first, known as the “purchase” method, acquirers would account for an M&A deal by recording the difference between the acquisition price and the fair value of the target's net assets (assets minus liabilities) as goodwill on their balance sheet. Such goodwill would then be amortized by the acquiring corporation, reducing future earnings.³

Under the second method, known as “pooling of interests” (hereafter: “pooling”) qualifying acquirers could simply fuse the accounting statements of the acquiring and acquired firms.⁴ The pooling method of accounting for acquisitions was disallowed by the Financial Accounting Standards Board (FASB) under FAS 141 effective at the end of June 2001. The most important of the conditions to qualify for pooling accounting was paragraph 47-b in APB 16: *all of* the consideration paid to target

³ This amortization of goodwill was not tax-deductible, as the goodwill was classified by the taxation authorities in the U.S. as a self-created intangible. See <https://www.law.cornell.edu/uscode/text/26/197>.

⁴ In APB 16 the FASB justified this method of acquisition accounting as a “fusion of equity interests,” specifically rejecting the notion that the “acquisition price” (and hence goodwill) could be accurately measured in deals in which the target's shares were exchanged for 100% acquirer stock, i.e., full stock-swap M&A deals.

shareholders had to be acquirer common stock (with rights identical to those of the majority of the acquirer's outstanding voting common stock) and the acquirer had to purchase at least 90% of the target's voting stock. This created artificial regulatory incentives promoting the use of stock as the exclusive method of payment in M&A deals (i.e., full stock swaps) between 1970 and the middle of 2001 (a period that we call the "pooling period").

Moreover, as explained in Section 2 of this paper, there are compelling reasons (e.g., EPS bootstrapping and incentives driven by CEO compensation contracts) to believe that these regulatory incentives specifically stimulated the use of stock as a method of payment by acquiring firms with highly or overvalued equity (either firm-specific, or more generally when equity markets appear broadly overvalued). The fact that pooling required 100% stock payment suggests that the positive correlation between full stock payment and valuation ratios observed during the pooling period (and documented in RRV) was conceivably driven by the willingness of acquirers to structure their acquisitions in such way that they qualified under the pre-2001 regulations for pooling accounting. These regulatory incentives promoting the use of stock in M&A deals were in effect during practically the entire RRV sample period (1978 – 2001⁵) but were withdrawn shortly thereafter.

Regressing the mode of payment choice on acquirer valuation ratios (as RRV do) without controlling for the chosen accounting method therefore induces an omitted variable bias. Standard results concerning omitted variable biases (which we will discuss later in the paper⁶) allow us to anticipate that this bias would generate an artificial positive correlation between the use of stock and acquirer valuation ratios. To test whether the absence of controlling for the accounting method has indeed been the omitted factor leading to erroneous conclusions about acquirers' opportunistic behavior,

⁵ Dong, Hirshleifer, Richardson, and Teoh (2006) and Ang and Cheng (2006) use data from basically this same sample period.

⁶ See Section 2.6.

we investigate whether the RRV results hold in the U.S. after the abolishment of pooling and, separately, whether those results *ever* held in international markets.⁷

We start by replicating the results in RRV as closely as possible, matching their sample selection criteria, in order to be sure that our updated results are not affected by an erroneous replication of the original RRV empirical design. As in RRV, we focus on full stock payment (100% stock-swaps), as this allows us to draw clean inferences about the relation between misvaluation and the choice of method of payment.⁸ We are able to closely replicate the vast majority of RRV's descriptive statistics using data gathered for a sample period that closely matches theirs (1978 – 2001), and we then turn to the commonly-used RRV regression-based market-to-book decompositions. In those decompositions, we obtain similar R-squared and regression coefficients as RRV for most industry-level and firm-level analyses.

Most importantly, in our replication of RRV over their sample period, our results confirm that both broad (i.e., market-to-book) and firm-specific proxies for overvaluation have a positive and statistically significant correlation with the propensity of a firm to participate in the M&A market, the propensity to participate as an acquirer, and, crucially in the present case, the propensity of an acquirer to use full stock payment. In all cases, the coefficients in our replication regressions are of the same sign as reported in RRV, and the vast majority have the same level of statistical significance. We are therefore confident that we faithfully replicate RRV's empirical design.

Next, we focus on M&A deals after June 2001. Using the same sample-selection criteria as in RRV, but for a sample period from July 2001 - 2017, we find that the proportion of M&A transactions fully paid in stock drops sharply during the post-2001 period compared to the earlier sample period that RRV used (21.5% vs. 36.7%), a fact already reported in Eric de Bodt, Jean-Gabriel Cousin, and Richard Roll (2018). The key insight that emerges from our analyses using data from the more recent sample period (July 2001 – 2017) is that, while we come to the same conclusion about the effect of overvaluation

⁷ Pooling accounting was either not an option for firms in the international markets, Europe and Australia in particular, or not frequently used in practice in those markets because the preconditions required for qualification were too restrictive.

⁸ See RRV Table 9, Panel C and p.590.

on a firm's participation in the M&A market and participation in the role of an acquirer, multivariate analyses of the probability of full stock payment reveal fundamentally different results than those reported in RRV. Specifically, in the more recent sample period, high market-to-book firms are actually *less* likely to use full stock payment to buy their target (conditional on making an offer to begin with) and the RRV misvaluation components either lose significance or flip sign explaining the method of payment.⁹

The contradictory results obtained for the determinants of full stock payment in acquisitions between the two sample periods (1980 – June 2001 vs. July 2001 – 2017) is striking. To assess the generalizability of these conflicting results, we turn to international evidence. We study the same sub-periods and report results for European countries (Austria, Belgium, Finland, France, Germany, Ireland, Italy, Norway, Portugal, Spain, Sweden, Switzerland, and the UK, as in Mara Faccio and Ronald Masulis, 2005), for the UK alone, and for Australia. We find no evidence of statistically significant relations between acquirer firm-specific RRV misvaluation proxies (or broad market-to-book ratios) and use of full stock payment during the earlier period. Such relations are generally also insignificant during the July 2001 to December 2017 sample period, and the only significant coefficients we find during this latter period support a *negative* relation between the market-to-book ratio or the firm-specific misvaluation proxy (from RRV) and the use of full stock payment (i.e., the opposite of RRV's original findings). Once again, our results fail to support the misvaluation hypothesis.

Finally, we develop two additional analyses that deliver results consistent with our view of pooling as an omitted latent factor in the original RRV work. In the first, using data from U.S. and the pooling period, we discriminate between the following subsets of deals: paying fully or partially in cash (those deals had to be accounted for using purchase accounting), paying fully in stock and using pooling accounting, or paying fully in stock and using purchase accounting. Our results show that the firm-specific RRV misvaluation component is significant only in explaining the choice of full-stock payment

⁹ The negative relation between the probability of full stock payment and the market-to-book ratio that we report for the post-2001 period is consistent with the market-to-book ratio being a proxy for future growth opportunities (Kenneth Martin, 1996; Faccio and Masulis, 2005), as acquirers anticipating a period of high growth could be more reluctant to share the benefits of such growth with a target firm.

combined with pooling accounting, but does not explain the choice of full-stock payment coupled with purchase accounting (which represents a little under half of the distribution of full-stock payment deals in the sample from the pooling period). This result again suggests that full stock payment was chosen by highly valued acquirers in order to qualify for pooling accounting prior to the accounting rule change in 2001.

In the second additional analysis, we revisit the probability with which a firm participates in the M&A market as an acquirer. Our results show that the M&A market participation decision is positively correlated with overvaluation during the pooling and the post-pooling periods, consistent with the evidence in RRV. But if full stock payment was (at least partially) motivated by qualifying for pooling accounting during the pooling period and if this incentive was stronger for highly valued acquirers, we should observe that the relation between M&A market participation and valuation weakens during the post-pooling period.¹⁰ We explicitly test this prediction and find that, indeed, the probability with which a firm enters the M&A market to undertake an acquisition is significantly more positively correlated with that firm's market-to-book ratio and RRV firm-specific misvaluation component in the pooling period compared to the post-pooling period. In other words, the relation between firm overvaluation and participation in the M&A market as an acquirer (i.e., Table 9, Panel A in RRV) is significantly weakened following the substantial change in accounting regulations in the middle of 2001.

The principal contribution from our analyses is to identify pooling as a confounding factor polluting the RRV results. Our identification of this confounding factor represents a prominent illustration of the consequences of omitted variables biases leading to incorrect causal interpretations of simple correlations.

The remainder of this paper proceeds as follows. Section 2 introduces our arguments about the relation between pooling and overvaluation. Section 3 describes our data sources and provides descriptive statistics. Section 4 contains our main empirical results, updating the RRV tests for the post-

¹⁰ We thank François Degeorge for this suggestion.

pooling period and introducing new international evidence, and in Section 5 we report additional results. Section 6 concludes.

2. Purchase versus pooling of interests in M&A accounting

The central theme of this paper is that the disappearance of the relation between acquirer overvaluation and full stock payment after June 2001 can be explained by highly-valued acquirers choosing stock as their sole method of payment in M&A deals in order to qualify for pooling accounting up to June 2001. In this section, we discuss the attributes and consequences of this M&A accounting choice and rationalize why we expect that pooling accounting was the more popular option for highly-valued acquirers.

2.1. The consequences of purchase accounting

If an acquirer qualified for pooling accounting pre-2001, the post-acquisition accounting impact of an M&A deal on the acquirer was relatively modest: the accounting statements of the acquirer and target were simply “fused” together going forward (as if the two firms had never existed separately). Under the alternative to pooling, called purchase accounting (which the acquirer had to use if they did not qualify for pooling), the impact on the acquirer was considerably more substantial. Two effects potentially adversely affected the post-acquisition accounting statements of the acquirer: (i) As a result of a merger, the target’s assets had to be written up to their “fair value.” In most settings, such a revaluation would result in an increase in the value of the target’s total assets. These additional assets would bloat the acquirer’s balance sheet, potentially adversely affecting asset-based ratios such as return on assets (ROA); and (ii) As a result of a merger, the difference between the price paid to acquire the target and the “fair value” of the target’s assets had to be accounted for as goodwill, and, under accounting regulations in effect prior to July 2001, that goodwill had to be amortized on a regular schedule.¹¹ Such amortization of goodwill would depress the earnings of the newly merged firm (and,

¹¹ This amortization, originally mandated by APB 17 in 1970, was described as “arbitrary” by the FASB in 2001, and replaced in FAS 142 by an annual test for impairment.

notably, have no offsetting positive tax consequences, since such amortization did not qualify as a tax deduction), and weaken ratios such as EPS or P/E (which led to the term “dilutive” to describe some acquisitions).

These costs associated with the purchase method gave acquirers a strong incentive to qualify for the pooling method of accounting. An interesting example of this motivation is AT&T’s acquisition of NCR in 1991. Thomas Lys and Linda Vincent (1995) report that AT&T agreed to pay as much as US\$500 million over what would otherwise have been required by NCR’s shareholders, simply to convince the target’s shareholders to accept a full stock-swap so that the acquirer (AT&T) could qualify for pooling accounting treatment. Furthermore, this choice boosted AT&T’s EPS by 17% *ceteris paribus* but had absolutely no effect on the fundamental future cash flows from the acquisition. In other words, AT&T appears to have paid a substantial amount of their shareholder’s wealth in order to benefit from a cosmetic accounting treatment (pooling) that boosted EPS but had no tangible consequences for the cash flows accruing to their shareholders. Another case reported in David Aboody, Ron Kasznik, and Michael Williams (2000) demonstrates the potential magnitude of the impact from purchase accounting: the Walt Disney-Capital Cities/ABC merger in 1995 resulted in a US\$16 billion asset write-up, adversely affecting Disney’s post-1995 net income by more than US\$400 million per year (see Aboody et al., 2000, footnote 2).

2.2. The correlation between acquirer and target valuations

Given that most of the costs associated with the purchase accounting were related to the valuation of the *target*, the believability of our thesis in this paper depends, therefore, on the credibility of the idea that highly valued *acquirers* had stronger incentives (than fairly- or under-valued acquirers) to qualify for pooling.

One possible explanation for the relation between acquirer overvaluation and the desire to use the pooling method of accounting prior to July 2001 is that the acquirer’s valuation ratio proxied for the general level of valuation in the stock market. In other words, acquirer overvaluation in the RRV results proxies for generally high valuations of firms in the U.S. (note that most of the pooling transactions in

our sample occurred in the mid-to-late 1990s: see Table 1). When market valuation ratios are generally high, the price paid to acquire a target would be high, exacerbating almost all of the accounting impacts from purchase accounting described above.¹² On the other hand, the acquirer could avoid these costs by paying for the target completely with acquirer stock and accounting for the transaction using pooling accounting. Therefore, the effect of correlated valuations implies a positive correlation between acquirer valuation ratios and full stock payment in M&A deals during the pooling period (1970 – June 2001).

2.3. Earnings per share (EPS) bootstrapping

Another possible explanation for the relation between acquirer overvaluation and the use of pooling is EPS bootstrapping. If an overvalued acquiring firm uses a stock-swap to buy a target firm that has a lower valuation multiple, the acquiring firm is essentially exchanging higher-priced shares for lower-priced shares. As a result of the acquisition, the number of shares outstanding in the acquiring firm will increase but by less than the total number of shares outstanding in the target because of the discrepancy in valuation multiples, assuming that the acquirer does not pay too high of a premium. When EPS is computed for the combined firm, therefore, the numerator (total earnings) will be the sum of the earnings of the acquirer and target (assuming no synergies), but the denominator (total shares outstanding) is less than the sum of the shares outstanding of the acquirer and target. The result, therefore, is a higher reported EPS (“bootstrapping”). Furthermore, this effect occurs if the price-to-earnings ratio of the acquirer (PER_A) is higher than the price-to-earnings ratio of the target (PER_T).

To see this, let A denote the acquirer, T the target, E_i earnings for firm $i \in \{A, T\}$, NS_i the number of shares for firm $i \in \{A, T\}$, and P_i the price of the shares in firm $i \in \{A, T\}$. In the case of full stock payment, after the merger the earnings and number of shares of the merged entity are respectively:

$$E_{A+T} = E_A + E_T \quad (1)$$

$$NS_{A+T} = NS_A + NS_T \times \frac{P_T}{P_A} = NS_A \times \left(1 + \frac{(NS_T \times P_T)}{(NS_A \times P_A)}\right), \quad (2)$$

¹² Also see Fangjian Fu, Leming Lin, and Micah Officer (2013), Table 5.

where (1) assumes that earnings are non-negative and that there are no real synergies in the merger, and (2) assumes that the exchange ratio is equal to the ratio of stock prices of the two merging firms (the premium is zero). For EPS bootstrapping to take place, it must be that $EPS_{A+T} > EPS_A$. Substituting Eq. (1) and (2), we obtain:

$$\frac{E_A + E_T}{NS_A \times \left(1 + \frac{(NS_T \times P_T)}{(NS_A \times P_A)}\right)} > \frac{E_A}{NS_A} \quad (3)$$

After simplification, we obtain¹³:

$$\frac{(NS_A \times P_A)}{E_A} > \frac{(NS_T \times P_T)}{E_T} \text{ or } PER_A > PER_T \quad (4)$$

The relation with pooling comes about because the bootstrapping effect assumes that the earnings of the combined firm is the sum of the earnings of the acquirer and the target (Eq. 1). Absent real synergies generated by the merger, this implies that no accounting goodwill has been recorded and, therefore, that there is no need for goodwill amortization associated with the acquisition. On the other hand, if the acquisition had been accounted for under the purchase method in effect between 1970 and June 2001, goodwill would likely have been recorded on the acquirer's balance sheet and said goodwill would need to be amortized in future years, reducing accounting earnings and dampening the "bootstrapping" effect. As a complementary analysis, we undertake simulations to study the relation between acquirer valuation levels, acquirer to target relative valuations, and the EPS bootstrapping effect. These simulations are reported in Appendix 1 and confirm that for low valuation bidders, no EPS bootstrapping is possible, regardless of whether the transaction is accounted for using purchase or pooling; for high valuation bidders, EPS bootstrapping is possible and potentially economically significant; and with no real synergies, the merged firm's EPS is always higher under pooling compared to purchase accounting (because of goodwill amortization in the latter).

Simply put, for high-valuation acquirers (especially those with higher valuation ratios than their target's), EPS bootstrapping worked best in M&A deals prior to July 2001 if the acquirer could qualify

¹³ After simplification (3) becomes $\frac{E_A + E_T}{\left(1 + \frac{(NS_T \times P_T)}{(NS_A \times P_A)}\right)} > E_A$ and after manipulation $E_T > E_A \frac{(NS_T \times P_T)}{(NS_A \times P_A)}$ which results in (4).

for pooling accounting (as AT&T did in their acquisition of NCR). Therefore, most highly valued (and possibly overvalued) acquirers had the incentive prior to July 2001 to structure their M&A deals as stock swaps in order to qualify for pooling and enjoy the greatest EPS bootstrapping benefits. In fact, there were CEOs of highly-valued acquiring firms in the mid-to-late 1990s who publicly stated that qualifying for pooling was a precondition for them to even consider an acquisition. For example, Barry Diller stated in 1997 that “We will not do any deals without pooling of interests accounting.”¹⁴

2.4. Managers’ preferences induced by executive compensation

Purchase accounting has no apparent cash-flow effect (if for no other reason than the amortization of goodwill does not produce a tax credit), and we may therefore wonder why firms care about this issue. This is discussed at length in Aboody, et al. (2000). The authors study a sample of 687 full-stock payment acquisitions of public companies occurring between 1991 and 1997, hand-collecting CEO compensation and share ownership data from acquiring firms’ proxy statements. They report several important results: (i) in acquisitions with large write-ups of target assets, CEOs with earnings-based compensation are more likely to choose the pooling method of accounting. In the authors’ own words, “... this finding reflects the notion that earnings-based bonus plans are often based on mechanical formulas that are not modified to compensate managers for the earnings penalty associated with the purchase method.” (Aboody, et al., 2000, p. 263); (ii) managers’ preference for pooling decreases with the costs associated with the conditions that must be met to qualify for pooling, in particular restrictions on stock repurchase activity and/or divestiture of the target company’s assets (when these requirements are potentially binding for the acquirer); (iii) the likelihood of observing an acquirer choosing pooling increases with the size of the gap between the acquisition price and the target firm’s book value of equity, a result supporting the desire to avoid large goodwill charges and the subsequent amortization (which was mandatory before mid-2001).

¹⁴ See James Reda (1999). The firm that Mr. Diller ran at that time, USA Networks, had a P/E multiple well in excess of 400 at the close of the 1997 fiscal year.

de Bodt, et al. (2018) also report results supporting the importance of CEO compensation in explaining the choice of accounting method in M&A transactions. Studying a sample of 1,146 acquisitions over the period 1990 to 2014 and using CEO compensation data collected from Execucomp, the authors find that the probability of full-stock payment as a function of the percentage of acquiring-firm CEO variable compensation decreases significantly in the post-pooling period (relative to the pre-pooling period). This is consistent with acquiring-firm CEOs' preferring full-stock payment for their targets during the pooling period because of compensation-related CEO incentives. Moreover, the authors show that this result holds in particular for high ROA and high market-to-book acquirers, an additional result which supports the notion that CEO incentives were in particularly important in the choice of accounting method for well-performing and highly-valued acquirers. Another recent contribution mentioning the importance of CEO incentives is Kai Li, Tingting Liu, and Julie Wu (2018). The authors use the abolishment of pooling of interests (as of July 1, 2001) as an exogenous shock to the probability with which firms use full-stock payment in acquisitions, in order to identify the causal effect of shareholder voting on deal quality. Their identification strategy rests on the clear preference of CEOs for pooling of interests during the U.S. accounting regime when pooling was an available accounting choice.

2.5. M&A accounting in international markets

Some of the important control tests in this paper involve studying whether we can observe a relation between equity misvaluation and the choice of stock as a method of payment in acquisitions in other countries around the world. To that end, it behooves us to establish that pooling was not a viable acquisition accounting choice in those countries, otherwise those tests could not serve as a robustness test for our results based on U.S. data (with and without the availability of pooling).

Kevin Li and Geoff Meeks (2016) study the accounting treatment of business combinations for the U.K., the U.S., and countries under the auspices of the International Accounting Standards Board or Committee (I.A.S.B. / I.A.S.C.¹⁵) from 1943 to 2005 (see Li and Meeks, 2016, Table 1). For each year,

¹⁵ The I.A.S.B. succeeded the I.A.S.C. in April 2001.

the authors report whether pooling of interests was viable in the given country (or under the given accounting standard) and whether it was compulsory or optional. The authors also report the criteria the acquirer had to meet to be eligible for pooling. Over the years, the global picture reflects a narrowing of options available to acquirers, with a convergence towards mandatory recognition of purchased goodwill associated with a formal process of impairment schemes in place of mandatory amortization.

Amir Amel-Zadeh, Geoffrey Meeks, and Jacqueline Meeks (2016) complement this historical analysis of accounting practices for M&A by describing whether for the U.K., the U.S., and the so-called international territories (those countries which adopt rules formulated by the I.A.S.B. or I.A.S.C.) pooling was a commonly-available accounting option in the 1975 to 2006 period (see Amel-Zadeh, et al., 2016, Table 1). For the U.K., pooling of interests is classified as optional from 1975 to 1993, becomes an uncommon option between 1994 and 1997, and purchase accounting becomes mandatory in the U.K. from 2005 (purchase accounting is optional from 1975 to 2004 but the status of pooling in 1998 and 1999 and between 2000 and 2004 is not reported). Concerning the international territories, pooling is optional up to 1992 and becomes uncommon from 1993 to 1999. Purchase accounting is mandatory from 2005 and the status of pooling is again unreported between 2000 to 2004.

Figures collected in the Securities Data Corporation (SDC) database are consistent with these claims. Over the period from 1993 (when pooling became an uncommon accounting choice in the international territories) to end of June 2001 (the end of pooling in the U.S.)¹⁶, SDC reports 3,019 M&A transactions accounted for under pooling in the U.S., 10 in the U.K., 32 across Austria, Belgium, Finland, France, Germany, Ireland, Italy, Norway, Portugal, Spain, Sweden and Switzerland (the set of European countries that we study in Section 4) and none in Australia. According to these statistics, pooling of interests was clearly an infrequent accounting choice outside of the U.S. (especially after the early 1990s).

¹⁶ Another reason to report numbers from 1992 onwards is because of data quality concerns about SDC's data on the choice of accounting method in M&A transactions during the 1980s, as explained in Section 3.

2.6. Pooling as an omitted variable

The arguments developed in Sections 2.1. to 2.4. highlight the existence of strong incentives for highly-valued U.S. acquirers to structure M&A transactions prior to June 2001 such that they qualify for pooling. The econometric consequences of failing to account for this pooling preference in regressions of consideration choice in M&A transactions on acquirer valuation ratios can be better understood using the classic omitted variable bias framework (Joshua Angrist and Jorn-Steffen Pischke, 2009). Adopting highly stylized notations, the short regression estimated in RRV takes the following form:

$$\text{Full Stock Payment} = \alpha + (\beta \times \text{Acquirer Valuation}) + \eta \quad (5)$$

where *Full Stock Payment* is an indicator variable equal to one for deals with 100% stock payment, *Acquirer Valuation* is an acquirer valuation ratio (such as the market-to-book ratio) and η is the error term. The correct form of equation (5) incorporates a *Pooling* indicator variable, equal to one when the M&A transaction qualifies for pooling:

$$\text{Full Stock Payment} = \alpha^* + (\beta^* \times \text{Acquirer Valuation}) + (\gamma^* \times \text{Pooling}) + \eta^* \quad (6)$$

The standard omitted variable bias formula (Angrist and Pischke, 2009, equation 3.2.11) relates β (essentially the estimated coefficient from RRV) to β^* (the true coefficient of interest):

$$\beta = \beta^* + (\gamma^* \times \delta^*) \quad (7)$$

where δ^* is the coefficient from a regression of *Pooling* on *Acquirer Valuation* on (i.e., the effect of the included variable on the omitted variable). γ^* is positive by definition in the accounting regulations (since 100% stock payment was compulsory to qualify for pooling) and we argue that δ^* is positive (as there were strong incentives for highly-valued acquirers to qualify for pooling, as explained in Sections 2.1. to 2.4.). Therefore, the omitted variable bias ($\gamma^* \times \delta^*$) is positive in all likelihood, and β (the coefficient reported in RRV regressions) overestimates β^* (the true coefficient of interest).

Is this omitted variable bias strong enough to lead us to erroneously conclude that acquirer valuation causes full stock payment? The straightforward route to test whether this is the case seems to be to estimate equation (6) (including the *Pooling* indicator variable) using a linear probability model. RRV, however, use a probit specification and departing from this modeling choice would render results that are not comparable: it would be unclear, for example, whether any observed differences are due to the addition of the accounting method as a control variable or to the change of specification. But using a probit specification also raises an issue. The conditions to qualify for pooling accounting are such that, under pooling, we only observe 100% stock payment. The coefficient of the *Pooling* indicator variable in equation (6) can, therefore, not be estimated in a probit specification. To solve this conundrum, we adopt the cleanest possible alternative, which is replicating the RRV probit models in environments in which pooling was simply not an option (i.e., the *Pooling* indicator variable is essentially equal to zero): the U.S. during the post-pooling period and in foreign countries where pooling was either forbidden or (almost) never used in practice.

3. Data and descriptive statistics

RRV collect a sample of 4,325 bids for 4,025 target firms over the period 1978 to 2001 from the Securities Data Corporation (SDC) database of mergers and acquisitions. RRV use the following sample selection criteria: (1) Acquirer and target are both public firms (according to SDC); (2) Necessary information about the acquirer and target are available in both the Center for Research in Securities Prices (CRSP) and Compustat databases (see Appendix 2); and (3) Both firms are required to have non-zero total assets, book-to-market below 100, and market value of equity greater than US\$10 million, and both successful and unsuccessful bids are included in RRV's sample.

Applying these criteria (some 15 years later) to the same data sources over the same period, we obtain 4,080 announced M&A bids between listed acquirers and targets. The difference between RRV's sample and ours (using exactly the same sampling criteria and data sources) is due to changes in the

SDC database itself through time¹⁷ and the lack of an available CRSP permanent number for the listed target firm. Table 1, Panel A documents the number of M&A deals and average deal size per year in the RRV sample and our sample.¹⁸ The well-known M&A waves are present in both cases. Despite our best efforts, however, there are some differences between the RRV sample and our replication sample. In particular, the average transaction size in our sample is smaller (US\$550 million versus US\$839 million in the RRV sample) and 1,307 have a method of payment that is completely in acquirer stock in our replication sample versus 1,218 in the RRV sample (and our sample consequently has fewer all-cash bids).

Insert Table 1 about here

In Table 1, Panel B we report the percentage of full-stock deals by year of announcement in our sample, and the proportion of these full-stock deals accounted for using the pooling and purchase methods. These statistics deserve several comments.

First, according to SDC data there were no pooling transactions in any year up to 1988, except for 1981, year in which one among 71 transactions in our sample is recorded as accounted for under pooling. This seems quite dubious given that pooling had been allowed by the (precursor to the) FASB since 1970. This questions whether SDC data presents an accurate record of the accounting method choice during that time period (and whether the accounting method reported for that one transaction in 1981 is simply a data error). We decided, therefore, to undertake a significant data validation effort. As our data source to obtain quarterly financial reports (10-Q's filed with the securities and Exchange Commission (SEC)) is the SEC Edgar database, we are limited to the 1993 to 2001 period. For each transaction, we collected the target's 10-Q for the three quarters following the announcement date. We

¹⁷ The SDC database is known to change over time due to back-filling of data (Helen Bollaert and Marieke Delanghe, 2015).

¹⁸ Note that RRV (2005) use SDC data over the period 1978 to 2001 but report mergers from 1977 to 2000 in their corresponding Table 1 (see p. 568).

then searched for the presence of words “pooling of interests” in those filings. This leads us to reclassify 43 transactions in our sample as accounted for under pooling while reported by SDC as accounted for under purchase accounting. This reclassified data is reflected in the percentages reported in Panel B of Table 1 between 1993 and 2001.

Second, it is apparent that pooling was the accounting method of choice during the late 1990s and early 2000s, when stock market valuation ratios were particularly high. Finally, in 2002, three transactions are recorded in SDC as being accounted for under pooling (7.7% of the subsample of the 100% stock deals in that year), while pooling was already abolished. These transactions are the acquisitions of Kerman State Bank by Westamerica Bancorp (announced on 02/26/2002), Massachusetts Fincorp Inc by Abington Bancorp (announced on 04/10/2002), and Franklin Financial Corp by Fifth Third Bancorp (announced on 07/23/2002). In the first case, the corresponding SEC filings mention that the transaction will be accounted for under purchase accounting. In the second case, the SEC filings report that the payment is 60% stock and 40% cash consideration, which is incompatible with accounting for the transaction under pooling. And in third case, we found no mention of pooling of interests in the SEC filings associated with the transaction. These three cases appear therefore to be data errors in the SDC database that have been corrected in our sample.

Figure 1 focuses on the year 2001 and displays the number of full-stock deals per month during the year in which pooling accounting was abolished in the U.S. The sharp drop in the frequency of announced full-stock deals in July is clearly apparent. This corresponds to the enactment of FAS 141, abolishing the use of pooling to account for M&A transactions.

Insert Figure 1 about here

We next use the matching procedure described in RRV to merge data from SDC, CRSP, and Compustat, applying the following rules (which are exactly the same as those described by RRV): (1) To calculate the market-to-book ratio, we match fiscal year-end data from Compustat with CRSP market

values measured three months afterward; (2) We associate CRSP and Compustat data with an announced bid from SDC if the bid announcement occurs at least one month after the date on which the CRSP market value is observed; and (3) If an M&A bid announcement occurs between the fiscal year-end and one month after the date on which the CRSP market value is observed, we match the M&A transaction with data from the prior fiscal year.

Using this matching procedure, we collect financial data on acquirers to compute size, performance, and leverage ratios. Table 2 reports descriptive statistics on these acquirer characteristics, with a comparison between the RRV sample and our replication sample. Variable definitions are provided in Appendix 2: we follow RRV in computing the market-to-book ratio, and specifically use book equity as the denominator (as do RRV).¹⁹ Our replication sample includes smaller acquirers (US\$16,253.55 million average market value of assets versus US\$18,486.55 million average in the RRV sample, with a similar conclusion using book value of assets, market value of equity, property, plant, and equipment (PP&E), long-term debt, capital expenditure, and net income). Our acquirers display also lower operating performance (return on assets of 2.85% versus 5.2% in the RRV sample and return on equity of 7.84% versus 15.2% in the RRV sample) but, importantly, a similar market-to-book ratio (3.55 versus 3.43 in the RRV sample). Finally, we observe that acquirers in our sample (vs. RRV's sample) are more levered, with an average book leverage ratio of 0.65 versus 0.59 and an average market leverage ratio of 0.50 versus 0.44, but display similar quick and current ratios.

In Table 2 we also provide a comparison of acquirer characteristics between the pooling and post-pooling periods (see columns (4) and (5)), using our RRV replication sample for the pooling period. For the post-pooling period, we collect a sample of acquisition bids in the July 2001 to 2017 window using the RRV sample selection criteria described above. This results in a sample of 2,080 acquisition bids announced between July 2001 and 2017.²⁰ In the remainder of this paper we will refer to this sample

¹⁹ This will be important when comparing our results to other references. For example, Faccio and Masulis (2005) and Martin (1996) both use total assets as the denominator and (a proxy for) the market value of asset as the numerator in their measure of Tobin's Q.

²⁰ 100 of the 236 deals announced in 2001 occur in the six months after the abolishment of pooling at the end of June of that year. Therefore, the post-pooling sample size described here starting in July 2001 (2,080) is different than the deal count reported in Table 1 for the post-pooling period (1,980) because Table 1 reports annual observations and starts the post-pooling period with 2002.

as the post-pooling sample. Note that this sample overlaps with the RRV sample for only six months, between July 2001 and December 2001.

Insert Table 2 about here

It appears that during the post-pooling period, acquirers in the sample described above are significantly larger, with an average market value of assets of US\$46,846.95 million versus US\$16,253.55 million during the pooling period. We reach a similar conclusion using the other size measures. Acquirers in the post-pooling sample also display weaker operating performance (with a return of assets of 1.77% versus 2.85% during the pooling period and return on equity of 5.67% versus 7.84%) and lower valuation ratios (with a market-to-book of 3.33 versus 3.55 during the pooling period). The financial structure of acquirers during the pooling and post-pooling periods appears more similar, except for the quick ratio which increases by more than 10% (from 1.99 during the pooling period to 2.23 during the post-pooling period).

As (economically²¹) significant differences exist between the original RRV sample and our replication sample, we will start our investigation by reproducing the RRV multivariate analyses using our replication sample to check whether these differences in sample composition prevent us from reaching the same conclusions as in RRV. We reproduce the market-to-book decomposition from RRV (see Section 4 of their paper), and present descriptive statistics for the decomposition (using RRV's Model III) in Appendix 3. We also replicate Table 7 from RRV (decomposition of the market-to-book ratio at the firm level) in Appendix 4. These descriptive statistics are based on our RRV replication sample plus a control sample of non-merger firms, collected using the same criteria as in RRV. Specifically, as in RRV, a firm-year from Compustat is labeled as an "M&A" observation if the firm

²¹ Note that since we do not have the original RRV sample at our disposal, we are not in position to test the statistical significance of differences highlighted in Table 2.

was involved in an M&A deal as either the acquirer or target (according to SDC data) in the specific year; all other firm-year observations from Compustat are then categorized as “non M&A.”

Like in RRV, in our replication sample (from the pooling period), merger firms display higher market-to-book than non-merger firms and acquirers display higher market-to-book than target firms. These results (which are entirely from the pooling period) are almost completely consistent with the results from Model III in Table 7 in RRV.

4. Firm valuation, merger participation, firm role, and full stock payment

4.1. Replication of the Rhodes-Kropf, Robinson, and Viswanathan (2005) results

In Table 3, we use our replication sample to reproduce the firm-level merger participation (Table 9, Panel A in RRV), role (Table 9, Panel B in RRV), and method of payment choice (Table 9, Panel C in RRV) multivariate analyses. Specifically, in Panel A we use the joint sample of merger and non-merger firm-years (described above) to examine whether the decision to be involved in a deal is a function of the valuation components as decomposed by RRV. The dependent variable in this regression is an indicator variable equal to one if a firm is involved in a merger either as acquirer or target, and zero otherwise. In Panel B, we focus on the sample of merging firms only, and examine whether valuation affects the decision to be an acquirer rather than a target (Panel B: the dependent variable is an indicator equal to one if the firm involved is an acquirer, and zero otherwise (i.e., if it is a target)). Finally, in Panel C, we focus on the choice of method of payment²² and the dependent variable is an indicator equal to one if the method of payment in the deal is a 100% stock swap, and zero otherwise. In Panel C the valuation metrics (i.e., the independent variables) are for the *acquirer*, as they are in RRV’s Table 9. All these panels replicate RRV’s original specifications (Table 9 in RRV), and we also present their coefficient estimates to ease comparability.²³

²² Here, as in RRV, the sample is restricted to deals with known consideration. RRV report 3,559 such deals (see their Table 1). Our sample is composed of 3,465 transactions.

²³ There is one exception to this. In Panel B, studying the likelihood of being an acquirer, we report results both with and without year fixed effects while RRV report their results without fixed effects only. RRV argue (p. 590)

We present results for the baseline specification, using a probit model that includes only the (log) market-to-book ratio as the sole independent variable, and the Model III specification from RRV (which includes their most developed definition of the firm-specific error, the time-series sector error, and the long-run value-to-book as independent variables). Estimates are presented in our Table 3 for pooled models with year fixed-effects (as in Table 9 of RRV). Our results confirm those in RRV for the sample drawn from the pooling period. Specifically, in Panel A of Table 3 firms are more likely to participate in the M&A market when their market-to-book ratio is high, and firm-specific valuation errors have a positive and statistically significant effect on the propensity to participate in the M&A market²⁴.

Insert Table 3 about here

In Panel B we find (as do RRV) that firms are much more likely to be an acquirer rather than a target when they have a high market-to-book ratio or high firm-specific valuation error, conditional on participating in the M&A market to begin with. Crucially in the present case, in Panel C we confirm that in our RRV replication sample highly-valued firms (whether using the book-to-market or the firm-specific valuation error identified in the RRV model) are significantly more likely to pay for an acquisition completely in stock than with cash or a mixed method of payment. We note that our coefficient estimates and significance levels are of about the same magnitude as those in RRV.

that year fixed effects would not affect the results in their regressions because the fraction of acquirers in the sample does not vary over time. In our case, however, the proportion of acquirers is not strictly constant over time in the sample because of the presence of repeat acquirers (and also because of data availability constraints that lead us to lose some acquirers and targets at some point in times). The intensity of repeat acquirers is time-varying and depends on many factors, such as access to credit, the business cycle, and so on (see Jarrad Harford, 2005). Establishing the robustness of our results to the inclusion of year fixed effects is therefore important.

²⁴ Note, however, that in our analysis of whether a firm participates in the M&A market, the market-to-book coefficient is positive and significant even when we include year fixed-effects (Panel A – Column 2) while statistical significance disappears in RRV’s Table 9 with the inclusion of year fixed-effects.

We conclude from these validity checks that, despite some differences in size and composition, our replication sample provides an adequate empirical basis to replicate RRV's results during the 1978 to 2001 period.²⁵

4.2. Post-pooling period evidence

Does the relation between overvaluation and full-stock payment persist in the post-pooling period or was it a transitory anomaly? There are good reasons to believe that the dynamics of the method-of-payment choice changed dramatically right after the RRV sample period ends: pooling accounting (qualification for which was a major motivation to use stock as the method of payment) was abolished by the FASB in June 2001. Section 2 above describes in detail some plausible explanations for why the overvaluation versus stock-payment relation may be very different in the absence of the availability of pooling accounting and the possible implications of omitting the accounting method choice in regressions of the mode of payment on acquirer valuation ratios.

In Table 4, we use our post-pooling sample (all acquisitions are announced from July 2001 to December 2017) to reexamine the results from RRV in light of this dramatic change in regulation right after the end of the sample period in the original RRV paper. The structure of the panels in Table 4 is similar to that in Table 3 above (and also Table 9 in RRV): Panel A examines participation in the M&A market, Panel B looks at whether that participation is in the role of an acquirer or target, and Panel C presents results for regressions explaining the method of payment choice. As in Table 3, we present results for the baseline specification which includes only the (log) market-to-book ratio as the sole

²⁵ One possibility, which we explore in Internet Appendix Table 1, is that acquirers chose the pooling method of accounting in the period before June, 2001, to mask "bad" deals on average. We examine ex-post accounting returns (ROA) in regressions similar to those in Table 7 in Jarrad Harford, Mark Humphery-Jenner, and Ronan Powell (2012). We find that for transactions in the period where pooling was allowed in the U.S., those accounted for using the pooling method of accounting exhibit abnormally high post-deal ROA while those accounted for with the purchase method do not. This is (at least) prima facie evidence that the acquirer's choice of accounting method (and, hence, method of payment) was not influenced by fundamental deal quality. Admittedly, however, we cannot observe the counterfactual: how acquirers during that period would have performed (in terms of post-deal ROA) had their deals been accounted for using purchase rather than pooling.

independent variable and the Model III specification from RRV (which includes the firm-specific error, the time-series sector error, and the long-run value-to-book as independent variables).

In Panels A and B of Table 4, we report the results from multivariate analyses of the decision to participate in the M&A market (Panel A) and the decision to participate as an acquirer (Panel B). The results concerning the market-to-book and the firm-specific RRV misvaluation component in Panels A and B are qualitatively similar to those reported in RRV, the sign of our coefficients are the same and the statistical significance levels are close to those in the original RRV analysis. Given these results, we reach the same conclusion as RRV using multivariate analyses about the effect of broad and firm-specific misvaluation components on the probability of a firm becoming involved in acquisitions and as an acquirer: highly- (or over-) valued firms are more likely than other firms to attempt to buy another firm.

Insert Table 4 about here

Where we diverge from RRV, however, is in the effect of valuation on the choice of method of payment: as can be seen in Panel C in Table 3, in the post-pooling period the acquirer's raw (log) market-to-book ratio does *not* positively predict full-stock payment in M&A deals as it did in RRV's analysis based solely in the pooling period. In fact, the coefficient on this variable is significantly *negative*, implying that highly-valued acquirers are *less* likely to use their own equity as the method of payment in an M&A deal. This result is consistent with the market-to-book ratio being a proxy for future growth opportunities (as argued in Martin, 1996 and Faccio and Masulis, 2005), as acquirers anticipating a period of high growth should be more reluctant to share benefits of this growth with the target shareholders. When we turn our attention to the components of the RRV decomposition in columns (3) and (4), we again find no support for the contention that highly- (or over-) valued acquirers are more likely to offer their target a full stock swap. Contrary to the strongly positive coefficient on the firm-specific error component of valuation (m_f_RRV) that RRV report for the pooling period, in our analysis

of M&A deals focused solely on the post-pooling period the coefficient on the firm-specific error component of valuation is statistically insignificant. Reflecting the fact that the negative coefficient on the market-to-book ratio in columns (1) and (2) must be driven by one of these components of valuation, the third RRV misvaluation components (m_b_RRV) has a significantly *negative* coefficient in Panel C of Table 4 (as opposed to the large and significantly positive coefficients reported in the original pooling-period results reported by RRV).

This collection of results presents substantial challenges for what is often thought of as the misvaluation theory of mergers. On the one hand, we confirm (in our Panels A and B of Table 4) the RRV results that, even in the post-pooling period, overvalued firms appear more likely to participate in the M&A market, and are more likely to do so in the role of an acquirer. On the other hand, our results in Panel C cast doubt on the predictive power of acquirer valuation to explain the use of stock as a merger currency.

Our interpretation of this contradictory evidence is that it is likely that many of these extant findings (such as those discussed above, but also potentially the higher target premiums and lower acquirer announcement returns for overvalued acquirers in Dong et al., 2006 and Fu et al., 2013) will eventually be explained by endogeneity or omitted variables, much as the method of payments results have been shown to be in this paper and in Eckbo et al. (2018). Specifically, the same factors that make a potential acquirer's stock highly- (or over-) valued (market optimism about firm-specific growth prospects, for example) likely reflect factors that also explain that firm's acquisitiveness (which drives that expected growth). Therefore, while there is almost certainly a correlation between valuations and, for example, participation in the M&A market, we do not believe these relations to be causal (much as the relation between valuation and the method of payment is likely not causal). While it is beyond the scope of this paper (which is focused on the method of payment relation) to design thorough tests of this speculation, we believe that further research will support the conclusion that many of these relations are simply not causal.

Insert Table 5 about here

In Table 5 we investigate whether results reported in Tables 3 and 4 are robust to alternative empirical choices. In Panel A of Table 5 we reduce the sample period to a four-year window around the abolishment of pooling. As in Panel C of Table 3, the acquirer's (log) market-to-book ratio does positively predict full-stock payment in M&A deals during the pooling period (from 1999 to June 2001) but, as in Panel C of Table 4, it fails to do so after pooling is abolished (from July 2001 to 2003). We obtain a similar result using the firm-specific error component of valuation (m_f_RRV).

In Panel B of Table 5, we exclude 100% stock transactions and use the percentage of stock in the payment package as the dependent variable. We use a tobit specification to model this censored variable.²⁶ While during the pooling period the (log) market-to-book ratio (weakly) maintains its statistical significance in explaining the method of payment, the firm-specific error component of valuation (m_f_RRV) coefficient is no longer significant in this specification. After the abolishment of pooling, the (log) market-to-book coefficient becomes negative (and statistically significant) while the firm-specific error component of valuation (m_f_RRV) fails again to significantly predict the use of stock payment in an M&A deal. These results demonstrate that a sample of deals with 100% stock payment is generally necessary to replicate the RRV results even in the pooling period, consistent with the desire to qualify for pooling fundamentally driving the method of payment choice (since 100% stock payment was required to qualify for pooling before June 2001).

Finally, we also check whether we obtain comparable results during M&A waves after the abolishment of pooling. We identify two M&A waves in the post-July 2001 period: 2003 to 2008 (the "sixth merger wave", George Alexandridis, Christos Mavrovutis, and Nickolaos Travlos, 2012) and 2011 to 2017. Our results (untabulated, but available from the authors by request) are similar in these two sub-periods compared to the full sample results in Panel C of Table 4.

²⁶ We obtain qualitatively similar results (available by request) if we revert to a probit specification and code the dependent variable as one if the percentage of stock used as consideration is above 80%.

What these results imply is that the link between acquirer equity overvaluation and the use of full stock payment is broken by the change in regulation that prohibited the use of pooling accounting in acquisitions. This link, which is very strong in the RRV paper and has become widely accepted in the academic finance profession, appears to be a transitory anomaly: it simply doesn't exist in analyses using data solely from the post-pooling period. Omitting the accounting method choice under which the transaction is recorded appears to generate a significant enough omitted variable bias to lead to erroneous conclusions.

4.3. International evidence

Another environment that we investigate for evidence concerning whether pooling is the factor driving the apparent relation between the RRV misvaluation components and the decision to pay fully in stock is in countries that either did not allow pooling at all or did so with such restrictive conditions that, in practice, accounting under pooling was not used. We first select the same sample of European countries as in Faccio and Masulis (2005): Austria, Belgium, Finland, France, Germany, Ireland, Italy, Norway, Portugal, Spain, Sweden, Switzerland, and the UK. We next focus on Australia. Our data sources are the SDC database for M&A transactions and Worldscope for accounting and financial information. Amel-Zadeh, et al. (2016) report that pooling accounting was not commonly used in these countries, a fact confirmed by data collected from SDC (see the discussion in Section 2.5.).

Testing whether misvaluation was driving the probability of full-stock payment in other countries outside the U.S. only makes sense if stock market valuation levels undergo significant variations through time in these countries as they did in the U.S. Figure 2 displays the evolution of the equally-weighted average market-to-book ratio from 1980 to 2016 for the U.S., the U.K., our set of European Union (E.U.) countries and Australia. For each country, we collect market values and book values of equity for all firms in the Worldscope database. Figure 2 confirms that time-series fluctuations of valuation levels in these foreign countries are comparable to those observed in the U.S. Moreover, the correlations between these curves are striking (and confirmed by simple pairwise correlation

coefficients that are around 0.6 or above in all cases, except between Australia and the U.S. for which the correlation coefficient is 0.21).

Insert Figure 2 about here

We report coefficients from regressions like those in RRV explaining the probability of full-stock payment for the period from 1990 (due to data availability) to the end of June 2001 (despite the fact that the regulatory change in question in this paper did not affect firms from those countries, as it was a change in accounting policy in the U.S.) and also from July 2001 to the end of 2017. The coefficients from these regressions are reported in Table 6, and Table 6 is organized the same way as Panel C in Tables 3 or 4. Columns 1 to 4 contain results for the E.U. countries, columns 5 to 8 for the U.K. alone, and columns 9 to 12 for Australia. Panel A in Table 6 is for the pooling period while Panel B is for the post-pooling period (again, despite the fact that the break point between these two accounting regimes in the middle of 2001 would not have been meaningful for these non-U.S. firms).

The results are again unambiguous. Concerning the pooling period (Panel A), neither the (log) market-to-book ratio nor the firm-specific RRV misvaluation component are statistically significant for any of these groups of countries.²⁷ During the post-pooling period (Panel B), the (log) market-to-book ratio is *negatively* and significantly correlated with the probability of full-stock payment for E.U. countries and the U.K. Its coefficient is also negative in the Australian sample, but is not statistically significant in those columns (9 – 10). We obtain similar negative coefficient estimates concerning the firm-specific RRV misvaluation component, not statistically significant for the E.U. countries and the U.K. and statistically significant in the Australian sample. The international evidence confirms that, in

²⁷ We obtain similar results when we restrict the sample period for the analysis to start in 1993. We do this (unreported) robustness test for several reasons. First, there may be concerns about the quality of SDC data for transactions prior to that (see our discussion above about SDC data-quality issues). Second, the evidence discussed above (from Amel-Zadeh, et al., 2016) suggests that the use of pooling was only uncommon in these non-U.S. countries after 1992 (its use was optional prior to that). In an additional (unreported) robustness test, we repeat these analyses excluding foreign firms cross-listed in the U.S., as they may be affected by the change in regulations in the U.S.: again, our results are unaffected.

absence of the opportunity to account for M&A transactions under pooling, the link between misvaluation proxies and the choice of full-stock payment disappears, even during the period overlapping the intensive use of pooling in the U.S.

Our results appear to stand in contrast with those reported in Faccio and Masulis (2005) and Xiao Gang Bi and Alan Gregory (2011). The former authors report a positive correlation between the percentage of stock in M&A offers and their measure of bidder investment opportunities (which is basically Tobin's Q) for their European sample (and their U.K. subsample) between 1997 and 2000. The latter study provides similar evidence over the period 1985 to 2004 using valuation metrics that are either based on a residual-income model or the (raw) book-to-market ratio. In Bi and Gregory (2011) the dependent variable is set equal to one if the merger offer made by the acquirer contains *any* of the acquirer's equity. The differences between those studies and ours could arise from different sample periods, different valuation metrics (i.e., the independent variables), or, importantly, different dependent variables (our dependent variable is an indicator for 100% stock payment). Also worthy of note is the fact that the econometric specifications in both Bi and Gregory and Faccio and Masulis lack year fixed-effects, which potentially causes problems with interpretation since the sample periods in both studies include the internet bubble episode.

Insert Table 6 about here

4.4. Robustness checks

As additional robustness checks, we investigate whether our results are affected by the internet bubble or the 2008 financial crisis (results reported in the Internet Appendix Tables 2 and 3). To check the robustness of our results to the inclusion of the internet bubble in our sample period, we replicate Table 3, Panel C for the pooling period (1978 to end of June 2001) and Table 4, Panel C for the post-pooling period (July 2001 to 2017) excluding high tech firms from our sample. High tech firms are identified using the Charles Kile and Mary Phillips (2009) SIC-code based classification. As in Panel C

of Tables 3 and 4, the coefficient on the RRV firm-specific misvaluation component is positive and highly significant during the pooling period but loses its significance in the post-pooling period (either with or without the inclusion of year fixed-effects). We note also that for the sample excluding high tech firms, the coefficient on the (log) the market-to-book ratio is negative and significant during the post-pooling period, confirming the results in Table 4, Panel C.

Our second robustness check focuses on the 2008 financial crisis. We replicate our analyses using the post-pooling but pre-financial crisis period (July 2001 to 2007) and the post-pooling and post-financial crisis period (2009 to 2017).²⁸ The coefficient on the RRV firm-specific misvaluation component is not statistically significant in either post-pooling subperiod excluding the financial crisis, while the coefficient on the (log) market-to-book ratio is negative and statistically significant in both periods. These results again fail to support the misvaluation hypothesis for the choice of stock as the sole method of payment.

5. Additional evidence

In an effort to more clearly identify the incentives to opt for full-stock payment during the pooling period, we discriminate in that period between transactions (i) paid fully or partially in cash, (ii) paid fully in stock and recorded under pooling accounting, and (iii) paid fully in stock and recorded under purchase accounting. Table 7 reports results obtained using probit regressions for the choice between (i) and (ii) (i.e., cash vs. stock-pooling) in columns (1) to (4) and for the choice between (i) and (iii) (i.e., cash vs. stock-purchase) in columns (5) to (8). A striking result emerges: while the RRV firm-specific misvaluation component is significant in explaining the choice of stock as the method of payment when pooling accounting is used, it is not significant when purchase accounting is used by the acquirer. In other words, our results show that the RRV firm-specific misvaluation component is only able to significantly explain the choice of full-stock payment and pooling accounting *as a package*, but is *not* able to explain the choice between cash and full-stock payment coupled in the absence of pooling. We

²⁸ We exclude the 2008 year from this analysis because that year was the nadir of the financial crisis.

also observe that the (log) market-to-book ratio is itself not a significant predictor of opting for full-stock payment and recording the transaction under purchase accounting when year fixed-effects are included in the regression (column (6)). These results again suggest strongly that the observed link between acquirer equity overvaluation and the use of full-stock payment is conditional on the availability of pooling as an accounting choice in acquisitions.

Insert Table 7 about here

As a second additional investigation, we test the following prediction about the probability to participate in the M&A market as an acquirer: if full-stock payment was (at least partially) motivated by the desire to qualify for pooling accounting during the pooling period, and if this incentive was stronger for highly-valued acquirers, we should observe that the relation between M&A market participation as an acquirer and high valuation (see Table 4, Panel B) weakens during the post-pooling period. In Table 8 we report a direct test of this prediction. Table 8 replicates Table 3, Panel B but with a sample combining the pooling (from 1978 to end of June 2001) and post-pooling (from July 2001 to 2017) periods (i.e., combining the samples from Tables 3 and 4). This allows us to include in the specification interactions between an indicator variable called *Post* that identifies transactions taking place during the post-pooling period, the (log) market-to-book ratio (columns (1) and (2)) and the RRV misvaluation components (columns (3) and (4)).²⁹

As predicted, the coefficient of the interaction term between *Post* and the firm-specific RRV misvaluation component is negative and highly statistically significant, with and without year fixed-effects. The interaction term between *Post* and the (log) market-to-book ratio is negative and significant in the absence of year fixed-effects (column (1)) but loses significance once year fixed-effects are included in the specification (column (2)). These results support the notion that highly valued firms

²⁹ Because the interpretation of coefficients of interaction terms in non-linear models raises difficulties (William Greene, 2010), we check whether we obtain similar results using a linear probability model, and this is the case.

wanted to undertake acquisitions more if they could qualify for pooling, as claimed by numerous CEOs at that time (see the Barry Diller quote in Section 2, as an example). The results also reveal that the abolishment of pooling in 2001 has had a profound impact on the M&A market, substantially modifying the composition of the population of acquirers and targets.

Insert Table 8 about here

Taken together, our results suggest that the RRV conclusions about the method of payment in M&A deals are driven by the availability of pooling as an accounting choice. Highly-valued acquirers desired to use pooling accounting for their M&A deals, and because pooling accounting was only acceptable to the FASB if the deal was a full stock-swap, this prompted highly-valued acquirers to use their own equity as the sole method of payment. This link was misinterpreted in the literature to be a link between (over)valuation and the method of payment in mergers and acquisitions, a link that was severed when the FASB disallowed pooling in June 2001.

6. Conclusions

The method of payment in M&A transactions has been closely examined in the finance literature. The Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004) theories of the use of stock as an acquisition currency argue that acquirer equity misvaluation is a key driver of the choice of the method of payment. Rhodes-Kropf, Robinson, and Vishwanathan (2005) report empirical results supporting this notion that the method of payment choice is at least partly dictated by opportunistic behavior on the part of the acquirer (i.e., paying with their own overvalued stock).

In this paper, we investigate the mechanism that lead to this erroneous interpretation of the empirical results in Rhodes-Kropf, Robinson, and Vishwanathan (2005). Our thesis is that during the period in which pooling accounting was allowed by the FASB in the U.S. (1970 – June 2001) these accounting regulations provided an artificial incentive for overvalued acquirers to use full stock swaps

to buy their targets, especially during periods of high general valuations. As we demonstrate using data from the post-pooling period and foreign countries, however, once those regulatory incentives are taken away (as they were starting in July 2001) the link between acquirer valuation and the choice to conduct a full stock-swap in an M&A deal is broken. Omitting to account for the choice of the pooling accounting method in their regressions exposed Rhodes-Kropf, Robinson, and Vishwanathan (2005) to the classic omitted variables bias, leading to invalid inferences. Our results also reveal that changes in accounting regulations can have a dramatic impact on behavior in financial markets, most importantly even in the absence of direct cash-flow implications.

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Figure 1 – Full stock deals during 2001

Description: Figure 1 presents the number of full-stock M&A deals during the year in which pooling accounting was abolished in the U.S. Pooling was abolished on June 30, 2001.

Interpretation: Figure 1 highlights the sharp drop in the number of full stock transactions around the abolition of pooling in June 2001.

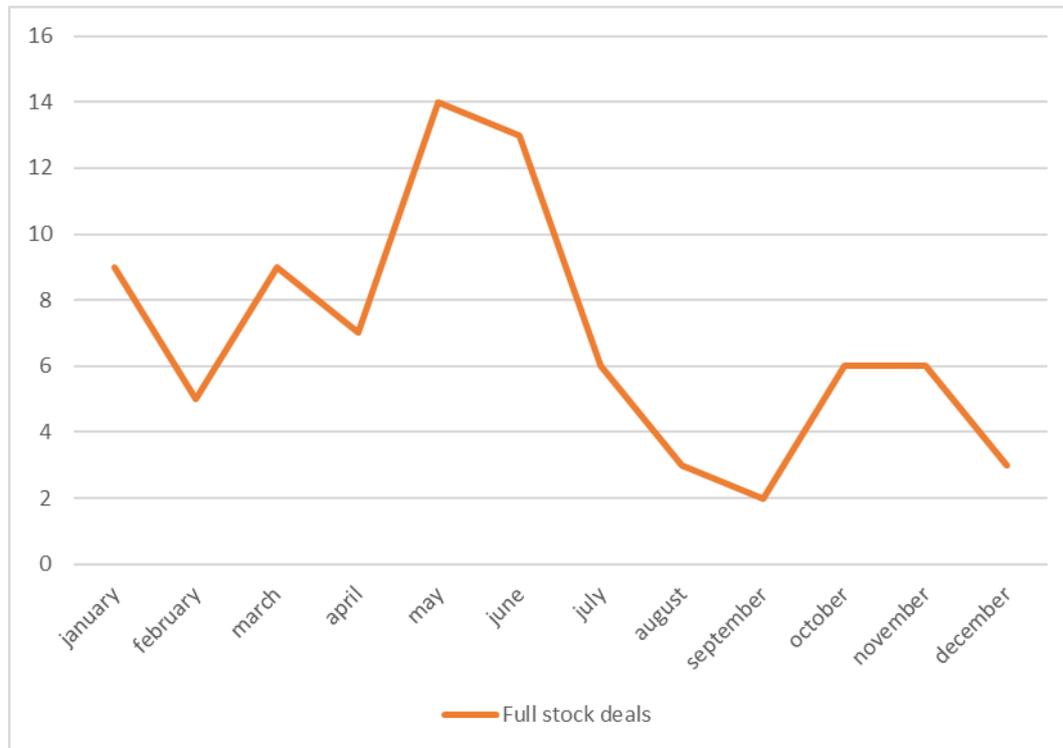


Figure 2 – Market-to-Book Ratios: International Evidence

Description: Figure 2 displays the evolution of the equality-weighted average market-to-book ratios from 1980 to 2016 for the four geographical areas under scrutiny in Section 4. The E.U. set is composed of Austria, Belgium, Finland, France, Germany, Ireland, Italy, Norway, Portugal, Spain, Sweden, Switzerland, and the UK (as in Faccio and Masulis, 2005). For each of the countries, the sample of firms is composed of all firms for which the Worldscope database reports the market value and book value of equity.

Interpretation: Figure 2 provides evidence that average market-to-book ratios are strongly positively correlated across the set of countries included in our tests, suggesting that our international evidence should also be valuable in assessing the relation between (over)valuation and the use of stock in M&A deals.

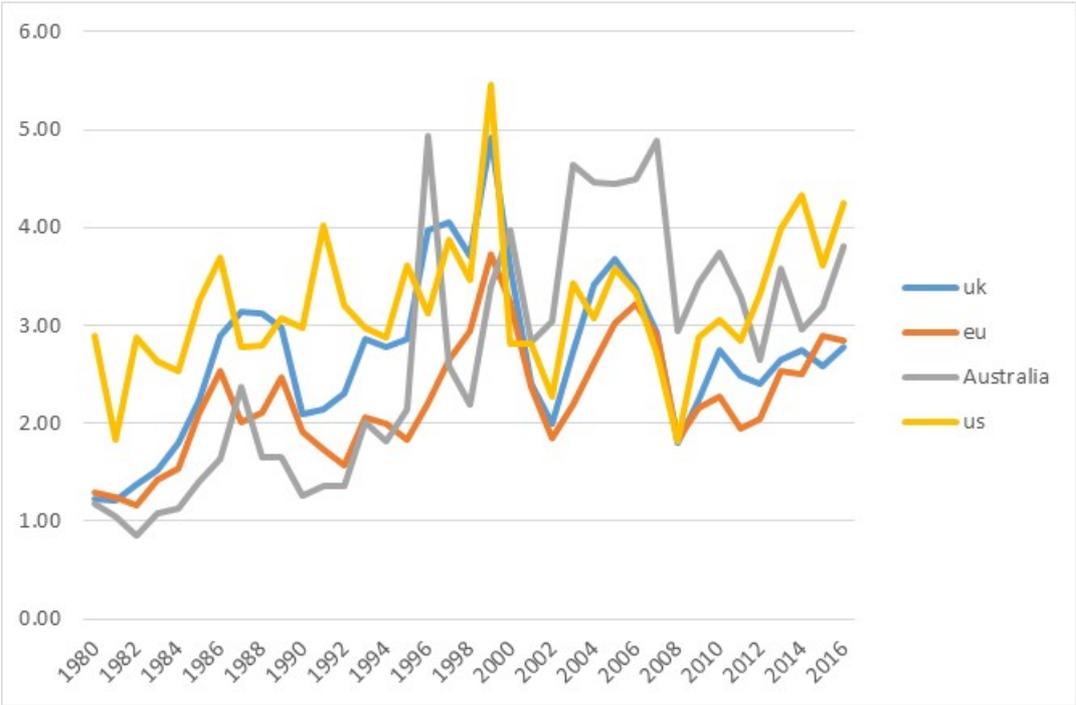


Table 1 – M&A Sample Descriptive Statistics

Description: Table 1 presents descriptive statistics for the RRV (Rhodes-Kropf, et al., 2005) sample and our replication M&A sample (“Ours”). Panel A presents a comparison of yearly M&A frequencies and average deal size between the RRV sample and our replication M&A sample. M&A transactions are collected from the SDC database and are required to have the necessary information available in the CRSP and Compustat databases. Sample selection criteria are reported in Section 3. *Deal Size* is the average nominal deal value in US\$ million as reported in the SDC database. *All Stock* and *All Cash* refer to transactions paid fully in acquirer stock or cash. Panel B presents, for our sample, the proportion of full-stock deals by year, and the proportion of these full-stock deals that use pooling or purchase accounting.

Interpretation: Our sample expands the data analyzed in RRV up to 2017, covering the post-pooling period (from July 2001 to December 2017). During the overlapping period (1978 to June 2001), the sample sizes from their paper and ours are of comparable magnitude.

Panel A

Year	<u>Acquisition Bids</u>		<u>All Stock</u>		<u>All Cash</u>		<u>Deal Size</u>	
	RRV (1)	Ours (2)	RRV (5)	Ours (6)	RRV (7)	Ours (8)	RRV (9)	Ours (10)
1978	11	8	4	3	7	4	434.7	207
1979	11	8	1	1	4	7	88.3	276
1980	18	5	0	0	3	0	310.2	761
1981	61	71	1	1	4	4	856.5	745
1982	63	70	0	1	0	0	270.6	197
1983	95	71	2	0	9	2	307.8	241
1984	104	122	7	4	34	6	251.6	283
1985	113	135	17	24	55	48	406.2	276
1986	144	145	14	26	81	60	300.1	272
1987	164	150	25	25	95	59	273.7	305
1988	141	160	20	19	70	61	175.0	278
1989	141	168	28	42	66	58	362.6	281
1990	101	121	19	24	49	33	274.4	276
1991	108	128	31	37	32	22	233.8	184
1992	99	129	24	53	43	20	227.9	124
1993	170	160	51	62	69	41	460.4	197
1994	255	256	96	108	98	58	259.5	237
1995	315	264	100	103	124	62	568.8	313
1996	367	301	141	110	116	63	716.7	430
1997	413	340	157	168	116	48	713.4	600
1998	426	351	154	153	127	67	1,840.1	838
1999	451	368	160	149	160	82	1,420.9	1,333
2000	395	313	124	116	137	74	1,665.7	915
2001	159	236	42	78	43	54	993.9	845
2002	-	164	-	40	-	48	-	637
2003	-	162	-	44	-	42	-	778
2004	-	148	-	42	-	35	-	2,113
2005	-	155	-	31	-	45	-	1,694
2006	-	162	-	25	-	68	-	1,962
2007	-	152	-	20	-	64	-	997
2008	-	117	-	20	-	55	-	1,938
2009	-	94	-	20	-	26	-	2,131
2010	-	100	-	13	-	46	-	1,111
2011	-	70	-	13	-	29	-	1,632
2012	-	88	-	19	-	38	-	856
2013	-	84	-	12	-	32	-	952
2014	-	122	-	23	-	41	-	3,067
2015	-	126	-	20	-	42	-	4,413
2016	-	120	-	19	-	50	-	3,443
2017	-	116	-	34	-	34	-	2,695
1978-2001	4,325	4,080	1,218	1,307	1,542	933	839	550
2002-2017	-	1,980	-	395	-	695	-	1,873

Panel B

Year	% All stock (1)	% All Stock Pooling (2)	% All Stock Purchase (3)
1978	42.9%	0.0%	100.0%
1979	12.5%	0.0%	100.0%
1980	0.0%	-	-
1981	1.5%	100.0%	0.0%
1982	1.4%	0.0%	100.0%
1983	0.0%	-	-
1984	3.6%	0.0%	100.0%
1985	20.5%	0.0%	100.0%
1986	20.5%	0.0%	100.0%
1987	18.1%	0.0%	100.0%
1988	14.5%	0.0%	100.0%
1989	27.9%	12.2%	87.8%
1990	23.5%	16.7%	83.3%
1991	33.0%	33.3%	66.7%
1992	49.1%	41.5%	58.5%
1993	43.4%	51.6%	48.4%
1994	49.8%	58.9%	41.1%
1995	44.2%	58.8%	41.2%
1996	43.2%	66.7%	33.3%
1997	54.8%	79.3%	20.7%
1998	48.9%	86.3%	13.7%
1999	46.1%	63.5%	36.5%
2000	42.5%	41.4%	58.6%
2001	35.2%	15.8%	84.2%
2002	26.4%	7.7%	92.3%
2003	30.5%	0.0%	100.0%
2004	30.4%	0.0%	100.0%
2005	21.7%	0.0%	100.0%
2006	16.6%	0.0%	100.0%
2007	13.9%	0.0%	100.0%
2008	18.5%	0.0%	100.0%
2009	23.3%	0.0%	100.0%
2010	14.0%	0.0%	100.0%
2011	19.4%	0.0%	100.0%
2012	22.4%	0.0%	100.0%
2013	14.5%	0.0%	100.0%
2014	19.7%	0.0%	100.0%
2015	16.3%	0.0%	100.0%
2016	16.1%	0.0%	100.0%
2017	30.4%	0.0%	100.0%
1978-2001	36.7%	53.2%	46.8%
2002-2017	21.5%	0.8%	99.2%

Table 2 - Characteristics of Acquirers: Descriptive Statistics

Description: Table 2 reports a set of descriptive statistics for acquirer characteristics, with a comparison between the RRV (Rhodes-Kropf, et al., 2005) sample and the sample we use to replicate the RRV results (“Ours”). This table also contains a test of difference of means for characteristics in our sample between the pooling period (1978 to end of June 2001) and the post-pooling period (July 2001 to 2017). Size, performance and leverage indicators are computed using data collected from the Compustat database, and all variables are defined in Appendix 2. Reported statistics are yearly averages. $t(diff)$ is the t-statistic for a difference of means test between the pooling and the post-pooling periods, with a correction for unequal variance across groups. Ratios are winsorized at 1% in each tail to control for outliers. *, **, or *** indicates statistical significance at the 10%, 5%, or 1% confidence level (respectively).

Interpretation: Acquirer descriptive statistics are significantly different between the pooling period (up to June 2001) and post-pooling period (from July 2001) in terms of size, valuation, capital structure, and performance.

Variable	Pooling Period		Post-Pooling Period	t(diff)	
	RRV	Ours	Ours		
	(1)	(2)	(3)	H ₀ : (3) – (2) = 0	
<i>Sample size</i>	4,325	3,980	2,080		
<i>Size</i>					
Market value (assets)	18,486.55	16,253.55	46,846.95	8.37	***
Book assets	11,516.44	10,187.36	33,664.34	7.03	***
Market equity	9,733.78	8,151.01	20,732.03	9.91	***
Book equity	2,518.64	1,896.67	6,694.25	11.72	***
PP&E	1,869.88	1,349.86	3,224.79	7.15	***
Long-term debt	1,596.73	1,200.72	4,889.75	9.19	***
Capital expenditure	466.12	408.00	620.48	3.98	***
Net income	401.63	328.59	1,132.35	10.37	***
<i>Performance</i>					
Return on assets	0.0520	0.0285	0.0177	-2.82	***
Return on equity	0.1520	0.0784	0.0567	-1.70	*
Market-to-book	3.43	3.55	3.33	-1.86	*
<i>Leverage</i>					
Leverage (book)	0.59	0.65	0.63	-2.18	**
Leverage (market)	0.44	0.50	0.47	-2.98	***
Quick ratio	2.00	1.99	2.23	3.14	***
Current ratio	2.52	2.50	2.61	1.36	

Table 3 - Rhodes-Kropf et al. (2005) Replication

Description : Table 3 replicates RRV's (Rhodes-Kropf, et al., 2005) main empirical results. Panel A focuses on the probability that a firm participates in the M&A market, Panel B on the probability of the firm being an acquirer conditional on participation, and Panel C on the probability that the M&A deal involves full-stock payment for the target. The RRV columns contain the results reported by RRV in their Table 9 and the Ours columns report results that we obtain using our replication sample. *Baseline* and *Model 3* present results using the log of the market-to-book ratio ($\ln(mb)$) and RRV model 3 market-to-book decomposition (see Equation 15 in RRV and Appendix 2 in this paper for definitions of m_f_RRV , m_s_RRV and m_b_RRV). The odd columns do not include year fixed-effects while the even columns do. All regressions are probit models where the dependent variables are indicator variables that equal one if the firm participates in the M&A market in that year (Panel A), if the firm participates as an acquirer (Panel B), and if the method of payment in the acquisition is completely acquirer equity (Panel C); and zero otherwise. The M&A sample is introduced in Table 1, and all variables are defined in Appendix 2. *T-statistics* are reported in parentheses below corresponding coefficients. *, **, or *** indicates statistical significance at the 10%, 5%, or 1% confidence level (respectively).

Interpretation: We obtain results comparable to RRV using our replication sample over the pooling period, whether we focus on market participation, acquirer status, or full-stock payment.

Panel A - M&A Market Participation

Valuation Component	RRV				Ours			
	Baseline		Model 3		Baseline		Model 3	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$\ln(mb)$	0.088*** (15.95)	-0.034 (-1.19)			0.0610*** (10.36)	0.0131** (2.10)		
m_f_RRV			0.209*** (24.13)	0.206*** (4.02)			0.1556*** (15.49)	0.1577*** (15.85)
m_s_RRV			0.722*** (28.38)	-0.233** (-1.90)			0.6583*** (29.28)	0.3320*** (11.16)
m_b_RRV			-0.083*** (-10.59)	-0.125*** (-3.28)			-0.1254*** (-14.63)	-0.1359*** (-15.86)
year FE	no	yes	no	yes	no	yes	no	yes
N	n.a.	n.a.	n.a.	n.a.	89,510	89,510	89,510	89,510

Panel B - Acquirer Status

Valuation Component	RRV				Ours			
	Baseline		Model 3		Baseline		Model 3	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
ln(mb)	0.097*** (6.86)	-			0.1677*** (9.72)	0.1918*** (10.44)		
m_f_RRV			0.379*** (18.00)	-			0.4622*** (15.51)	0.4663*** (15.70)
m_s_RRV			0.491*** (8.39)	-			0.3867*** (7.11)	0.7397*** (10.46)
m_b_RRV			-0.229*** (-11.27)	-			-0.1398*** (-5.65)	-0.1215*** (-4.85)
year FE	no	yes	no	yes	no	yes	no	yes
N	n.a.	n.a.	n.a.	n.a.	8,318	8,318	8,318	8,318

Panel C - Full Stock Payment

Valuation Component	RRV				Ours			
	Baseline		Model 3		Baseline		Model 3	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
ln(mb)	0.232*** (14.35)	0.179*** (10.11)			0.2172*** (7.88)	0.0993*** (3.36)		
m_f_RRV			0.146*** (6.33)	0.116*** (5.02)			0.2003*** (4.63)	0.2103*** (4.82)
m_s_RRV			0.643*** (10.53)	0.373*** (5.70)			0.7976*** (9.70)	0.0060 (0.05)
m_b_RRV			0.236*** (10.87)	0.219*** (9.92)			0.0505 (1.22)	0.0056 (0.13)
year FE	no	yes	no	yes	no	yes	no	yes
N	n.a.	n.a.	n.a.	n.a.	3,465	3,465	3,465	3,465

Table 4 - Post-Pooling Period Results

Description: Table 4 displays results obtained estimating the same models as in Table 3 but using our sample from the post-pooling period (July 2001 to 2017). Panel A focuses on the probability of a firm participating in the M&A market, Panel B on the probability of the firm being an acquirer conditional on participation, and Panel C on the probability that the M&A deal involves full stock payment for the target. *Baseline* and *Model 3* present results using the log of the market-to-book ratio ($\ln(mb)$) and RRV model 3 market-to-book decomposition (see Equation 15 in RRV and Appendix 2 in this paper for definitions of m_f_RRV , m_s_RRV and m_b_RRV). The odd columns do not include year fixed-effects while the even columns do. The M&A sample is introduced in Table 1, and all variables are defined in Appendix 2. *T-statistics* are reported in parentheses below corresponding coefficients. *, **, or *** indicates statistical significance at the 10%, 5%, or 1% confidence level (respectively).

Interpretation: While the market participation and acquirer status results from RRV survive during the post-pooling period, the full-stock payment result disappears.

Panel A - M&A Market Participation

Valuation Component	Post-pooling			
	Baseline		Model 3	
	(1)	(2)	(3)	(4)
$\ln(mb)$	0.0507*** (6.24)	0.0452*** (5.30)		
m_f_RRV			0.1346*** (11.38)	0.1362*** (11.40)
m_s_RRV			0.1301*** (3.55)	0.0522 (1.10)
m_b_RRV			-0.0513*** (-4.10)	-0.0567*** (-4.46)
year FE	no	yes	no	yes
N	55,343	55,343	55,343	55,343

Panel B - Acquirer Status

Valuation Component	Post-pooling			
	Baseline		Model 3	
	(1)	(2)	(3)	(4)
$\ln(mb)$	0.1571*** (5.86)	0.1602*** (5.84)		
m_f_RRV			0.2756*** (7.26)	0.2774*** (7.28)
m_s_RRV			0.1277 (1.30)	0.0486 (0.39)
m_b_RRV			0.0355 (0.93)	0.0434 (1.12)
year FE	no	yes	no	yes
N	3,670	3,670	3,670	3,670

Panel C - Full Stock Payment

Valuation Component	Post-pooling			
	Baseline (1)	(2)	Model 3 (3)	(4)
ln(mb)	-0.1685*** (-3.60)	-0.1760*** (-3.66)		
m_f_RRV			0.0690 (1.10)	0.0640 (1.00)
m_s_RRV			-0.0236 (-0.14)	-0.0285 (-0.15)
m_b_RRV			-0.4350*** (-6.88)	-0.4499*** (-6.94)
year FE	no	yes	no	yes
N	1,931	1,931	1,931	1,931

Table 5 – Additional evidence

Description: Table 5 replicates the analyses in Table 3 and 4 Panel C (determinants of the probability to pay in stock) with alternative empirical specifications. In Panel A, we use a four-year sample period centered on pooling abolishment (from 1999 to 2003) in place of the full period (from 1978 to 2017). In Panel B, full stock transactions are excluded from the sample, the dependent variable is the percentage of stock used as consideration, and a tobit model for censored data is employed. *Baseline* and *Model 3* present results using the log of the market-to-book ratio ($\ln(mb)$) and RRV model 3 market-to-book decomposition (see Equation 15 in RRV and Appendix 2 in this paper for definitions of m_f_RRV , m_s_RRV and m_b_RRV). We report results without year fixed-effects (Columns 1 and 3) and with year fixed-effects (Columns 2 and 4) and using the log of the market-to-book ($\ln(mb)$) (Columns 1 and 2) and RRV model 3 market-to-book decomposition. The M&A sample is introduced in Table 1, and all variables are defined in Appendix 2. *T-statistics* are reported in parentheses below corresponding coefficients. *, **, or *** indicates statistical significance at the 10%, 5%, or 1% confidence level (respectively).

Interpretation: The results in Tables 3 and 4 are confirmed using a shorter window (four years around the abolishment of pooling). Excluding 100% stock transactions, the firm specific component of misvaluation loses its significance during both the pooling and the post-pooling periods.

Panel A – Four-year window centered on pooling abolishment

Valuation Component	Pooling period (1999 - June 2001)				Post-pooling period (July 2001 - 2003)			
	Baseline		Model 3		Baseline		Model 3	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
$\ln(mb)$	0.1606*** (3.30)	0.1599*** (3.29)			-0.0420 (-0.55)	-0.0408 (-0.53)		
m_f_RRV			0.2001*** (2.75)	0.2000*** (2.75)			0.0540 (0.55)	0.0537 (0.54)
m_s_RRV			0.1574 (1.08)	0.1545 (1.06)			-0.2618 (-0.97)	-0.1616 (-0.56)
m_b_RRV			0.1105 (1.29)	0.1102 (1.29)			-0.1340 (-1.10)	-0.1523 (-1.22)
year FE	no	yes	no	yes	no	yes	no	yes
N	720	720	720	720	379	379	379	379

Panel B – Full stock payment excluded – tobit specification

Valuation Component	Pooling period				Post-pooling period			
	Baseline		Model 3		Baseline		Model 3	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
ln(mb)	0.0894*** (2.58)	-0.0400 (-1.03)			-0.1666*** (-4.95)	-0.1749*** (-5.07)		
m_f_RRV			-0.0217 (-0.39)	-0.0191 (-0.37)			0.0081 (0.18)	0.0042 (0.09)
m_s_RRV			0.6713*** (7.38)	-0.2439* (-1.79)			0.2096** (2.01)	0.1151 (1.02)
m_b_RRV			0.0265 (0.50)	-0.0352 (-0.65)			-0.3831*** (-9.10)	-0.3862*** (-9.08)
year FE	no	yes	no	yes	no	yes	no	yes
N	2,195	2,195	2,195	2,195	1,520	1,520	1,520	1,520

Table 6 – International Evidence

Description: Table 6 displays results obtained estimating the same probit models as in Table 3, Panel C (the probability that the M&A deal involves full-stock payment for the target) but using a sample of international deals from the 1990-2017 period. Panel A reports results for the pooling period (1990 to June 2001) and Panel B for the post-pooling period (July 2001 to 2017). The table displays results for deals in subsamples of international countries: all EU countries (columns (1) to (4)), the UK only (columns (5) to (8)), and Australia (columns (9) to (12)). *Baseline* and *Model 3* present results using the log of the market-to-book ratio ($\ln(mb)$) and RRV model 3 market-to-book decomposition (see Equation 15 in RRV and Appendix 2 in this paper for definitions of m_f_RRV , m_s_RRV and m_b_RRV). The odd columns do not include year fixed-effects while the even columns do. All variables are defined in Appendix 2. *T-statistics* are reported in parentheses below corresponding coefficients. *, **, or *** indicates statistical significance at the 10%, 5%, or 1% confidence level (respectively).

Interpretation: The RRV result concerning the relation between acquirer (over)valuation and full-stock payment does not show up in international M&A markets in which the use of pooling accounting is extremely rare (because it is either forbidden or not used in practice due to restrictive conditions).

Panel A - Pooling Period

Valuation Component	European Union				UK only				Australia			
	Baseline		Model 3		Baseline		Model 3		Baseline		Model 3	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\ln(mb)$	0.0079 (0.21)	-0.0077 (-0.19)			0.0049 (0.09)	-0.0078 (-0.13)			-0.0005 (-0.01)	0.0415 (0.42)		
m_f_RRV			-0.0058 (-0.11)	-0.0197 (-0.35)			-0.0185 (-0.20)	-0.0195 (-0.21)			0.0847 (0.71)	0.1204 (0.98)
m_s_RRV			0.3120*** (3.38)	0.3276*** (3.24)			0.1618 (0.97)	0.1246 (0.75)			0.1248 (0.30)	0.3044 (0.68)
m_b_RRV			0.0075 (0.15)	-0.0053 (-0.10)			0.0098 (0.13)	-0.0095 (-0.13)			-0.2181 (-1.02)	-0.1841 (-0.83)
year FE	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
N	1,558	1,558	1,558	1,558	554	554	554	554	123	120	123	120

Panel B - Post-Pooling Period

Valuation Component	European Union				UK only				Australia			
	Baseline		Model 3		Baseline		Model 3		Baseline		Model 3	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ln(mb)	-0.0757** (-1.99)	-0.0992** (-2.48)			-0.1086* (-1.74)	-0.1269* (-1.93)			-0.1016 (-1.58)	-0.0896 (-1.35)		
m_f_RRV			-0.0672 (-1.23)	-0.0771 (-1.39)			-0.0695 (-0.83)	-0.0961 (-1.11)			-0.1762** (-2.29)	-0.1604** (-2.08)
m_s_RRV			0.1956** (2.18)	0.1770* (1.77)			0.1965 (1.40)	0.2724 (1.63)			0.0882 (0.62)	0.1850 (1.17)
m_b_RRV			-0.1011** (-2.06)	-0.1244** (-2.45)			-0.1348 (-1.62)	-0.1275 (-1.41)			-0.0104 (-0.12)	-0.0095 (-0.10)
year FE	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
N	1,836	1,836	1,836	1,836	562	562	562	562	510	510	510	510

Table 7 – Cash and Mixed payment versus All-Stock Pooling / Purchase

Description: Table 7 displays results obtained estimating probit regressions for the choice of payment using our sample from the pooling period (before July 2001). Columns (1) to (4) (under the heading Full Stock Pooling) report estimates obtained using the sub-sample of transactions that were either fully- or partially- paid for in cash or fully paid for with acquirer stock *and* accounted for using pooling. Columns (5) to (8) (under the heading Full Stock Purchase) report estimates obtained using the sub-sample of transactions that were either fully- or partially- paid for in cash or fully paid for with acquirer stock *and* accounted for using the purchase method. In both cases, the dependent variable is an indicator variable taking value one in case of full-stock payment, and zero otherwise. *Baseline* and *Model 3* present results using the log of the market-to-book ratio ($\ln(mb)$) and RRV model 3 market-to-book decomposition (see Equation 15 in RRV and Appendix 2 in this paper for definitions of m_f_RRV , m_s_RRV and m_b_RRV). The odd columns do not include year fixed-effects while the even columns do. The M&A sample is introduced in Table 1, and all variables are defined in Appendix 2. *T-statistics* are reported in parentheses below corresponding coefficients. *, **, or *** indicates statistical significance at the 10%, 5%, or 1% confidence level (respectively).

Interpretation: The RRV full-stock payment result is present only in the sub-sample of transactions accounted for under pooling.

Valuation Component	Full Stock Pooling				Full Stock Purchase			
	Pooling period		Pooling period		Pooling period		Pooling period	
	Baseline	Model 3	Baseline	Model 3	Baseline	Model 3	Baseline	Model 3
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
$\ln(mb)$	0.2839*** (8.80)	0.1270*** (3.57)			0.1226*** (3.91)	0.0555 (1.63)		
m_f_RRV			0.3112*** (6.15)	0.3346*** (6.23)			0.0623 (1.28)	0.0608 (1.25)
m_s_RRV			1.0486*** (10.88)	-0.1007 (-0.72)			0.4642*** (5.20)	0.0447 (0.35)
m_b_RRV			0.0269 (0.55)	-0.0543 (-1.02)			0.0620 (1.27)	0.0523 (1.05)
year FE	no	yes	no	yes	no	yes	no	yes
N	2,849	2,849	2,849	2,849	2,754	2,754	2,754	2,754

Table 8 – Pooling Abolishment and the Probability of Undertaking Acquisitions

Description: Table 8 reports estimates of the probability of a firm participating in the M&A market as an acquirer, as in Panel A of Table 3, using a combined sample covering the whole 1978 to 2017 period. The *Post* indicator variable takes value one during the post-pooling period (July 2001 to 2017), and zero otherwise. *Baseline* and *Model 3* present results using the log of the market-to-book ratio ($\ln(mb)$) and RRV model 3 market-to-book decomposition (see Equation 15 in RRV and Appendix 2 in this paper for definitions of m_f_RRV , m_s_RRV and m_b_RRV). The odd columns do not include year fixed-effects while the even columns do. The M&A sample is introduced in Table 1, and all variables are defined in Appendix 2. All regressions are probit models where the dependent variables are indicator variables that equal one if the firm participates in the M&A market in that year. *T-statistics* are reported in parentheses below corresponding coefficients. *, **, or *** indicates statistical significance at the 10%, 5%, or 1% confidence level (respectively).

Interpretation: After the abolishment of pooling in 2001, the predictive power of the RRV firm-specific misvaluation component for the likelihood of being an acquirer (as in Panel A of Table 3 or Table 4) declines significantly.

Valuation Component	All period			
	Baseline (1)	Baseline (2)	Model 3 (3)	Model 3 (4)
$\ln(mb)$	0.1290*** (20.67)	0.0728*** (10.52)		
Post x $\ln(mb)$	-0.0848*** (-9.13)	0.0121 (1.03)		
m_f_RRV			0.3053*** (26.19)	0.3000*** (26.27)
m_s_RRV			0.7161*** (25.60)	0.5452*** (15.66)
m_b_RRV			-0.1376*** (-14.85)	-0.1637*** (-17.05)
Post x m_f_RRV			-0.1163*** (-6.79)	-0.1003*** (-5.78)
Post x m_s_RRV			-0.5439*** (-11.03)	-0.4675*** (-7.05)
Post x m_b_RRV			0.0325** (2.42)	0.1206*** (6.89)
year FE	no	yes	no	yes
N	144,853	144,853	144,853	144,853

Appendix 1 - EPS Bootstrapping Simulations

As a complementary analysis, we report simulation results connecting acquirer valuation levels, acquirer to target relative valuations, and the EPS bootstrapping effect.

A.1. Simulation procedure

We start by assuming that the market-to-book ratio (MB) is driven by a constant growth model:

$$MB = \frac{ROE-g}{k-g} \quad (A.1)$$

where ROE is the return on equity, k is the required rate of return, and g is the constant growth rate. Net income is given by:

$$Net\ income = ROE \times BV \quad (A.2)$$

where BV is the book value of equity. Using Eq. (A.1) and Eq. (A.2) and the definition of the market-to-book ratio ($MB = MV/BV$, where MV is the market value of equity), we obtain:

$$Net\ income = MV \times (k - g) + g \times BV \quad (A.3)$$

The acquisition price is:

$$Price = MV_T \times (1 + \pi) \quad (A.4)$$

where π is the acquisition premium. Acquisition goodwill is, by definition, the difference between the acquisition price ($Price$) and the book value of target (BV_T). In case of pooling, the net income of the merged entity is the sum of the acquirer and target net incomes. If the transaction is accounted for under purchase accounting, the net income for the merged entity is given by:

$$Net\ income_P = Net\ income_A + Net\ income_T - (Goodwill \times \%_{Amt}) \quad (A.5)$$

where $Net\ Income_A$ and $Net\ Income_T$ are respectively the net incomes of the acquirer and the target, and $\%_{Amt}$ is the goodwill amortization rate. Finally, to compute EPS, we assume that the ratio of the target to the acquirer number of shares is proportional to their relative size (as given by their respective book values).

For simplicity (but without loss of generality), we assume that target book values are fair values (there is no asset revaluation in case of an acquisition accounted for under purchase accounting to compute the goodwill) and full stock payment is financed by SEO at the current market price. We choose the

simulation parameters as follows: goodwill amortization rate ($\%_{Amt}$) equal to 5%, acquisition premium (π) equal to 40%, book value of acquirer (BV_A) equal to 1,000, book value of target (BV_T) equal to 1,000 times the target to acquirer relative size, itself equal to 0.1. The required rate of return (k) is 7%, the acquirer growth rate (g_A) is 6% and the target growth rate (g_T) 2%.

A.2. Results

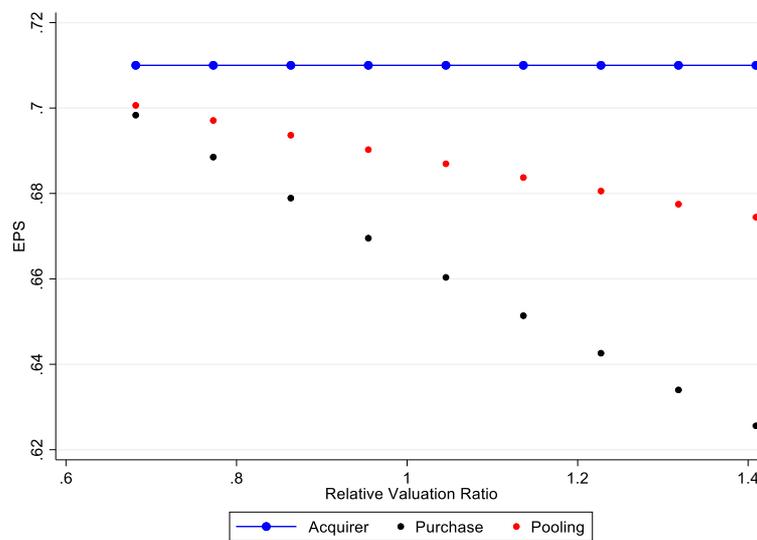
Simulation results are presented in Figure A.1. Panel A focuses on low-valuation acquirers (market-to-book equal to 1.1), while Panel B concentrates on high-valuation acquirers (market-to-book equal to 1.9). In both panels, the horizontal axis is the target to acquirer relative valuation ratio (target market-to-book ratio divided by the acquirer market-to-book ratio) and the vertical axis measures the EPS. We identify the acquirer EPS in the absence of a merger (a horizontal line, as this doesn't depend on the target valuation by construction), the EPS of the merged entity under purchase accounting, and the EPS of the merged entity under pooling accounting. Payment consideration is full stock in all cases. Clear conclusions emerge here also: (i) for low valuation bidders, no EPS bootstrapping is possible, regardless of whether the transaction is accounted for using purchase or pooling; (ii) for high valuation bidders, EPS bootstrapping is possible and potentially economically significant; and (iii) with no real synergies, the merged firm's EPS is always higher under pooling compared to purchase accounting (because of goodwill amortization in the latter).

Figure A.1 – Acquirer to Target Valuation and EPS Bootstrap

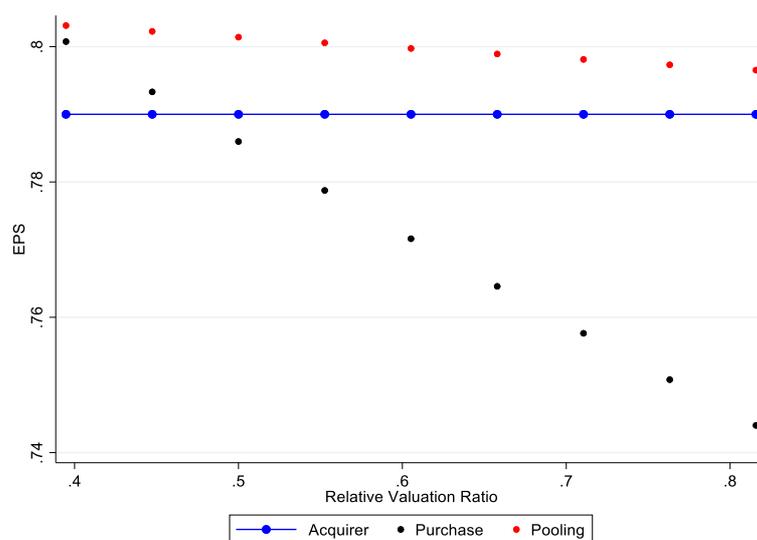
Description: Figure A.1 reports simulation results connecting acquirer valuation levels, acquirer to target valuation ratios, and earning per share (EPS). Panel A focuses on low-valuation acquirers (market-to-book equal to 1.1) and Panel B on high-valuation acquirers (market-to-book equal to 1.9). In both panels, the horizontal axis is the target to acquirer relative valuation ratio (target market-to-book ratio divided by the acquirer market-to-book ratio) and the vertical axis is the EPS. We identify acquirer EPS in the absence of merger (a horizontal line as it doesn't depend on the target valuation by construction), EPS for the merged entity under purchase accounting, and EPS for the merged entity under pooling accounting. Payment is full stock in all cases. The simulation procedure is described in detail in Appendix 1.

Interpretation: EPS bootstrap is present for high valuation acquirers under pooling accounting, especially in case of a high relative valuation ratio.

Panel A – Low Valuation Acquirers



Panel B – High Valuation Acquirers



Appendix 2 - Variable Definitions

Variable	Definition	Source
<i>All Stock</i>	Indicator variable = 1 for M&A deals with full stock payment, 0 otherwise	SDC
<i>Book Assets</i>	Book value of total assets (Compustat item AT): US\$ million	Compustat
<i>Book Equity</i>	Book value of equity (Compustat item CEQ): US\$ million	Compustat
<i>Capital Expenditure</i>	Capital expenditure (Compustat item CAPX): US\$ million	Compustat
<i>Current Ratio</i>	Current assets (Compustat item ACT) / Current Liabilities (Compustat item LCT)	Compustat
<i>Leverage (book)</i>	1 - (Book equity (Compustat item CEQ) / Book value of total assets (Compustat item AT))	Compustat
<i>Leverage (market)</i>	1 - (Market equity / Market value (assets))	Compustat
<i>Ln(mb)</i>	Logarithm of Market-to-book	Compustat
<i>Long-term Debt</i>	Long-Term Debt (Compustat item DLTT): US\$ million	Compustat
<i>Market Equity</i>	Price (Compustat item PRCC_F) * Shares outstanding (Compustat item CSHO): US\$ million	Compustat
<i>Market Value (assets)</i>	Market equity + Book value of total assets (Compustat item AT) - Book equity (Compustat item CEQ) - Deferred taxes (Compustat item TXDB): US\$ million	CRSP,Compustat
<i>Market-to-book</i>	Market equity / Book equity (Compustat item CEQ)	Compustat
<i>m_b_RRV</i>	Long-run value to book (RRV (2005) decomposition)	CRSP,SDC
<i>m_f_RRV</i>	Firm specific error (RRV(2005) decomposition)	CRSP,SDC
<i>m_s_RRV</i>	Time series sector error (RRV (2005) decomposition)	CRSP,SDC
<i>Net income</i>	Net income (Compustat Item NI): US\$ million	Compustat
<i>Post</i>	Indicator variable = 1 if the M&A deal announcement date is after 06/30/2001, 0 otherwise	SDC
<i>PP&E</i>	Property, plant, and equipment (Compustat item PPENT): US\$ million	Compustat
<i>Quick Ratio</i>	(Current assets (Compustat item ACT) - Inventories (Compustat item INVT)) / Current liabilities (Compustat item LCT)	Compustat
<i>Return On Assets</i>	Net income (Compustat item NI) / Book value of total assets (Compustat item AT)	Compustat
<i>Return On equity</i>	Net income (Compustat item NI) / Book equity (Compustat item CEQ)	Compustat

Legend: SDC: Thomson SDC M&A database; CRSP: Center for Research in Security Prices database ; Compustat: Fundamental Annual database

Appendix 3 - Conditional Regression Multiples

Description: Appendix 3 provides coefficient estimates from RRV valuation regressions (model 3) for Fama and French 12 industry classifications. *RRV* rows contain the results reported by RRV in their Table 4 and the *Ours* rows report corresponding coefficient estimates by replicating RRV regressions using our sample. Each model is estimated cross-sectionally at the industry level. Alpha0 is the time-series average of the constant term of each regression while Alphak is the time series average from the regression coefficient associated with the kth accounting variable. This regression uses natural logs of market and book value, natural log of the absolute value of net income, and an indicator interacted with log net income to separately estimate net income for firms with negative net income, and leverage. Fama-Macbeth standard errors are reported below average coefficient. For each set of estimates, the last row reports the time-series average R².

Interpretation: we obtain results comparable to RRV using our sample

Sample		Fama and French industry classification											
Parameters		1	2	3	4	5	6	7	8	9	10	11	12
RRV	Alpha0	2.39	2.56	2.20	2.35	2.38	2.55	2.91	2.15	2.44	2.68	2.21	2.60
		0.04	0.11	0.05	0.06	0.11	0.05	0.10	0.13	0.05	0.04	0.04	0.05
	Alpha1	0.64	0.56	0.64	0.66	0.64	0.59	0.60	0.85	0.62	0.61	0.58	0.60
		0.01	0.02	0.01	0.02	0.05	0.02	0.03	0.03	0.01	0.02	0.01	0.01
	Alpha2	0.27	0.30	0.27	0.23	0.31	0.29	0.26	0.12	0.28	0.26	0.30	0.25
		0.01	0.02	0.01	0.02	0.04	0.01	0.04	0.03	0.01	0.01	0.01	0.01
	Alpha3	0.08	0.05	0.10	0.00	0.13	-0.03	0.27	0.17	0.01	-0.09	-0.16	0.00
		0.03	0.06	0.03	0.04	0.06	0.04	0.05	0.04	0.04	0.05	0.05	0.04
	Alpha4	-2.59	-2.36	-2.09	-2.13	-2.43	-2.55	-2.27	-2.52	-2.11	-2.42	-1.06	-2.15
	0.05	0.09	0.07	0.15	0.19	0.11	0.18	0.23	0.06	0.10	0.05	0.09	
	R-square	0.84	0.80	0.86	0.88	0.90	0.83	0.87	0.94	0.86	0.85	0.82	0.80
Ours	Alpha0	2.03	1.97	2.05	2.10	2.30	2.46	2.85	1.75	2.39	2.70	2.02	2.39
		0.05	0.08	0.04	0.08	0.08	0.05	0.07	0.07	0.03	0.06	0.06	0.04
	Alpha1	0.64	0.63	0.64	0.65	0.59	0.57	0.56	0.87	0.59	0.54	0.62	0.61
		0.02	0.03	0.02	0.02	0.03	0.02	0.02	0.02	0.01	0.02	0.02	0.01
	Alpha2	0.35	0.33	0.30	0.29	0.36	0.35	0.32	0.11	0.33	0.37	0.33	0.31
		0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00
	Alpha3	-0.08	-0.04	-0.05	-0.08	-0.08	-0.13	0.02	0.03	-0.13	-0.17	-0.16	-0.10
		0.01	0.02	0.01	0.01	0.02	0.01	0.02	0.02	0.01	0.01	0.01	0.01
	Alpha4	-1.81	-1.49	-1.63	-1.38	-1.66	-2.07	-1.79	-1.90	-1.83	-1.93	-1.00	-1.73
	0.05	0.05	0.06	0.07	0.10	0.13	0.10	0.11	0.05	0.10	0.04	0.05	
	R-square	0.90	0.91	0.89	0.90	0.92	0.85	0.89	0.97	0.88	0.86	0.89	0.84

Appendix 4 - Decomposing Market-to-book at the Firm Level in the Pooling Period

Description: Appendix 4 displays average log of market-to-book and RRV valuation model components (model 3) for different sub-samples. In Columns (1) to (3), results are for all firms, with a comparison between firms that do not participate in the M&A market (Column 1) and that do so (Column 2). Columns (4) and (5) compare targets to acquirers. Columns (7) and (8) focus on all cash transactions while Columns (10) and (11) focus on all stock transactions. Columns (3), (6), (9) and (12) report a test of difference of means. The *RRV* rows contain the results reported by RRV in their Table 6 for their model 3 and the *Ours* rows report corresponding estimates obtained by using our sample. *, **, or *** indicates statistical significance at the 10%, 5%, or 1% confidence level (respectively).

Interpretation: we obtain results comparable to RRV using our sample

Sample	Valuation Component	All			M&A			All Cash			All Stock		
		Non M&As	M&As	t(diff)	Target	Acquirer	t(diff)	Target	Acquirer	t(diff)	Target	Acquirer	t(diff)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
RRV	ln(mb)	0.59	0.76	-15.81 ***	0.69	0.83	-6.95 ***	0.61	0.79	-5.13 ***	0.87	1.12	-6.97 ***
	m_f_RRV	-0.01	0.18	-25.21 ***	0.03	0.32	-20.21 ***	-0.08	0.29	-15.01 ***	0.05	0.44	-16.09 ***
	m_s_RRV	0.03	0.10	-24.20 ***	0.07	0.12	-8.73 ***	0.06	0.14	-8.40 ***	0.12	0.17	-5.21 ***
	m_b_RRV	0.57	0.48	10.69 ***	0.58	0.39	12.52 ***	0.62	0.37	9.97 ***	0.71	0.51	6.94 ***
Ours	ln(mb)	0.64	0.79	-13.41 ***	0.68	0.87	-8.74 ***	0.53	0.78	-6.43 ***	0.82	1.00	-5.30 ***
	m_f_RRV	-0.01	0.14	-20.28 ***	-0.01	0.24	-16.51 ***	-0.10	0.18	-10.45 ***	0.03	0.29	-12.21 ***
	m_s_RRV	0.01	0.08	-20.01 ***	0.07	0.09	-2.64 ***	0.06	0.09	-2.80 ***	0.09	0.11	-1.67 *
	m_b_RRV	0.64	0.57	8.68 ***	0.61	0.55	4.48 ***	0.57	0.51	2.16 **	0.70	0.60	4.62 ***