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Allard Bruinshoofd, Leo de Haan

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Market timing and corporate capital structure: A transatlantic comparison*

W. Allard Bruinshoofd ^{a,*}

^a *Rabobank, Utrecht, The Netherlands*

Leo de Haan ^b

^b *De Nederlandsche Bank, Economics and Research Division, Amsterdam, The Netherlands*

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Abstract

This paper provides comparative international evidence on the effect of market timing on corporate capital structures using panel data for US, UK, and continental European firms. We document that the empirical regularity found for US firms, that historical market-to-book ratios and corporate leverage correlate negatively, does not extend to UK and continental European firms. The latter tend to raise debt rather than equity when stock prices are high, thus sticking more closely to a pecking order in which debt is preferred over external equity.

JEL codes: C33, G32

Keywords: Market Timing, Capital Structure, Pecking order

* Corresponding author. E-mail: w.a.bruinshoofd@rn.rabobank.nl

1. Introduction

According to Baker and Wurgler's (2002, henceforth BW) market timing theory of corporate capital structure, leverage ratios of nonfinancial firms are the cumulative result of past attempts to time the equity market by issuing equity when stock prices are high. BW measure market timing by the external finance-weighted average of historical market-to-book ratios. They find that US firms' leverage ratios are significantly and negatively related to this market timing measure, which they interpret as evidence of the market timing theory. Their findings inspired a growing number of studies testing the consequences of equity market timing on capital structure. For instance, Hovakimian (2006) and Kayhan and Titman (2007) confirm the negative effect of historical market-to-book ratios on US corporate leverage, but do not corroborate its long-term persistency. Alti (2006) and Leary and Roberts (2005) show that US firms actively rebalance their leverage to stay within an optimal range, so that effects of market timing and other shocks are temporary. Welch (2004), on the other hand, demonstrates that US firms do not counteract the mechanistic influences of stock valuation on debt/equity ratios.

The studies cited above derive their empirical results from US data sets. The evidence for non-US firms on the impact of market timing on corporate capital structures is scarce and mixed. Högfeldt and Oborenko (2005), Mendes et al. (2005), Hegge (2006) and De Bie and De Haan (2007) do not find a significant relation between BW's market timing measure and leverage for Sweden, Brasil, the Netherlands, and Belgium, respectively. On the other hand, Mahajan and Tartaroglu (2008) report a negative relation for the G-7 countries, but find that this negative relationship cannot be attributed to equity market timing.

It is no coincidence that the attention for market timing came up soon after one of the biggest boom-bust cycles on the international stock exchanges of the last decades: the 'internet boom' in the second half of the 1990s. This boom was particularly evident in the valuation of stocks for information and communication technology (ICT) firms. This raises the question of whether market timing effects on corporate capital structures have been specific to ICT firms or the ICT boom episode.

Our results confirm the empirical regularity that historical market-to-book ratios are negatively related to US corporate leverage. However, we also document that these results do not extend to samples of UK and continental firms. The few market timing effects that we find for continental European firms appear to be specific to ICT firms and the ICT boom episode. For UK firms the overall results are insignificant. These results corroborate the

findings of Bruinshoofd and De Haan (2011). We extend their analysis in the present paper in a number of ways. First, we reveal that historical market-to-book ratios in fact are *positively* correlated with the long-term part of corporate leverage ratios in the continental European sample, whilst in the US sample the correlation remains negative. Second, by separating market timing of equity and long-term debt issues, we find that continental European firms tend to issue more long-term debt rather than equity when stock prices are high. This explains why the results for European and US firms are so different. We conclude that BW's measure of market timing is not suited for a sample of firms that stick closely to a pecking order where debt is preferred over external equity.

The paper proceeds as follows. Section 2 discusses BW's market timing measure. Section 3 presents the data. Section 4 presents the results. Section 5 concludes.

2. Discussion of BW's market timing measure

BW's measure for market timing, the so-called external-finance-weighted average market-to-book ratio ($EFWAMB^{BW}$), is defined as follows:¹

$$EFWAMB_t^{BW} = \frac{\sum_{s=1}^{t-1} \frac{e_s + d_s}{\sum_{r=1}^{t-1} e_r + d_r} \times MB_s}{\sum_{r=1}^{t-1} e_r + d_r} \times MB_s \quad (1)$$

where e and d denote equity and total debt issues, respectively, MB is the market-to-book ratio, and suffix s and r denote time. For a firm observed at time t , $EFWAMB^{BW}$ is the weighted average of a time-series of historical market-to-book ratios, starting with year 1, i.e. the first observation available in the sample, and ending with the market-to-book ratio at $t-1$. The weight for each year is the ratio of external financing in that year to the total external financing raised by the firm in years 1 through $t-1$. Thus, firms that issue a lot of equity when market-to-book ratios are relatively high will tend to have high values of $EFWAMB^{BW}$. BW define equity issues as the change in the book value of share capital and debt issues as the change in the book value of debt.

BW regress leverage on $EFWAMB^{BW}$ plus the usual Rajan and Zingales (1995) set of control variables including unweighted market-to-book, tangibility, profitability and firm size. The unweighted market-to-book ratio controls for 'the cross-sectional variation in the *level* of market-to-book. What is left for $EFWAMB^{BW}$ is the residual influence of past, within-firm variation in market-to-book' (BW, p. 15; italics in the original). The usual assumptions for the

¹ We follow the notation of Hovakimian (2006).

1 control variables are that larger and more tangible firms are safer debtors and therefore can
2 get more debt, and that the effect of high profitability on leverage is either negative according
3 to the pecking order theory (more funding from retained earnings) or positive according to the
4 trade-off theory (higher tax shield from debt, lower probability of bankruptcy, bigger free
5 cash flow problem).
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10 BW's hypothesis is that if firms systematically time their equity issues to the market
11 and do not consecutively rebalance their capital structures, $EFWAMB^{BW}$ should have a
12 significantly negative effect on leverage. Otherwise, $EFWAMB^{BW}$ would be insignificant. BW
13 test the market timing hypothesis for US firms and indeed find a significantly negative effect
14 of $EFWAMB^{BW}$ on leverage.
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19 At this point we want to emphasize that BW's $EFWAMB^{BW}$ measure of market timing
20 weighs the *sum* of debt and equity issues by the market-to-book ratio. In the remainder of this
21 section we shall argue that this feature of $EFWAMB^{BW}$ precludes the definition of strong
22 empirical priors concerning its role in capital structure regressions. In particular, we argue that
23 market timing does not necessarily generate a negative effect on leverage in all cases.
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28 *1. Substitution between debt and equity.* Let us assume that a firm substitutes debt for equity
29 issues and vice versa, depending on the relative costs of equity and debt, while keeping the
30 sum of external finance (equity and debt issues) constant. In that case, a low value for
31 $EFWAMB^{BW}$ would falsely indicate that the firm is not timing the market. In other words,
32 $EFWAMB^{BW}$ is a 'noisy' measure of equity market timing. In this particular case there is also
33 no a priori reason for a statistically significant relationship between $EFWAMB^{BW}$ and
34 leverage. Probably, there would be none. BW's expectation of a negative relationship is based
35 on the assumption that firms issue equity when stock market valuation is high, not on the
36 assumption that firms substitute debt for equity issues when stock market valuation is
37 relatively low.
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46 *2. Pecking order.* Take a firm with a strong pecking order so that it issues debt instead of
47 equity if retained earnings are insufficient to finance good investment projects. Further,
48 assume that a firm's market-to-book ratio is higher when it has good investment opportunities
49 (Myers, 1977). Thus, $EFWAMB^{BW}$ for a firm may be higher because it issues debt (rather than
50 equity) when stock prices are high. In this setting, a high value for $EFWAMB^{BW}$ would falsely
51 indicate equity market timing. Moreover, in this case one may expect a positive, rather than a
52 negative relationship between $EFWAMB^{BW}$ and leverage.
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58 *3. Pecking order variability.* The effect of $EFWAMB^{BW}$ on leverage could change in
59 magnitude or even switch sign over time if the pecking order changes over time. Huang and
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2 Ritter (2009), for example, argue that the pecking order may vary over time and across firms,
3 depending on the relative cost of each type of funding. If the equity risk premium is
4 sufficiently low, firms may even prefer external over internal equity, giving rise to the market
5 timing feature that firms issue equity even when they do not have financing deficits (Frank
6 and Goyal, 2003; Fama and French, 2005). External equity can be costly because of conflicts
7 of interest between management and outside shareholders resulting from the separation of
8 ownership and control (Jensen and Meckling, 1976). If these agency costs are sufficiently
9 high, firms will typically prefer debt over equity in the pecking order. If they are not,
10 managers may prefer external equity over debt when the cost of external equity falls
11 sufficiently (i.e., when stock valuations are sufficiently high).
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14 Summing up:, a negative empirical relationship between $EFWAMB^{BW}$ and capital
15 structure should not be implied a priori, especially for firms that are not characterized by
16 dispersed ownership or that do not operate in financial systems that embed an active market
17 for corporate control such as in the US. Specifically, comparing the role of $EFWAMB^{BW}$ in
18 capital structures on both sides of the Atlantic, we do not expect to find as strong an effect of
19 $EFWAMB^{BW}$ on the capital structure of European firms as is typically found for US firms.
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33 **3. Data**

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35 We use a dataset that contains not only US firms, but also UK and continental European
36 firms. Keeping constant the source of the data, definition of the variables, specification of the
37 capital structure equation and econometric techniques, we can thus assess the stability of the
38 market timing effect in the determination of capital structure across countries and financial
39 systems.
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46 In addition, we distinguish ICT and non-ICT firms so that we may test whether the
47 market timing effects on capital structure were stronger for (or even specific to) ICT firms
48 whose stock prices soared during the dotcom bubble (Figure 1). Firms are denoted ICT-firms
49 if they belong to one of the ICT industries (Appendix A gives the four-digit SIC87 industry
50 classification key used). About one out of four firms in our sample is an ICT firm. Our sample
51 period is 1991-2001 and includes the ICT boom-bust cycle of 1996-2001.
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58 [insert Figure 1 about here]
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Our data are taken from the COMPUSTAT Global data files on publicly traded firms. Following BW, we define equity issues as the change in the book value of share capital and debt issues as the change in the book value of debt. However, we check whether the resulting data on external funding are consistent with the cash flow identity, according to which the external financing deficit ex post should be equal to external funding.² Moreover, we select firms for which there are at least eight consecutive observations on external funding available. This leaves us with an unbalanced panel data set containing 727 firms, among which 230 US firms, 159 UK firms, and 338 continental European firms.³

Table 1 gives key financial ratios for the US, the UK and continental Europe.⁴ Within each region, statistics are compared between ICT and non-ICT firms. A few observations catch the eye. First, relative to US firms, long-term debt issues are more important for continental European firms. The average ratio of equity issues to long-term debt issues is nearly 20 for US firms, while it is only about 4 for UK and continental European firms. Consistent with the relative importance of outside equity financing, US leverage ratios are also lowest of all three regions. Second, relative to non-ICT firms, long-term debt issues are about equally important for ICT firms across all regions. At the same time, ICT firms raise about two to three times the amount of external finance on average as non-ICT firms. Cumulative indebtedness is nevertheless lower for ICT firms, the difference relative to non-ICT firms being largest in the US sample.

[Table 1 about here]

Table 2 describes the market timing behavior of our sample of firms in terms of the *level* of the external finance weighted market-to-book ratio. To facilitate comparison between levels, we scale $EFWAMB^{WB}$ by the average level of the market-to-book ratio over each firm's entire sample period, \overline{MB} .⁵ Additionally, we take on board only long-term debt, *ltd*, rather than total debt, because the former more accurately represents issuance decisions than the latter.⁶ Our market timing measure reads:

² Specifically, the following cash flow identity should hold: Capital expenditures + investment in working capital - internal cash flow = equity issues + long-term debt issues.

³ Our data contains firms from Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and the United States. Despite the broad coverage of countries, the rather limited number of firms for most countries in our sample does not allow for an extensive analysis at the country-level.

⁴ The note of this table gives all variable definitions.

⁵ We thank Clemens Kool for suggesting this adjustment.

⁶ Leverage may also change as a result of short term debt accumulation. We shall in fact focus on debt issues as changes in the book value of long term debt titles only, as short term debt dynamics are strongly driven by inter-

$$EFWAMB_t = \frac{1}{MB} \sum_{s=1}^{t-1} \frac{e_s + ltd_s}{\sum_{r=1}^{t-1} e_r + ltd_r} \times MB_s. \quad (2)$$

As a result of the scaling, *EFWAMB* will be 1 if market conditions play no role in the firm's decision to raise external funds. Firms raising external funds specifically in years of above-average market-to-book ratios are characterized by values of *EFWAMB* exceeding 1. We note that the value of BW's *EFWAMB*^{BW} measure, being unscaled, not only reflects market timing behavior but also the average level of market-to-book for a firm. By scaling we allow a direct interpretation of any deviations from 1 of this market timing measure.

Table 2 demonstrates that *EFWAMB* is typically highest in the US sample and lowest in the continental European sample. Hence, continental European firms are less active market timers than US firms. The exception is the high value for *EFWAMB* for UK ICT firms, although the difference with US ICT firms is statistically insignificant. Also note that *EFWAMB* is never larger for ICT firms than for non-ICT firms in statistical terms. In fact, in the US as well as the continental European samples, median *EFWAMB* is significantly higher for non-ICT firms, suggesting that these firms timed the markets most actively. As Figure 2 demonstrates, though – plotting the development of median *EFWAMB* over time using four-year rolling windows – ICT firms have generally become more active market timers in the second half of our sample period.

[Table 2 about here]

[Figure 2 about here]

company (trade) credits, and as such are in large measure induced by normal business operations, and therefore to a large extent are unrelated to market timing or long term capital structure objectives (e.g. Petersen and Rajan, 1997; Bevan and Danbolt, 2002, 2004).

4. Results

We will next explore how the lower market timing activity found for continental European firms compared to US firms feeds into differential effects on capital structures. First, we present leverage regression results for our three regions, followed by some robustness checks. Finally, we give an interpretation of the results.

4.1 Market timing and capital structure

Since our main interest is in differences in capital structure determination on both sides of the Atlantic we run capital structure regressions on separate samples of US, UK and continental European firms. To assess differences in market timing effects on the capital structure of ICT and non-ICT firms, we interact *EFWAMB* with an ICT-dummy variable. We also estimate capital structure equations on four-year moving windows, i.e. the first regression is for the 1993-1996 period and the last regression for the 1998-2001 period.⁷ This strategy enables us to detect changes in the determination of capital structure that may relate to the boom-bust cycle in ICT share prices, without abandoning the time-series dimension of our panel data set. The four-year window is both sufficiently long to allow for a meaningful role for the time series dimension of capital structure determination and sufficiently short to allow for potential changes over time in the determination of capital structure.

We apply generalized least squares (GLS), which unlike OLS allows for the presence of autocorrelation within panels and cross-sectional correlation and heteroskedasticity across panels. As capital structures are typically autocorrelated and heteroskedasticity is a common feature in panels, GLS is especially suitable to our purposes (e.g., Greene, 2003).

The overall estimation results are in Appendix B. Before turning to the role of *EFWAMB* we give a succinct description of the overall results.

The empirical determinants of corporate capital structure that we use are well-known in the relevant literature (e.g. Harris and Raviv, 1991; Rajan and Zingales, 1995; Shyam-Sunder and Myers, 1999; Baker and Wurgler, 2002). The same applies to most of the signs of the coefficient estimates that we obtain. Specifically, we find static tradeoff elements in capital structure management in the sense that large firms tend to have higher leverage ratios, while higher interest rates are associated with lower indebtedness. In this regard, the finding that the variable intangibility relates mostly positively to leverage in all three samples is

⁷ The construction of *EFWAMB* generates a loss of the first years 1991-1992.

counter-intuitive. In addition to the static trade-off effects, we find pecking order effects in the negative coefficient for profitability. Market-to-book is expected to be negatively related with leverage, based on the underinvestment theory of Myers (1977). According to this theory, firms with high growth opportunities⁸ choose lower leverage to prevent the cost of future underinvestment associated with high leverage. Roughly speaking, leverage in the US sample seems most strongly and negatively connected to market-to-book while this is much less the case in the continental European sample. In the UK sample, the positive connection between UK leverage and market-to-book stands out compared to our findings for the US and continental Europe, although this is a well-documented result in the empirical literature on UK firms' capital structures (e.g. Chittenden et al., 1996; Michaelas et al., 1999; Bevan and Danbolt, 2002).⁹

Our main focus, however, is on *EFWAMB*, capturing the lasting effect of market timing on capital structure. Therefore, Table 3 summarizes the coefficients estimated for *EFWAMB* for ICT and non-ICT firms in the three regions. These coefficient estimates derive from regression equations that include all the above-mentioned control variables as well as an ICT interaction dummy on *EFWAMB* ($EFWAMB \times D^{ICT}$, see Appendix Table A2 for the specifics).¹⁰ Interestingly enough, the estimated coefficients on *EFWAMB* for non-ICT firms are significantly negative in all time windows for non-ICT firms in the US sample, whereas they are never significantly negative in either the UK or the continental European samples. Hence, while we confirm the negative relationship between *EFWAMB* and leverage found in other studies for the US (BW; Hovakimian, 2006) for our sample of US firms, this empirical regularity does not seem to extend to our UK and continental European samples. The negative connection between market timing and capital structure therefore stands out as a US phenomenon.¹¹

[Table 3 about here]

⁸ Penman (1996) demonstrates that under market efficiency the market-to-book ratio is an appropriate indicator of earnings growth, while Cheng (2005) shows that market analysts are fairly efficient in predicting future earnings. This bolsters out confidence in the market-to-book ratio as a proxy for future profitability.

⁹ Bevan and Danbolt (2002) note that their significantly positive market-to-book coefficient is driven by trade credit which accounts for more than 62% of total liabilities of UK firms in their sample. These authors interpret their results as indicating that firms with strong growth potential prefer to finance themselves with inter-enterprise credit rather than through more formal lines. This is consistent with the predictions of Barclay and Smith (1999) who argue that high growth firms prefer debt with few restrictive covenants in order to maintain financial flexibility.

¹⁰ The *t*-values on the *EFWAMB* coefficient estimates for ICT firms derive from auxiliary regressions where a non-ICT interaction dummy on *EFWAMB* is used instead ($EFWAMB \times D^{non-ICT}$).

¹¹ Unreported robustness checks (that are available on request) reveal that this result holds if we lag all explanatory variables by one year. Note that *EFWAMB* itself by construction only relates to past issuance behaviour (see Equation (2)).

4.2 Robustness

Before jumping to conclusions, however, let us first consider a number of potential explanations as to why our results may diverge from those reported by BW. Such explanations potentially also explain why we find such strikingly different results for continental Europe and the UK. To start with, our definition of *EFWAMB* relates the timing of share and long-term debt issues to changes in total leverage, whereas BW look at the timing of shares and *total* debt issues and relate this to total leverage. To the extent that the results of continental European market timing are blurred by short-term debt dynamics, it may not be picked up by our *EFWAMB* variable, resulting in biased coefficient estimates. To check for this, we first synchronize our dependent variable to our definition of *EFWAMB* and construct leverage as the ratio of long-term debt to assets. Subsequently we check the coefficient estimates on *EFWAMB*, see panel A of Table 4 (as before in Table 3 all output other than the *EFWAMB* coefficients and absolute *t*-values is suppressed). The resulting *EFWAMB* coefficients retain their negative signs and statistical significance in all but one window in the US sample. In the UK sample we still find no significant market timing effects. In our continental European sample, however, the *EFWAMB* coefficients are now significantly *positive*. This is a remarkable result, which we will examine further in Section 4.3.

[Table 4 about here]

But first, as a second robustness check, we synchronize *EFWAMB* to the definition of BW, see Equation (1). The resulting *EFWAMB* coefficient estimates are in panel B of Table 4. The *EFWAMB* coefficients retain their negative signs and significance in the US regressions, while little or no statistically significant connection is detected in either the UK or the continental European sample.

Summing up, we confirm the empirical regularity that US capital structures associate negatively with *EFWAMB*, consistent with the market timing theory. We find robust evidence, however, that this result does not extend to UK and continental European samples.

4.3 European firms issue more debt when stock prices are high

We now turn to the significantly positive association between *EFWAMB* and long-term debt ratios that was found for continental European firms. As argued in Section 2, such a positive association may result when firms issue long-term debt rather than equity when stock prices are high. To further examine this hypothesis, we define two alternative market timing measures, the external *equity* weighted average market-to-book (*EEWAMB*) and the long-term *debt* weighted average market-to-book ratios (*DWAMB*), respectively:

$$EEWAMB_t = \frac{1}{MB} \sum_{s=1}^{t-1} \frac{e_s}{\sum_{r=1}^{t-1} e_r} \times MB_s \quad (3)$$

$$DWAMB_t = \frac{1}{MB} \sum_{s=1}^{t-1} \frac{ltd_s}{\sum_{r=1}^{t-1} ltd_r} \times MB_s \quad (4)$$

To identify potentially separate effects of the timing of equity and long-term debt issues on leverage, panel C of Table 4 presents regression results for these two measures. The results for the continental European sample show that the timing of equity issues has little impact on capital structures, whereas the timing of long-term debt issues is associated with *higher* leverage ratios. This leads to the conclusion that the non-existence of a significantly negative relationship between *EFWAMB* and leverage for European firms is due to the fact that, apparently, these firms issue debt rather than equity when stock prices are high.

For the UK sample the results remain insignificant, while for the US sample the timing of equity issues (*EEWAMB*) retains its negative connection with leverage, though not always significantly, while the timing of long-term debt issues is insignificant, except in the beginning of the sample.

4.4 Pecking order variability over time

Our main contribution in this paper is to give evidence of the insignificance of market timing effects on capital structures in Europe, in contrast to the existing evidence for the US. An extensive analysis into the reasons for this difference between the regions lies beyond the scope of this paper and is thus left for future research. However, we allow ourselves to make some suggestions as to the possible directions into which such further search might be conducted. For this reason we explore some recent literature on the subject.

Högfeldt and Oborenko (2005) argue that European firms' capital structures are less sensitive to market timing compared to their US counterparts', because the former have a

1
2 stronger preference for debt over equity when external financing is needed. They link this
3 stronger pecking order in Europe to the rather concentrated ownership of continental
4 European firms and the relatively strong separation of ownership and control, both of which
5 would generate a relatively large wedge between the costs of debt and external equity.
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9 There are several papers that attempt reconciling the pecking order theory with the
10 market timing theory by assuming that adverse selection costs are time-varying. Early
11 contributions by, for example, Korajczyk et al. (1992) and Choe et al. (1989) emphasize that
12 firms attempt to issue equity specifically when problems related to asymmetric information
13 are expected to be relatively unimportant. Dittmar and Thakor (2007) argue that the likelihood
14 of disagreement between shareholders and management concerning project choice is lower
15 when stock prices are high, and that managers issue equity when they believe that investors'
16 views about project payoffs are aligned with theirs. Within this setting, we may expect the
17 pecking order to vary with stock price valuation. Huang and Ritter (2009) assume that, under
18 pecking order financing, in times of normal stock price valuations debt issues are preferred
19 over external equity issues. In their view external equity may by exception be preferred over
20 debt when stock price valuations are relatively high.
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24 In connection to our analysis at hand, the key idea behind all this is that reversals of
25 the pecking order may be less likely to occur in Europe than in the US, as in Europe the cost
26 differential between external equity and debt may be relatively large. It could be precisely for
27 this reason that high stock prices would induce US firms to prefer external equity issues over
28 debt issues – driving the negative relationship between *EFWAMB* and leverage – whereas
29 European firms would continue to prefer debt over external equity issues and for that reason
30 exhibit an insignificant connection between *EFWAMB* and leverage.
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34 Further research of this hypothesis would preferably require extensive data on cost
35 differentials between debt and external equity (issues) and/or on ownership structures of
36 companies. As these data are notoriously hard to come by we cannot in the present paper
37 indulge in an in-depth analysis of this kind. What we can do is offer circumstantial evidence
38 which may fall some way short of being solid evidence in favor of such a hypothesis, but at
39 least be consistent with it. In particular, we exploit the heterogeneity between firms *within a*
40 *region* to test whether capital structures of firms (temporarily) experiencing relatively high
41 stock price valuations are more susceptible to pick up market timing effects than firms
42 without such stock market events. In our samples, we specifically employ the heterogeneity
43 between ICT firms and non-ICT firms. Since ICT firms have seen such tremendous swings in
44 share prices over our sample period everywhere, we may expect to see some of this varying
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1 ordering of the pecking order in play, even in the European sample. Thus ICT firms may have
2 had a stronger appetite for outside equity financing relative to debt for some years,
3 specifically during the ICT stock price boom. If this is the case, the coefficient on *EFWAMB*
4 in leverage regressions should turn (more) negative for ICT firms in those ICT boom years
5 and revert to pre-boom levels thereafter.
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10 Turning back to the *EFWAMB* coefficients for ICT firms presented in Table 3, such a
11 pattern is indeed apparent. For US ICT firms, the *EFWAMB* coefficients turn significantly
12 negative in the 1996-1999 window and reaches a trough in the 1997-2000 window, which
13 coincides with the peak in ICT share prices. Subsequently, the 1998-2002 *EFWAMB*
14 coefficient drops towards pre-boom levels, turning insignificant as before. Similar patterns in
15 the development of ICT firms' *EFWAMB* coefficients can be distinguished for the UK and
16 continental European samples, though in statistical terms it is only visible in continental
17 Europe. For the continental European sample, *EFWAMB* is found to be significantly negative
18 only for ICT firms and then only at the peak of the ICT boom episode (1997-2000).
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27 These findings are important for two reasons. Firstly, they suggest that market timing
28 has been more important for those firms that experienced episodes of (extremely) high share
29 price valuation. For these firms and in those episodes, market timing effects on capital
30 structure are discernible even in continental Europe. This warrants further research on the
31 precise factors that drive market timing and its effects on capital structure along the lines
32 sketched above. Secondly, they reiterate that market timing effects on corporate capital
33 structure in continental Europe are limited and short-lived. In our sample they appear to be
34 specific to ICT firms and the ICT stock market boom.
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43 **5. Conclusion**

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46 This paper provides comparative international evidence on the correlation between market
47 timing and corporate capital structures using panel data for US, UK, and continental European
48 firms. We document that the US empirical regularity, that market timing and corporate
49 leverage correlates negatively, does not extend to samples of UK and continental European
50 firms. The few market timing effects on European firms' capital structures that we find appear
51 to be specific to ICT firms and the ICT boom episode. We demonstrate that continental
52 European firms tend to raise leverage ratios when stock prices are high by timing long-term-
53 debt issues, thus apparently sticking more strongly to a pecking order where debt is preferred
54 over external equity.
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For Peer Review

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For Peer Review

Table 1
Descriptive statistics 1991-2001

| Variable | Median values | | Difference ICT minus non-ICT |
|--------------------------------|---------------|-------|------------------------------------|
| | Non-ICT | ICT | |
| United States | | | |
| Leverage | 0.546 | 0.380 | -0.166 ** |
| Profitability | 0.075 | 0.066 | -0.009 ** |
| Size | 5.885 | 4.617 | -1.268 ** |
| Interest rate | 0.082 | 0.082 | 0.000 |
| Market-to-book | 1.399 | 1.919 | 0.520 ** |
| Intangibility | 0.052 | 0.016 | -0.036 ** |
| Net debt issues ^a | 0.004 | 0.012 | 0.008 |
| Net equity issues ^a | 0.073 | 0.235 | 0.162 ** |
| United Kingdom | | | |
| Leverage | 0.538 | 0.483 | -0.055 ** |
| Profitability | 0.057 | 0.066 | 0.009 ** |
| Size | 4.653 | 3.774 | 0.879 ** |
| Interest rate | 0.085 | 0.085 | 0.000 |
| Market-to-book | 1.378 | 2.057 | 0.679 ** |
| Intangibility | 0.000 | 0.001 | 0.001 ** |
| Net debt issues ^a | 0.010 | 0.022 | 0.012 |
| Net equity issues ^a | 0.039 | 0.134 | 0.095 ** |
| Continental Europe | | | |
| Leverage | 0.639 | 0.560 | -0.079 ** |
| Profitability | 0.066 | 0.063 | -0.003 |
| Size | 5.857 | 4.647 | -1.210 ** |
| Interest rate | 0.079 | 0.082 | 0.003 |
| Market-to-book | 1.183 | 1.617 | 0.434 ** |
| Intangibility | 0.019 | 0.052 | 0.033 ** |
| Net debt issues ^a | 0.009 | 0.018 | 0.009 |
| Net equity issues ^a | 0.034 | 0.070 | 0.036 ** |

Note: Variable definitions are the following. Leverage: total debt as a fraction of total assets. Profitability: earnings after interest, taxes and dividends, but before depreciation and amortization as a fraction of total assets. Size: the logarithm of total assets in 2000 prices. Interest rate: total interest expense as a fraction of total debt. Market-to-book: the market value of the firm relative to the book value of assets; calculated as book value of debt plus market value of equity divided by book value of total assets. Intangibility: the amount of intangible assets relative to total assets. Net debt issues: the change in the book value of long term debt as a fraction of total assets. Net equity issues: the change in the book value of stock capital as a fraction of total assets.

Statistical significance of the difference in medians at the 5 or 1 percent level is indicated by * and **, respectively, using the continuity corrected Pearson $\chi^2(1)$ test.

a) Means are reported rather than median values as median values are zero. Statistical significance of the difference in means is calculated using the *t*-test.

Table 2**EFWAMB by sector**

| | All firms | non-ICT firms | ICT firms | Difference non-ICT vs. ICT |
|---|----------------------------------|---------------------------------|-----------------------------------|----------------------------------|
| United States | 1.031 | 1.039 | 1.008 | 0.031** |
| United Kingdom (difference vs. United States) | 1.015 (-0.016*) | 1.014 (-0.025**) | 1.056 (0.048) | 0.042 |
| Continental Europe (difference vs. United States) (difference vs. United Kingdom) | 1.003 (-0.028**) (-0.012*) | 1.005 (-0.034**) (-0.009) | 0.972 (-0.036**) (-0.084**) | 0.033* |

Note: Median values. Statistical significance of the difference in medians at the 5 or 1 percent level is indicated by * and **, respectively, using the continuity corrected Pearson $\chi^2(1)$ test.

Table 3

Historical market-to-book effects in capital structure regressions

| | 1993- 1996 | 1994- 1997 | 1995- 1998 | 1996- 1999 | 1997- 2000 | 1998- 2001 | Full sample |
|---------------------------|-------------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| United States | | | | | | | |
| Non-ICT firms | -0.085** (5.5) | -0.111** (10.7) | -0.106** (8.0) | -0.118** (6.8) | -0.086** (4.9) | -0.075** (3.7) | -0.087** (6.3) |
| ICT firms | 0.006 (0.2) | 0.006 (0.5) | -0.016 (0.6) | -0.059* (2.5) | -0.080** (4.2) | -0.018 (0.5) | -0.019 (0.8) |
| United Kingdom | | | | | | | |
| Non-ICT firms | 0.028 (1.8) | 0.058** (4.1) | 0.025 (1.1) | 0.015 (0.7) | -0.001 (0.0) | -0.003 (0.1) | 0.020 (1.1) |
| ICT firms | -0.123* (2.2) | 0.051 (0.5) | 0.018 (0.3) | -0.105 (1.6) | -0.097 (1.5) | -0.053 (0.9) | -0.036 (0.7) |
| Continental Europe | | | | | | | |
| Non-ICT firms | 0.006 (0.5) | 0.003 (0.3) | -0.006 (0.5) | 0.016 (1.2) | 0.023 (1.8) | 0.003 (0.2) | 0.002 (0.2) |
| ICT firms | -0.072 (1.9) | 0.003 (0.1) | -0.045 (0.9) | -0.047 (1.0) | -0.094* (2.0) | -0.025 (0.6) | -0.077* (2.3) |

Note: The dependent variable is leverage. Appendix A specifies the four-digit SIC codes that we classify as ICT industries. Additional control variables as per Appendix B are included, but only the coefficients on external-finance-weighted market-to-book (EFWAMB) are reported. Appendix B presents the regression results in full. Presented results derive from cross-sectional time-series FGLS regressions, allowing for heteroskedastic panels and a common autoregressive coefficient for all panels. * and ** denote statistical significance at the 5% and 1% level, respectively.

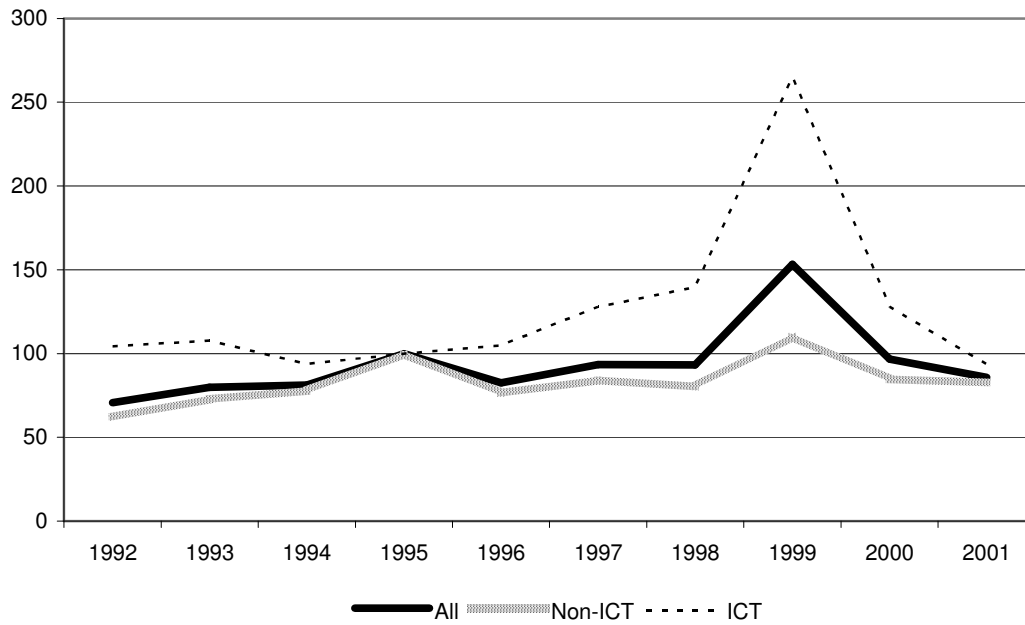
Table 4

Robustness: historical market-to-book effects in various specifications

| | 1993- 1996 | 1994- 1997 | 1995- 1998 | 1996- 1999 | 1997- 2000 | 1998- 2001 | Full sample |
|--|-------------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| PANEL A: Dependent variable is long-term leverage | | | | | | | |
| United States | | | | | | | |
| <i>EFWAMB_t</i> | -0.027 (1.9) | -0.030* (2.1) | -0.041** (4.8) | -0.061** (5.5) | -0.043** (3.1) | -0.055** (3.4) | -0.038** (3.1) |
| United Kingdom | | | | | | | |
| <i>EFWAMB_t</i> | -0.009 (0.8) | -0.008 (0.9) | 0.004 (0.3) | 0.000 (0.0) | -0.023 (1.3) | -0.005 (0.3) | -0.005 (0.4) |
| Continental Europe | | | | | | | |
| <i>EFWAMB_t</i> | -0.008 (1.0) | 0.062** (6.1) | 0.048** (4.4) | 0.049** (4.0) | 0.051** (4.3) | 0.042** (2.8) | 0.041** (3.8) |
| PANEL B: <i>EFWAMB^{BW}</i> defined as in Baker and Wurgler (2002) | | | | | | | |
| United States | | | | | | | |
| <i>EFWAMB^{BW}_t</i> | -0.161** (9.3) | -0.207** (12.0) | -0.161** (9.5) | -0.172** (9.9) | -0.177** (8.1) | -0.121** (5.0) | -0.146** (9.1) |
| United Kingdom | | | | | | | |
| <i>EFWAMB^{BW}_t</i> | 0.008 (0.6) | -0.037* (2.3) | 0.007 (0.3) | 0.027 (1.2) | 0.023 (0.9) | 0.025 (0.9) | 0.013 (0.7) |
| Continental Europe | | | | | | | |
| <i>EFWAMB^{BW}_t</i> | 0.002 (0.2) | -0.006 (0.4) | -0.007 (0.5) | 0.008 (0.6) | 0.003 (0.2) | -0.003 (0.2) | 0.003 (0.3) |
| PANEL C: Dependent variable is long-term leverage; <i>EEWAMB</i> and <i>DWAMB</i> instead of <i>EFWAMB</i> | | | | | | | |
| United States | | | | | | | |
| <i>EEWAMB_t</i> | -0.113** (9.1) | -0.058** (3.3) | -0.024 (1.5) | -0.029 (1.8) | -0.031* (2.3) | -0.008 (0.6) | -0.018 (1.4) |
| <i>DWAMB_t</i> | 0.102** (7.5) | 0.042* (2.1) | 0.005 (0.3) | -0.014 (0.7) | 0.010 (0.5) | 0.004 (0.2) | -0.010 (0.6) |
| United Kingdom | | | | | | | |
| <i>EEWAMB_t</i> | -0.021 (1.8) | 0.007 (0.4) | 0.022 (1.3) | 0.024 (1.4) | -0.014 (0.7) | 0.008 (0.4) | 0.019 (1.2) |
| <i>DWAMB_t</i> | 0.055** (6.2) | 0.005 (0.4) | 0.004 (0.2) | -0.012 (0.8) | -0.032 (1.5) | -0.026 (1.4) | -0.010 (0.6) |
| Continental Europe | | | | | | | |
| <i>EEWAMB_t</i> | 0.051** (7.8) | 0.013 (0.8) | -0.028 (1.7) | 0.020 (1.3) | 0.007 (0.5) | 0.008 (0.7) | 0.011 (0.9) |
| <i>DWAMB_t</i> | -0.025** (3.2) | 0.053** (3.5) | 0.105** (6.8) | 0.055** (4.0) | 0.087** (10.1) | 0.076** (6.4) | 0.054** (4.2) |

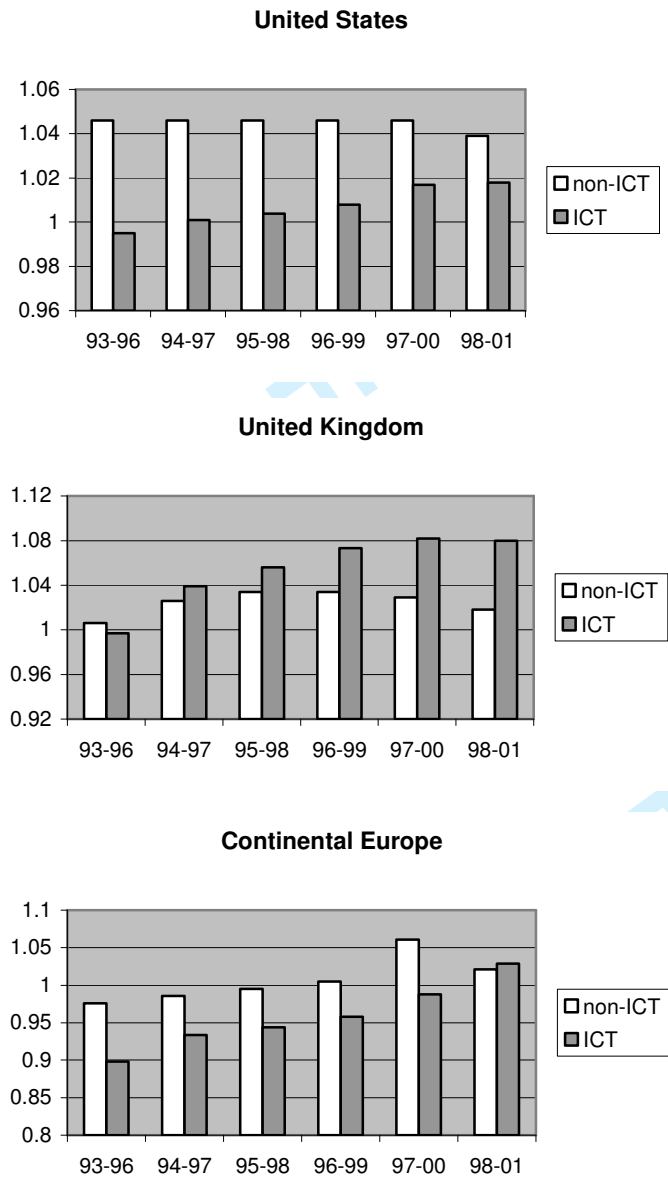
Note: Additional control variables as per Appendix B are included, but only the coefficients on external-finance-weighted market-to-book are reported. Presented results derive from cross-sectional time-series FGLS regressions, allowing for heteroskedastic panels and a common autoregressive coefficient for all panels. * and ** denote statistical significance at the 5% and 1% level, respectively.

Fig. 1 - Stock price index (1995=100)



Source: Compustat, authors' calculations.

Figure 2
Median EFWAMB by region and period



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APPENDIX A

ICT industries (SIC 1987 codes)

| SIC code | Sector description |
|----------|--|
| 3571 | Electronic Computers |
| 3572 | Computer Storage Devices |
| 3575 | Computer Terminals |
| 3576 | Computer Communications Equipment |
| 3577 | Computer Peripheral Equipment, NEC |
| 3613 | Switchgear and Switchboard Apparatus |
| 3629 | Electrical Industrial Apparatus, NEC |
| 3651 | Household Audio and Video Equipment |
| 3652 | Phonograph Records and Prerecorded Audio Tapes and Disks |
| 3661 | Telephone and Telegraph Apparatus |
| 3663 | Radio and Television Broadcasting and Communications Equipment |
| 3669 | Communications Equipment, NEC |
| 3671 | Electron Tubes |
| 3672 | Printed Circuit Boards |
| 3674 | Semiconductors and Related Devices |
| 3675 | Electronic Capacitors |
| 3676 | Electronic Resistors |
| 3677 | Electronic Coils, Transformers, and Other Inductors |
| 3678 | Electronic Connectors |
| 3679 | Electronic Components, NEC |
| 3695 | Magnetic and Optical Recording Media |
| 3699 | Electrical Machinery, Equipment, and Supplies, NEC |
| 3812 | Search, Detection, Navigation, Guidance, and (Aero)autical Systems and Instruments |
| 3823 | Industrial Instruments for Measurement, Display, and Control of Process Variables; and Related |
| 3824 | Totalizing Fluid Meters and Counting Devices |
| 3825 | Instruments for Measuring and Testing of Electricity and Electrical Signals |
| 3826 | Laboratory Analytical Instruments |
| 3827 | Optical Instruments and Lenses |
| 3829 | Measuring and Controlling Devices, NEC |
| 3861 | Photographic Equipment and Supplies |
| 3873 | Watches, Clocks, Clockwork Operated Devices and Parts |
| 4812 | Radiotelephone Communications |
| 4813 | Telephone Communications, Except Radiotelephone |
| 4822 | Telegraph and Other Message Communications |
| 4832 | Radio Broadcasting Stations |
| 4833 | Television Broadcasting Stations |
| 4841 | Cable and Other Pay Television Services |
| 4899 | Communications Services, NEC |
| 5045 | Computers and Computer Peripheral Equipment and Software |
| 5063 | Electrical Apparatus and Equipment Wiring Supplies, and Construction Materials |
| 5064 | Electrical Appliances, Television and Radio Sets |
| 5065 | Electronic Parts and Equipment, NEC |
| 5072 | Hardware |
| 5731 | Radio, Television, and Consumer Electronics Stores |
| 5734 | Computer and Computer Software Stores |
| 7371 | Computer Programming Services |
| 7372 | Prepackaged Software |
| 7373 | Computer Integrated Systems Design |
| 7374 | Computer Processing and Data Preparation and Processing Services |
| 7375 | Information Retrieval Services |
| 7376 | Computer Facilities Management Services |
| 7377 | Computer Rental and Leasing |
| 7378 | Computer Maintenance and Repair |
| 7379 | Computer Related Services, NEC |

APPENDIX B - Capital structure regression results

| | 1993- 1996 | 1994- 1997 | 1995- 1998 | 1996- 1999 | 1997- 2000 | 1998- 2001 | Full sample |
|--|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| United States | | | | | | | |
| Profitability _t | -0.545** (10.4) | -0.784** (14.3) | -0.814** (15.2) | -0.652** (13.9) | -0.573** (13.3) | -0.564** (13.1) | -0.557** (15.8) |
| Size _t | 0.036** (16.8) | 0.035** (20.2) | 0.038** (21.4) | 0.035** (17.8) | 0.034** (17.2) | 0.035** (14.7) | 0.039** (21.1) |
| Interest rate _t | -0.293** (6.6) | -0.252** (6.0) | -0.308** (7.0) | -0.274** (6.9) | -0.234** (6.4) | -0.375** (9.9) | -0.298** (10.3) |
| Market-to-book _t | -0.019** (4.4) | -0.012** (4.0) | -0.010** (4.3) | -0.009* (2.5) | -0.004 (1.7) | -0.008* (2.4) | -0.009** (3.9) |
| Intangibility _t | -0.004 (0.1) | 0.055* (2.5) | 0.144** (4.9) | 0.241** (10.6) | 0.244** (10.3) | 0.200** (7.3) | 0.120** (4.6) |
| EFWAMB _t | -0.085** (5.5) | -0.111** (10.7) | -0.106** (8.0) | -0.118** (6.8) | -0.086** (4.9) | -0.075** (3.7) | -0.087** (6.3) |
| EFWAMB _t × D ^{ICT} | 0.091** (3.0) | 0.117** (7.2) | 0.090** (2.9) | 0.059* (2.0) | 0.005 (0.2) | 0.058 (1.4) | 0.068* (2.5) |
| D ^{ICT} | -0.111** (3.0) | -0.136** (5.8) | -0.119** (3.2) | -0.078* (2.4) | -0.020 (0.7) | -0.091* (2.0) | -0.096** (3.0) |
| # observations | 604 | 766 | 853 | 885 | 894 | 852 | 1731 |
| # firms | 195 | 215 | 228 | 230 | 232 | 229 | 241 |
| Pseudo R ² | 0.357 | 0.381 | 0.462 | 0.433 | 0.375 | 0.420 | 0.397 |
| Wald test | 587.1** | 1190.0** | 1256.2** | 1296.4** | 1130.2** | 760.2** | 1270.7** |
| Common AR(1) coefficient | 0.73 | 0.44 | 0.69 | 0.71 | 0.78 | 0.77 | 0.75 |
| United Kingdom | | | | | | | |
| Profitability _t | -0.340** (3.3) | -0.347** (6.2) | -0.415** (7.2) | -0.392** (6.2) | -0.338** (5.0) | -0.415** (6.2) | -0.385** (7.3) |
| Size _t | 0.005 (1.6) | 0.021** (3.9) | 0.009** (3.5) | 0.010** (4.1) | 0.015** (6.5) | 0.018** (7.0) | 0.020** (7.6) |
| Interest rate _t | -0.314** (4.3) | -0.230** (7.2) | -0.205** (5.1) | -0.120** (3.4) | -0.120** (4.0) | -0.110** (4.4) | -0.132** (5.7) |
| Market-to-book _t | 0.026** (3.4) | 0.021** (4.8) | 0.028** (5.5) | 0.023** (4.9) | 0.012* (2.5) | 0.015** (3.0) | 0.012** (3.1) |
| Intangibility _t | 0.091 (1.0) | 0.062 (0.6) | -0.041 (0.9) | 0.040 (1.0) | 0.033 (1.0) | 0.107** (3.1) | 0.057** (1.6) |
| EFWAMB _t | 0.028 (1.8) | 0.059** (4.1) | 0.025 (1.1) | 0.015 (0.7) | -0.001 (0.0) | -0.003 (0.1) | 0.020 (1.1) |
| EFWAMB _t × D ^{ICT} | -0.152** (2.6) | -0.008 (0.1) | -0.007 (0.1) | -0.120 (1.8) | -0.096 (1.4) | -0.051 (0.8) | -0.056 (1.0) |
| D ^{ICT} | 0.080 (0.9) | 0.018 (0.1) | 0.019 (0.3) | 0.139 (1.9) | 0.112 (1.4) | 0.045 (0.6) | 0.077 (1.2) |
| # observations | 386 | 514 | 584 | 622 | 630 | 619 | 1195 |
| # firms | 125 | 148 | 156 | 160 | 161 | 164 | 165 |
| Pseudo R ² | 0.069 | 0.078 | 0.057 | 0.045 | 0.058 | 0.093 | 0.086 |
| Wald test | 56.8** | 145.8** | 116.6** | 107.8** | 125.1** | 180.7** | 192.4** |
| Common AR(1) Coefficient | 0.66 | 0.97 | 0.73 | 0.69 | 0.65 | 0.70 | 0.74 |

App. B (continued)

| | 1993- 1996 | 1994- 1997 | 1995- 1998 | 1996- 1999 | 1997- 2000 | 1998- 2001 | Full sample |
|--|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Continental Europe | | | | | | | |
| Profitability _t | -0.587** (13.4) | -0.713** (17.9) | -0.590** (19.3) | -0.627** (15.9) | -0.596** (16.1) | -0.598** (15.3) | -0.572** (18.6) |
| Size _t | 0.026** (22.3) | 0.019** (17.5) | 0.023** (25.9) | 0.022** (16.3) | 0.024** (16.0) | 0.022** (16.8) | 0.026** (18.8) |
| Interest rate _t | -0.138** (6.4) | -0.154** (9.4) | -0.179** (9.9) | -0.161** (8.9) | -0.152** (7.8) | -0.112** (5.6) | -0.142** (10.7) |
| Market-to-book _t | -0.009* (2.0) | -0.008* (2.2) | -0.003 (1.0) | -0.002 (0.7) | 0.001 (0.6) | 0.001 (0.4) | -0.001 (0.5) |
| Intangibility _t | 0.095** (3.5) | 0.064** (3.3) | 0.109** (5.6) | 0.016 (1.1) | 0.012 (0.6) | -0.011 (0.5) | 0.053** (2.7) |
| EFWAMB _t | 0.006 (0.5) | 0.003 (0.3) | -0.006 (0.5) | 0.016 (1.2) | 0.023 (1.8) | 0.003 (0.2) | 0.002 (0.2) |
| EFWAMB _t × D ^{ICT} | -0.078* (2.0) | 0.000 (0.0) | -0.039 (0.8) | -0.063 (1.2) | -0.117* (2.4) | -0.028 (0.6) | -0.079* (2.3) |
| D ^{ICT} | 0.049 (1.2) | -0.044 (0.9) | 0.015 (0.3) | 0.032 (0.6) | 0.080 (1.6) | -0.008 (0.2) | 0.057 (1.6) |
| # observations | 949 | 1152 | 1268 | 1325 | 1340 | 1312 | 2625 |
| # firms | 287 | 316 | 334 | 341 | 343 | 344 | 348 |
| Pseudo R ² | 0.292 | 0.259 | 0.236 | 0.217 | 0.227 | 0.199 | 0.231 |
| Wald test | 1348.8** | 1376.2** | 1321.3** | 1331.3** | 902.4** | 722.4** | 1200.9** |
| Common AR(1) Coefficient | 0.89 | 0.80 | 0.84 | 0.80 | 0.83 | 0.76 | 0.80 |

Note: The dependent variable is leverage. D^{ICT} is a dummy variable that takes value 1 if the respective firm is in an ICT industry and 0 otherwise. Appendix A specifies the four-digit SIC codes that we classify as ICT industries. See Table 1 for variable definitions. In addition to the reported variables each regression contains a year-specific constant term. Presented results derive from cross-sectional time-series FGLS regressions, allowing for heteroskedastic panels and a common autoregressive coefficient for all panels. The Wald test checks whether all coefficients are equal to zero. * and ** denote statistical significance at the 5% and 1% level, respectively.