LIMITS OF ARBITRAGE AND CORPORATE FINANCIAL POLICIES*

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Abstract: We focus on an exogenous event that changes the cost of equity of the firm—the addition of its stock to the S&P 500 index—and we use it to test capital structure theories in a controlled experiment, where the effect of the index addition on the stock price is exogenous from a manager's point of view. We investigate how firms modify their corporate financial and investment policies as a reaction to the addition to the index. Consistent with both traditional theories and Stein's (1996) market timing theory, we find bigger increases in equity issues and investment - partly through more acquisitions – in response to bigger drops in the cost of equity. However, in the 24 months after the index addition, firms that issue equity and increase investment display negative abnormal returns and they perform worse than firms that issue but do not increase investment. This finding is consistent only with the market timing theory of Stein (1996) and supports a "limits of arbitrage" story in which stocks display a downward sloping demand curve and firms themselves act as "arbitrageurs" taking advantage of the window of opportunity provided by the stock price change around the S&P500 index addition.

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1 Introduction

The literature on "limits of arbitrage" argues that, if institutional investors are constrained by the lack of long-term resources, they cannot arbitrage away differences in price between otherwise identical — in terms of cash flow and risk profile — stocks. A classic example of this phenomenon is the abnormal announcement return observed when a stock is added to the S&P 500 index (e.g., Shleifer, 1986). Given that some investors (e.g., index funds) are institutionally required to invest only in stocks of S&P 500 firms, the addition to the index increases the pool of investors holding the stock. In the absence of sufficient arbitrage capital,[1] this raises the demand for the stock and increases its price, reducing the cost of capital for the firm, *even in the presence of no change in the firm's risk profile*. Therefore, the index addition provides the firm with access to cheaper funds and, at the same time, reduces the effectiveness of the new cost of capital as a proper risk-based hurdle rate for the investment of the firm (Stein, 1996).

Since the index addition is exogenous from the point of view of the managers, the event provides an ideal setting to test Stein's (1996) market timing theory. This theory relates corporate financial decisions to a mispricing of equity – i.e., to a change in the cost of equity that is not risk related. In our test setting, market timing predicts that managers react to the "mispricing" (drop in the cost of equity) by issuing equity to take advantage of the window of opportunity.

Given that the new cost of capital is not a proper risk-based hurdle rate for the investment of the firm, any investment undertaken on the basis of it would not be value enhancing. Therefore, only short-horizon managers – by definition indifferent to the firm's long run value – use the money to increase investment. Long horizon managers, instead, use the proceeds to pay back debt or increase cash.

However, the change in the cost of equity ensuing the index addition may also be related to changes in the risk profile (e.g., due to changes in liquidity) as opposed to mispricing. In this case, traditional capital structure theories predict that in response to a lower cost of equity, firms issue more equity and increase investment. Since the change in the cost of equity is related to a change in the risk profile, the effectiveness of the new cost of capital as a proper risk-based hurdle rate for the investment of the firm is not in question. Consequently, increases in investment should be value enhancing.

Therefore, the index addition provides us with the possibility of testing the joint hypotheses of market timing and mispricing (equity issue and value-destroying investment)

[1] We use the term limits of arbitrage interchangeably with limited arbitrage to include the case where all market participants are rational but arbitrageurs' resources are limited (Shleifer and Vishny, 1997).

against traditional capital structure theories and a risk-related change in the cost of equity (equity issue and value enhancing investment).

We focus on a sample of 222 firms added to the S&P 500 index in the years 1981 through 1997 and show that around the S&P 500 index addition the cost of equity decreases significantly. Using the Fama-French three-factor model, we find the drop to be a statistically and economically significant 1.2 percentage points – a decrease in the average cost of capital of about 8%.

We also find strong evidence that firms react to the drop in the cost of equity by issuing more equity and increasing investment, even compared to matching sample firms. For example, our regressions imply that a one standard deviation bigger drop in the cost of equity around the index addition leads an increase in the net[2] ratio of equity issues to assets of 3.6 percentage points. Compared to an average net equity issue of 0.5 percent, this is a economically significant change. At the same time, a one standard deviation bigger drop in the cost of equity also leads to a 3.3 percentage point increase in net investment. In comparison with an average net ratio of investment to assets of 1.3 percent, the impact of the cost of equity change is again quite sizeable. Firms seem to carry out the increase in investment largely by making new acquisitions. The increase in equity issues and investment in response to a drop in the cost of equity is consistent with both, traditional theories and Stein's (1996) market timing theory where the average firm is managed by short-horizon managers.

The analysis of long-run stock returns allows us to differentiate between market timing and traditional theories. Traditional models are based on the assumption that the drop in the cost of equity is not due to mispricing but is related to a change in the fundamental risk of the firm. This implies that issuing equity and increasing investment, by allowing managers to exploit the additional positive NPV projects, will lead to a *higher* firm value in the long run relative to issuing but not investing. On the contrary, Stein's (1996) theory posits that firms that issue equity and increase investment should experience a negative long-run abnormal return and underperform firms that issue equity but do not increase investment. The intuition is that the new cost of equity does not represent a proper hurdle rate and therefore investment will be only undertaken by short-horizon managers who do not care about the long-run performance of the firm.

Consistent with the market timing theory and in contrast to the prediction of the traditional theories, we do indeed find that the subsample of firms that issues equity and increases investment in the two years after the index addition displays significantly negative long-run abnormal returns. Moreover, firms that issue equity and increase cash perform better, while firms that issue equity and reduce debt do even better. Our results are consistent with the interpretation

[2] We define net as the difference with respect to the ratio of comparable firms.

that the change in the cost of equity around the index addition is at least partially caused by mispricing and that firms exploit it by issuing equity – thus *de facto* acting as arbitrageurs.

As a further refinement, we also exploit the prediction of Stein's (1996) model that financially constrained firms act as if they were managed by short-horizon managers. Managers of unconstrained firms can instead still have a long or a short horizon. We therefore expect, according to market timing, that the unconstrained firms that issue and increase investment should *reveal themselves* to be managed by short-horizon managers whereas the ones that do not increase investment should reveal themselves to be managed by long-horizon managers.

The data supports this hypothesis. We find that the long-run abnormal returns for financially constrained firms are significantly negative regardless of whether they increase investment (consistent with the findings of Lamont, Polk, and Saa Requejo, 2001). On the other hand, the long-run abnormal returns of financially unconstrained firms, while in general positive, turn negative if firms issue equity and increase investment. Thus, firms revealing themselves to be operated by short-horizon managers suffer significantly in the long run, consistent with the market timing theory and in direct contrast with the traditional ones.

Our paper relates to two strands of literature: the one on limits of arbitrage and the one on testing capital structure theories. The literature on the limits of arbitrage has found compelling evidence that limits of arbitrage affect individual stock prices through downward-sloping demand curves. Shleifer and Vishny (1997) theoretically show how limits to arbitrage can exist in the market if arbitrageurs are constrained in their resources. Indirect evidence is provided by the studies on the effects of compositional changes in broad indices, block trading and international flows of funds. Studies analyzing additions and deletions to the S&P 500 index find that additions to the index increase share prices, while delistings decrease share prices (e.g., Garry and Goetzmann, 1986; Harris and Gurel, 1986; Shleifer, 1986; Dhillon and Johnson, 1991; Beneish and Whaley, 1996; and Lynch and Mendenhall, 1997). Similar effects have been documented in studies of index additions in other countries (e.g., Masse *et al*., 2000). More recently, Barberis, Shleifer and Wurgler (2005) show that the addition to the index causes the stock to co-move more with other S&P 500 firms and increases the beta with respect to the S&P 500 index. More direct evidence on the impact of flows on stocks is provided by Warther (1995), Zheng (1999), Goetzmann and Massa (2002) and Teo and Woo (2003), who show that demand pressure from mutual funds has a direct impact on stock prices and increases stocks' cross-correlations. Gromb and Vayanos (2002) investigate the welfare implications of limits of arbitrage.

The second literature we relate to is the one on capital structure and investment. Traditional capital structure theories are based on the assumption that the market is rational.

Market timing theory, instead, is based on mispricing. Such mispricing may be due to market irrationality and behavioral biases or limits of arbitrage existing for rational or irrational reasons. Stein (1996) argues that, in the presence of mispricing, rational managers time the market, issuing and investing depending on the level of market sentiment and their own investment horizons. Empirically, Baker and Wurgler (2002) find that managers time the market. That is, firms with higher market-to-book ratios in previous years display comparatively lower leverage. Also, Baker *et al*. (2003) show that financially constrained firms display a higher sensitivity of issuing equity to current market valuation. An extensive summary of the market timing literature can be found in Baker *et al*. (2004). Misvaluation in the stock market has also been shown to affect corporate investment. For example, Panageas (2004) finds this in a sample of firms that were introduced into a loan crowd in 1926. Himmelberg *et al*. (2004) investigate the technology boom in the 1990s, while Baker *et al*. (2004) look at FDI flows.

However, to our knowledge, there are no studies that focus on the impact of limits of arbitrage on corporate financial policy and in turn its impact on the market. In the present paper, we bridge this gap. Our goal is to study how the managers' choice of capital structure, investment and cash holding policies is affected by the change in the cost of equity around the index addition. That is, if limits to arbitrage prevent *investors* from arbitraging away differences in prices, how are *firms* reacting to this situation, and then how is the market reacting to the corporate reaction?

Our contribution is threefold. First, we are able to test predictions of capital structure theories using the S&P 500 index addition as an event — an event that is *exogenous* to the firm's decisions. Few studies analyzing corporate financial policy issues can escape the criticism of endogeneity. Investment decisions are affected by and affect funding decisions. Payout policy is interlinked with the funding and investment decisions. The corporate financial structure (leverage) is often the result of a series of separate decisions taken over a long period of time (Baker and Wurgler, 2002) and is not necessarily based on an optimizing decision (Welch, 2004). This implies that there are very few situations where it is possible to find an identifying restriction that lets us break the simultaneity inherent in any corporate financial decision (Lamont, 1997). We believe the addition of a firm to the S&P 500 index – an event largely outside management's control and exogenously changing the cost of equity – to be one such situation.

Second, to our knowledge, we are the first to test directly the predictions of Stein's (1996) behavioral market timing model against rational capital structure theories. Current tests of Stein's model have been limited to testing cross-sectional predictions of the model itself, without explicit considerations for rational alternatives. In cross-sectional tests, if the changes in the stock prices are driven by risk-related factors as opposed to mispricing, predictions of rational alternatives may be observationally equivalent to those of a market timing model.

Third, our results offer a potential reconciliation between the findings of Shleifer (1986) and Garry and Goetzmann (1986), who show that the addition to the index has a permanent effect on the share price, and Harris and Gurel (1986), Beneish and Whaley (1996) and Lynch and Mendenhall (1997), who find a reversal. We argue that the equity issues offset the initial reason for the increase in stock prices by increasing the supply of shares. Thus, firms *de facto* act as arbitrageurs. Firms' reactions to the event itself seem to affect the long-run performance, thus leaving room for different findings at different time horizons.

It is also interesting to note that these results question the degree of market efficiency. Indeed, if firms are able to take advantage of stock market reactions, either the market does not rationally foresee firms' reactions, or it is prevented by some constraint from optimally adjusting to the long-run value. This provides further indirect evidence on the limits of arbitrage and suggests the existence of constraints analogous to the ones found in the case of lack of "arbitrage capital" in mergers and acquisitions (Baker and Savasoglu, 2002).

The paper is structured as follows: In the next section, we investigate the effect of the S&P 500 index addition on the change in the cost of equity. In Section 3, we study the firm's reaction to the change in the cost of equity. In Section 4, we focus on the long-run market reaction to distinguish between the market timing and the traditional theories. Section 5 extends the tests by including proxies for financial constraints. In Section 6, we discuss the implications of our findings for market efficiency. A brief conclusion follows.

2 Does the Index Addition Change the Cost of Equity?

We start by describing the sample selection process. Then we investigate whether the S&P 500 index addition changes the cost of equity.

2.1 Sample selection

We study firms that were added to the S&P 500 index over the period from 1981 through 1997. We start with a sample of 392 firms but exclude events where firms are added to the S&P 500 index due to a merger, spin-off or some other form of restructuring (85 events). We also exclude financial firms defined as firms operating in the SIC between 6,000 and 6,999, because their choice of leverage differs from those of non-financial firms (59 events). We require that our sample firms have data available in Compustat and CRSP for stock prices and financial data, I/B/E/S for analyst coverage, and TFN/Institutional for institutional ownership. We also require data on insider ownership in the year prior to the index addition. This data is collected from Valueline and proxy filings. These requirements eliminate another 26 events, so we end up with 222 firms that have all the data available to be included in our sample.

2.2 The change in the cost of equity

Shleifer (1986) argues that the positive announcement return observed at the time of the S&P500 index addition is a reflection of a drop in the discount rate[3] rather than a change in expected cash flows because S&P does not change its stock rating around the index addition. Kaul *et al.* (2000) present further evidence that support the downward sloping demand curve argument. They find price changes on the announcement of the re-weighting of the Canadian Index. Thus, even if firms are already part of the index, a change in the weight requiring index funds to buy or sell certain firms' stock, affects stock prices. In contrast, Denis *et al.* (2003) find that earnings expectations increase after the index addition and that realized earnings relative to comparable firms also increase. They conclude that managers of firms added to the index experience more pressure to perform well, which makes them generate higher earnings.

We address this issue, by directly measuring the change in the cost of equity. We use a methodology similar to the one employed by Vijh (1994) and Barberis, Shleifer and Wurgler (2005), but considering the Fama-French three-factor model instead of the market model. Barberis, *et al.* (2005) document a change in the covariance between the stock return of firms added to the index and the market return. They interpret this as evidence in favor of "comovement" that is based on frictions or sentiment rather than on fundamentals.

We compute the change in the cost of equity in the following way: for each firm, we compute the difference in the Fama-French factor loadings ($Beta_{Market}$, $Beta_{SMB}$ and $Beta_{HML}$) around the event and multiply it by the average value of the factors (Market, SMB and HML) calculated over the 60 months prior to the event (or alternatively over the period from 1977 to 2000). We use alternative specifications in which the factor loadings are computed in the 24 (12) months ending one month before the event and in the 24 (12) months after the event, using daily returns.

The results are reported in Table 1, Panel A. They show that the cost of equity decreases significantly around the index addition. This holds regardless of the specification employed to calculate the change in the cost of equity. For example, when we use 24 months to calculate the betas before and after, and use the average risk premium for the factors in the 60 months prior to

[3] This can be seen most easily by thinking of the present value of a perpetuity with cash flow CF and discount rate r_1. The event increases the present value from PV_1 to PV_2 without changing CF. Thus the new discount rate r_2 would need to be lower than r_1.

the event, we observe a significant drop in the cost of equity of 1.26 percentage points for the average firm[4]. The economic magnitude is similar to the change in the cost of equity found in the ADR literature (e.g., Karolyi, 1998).[5] The 1.26 percentage point drop in the cost of capital represents about an 8% drop from the previous average of 16.05% (Table 1, Panel B). The fact that the change in the cost of capital is statistically and economically significant supports the notion that the index addition's announcement effect might be related to a downward sloping demand curve. However, it does not exclude the reasoning of Denis *et al.* (2003).

The drop in the cost of equity is quite substantial, especially if we compare it to the abnormal announcement return of 3.21% (Table 1, Panel B). This is calculated over the window of -5 to +5 days around the index addition announcement using the parameters of the market model over the 254 days ending 46 days prior to the S&P 500 index addition announcement, and with the equally weighted CRSP index as the market return.

How can we reconcile these two figures – the change in the cost of equity and the announcement return? A simple growing perpetuity formula with a cost of equity of, say, 16% and a growth rate of 3% would suggest that the price at the announcement had to increase by 11% if the full 1.26 percentage point drop in the cost of equity had to be related to the announcement. Since the change in the cost of equity is calculated as the difference between the 24 months before relative to the 24 months after the index addition, factors other than the index addition itself affect the change in the cost of equity. In particular, event firms experience a significant run-up equivalent to 8.9% in the 6 months prior to the event. In our regression analysis we will control for it and other determinants of the cost of equity change around the index addition.

2.3 Institutional ownership change and the change in the cost of equity

We find that the fraction of institutional ownership increases by an average 1.4 percentage points from the quarter before to the end of the quarter of the index addition. The increase is statistically significant at the 1% level. The increased institutional ownership is in line with the interpretation that index funds need to buy the newly added stock, thus causing an increase in demand. If the demand curve is not flat, this phenomenon can lead to a price increase.[6]

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[4] In what follows we use this version of computing the change in the cost of equity. However, similar results are obtained using the other versions (not shown).

[5] The most significant change is the drop in $Beta_{SMB}$. Also significant is the drop in $Beta_{HML}$. In contrast to Barberis, Shleifer and Wurgler (2005), we do not find a significant change in $Beta_{Market}$ although the index addition is moving the market beta closer to 1. This can be explained by our use of a three-factor model where the market return is the value-weighed CRSP index, as opposed to Barberis et al. (2005), who use a one-factor model with the S&P 500 index as the market. Indeed, if we reestimate the change in the cost of equity using a single-factor model, the results are consistent with the ones of Barberis et al. (2005) (not tabulated).

[6] In the regression framework we will further investigate the correlation between the change in the cost of capital (as well as the announcement return) and the change in institutional ownership.

These findings support Shleifer's interpretation that the announcement return is caused by a downward-sloping demand curve.

2.4 Liquidity and change in the cost of equity

While our finding of a drop in the cost of equity is consistent with Shleifer's argument of a downward-sloping demand curve for stocks, we cannot exclude the possibility that other factors, such as liquidity, might affect the cost of equity. Indeed, if the stocks added to the index become more liquid, the value of this additional liquidity should be reflected in the abnormal return and possibly in the cost of equity.

The literature contains mixed results about the existence of a liquidity improvement after the index addition. Beneish and Whaley (1996) find a permanent increase in the trading volume but only a temporary decrease in the quoted spread. They therefore reject the hypothesis that an increase in liquidity is the main driver of the abnormal return experienced by firms added to the index. In contrast, Hedge and McDermott (2003) find evidence of a long-term sustained increase in the liquidity of the added stocks, mostly due to a reduction in the direct cost of transacting. This takes the form of an increase in the quoted dollar depth, trading volume and trading frequency.

In order to control for the potential effects of a change in liquidity we use a proxy based on trading volume. This variable, called *liquidity change*, is the difference between the average monthly volume in the interval [+1,+12] and [-12,-1], where volume is the number of shares traded divided by the number of shares outstanding. In Table 2, we show that trading volume increases significantly, thus leaving room for the possibility that the change in the cost of equity and the abnormal announcement return reflect expected improvements in the stock liquidity.

3 Corporate Reaction to the Index Addition

The S&P 500 index addition event is a unique setting to test the predictions of the market timing theory for two reasons: first, the change in the stock price at the announcement of the index addition is exogenous from the point of view of the managers. They can neither time the index addition event, nor control the market's reaction to it. Indeed, while the market may have expectations about the pool of firms that deserve to be added, the decision of which firm finally gets into the index is not predetermined (Shleifer, 1986)[7]. Second, the existing literature leaves

[7] Criteria for inclusion in the S&P 500 index are objective as well as subjective. A potential index firm must be profitable (for at least four quarters), not closely held (a minimum of 50% of its stock should be public) and large (at least $4 billion market capitalization is the standard in 2004), and must have a significant share trading volume (one-third of its total shares per year). Besides the objective criteria, industry composition and representation of the

room for the possibility that the change in the stock price can reflect mispricing, which is a necessary condition for the market timing theory.

3.1 Two hypotheses

We start by laying out the hypotheses relating to the firm's reaction to the index addition and then we move on to the empirical tests. We consider two alternative sets of theories of capital structure: market timing and traditional theories. The former is the market timing theory brought forward by Stein (1996). The latter include the trade-off and pecking-order theories.

3.1.1 Market timing theory

The market timing theory (Stein, 1996) is based on the assumption that the market price can be wrong – i.e., not reflecting a true change in the firm's riskiness and opportunities. This may be due to behavioral biases, as well as constraints on institutional investors that effectively segment the market. Firms can take advantage of the mispricing (i.e., the drop in the cost of equity) by issuing equity. This leads to the cross-sectional prediction that the bigger the drop in the cost of equity around the addition to the index, the more equity should be issued.

A unique feature of the market timing theory is that corporate decisions depend on the managers' investment horizon. Managers can have either a short horizon or a long horizon[8]. In either case, the managers act rationally given their horizon. In our test setting, s*hort-horizon* managers use the market-implied lower cost of equity to discount project cash flows. Given the lower hurdle rate for new projects, short-horizon managers are expected to increase investment. Thus, if the average firm is run by short-horizon managers, the market timing theory predicts a negative correlation between the change in the cost of equity and investment. In contrast, *long-horizon* managers realize that making investment decisions based upon the low(er) cost of equity – not in line with the true riskiness of the firm – would be detrimental to long-term shareholder value. Therefore, while they would exploit the window of opportunity and issue equity, they would not use the proceeds to increase investment. They would, instead, retire debt and/or increase cash.

3.1.2 Traditional theories

The traditional capital structure theories are based on two assumptions: first, that the change in the cost of equity is driven by a change in the firm's riskiness and second, that

economy are factors the eight-member committee considers. However, once added to the index, S&P 500 companies do not need to meet these criteria to stay in the index (www2.standardandpoors.com/spf/pdf/index/US_Methodology.pdf; September 2004).

[8] Stein (1996) defines managers as having a short horizon if they can realize gains from their actions before the "truth" is revealed. Essentially, the gains are based upon wealth transfers between new and old investors.

managers optimally react to it. If the cost of equity drops, managers react to it by issuing equity and increasing investment. The reason is that if one source of capital becomes cheaper, namely equity, the firm should use more of it. Also, if the discount rate drops, more projects will become positive-NPV projects, requiring an increase in investment. In addition, the trade-off theory predicts that a drop in the cost of equity shifts the optimal capital structure to include less debt.[9] Given that the relevant level of debt is gross debt minus cash, one way of reducing debt would be to increase cash.[10] Therefore, firms with a bigger drop in the cost of equity should increase their cash leverage more. These considerations allow us to formulate the following hypotheses:

H1A. Traditional theories: Managers react to the reduction in the cost of equity by issuing equity, increasing investment and either reduce debt or increase cash.

H1B. Market timing theory: Short-horizon managers react to the reduction in the cost of equity by issuing equity and increasing investment. Long-horizon managers use the window of opportunity to issue equity and do not increase investment, but reduce debt or increase cash.

Therefore, both the traditional and the behavioral theories predict a negative correlation between the change in the cost of equity and *equity issues*. However, the correlation between the change in the cost of equity and *investment* can potentially help us to differentiate between the traditional and the market timing theory. The traditional theories predict a negative correlation between the change in the cost of equity and investment, while the market timing theory predicts such a relationship only if the firm's managers have a short horizon.[11]

[9] The trade-off theory predicts that leverage is set to a level at which the costs and benefits of debt are balanced. The benefits of debt are its tax shield (Modigliani and Miller, 1963) and a potential reduction in the free cash flow problem (Jensen, 1986). In particular, a reduction in the cost of capital increases the number and size of the positive-NPV projects. This lowers the free cash flow at hand and thus the agency cost of equity. At the same time, more valuable investment opportunities increase the cost of financial distress and agency cost of debt. These three effects — lower agency cost of equity, higher financial distress and agency cost of debt — coincide to reduce the amount of debt in the optimal capital structure. A feature that is unique to our experiment is that we measure the change in the discount rate directly that is underlying the change in the equity value. If instead the change in equity value were primarily due to changes in expected cash flows, the optimal leverage could increase because tax shields become more valuable. This sets this experiment apart from prior studies (Baker and Wurgler, 2002; Welch, 2004).

[10] However, if firms also choose an optimal cash leverage (e.g., Opler, Pinkowitz, Stulz and Williamson, 1999), our tests need to consider the impact of the change in the cost of equity on debt and cash separately. According to Opler et al. (1999), a drop in the cost of capital increases investment opportunities and thus raises the value of the precautionary motive of cash. Also, a reduction in the opportunity cost of holding cash due to the lower cost of capital increases the optimal level of cash holdings.

[11] There exists a further possibility, namely, that managers are irrational. If we assume that the irrationality is overconfidence like in Malmandier and Tate (2004), then our test setting actually controls for this effect. The reason is that Malmendier and Tate (2004) posit that overconfident CEOs display a higher investment-cash flow sensitivity because they rely on internal cash flow for investment rather than issue undervalued equity. Thus the main effect on investment should come from changes in cash flows, not stock price changes. Stein's theory posits exactly the opposite. The advantage of our experiment is that cash flows do not change and only the equity value changes as a result of the addition to the index.

3.2 Empirical analysis

We now look at the way firms react to the change in the cost of equity around the index addition. In particular, we relate the change in the cost of equity to the changes in the corporate financial policies, investment and cash holdings, and other control variables that proxy for the change in the cost of debt, agency problems, asymmetric information and investment opportunities.

3.2.1 Data description and variable definition

We first compute raw measures of the changes in the corporate policies, which are based on changes in the event firm only. The variables of interest are leverage, stock and debt issues, investment and cash holdings. We use data provided by Compustat and follow Baker and Wurgler (2002) in defining leverage as the book value of debt divided by total assets (#6)[12], where the book value of debt is total assets minus book value of equity. The *book value of equity* is defined as total assets minus total liabilities (#181) and preferred stock (#10), plus deferred taxes (#35) and convertible debt (#79). We define *cash holdings* as cash and short-term investment (#1) divided by total assets. *Investment* is capital expenditures (#128) plus acquisitions (#129), divided by total assets.

We define *stock issues* as the common and preferred stock issued minus common and preferred stock repurchased (#108-#115), divided by total assets.[13] Similarly, *debt issue* is long-term debt issued minus long-term debt retired (#111-#114) plus changes in short-term debt (#301), divided by total assets. For the leverage and cash holdings, we use the change from the fiscal year end before to the fiscal year end one year after the event, i.e., the level at year t+1 minus the level at year t-1. For investment, stock issue and debt issue, we use the average of the variables in year 0 and year 1. We choose these definitions because firms may have a target leverage and cash holding, which requires studying the change from the previous levels, while for investment, stock issue and debt issue, no such target level exists. Flow measures are thus appropriate to study the cross-sectional implications of the capital structure theories. [14]

The use of raw measures has two main limitations. First, over the two-year period over which we gauge these changes other common factors could affect a firm's choice of leverage, investment or cash holding. Second, during the long period on which our analysis focuses (1981–

[12] The numbers in parentheses indicate the reference to the Compustat data item number.

[13] Qualitatively similar results obtain if we use the change in the book value of equity using the balance sheet information instead of the cash flow statement. Equity issues not for cash are also included in the balance sheet measure.

[14] For robustness tests we have also used SDC data on equity issues and repurchase announcements to select only equity transactions in the 24 months after the index addition. SDC data also excludes increases in equity due to option exercises. Results are similar to the ones reported below and are omitted for brevity.

1997), many changes may have taken place in the way both the market and managers react to the index addition. This could affect our analysis. In order to control for these two potentially confounding effects, we compute a net measure. The net measure is based on the difference between the *event firm* and a sample of *control firms*. To implement this, we construct a portfolio of three comparable firms for each event firm. These comparable firms are not in the S&P 500 index and are not added to it during the event year.

To find the comparable firms, we match the event firm with all the other non–S&P 500 firms in the same industry, measured at the one-digit SIC level. We choose the one-digit level and not a more detailed level because the S&P500 industry indices are also relatively coarsely defined (ten industries). The three matching firms are selected according to five criteria: size, market-to-book, leverage, number of analysts and institutional ownership. We choose to match on size because S&P500 firms need to be of a certain minimum size. The market-to-book ratio is used as a proxy for growth opportunities. We believe it is important to find a matching firm with similar growth potential, otherwise S&P 500 firms might display vastly different investment and financing patterns. Since we want to study the financing decisions of our event firms after the index addition, the difference to the matching firms needs to be determined by the index addition's effect, not by differences in leverage structures. In addition, S&P is more likely to choose firms that are growing in order to minimize chances that they have to be replaced quickly. We include the number of analysts as a matching criterion to get matching firms with similar levels of asymmetric information. Myers and Majluf (1984) have shown how asymmetric information can affect financing decisions. Finally, we match on institutional ownership level prior to the index addition in order to study the effect of institutional ownership change on the cost of equity as well as the corporate policies relative to the matching sample firms. In addition, S&P500 firms require a certain level of free float and turnover which we also proxy for by using institutional ownership.[15]

We first compute the absolute value of the percentage difference between the event and non-event firms along all the five criteria. Then, we rank the non-event firms according to the overall difference, which we define as the sum of the percentage difference of each of these five

[15] Our matching process has the advantage that corporate policy decisions are net of those of firms which had a similar chance of getting into the index. Thus, shocks that affect the corporate decisions of firms with, say high number of analyst following, will correctly lead us to conclude that there is no abnormal change in corporate policy. However, if we had just focused on finding a match based upon a narrow definition of the industry, our matching firm might not have been affected in the same way by such a shock – thus we would infer incorrectly an abnormal corporate policy change. This is significant because such a shock is related to the criteria of the index addition and would bias our results. On the other hand, if a shock affects just the industry, say the car industry is affected by a gas price increase, then our matching process might lead us to conclude that there is an abnormal corporate policy reaction whereas a closer industry match would not. However, our inferences are not biased because the shock is idiosyncratic enough to average out in aggregate.

criteria. Finally, we choose the three non-event firms with the smallest overall difference to form an equally weighted portfolio, which we call the *matching sample firms*. Based on the differences between the event and matching sample firms, we construct net measures as our primary proxies to assess the changes in capital structure, investment and cash holdings around the index addition.

In Table 2 we report univariate statistics of the corporate financial policies, investment and cash holding variables. We find that index addition firms issue, on average, 0.56 percentage points more equity than the comparable firms (median 0.48 percentage points and significant at the 5% level). More interestingly, we find a marginally significant correlation of –0.11 between the change the cost of equity and net equity issues (not tabulated). There is no significant difference in the average net debt issues. Overall, this leads to a significant reduction in the average net leverage of -1.67 percentage points (median -2.77 percentage points and significant at the 1% level). These univariate statistics seem to lend some support to the notion that managers are reacting to the change in the cost of equity implied by the index addition by issuing more equity and reducing leverage.

We do not find a consistent result for net investment. The average index addition firm invests 1.29 percentage points more than the comparable firms; the median, however, is lower by 0.05 percentage points. We check whether this result is driven by outliers but rather find that a large group of firms increases investment very significantly. In fact, we find 120 firms that announce an M&A transaction in the 24 months after the index addition compared to only 92 in the matching sample. The average (median) transaction size, measured as the value of the acquisition relative to the book value of the event firm, is 19.3% (4.3%). For the comparable firms, the relative transaction size is only 6.4% (2.6%). This evidence is consistent with the interpretation that the index addition affects corporate policies. However, it remains to be seen whether the increase in investment is related to the change in the cost of equity.

A word of caution is required in interpreting these univariate results because the corporate policies are strongly correlated with each other (Table 3). This is to be expected based on our hypotheses developed in subsection 3.1. Before drawing any conclusions about managers' reactions to the event, we will have to study the changes in a simultaneous equation framework using additional control variables.

3.2.2 Methodology

We proceed to test how firms change their corporate policies as a function of the change in the cost of equity due to the S&P 500 index addition. The predictions of the models outlined in subsection 3.1 can be tested only if we study all the corporate policies simultaneously. For example, equity issues may simultaneously affect cash holdings, investment and debt issues. By the same token, an equity issue can also be affected by the need for cash, investment opportunities or adjustments to leverage. To control for these factors, we use a simultaneous equation framework. The system contains four equations determining the corporate policies, and one determining the change in the cost of equity. To estimate the system, we use a three-stage least squares (3SLS) estimator. This procedure is consistent and asymptotically efficient for normally distributed disturbances (e.g., Greene, 1997). Moreover, it has the advantage of estimating the full covariance matrix, thus properly accounting for the correlations in error terms across regressions. This is especially important in our test setting, as all four corporate policy equations refer to the same firm and time.[16] We estimate the following system:

$$\begin{aligned}
\Delta \mathrm{COE}_i &= a_1 + a_2 \times \mathrm{InstownerChange}_i + a_3 \times \mathrm{NetStockIssue}_i + a_4 \times \mathrm{NetDebtIssue}_i + a_5 \times \mathrm{NetCashChange}_i \\
&\quad + a_6 \times \mathrm{NetInvestment}_i + \mu_1 C_{1i} + \varepsilon_{1i} \\
\mathrm{NetStockIssue}_i &= b_1 + b_2 \times \Delta \mathrm{COE}_i + b_3 \times \mathrm{NetDebtIssue}_i + b_4 \times \mathrm{NetCashChange}_i + b_5 \times \mathrm{NetInvestment}_i + \mu_2 C_{2i} + \varepsilon_{2i} \\
\mathrm{NetDebtIssue}_i &= c_1 + c_2 \times \Delta \mathrm{COE}_i + c_3 \times \mathrm{NetStockIssue}_i + c_4 \times \mathrm{NetCashChange}_i + c_5 \times \mathrm{NetInvestment}_i + \mu_3 C_{3i} + \varepsilon_{3i} \\
\mathrm{NetCashChange}_i &= d_1 + d_2 \times \Delta \mathrm{COE}_i + d_3 \times \mathrm{NetStockIssue}_i + d_4 \times \mathrm{NetDebtIssue}_i + d_5 \times \mathrm{NetInvestment}_i + \mu_4 C_{4i} + \varepsilon_{4i} \\
\mathrm{NetInvestment}_i &= e_1 + e_2 \times \Delta \mathrm{COE}_i + e_3 \times \mathrm{NetStockIssue}_i + e_4 \times \mathrm{NetDebtIssue}_i + e_5 \times \mathrm{NetCashChange}_i + \mu_5 C_{5i} + \varepsilon_{5i}
\end{aligned} \tag{1}$$

where $\mathrm{NetStockIssue}_i$, $\mathrm{NetDebtIssue}_i$, $\mathrm{NetCashChange}_i$ and $\mathrm{NetInvestment}_i$ are the corporate policies of firm *i*. $\Delta \mathrm{COE}_i$ is the change in the cost of equity, and C_{xi} is a vector containing control variables. The sets of control variables are specific to each regression in order to identify the system. We define and describe in which regression they are included in the Appendix alongside the exact variable definitions. The univariate statistics of these variables are reported in Table 2.

3.2.3 Results

The results are reported in Table 4. It is immediately clear that the inclusion in the index induces managers to increase the share of equity in the capital structure. As the cost of equity decreases, equity issues increase significantly. The coefficient in the net stock issue regression is –0.442, significant at the 1% level, indicating that firms with a bigger drop in the cost of equity issue more equity than the matching firms do in the same period. For example, a one-standard deviation bigger drop in the cost of equity is, on average, associated with a 3.57 percentage points higher level of equity issue. Compared to an average ratio of net equity issue to book value of assets of 0.5 percent this suggests that firms respond very sensitively to a change in the cost of equity. This finding is important as it suggests a potential role for the firms themselves as arbitrageurs. However, by itself it does not allow us to differentiate between the market timing and more traditional capital structure theories.

[16] Using 2SLS instead, we find the coefficients to be similar but less significant, as expected (e.g., Greene, 1997).

Regarding the asset side, the change in the cost of equity is significantly negatively correlated with net investment and uncorrelated with changes in net cash holdings. The first correlation is in line with our earlier finding that the average cost of equity decreases after the event and suggests that investment is increased in response to the equity price change. Economically, a one standard deviation bigger drop in the cost of equity around the index addition leads to an increase in net investment of 3.26 percentage points. In comparison with the average ratio of net investment to assets of 1.29 percent, this represents a sizeable impact.

The question is how can firms adjust their investment so quickly to the change in the cost of equity. The answer is, by making acquisitions. As reported earlier, the median acquisition relative to book value of asset is 4.3% for the 120 event firms that do an M&A in the two years after the index addition. Our cross-sectional result support the interpretation that a firm's cost of equity change leads to more investment, in particular through more acquisitions. The increase in investment is consistent with the traditional theories as well as with the market timing theory, under the assumption that the average firm is run by managers with a short horizon. The insignificant correlation between the change in the cost of equity and the change in cash holdings does not help us to differentiate between the theories.

The finding of an insignificantly negative correlation between the change in the cost of equity and net debt issues does not support the trade-off theory argument which would predict that a lower cost of equity reduces the amount of debt raised.

Let us now focus on the change in the degree of information asymmetry. According to the pecking-order theory, a reduction in information asymmetry should induce firms to issue more equity and have lower cash holdings[17]. The findings support this prediction. Indeed, there is a positive and significant correlation between our proxy for the reduction in the level of information asymmetry — net change in the number of analysts — and net stock issues. Moreover, there is a negative and significant correlation between the net change in the number of analysts and the net change in cash.

However, the pecking-order theory also posits that a reduction in information asymmetry should induce firms to underinvest less, as they are now, on average, more valued in line with managers' view. In other words, firms should raise external capital primarily to cover investment expenses. This prediction is not supported by the data, given the lack of correlation between the change in information asymmetry and investment as well as equity issues and investment.

[17] However, it is worth noting that a similar prediction is made by the trade-off theory as highlighted in Opler, Pinkowitz, Stulz and Williamson (1999). If the wedge between the cost of internal and external capital decreases, the precautionary motive for holding cash loses importance, therefore predicting a negative correlation between changes in the net number of analysts and cash holdings.

Therefore, the analysis of the changes in the corporate policies conditional on changes in information asymmetry is only partially consistent with the predictions of the pecking-order theory.

Firms with higher insider ownership reduce net cash holdings significantly around the index addition, but do not display a difference in either investment, stock or debt issues. Thus, assuming that higher insider ownership proxies for fewer agency problems, the data support the prediction of the agency models that higher agency problems lead to higher cash holdings but not the predictions that higher agency problems lead to higher investment (more overinvestment), higher use of equity or lower use of debt. Also, the lack of correlation between equity issues and investment is contrary to the predictions of agency models based on empire building managers.[18]

Finally, our identifying variables are always significant, with the exception of the coefficient on the stock return volatility in the ΔCOE-regression.

If we explore the endogeneity of the change in the cost of equity, we find that the change in the cost of equity is affected by net equity issues and net cash changes, while the other corporate policy changes do not significantly affect it. Interestingly, the change in the cost of equity is not significantly affected by the change in liquidity. However, since the sign is negative, the *p-value* is 0.19, and our proxy for the change in liquidity is not perfectly contemporaneous with the change in the cost of equity, we refrain from making a strong statement about the role of liquidity in our setting.

Finally, it is worth noting that the change in institutional ownership is not significantly related to the change in the cost of equity. One possible interpretation is that, on average, firms act as arbitrageurs by issuing equity and thus reverse, in the long run, part of the move down the demand curve caused around the announcement of the index addition. This may suggest that the change in the cost of equity we use may not be fully exogenous from the point of view of the managers. In order to address this issue, in the following section we will concentrate on a strictly exogenous – albeit very short term – proxy, namely the abnormal announcement return.

3.2.4 Robustness tests: Abnormal announcement return

Thus far, we have used the change in the cost of equity measured as the difference between the cost of equity in the 24 months prior relative to the 24 months after the index addition. As a robustness test, we now use the abnormal announcement return as computed in Table 1. We estimate the same system of equations, except for the specification of the AR-

[18] However, the negative correlation between net equity issue and net debt issue is in line with the predictions of agency models (Jensen and Meckling, 1976; Jensen, 1986; Morellec, 2004). Indeed, this would be consistent with a story in which managers react to an unexpected increase in stock value by issuing more equity and using the proceeds to reduce debt, given their preference for low(er) leverage (Morellec, 2004).

regression. From the AR regression, we exclude the corporate policy variables, since those are chosen *only after* the index addition. We also add the term premium in the AR-regression because we use the market model to compute the abnormal return and the vastly different interest rates throughout our sample period might be correlated with the market risk premium.

The results are reported in Table 5 and support our earlier findings that firms issue more equity in response to an increase in the stock price. The data imply that a one percentage point higher announcement return increases net stock issues by 0.8 percentage points. The economic impact seems to be quite large given the average net stock issue of 0.56 percent. Also, the abnormal return has a positive correlation with net investment. Net Investment increases by 3.4 percentage points in response to a one-standard deviation higher abnormal return. Relative to the average net investment of 1.29%, the impact of a higher abnormal return is again economically sizeable.

These results are consistent with earlier studies that find a correlation between stock market valuation and equity issues (Marsh, 1982; Loughran, Ritter, and Rydqvist, 1994; Jung, Kim, and Stulz, 1996; Pagano, Panetta, and Zingales, 1998; and Graham and Harvey, 2001) and investment (Polk and Sapienza, 2003; Gilchrist, Himmelberg, and Huberman, 2003). However, unlike this literature we have an event that, from a manager's perspective, is truly *exogenous*.

The change in institutional ownership is significantly positively correlated with the abnormal announcement return. This finding is in line with earlier studies (e.g., Shleifer, 1986) attributing the market's reaction to a downward-sloping demand curve for stocks. The insignificant coefficient on the proxy for the change in liquidity suggests that either our proxy is not good enough or that liquidity is in fact not a major determinant of the announcement return. This would be in line with the conclusion drawn by Beneish and Whaley (1996)[19]. Finally, the negative, but insignificant, coefficient on the net run-up is consistent with the interpretation that some institutional investors already buy stocks in anticipation of their being added to the index, thus reducing the market impact at the announcement.

3.2.5 Robustness of 3SLS analysis

While the 3SLS estimator is consistent and in general more efficient than the 2SLS estimator (e.g., Greene, 1997), it is generally more sensitive to the specification chosen. In particular, if one equation is misspecified, the coefficients of all the regressions could be biased. We thus compute the Basmann's (1960) specification test to investigate whether exogenous variables have been inappropriately omitted from any given equation. The findings are reported in

[19] Our finding supports their conclusion that liquidity is not a major determinant of AR.

Tables 4 and 5. They provide evidence in favor of the robustness of our specification by failing to reject the null for any of the equations.[20] We can therefore focus on the 3SLS that are the more efficient ones. Robustness checks show that the inferences do not change even if we use 2SLS (not reported for brevity), although the test statistics are almost uniformly weaker.

We also compute the simple correlations between our instruments and the dependent variables and find them to be significant and of the same sign as in the system estimation. Moreover, with one exception, our identifying instruments are significant and consistent across the two measures of the market's reaction to the index announcement (i.e., abnormal return and change in cost of equity). These findings support the inferences we have drawn so far.

Finally, to get an independent verification of our findings, we employ a methodology developed by Shyam-Sunder and Myers (1999) and Frank and Goyal (2003). This methodology does not consider the investment and financing to be simultaneously determined, but does instead focus on investigating whether the financing deficit is covered by debt or equity. If we define D as net debt issues in year t, E as net equity issues and DEF as the financing deficit defined as dividends plus net investment plus change in working capital minus cash flow after interest and taxes, we can express the financing deficit as $DEF_t = \Delta D_t + \Delta E_t$. We can therefore estimate:[21]

$$\Delta E_{it} = a + b_1 \, DEF_{it} + b_2 \times AFTERDUMMY_i \times DEF_{it} + e_{it}, \qquad (2)$$

where AFTERDUMMY is a dummy variable equal to 1 in event year 0 and +1. This specification lets us investigate if firms are more likely to issue equity after the index addition. The market timing theory predicts b_2 to be significantly positive. That is, a higher fraction of the financing deficit is covered by new equity issues after the index addition. Table 6 displays the results.

Using data only for the event firms, column 2 shows that our event firms cover more of their financing deficit with new equity issues after the index addition event. The coefficient b_2 is 0.134 and significant at the 1% level. Firms increase their use of equity to cover the financing deficit by about 40% (b_2/b_1-1) with respect to the level before the index addition. The results obtain also if we use measures net of our matching sample firms (column 5).

Moreover, when we disaggregate DEF into the investment and the remaining components, we find a result consistent with our 3SLS analysis. Increases in investment are significantly more likely to be financed with new equity issues after the index addition. This result again holds for the firm level as well as the net measure. [22]

[20] The same inferences can be drawn from a Hausman test based on the Lagrange multiplier principle (Greene, 1997).

[21] Frank and Goyal (2003) run the following regression: $\Delta D_{it} = a + b \times DEF_{it} + e_{it}$. The pecking order predicts b to be 1.

[22] The remaining components show a significant increase only in the sensitivity in the firm level variables, not in the net regression. This is consistent with the interpretation that what drives the increased sensitivity of equity issues to the financing deficit is investment. It suggests that it is important to control for the corporate policies simultaneously.

4 Market Reaction

Thus far, both in the case of the change in the cost of equity and in the case of abnormal returns, we find managers' reaction to the index addition is consistent with rational theories as well as Stein's (1996) market timing theory in the case in which the average manager acts as if he had a short horizon. In order to further distinguish between the two theories, we investigate the stock market's reaction to the event firms' behavior after the index addition.

4.1 Two hypotheses

The traditional theories predict that firms issue more equity and increase investment in response to a lower cost of equity because the drop in the cost of equity correctly gauges a reduction in the firm riskiness and therefore a reduction in the hurdle rate for new projects. This would warrant an increase in investment. Therefore, we expect firms that issue equity and increase investment to display realized long-run returns that are higher than those of firms that issue equity but do *not* increase investment simply because taking more positive NPV projects generates value. This is true unless the market perfectly foresees which firms will issue equity and increase investment in response to the index addition.

Market timing is instead based on the assumption that the drop in the cost of equity does not reflect a reduction in the firm's riskiness and therefore does not represent a reduction in the hurdle rate for new projects. The implications from the market timing theory depend on how the proceeds from the equity issuance are used. Any increase in investment is bad for long-term value because the investment decision is based on the market-implied discount rate, which is assumed to be wrong. Such a decision would be taken only by managers with short horizons, i.e., managers who, by definition, do not care about the long-term value of the firm. Long-horizon managers would use the proceeds to either reduce debt or increase cash rather than investing in a project that, according to the true cost of capital, has a negative NPV. Therefore, shareholders should be *positively* surprised by the fact that the firm did not increase investment in response to the decrease in cost of equity. The considerations allow us to formulate the following two hypotheses.

H2A. Traditional theories: Firms that issue equity and increase investment display higher long-run stock returns than firms that issue equity but do not increase investment.

H2B. Market timing theory: Firms that issue equity and increase investment display lower long-run stock returns than firms that issue equity but do not increase investment.

4.2 Empirical tests

In order to test these hypotheses, we compute long-run abnormal returns and compare the performance of a portfolio of firms that issue equity and increase investment to a portfolio of firms that issue equity but do not increase investment.

We use two proxies for the long-run abnormal returns, both based on the Fama-French three-factor model. For the first proxy, we use the 12 months prior to the event in order to estimate the factor loadings. We then use these loadings and multiply them by the corresponding monthly factor premium to obtain firm level long-run abnormal returns. For the second proxy, we follow Fama's (1998) suggestion and use the Fama-French three-factor model combined with Ibbotson's (1975) returns across time and security method (e.g., Foerster and Karolyi, 1999; Peyer and Vermaelen, 2005). This methodology results in monthly average abnormal returns in event time. One cross-sectional regression is run for each event month j (j=0 is the month in which the firm is announced to be added to the index), with j from 1 to 36. The following regression is run each event month j:

$$\left(R_{i,t} - R_{f,t}\right) = a_j + b_j\left(R_{m,t} - R_{f,t}\right) + c_j SMB_t + d_j HML_t + \varepsilon_{i,t}, \qquad (3)$$

where $R_{i,t}$ is the monthly return on security i in calendar month t. $R_{f,t}$ and $R_{m,t}$ are the risk-free rate and the return on the equally-weighted CRSP index, respectively. SMB_t and HML_t are the monthly return on the size and book-to-market factor in month t, respectively. The numbers reported are sums of the intercepts of cross-sectional regressions a_j over the relevant event-time periods.

The results with the first method of estimating long-run abnormal returns are reported in Table 7, while the ones with the second method are reported in Table 8. We start with results based on the first method. For the full sample, the data in panel A do not show any significant long-run abnormal returns at the 12-, 24- or 36-month horizon with either methodology. These findings are consistent with Shleifer (1986), Garry and Goetzmann (1986), Beneish and Whaley (1996) and Denis *et al.* (2003), who do not find a reversal of the short-term announcement return.

While it is interesting to see that, on average, there is no reversion, our previous analysis suggests that we should observe negative abnormal returns for certain subsamples. Panel B of Table 7 reports correlations between changes in the corporate policies and the firm-level long-run abnormal returns estimated using the first proxy. In line with prior studies (e.g., Loughran and Ritter, 1995, Speiss and Affleck-Graves, 1995, and Baker and Wurgler,2000), we find that firms with higher net stock issues have lower long-run abnormal returns. However, the correlations are significant only at the 24- and 36-month horizon. Consistent with Speiss and Affleck-Graves

(1999) and Richardson and Sloan (2003), and with both market timing and traditional theories, net debt issues and long-run abnormal returns are negatively correlated, i.e., firms that reduce debt increase value. In addition, firms that increase net investment (net cash holdings) display a negative (positive) and mostly significant correlation with long-run abnormal returns. The negative correlation between the long-run return and investment supports the market timing theory.

Using the second method of estimating long-run abnormal returns, we find similar results. The average long-run abnormal return for firms that issue equity is negative, but significant only at certain horizons, as shown in Table 8 (e.g., -9.23% in the window [+1,+36], significant at the 10% level). The subsample of firms that issue equity and increase investment displays the worst long-run performance (e.g., -16.56% in the window [+1,+36], significant at the 5% level). Issuing equity and increasing cash is also related to negative, and sometimes significant, long-run abnormal returns (e.g., -6.48% in the window [+1,+36], insignificant). Only the subsample of firms that issue equity and retire debt does not show any significant abnormal returns (e.g., -2.82% in the window [+1,+36], insignificant).[23]

In sum, the analysis of the long-run stock returns supports the predictions of the market timing theory that firms issuing equity and increasing investment experience negative long-run abnormal returns – lower returns than observed for any other use of equity issue proceeds. These findings also suggest that the firm itself acts as an arbitrageur that, by issuing new equity, sells potentially overvalued stock and in doing so closes the window of opportunities.

4.3 The window of opportunity and the change in the cost of equity

The conclusion from the previous section suggests that the change in the cost of equity is not permanent. In fact, if the change is not due to a permanent change in the firm's risk profile, but should be ascribed to an increase in the demand for the stock, the very fact that the firm acts as an arbitrageur and meets such an increased demand with new issues should make the change revert. To address this issue, we look at whether the change in the cost of equity varies with the time that elapses after the firm implements a policy that may close the window of opportunity provided by the index addition.

Table 9 contains our measures for the change in the cost of equity for the firms that exploit the window of opportunity – i.e., the subsample of firms that issues equity and the one

[23] We also investigate whether the occurrence of the different subsamples is correlated with business cycles. In particular we were concerned whether the "issue and invest" subsample displays a higher frequency toward the end of a business cycle, thus displaying negative long-run returns due to the effect of the business cycle downturn on the value of the investments. We could not find any evidence of such clustering (not tabulated).

that issues and increases investment. We use the Fama-French three-factor model as reported in Table 1. The results are consistent with the interpretation that the window of opportunity closes less than 2 years after the index addition. In particular, as shown in Panel A, the subsample of firms that issues equity displays a drop in the cost of equity of 2.24 percentage points (measured over the months +1 to +12 relative to the 24 months prior to the index addition). However, the difference in the cost of equity from before to after the index addition loses significance if measured over the months +13 to +24, and +25 to +36, respectively. Panel B shows that the change is even faster for the subsample of firms that issues equity and increases investment. This indicates that there is a window of opportunity that closes over time, probably in part as a reaction to the firms' behavior.

5 A More Direct Test of Market Timing

Overall, the results are most consistent with the predictions of the market timing framework where the stock price change around the index addition is not risk related, i.e., reflects mispricing. They also complement the recent evidence in Baker and Wurgler (2002) and Baker *et al*. (2003). That is, capital structure decisions are not necessarily related to the investment policy of the firm. They are instead based on the exploitation of windows of opportunity provided by the market.

In order to verify our results, what we really need is a direct measure of the horizon of the managers. Unfortunately, such a measure is difficult to get other than by inferring it from the actions of the managers. However, Stein (1996) shows that the existence of financial constraints induces long-horizon managers to behave as short-horizon ones, thus investing even if the market-implied discount rate is wrong and managers know it. This has three directly testable implications, two based on a cross-sectional analysis and one based on long-run abnormal returns, which can help us to check the robustness of our results.

The first implication is that financially constrained firms ought to be more "equity dependent" — i.e., display a higher sensitivity of equity issues to the change in the stock price due to the event. This testing dimension has already been exploited by Baker *et al*. (2003), who show that firms that are equity dependent rely more heavily on external capital when making investment decisions. We add to this test a setting in which the stock price changes for an exogenous reason.

Second, financially constrained firms should also react more to changes in the stock price due to the index addition by increasing investment. Again, in line with Baker, *et al.* (2003), investment for equity-dependent firms should be more sensitive to stock price changes.

The third test is based on the long-run abnormal returns *after* the index addition. This test is unique to our setup. The addition to the index allows both the financially constrained and the unconstrained firms to issue equity and invest. However, the long-run equity return implications of this equity issue/investment decision are different. Financially constrained firms are, according to Stein's theory, the ones run by managers who act as if they had a short horizon. The long-run return implications of their financial and investment decisions are therefore negative, being based on a too-low market-implied discount rate. The addition to the index is unlikely to alter the market's expectation about these firms that have revealed themselves to be managed by short-horizon managers.[24]

This is different in unconstrained firms. There, managers' actions reveal whether they have a short or long horizon. Managers with a long horizon should exploit the temporary overvaluation to issue equity and use the proceeds to buy back debt or increase cash holdings. They should not increase investment since the market implied discount rate is wrong. However, managers of unconstrained firms that issue equity and increase investment, reveal themselves to be short-horizon managers. Consequently, we expect unconstrained firms to underperform in the long run if they issue equity and increase investment relative to the firms that issue equity but do not increase investment.

To test these implications we construct a measure of financial constraints based on Kaplan and Zingales (1997) and Lamont, Polk and Saa-Requejo (2001). This index ("KZ-Index") is:

$$KZIndex_{it} = -1.002\frac{CF_{it}}{A_{it-1}} - 39.368\frac{DIV_{it}}{A_{it-1}} - 1.315\frac{C_{it}}{A_{it-1}} + 3.139 LEV_{it} + 0.283 Q_{it}, \quad (4)$$

where CF_{it}/A_{it-1} is cash flow divided by assets; DIV_{it} is cash dividends; C_{it} is cash balances; LEV_{it} is leverage measured in book value terms (long- and short-term debt divided by long- and short-term debt plus book value of equity); Q_{it} is the Tobin's *q* measured as the market value of equity plus the book value of debt minus the book value of equity all divided by assets. Since Q is endogenous, we follow Baker, *et al.* (2003) and define the KZ-Index by dropping the Q_{it} part in equation 4 to avoid potential endogeneity issues.

We find a mean (median) KZ-Index of -0.28 (-0.20) for our sample of S&P 500 index addition firms (Table 2). While our sample firms are likely to be large and rather "older" firms, the cross-sectional variation in the KZ-Index is nonetheless important. A higher value indicates a

[24] The only exception is the case in which the event, by relaxing the financial constraints of the firm, allows the firm to undertake positive-NPV projects it could not take before. Then the long-run stock returns could be positive *relative* to firms that are financially constrained and do not issue and invest.

higher "equity dependence". We form a dummy variable, KZ dummy, which is equal to 1 if the KZ-Index is above the sample median.

5.1 Corporate reaction and financial constraints

We investigate whether financially constrained firms react differently to the change in the cost of equity around the index addition by reestimating the system of equations, including the dummy variable for financial constraints and the interaction between the dummy and the change in the cost of equity.

The results are reported in Table 10. Net equity issues are negatively but insignificantly affected by the change in cost of equity after controlling for financial constraints.[25] However, financially constrained firms display a significantly negative sensitivity of their equity-issuing activity to the change in the cost of equity. This finding is consistent with Baker, *et al.* (2003). Similarly, net investment is also only significantly related to the change in the cost of equity for financially constrained firms (the *p-value* of the *F-test* that the sum of the coefficients on cost of equity change and the interaction term is zero is 0.04). Finally, debt issues and cash holdings are not significantly affected by the change in the cost of equity, neither for constrained nor for unconstrained firms.

Taken together, all these findings suggest that the firms that are more constrained respond to the drop in the cost of equity by issuing more equity and increasing investment. These firms are the very firms that Stein's (1996) theory predicts to be managed by short-horizon managers.

5.2 Market reaction and financial constraints

As we mentioned before, financial constraints and the equity issue/investment decision following the addition to the index allow the identification of short-term managers. We report the results of the long-run abnormal return tests in Table 11. We break down the sample in financially constrained firms (first column) and financially unconstrained firms (second column), as well as in firms that issue equity and increase investment separated into financially constrained firms (third column) and financially unconstrained ones (fourth column).

The results are very striking and supportive of the market timing theory. The first thing to note is the very strong negative long-run abnormal returns of the financially constrained firms, measured by a high KZ-Index. This is consistent with previous findings in Lamont, *et al.* (2001). More interesting, however, is the fact that for the subsample of firms that issue equity and increase investment, the long-run abnormal return is indistinguishable from the high KZ-Index

[25] We get similar results if we define net equity issues using SDC as a source for seasoned equity issues or if we use the balance sheet change in equity.

firms in column 1. In other words, financially constrained firms that issue and increase investment perform poorly in the long run but not worse than the remaining financially constrained firms.

While issuing equity and investing does not alter the negative performance of financially constrained firms, the subsample of unconstrained firms displays remarkably different long-run returns. Unconstrained firms overall display a significant positive long-run performance. However, the decision to issue equity and increase investment leads to a negative long-run performance (although only marginally significant after 14 to 28 months), whereas issuing and not increasing investment leads to positive long-run performance (marginally significant at certain horizons). Thus, issuing equity and increasing investment sets firms' long-run returns apart as predicted by the market timing theory. Moreover, our results support the notion that firms with short-horizon managers (or managers who act as if they have a short horizon due to financial constraints) underperform in the long run, at least in part because their investment decisions are based on stock mispricing.

6 Considerations on the Limits of Arbitrage and the Efficiency of the Market

These findings raise an important question: why is it the case that the market does not foresee the reaction of the firm? If the market were foreseeing it, we should find that the firm is not able to exploit the differential in cost of capital generated by the addition to the index. There are three possible answers. The first is simply that this is an anomaly, and the market has not yet fully rationalized it. Over time it is bound to disappear as the market gets better educated.

The second possibility is that investors are, at least to a certain degree, irrational, in the sense that equity can be mispriced, and the corporate reactions to the mispricing are only slowly and over time used to update the value of equity.

A third possibility assumes that investors are rational, but that there are limits to arbitrage. Thus, investors are optimally reacting, but with a delay. The intuition is similar to the one for arbitrage capital around merger and acquisitions (Baker and Savasoglu, 2002). Investors ("arbitrage capital") know that the firm will, on average, experience no long run abnormal return. However, they also know that there will be underperformance in the long run if the firm issues equity and increases investment, and are uncertain about the issue-and-invest decision of the firm. They know that this will happen only with a certain probability, and account for the risk involved in this strategy in a way analogous to arbitrage capital in mergers and acquisitions. In that case the risk is completion risk; here the risk is that the firm issues new equity and increases investment. The investor's gain would accrue in cases in which the firm does not increase investment. This provides a new dimension to the "S&P 500 game" and outlines the role of two players: the firms, who act as arbitrageurs, and the investors, who act as capital providers. It also sheds new light on the literature on the limits of arbitrage and links it to Stein's theory of corporate finance.

7 Conclusion

We study an event — the addition of the stock of a firm to the S&P 500 index — that allows the firm itself to act as an arbitrageur. We find that the higher the index addition's abnormal announcement return, the more equity a firm issues. We show that the long-run abnormal returns are negative for the subsample of firms that issue equity after the event and we argue that this supports the interpretation that managers exploit the window of opportunity when issuing equity. Our findings offer a potential reconciliation between the findings showing that the index addition has a permanent effect on the share price, and those showing a reversal. The very fact that a firm's reactions to the event itself seems to affect long-run performance leaves room for different findings at different time horizons.

We also use the S&P 500 index addition as an experiment where the equity valuation changes — exogenously from a manager's point of view — to test alternative capital structure theories. We show that the addition to the index reduces the cost of equity. We find that firms react to a decrease in the cost of equity by issuing more shares and increasing investment. This supports the predictions of both Stein's (1996) market timing theory and traditional theories. The analysis of the long-run market reaction supports the market timing theory. Firms that are unconstrained but issue equity and increase investment display negative long-run abnormal returns, consistent with the firms being managed by short-horizon managers. Thus, these findings support the notion of a downward sloping demand curve being an important cause for the abnormal price changes around the S&P500 index addition. We believe that these findings provide an important step toward a better understanding of the interactions between asset pricing and corporate finance, which should be a promising area for future research.

Appendix
Regression Specification

We include the change in institutional ownership in the ΔCOE regression, as the index addition creates demand for the stock from index funds. With a downward-sloping demand curve for stocks, we expect a negative coefficient on this variable in the ΔCOE regression. We also include institutional ownership in the other regressions to control for the possibility that institutional owners affect corporate policy directly, for example, through their shareholder activism. In particular, one could expect that increased institutional ownership could lead to better access to external capital. Not controlling for the change in institutional ownership could thus lead to a spurious correlation between the change in the cost of equity, and equity or debt issues.

In the ΔCOE regression, we also include our proxy for the changes in liquidity of the stock. This variable is also added to the net stock issue regression to control directly for the effect of changes in liquidity around the event on net stock issues. In addition, we control for the lagged level of liquidity in the net stock issue regression to control for the possibility that the level of liquidity affects the amount of stock issues. Insider ownership, an inverse proxy for agency problems between managers and shareholders, could affect the abnormal return as well as the reaction to it on the corporate side. We therefore include this variable in all the regressions. The change in the number of analysts is used as a proxy for variations in information asymmetry around the event. The pecking-order theory predicts a positive correlation between the change in the number of analysts and investment, equity and debt issues, but a negative correlation with changes in cash holdings. The variable is thus included in all regressions. The net change in bond ratings is used to control for the potential change in the cost of debt and is included in all regressions. We also control for prior stock market conditions, both market wide and stock specific. The former include the prior market return and the prior market volatility. Potentially, marketwide fluctuations can affect a firm's decision to issue equity and determine the intensity of the market's reaction to the index addition. We thus include these two variables in the ΔCOE and net stock issue regressions. The stock-specific conditions are proxied by the stock's net run-up. Net run-up controls for prior firm-specific excess stock return that has been shown to affect equity issue decisions (Lucas and McDonald, 1990) as well as for market expectations. For example, if the market anticipates the firm's likelihood of being added to the index, then arbitrageurs might increase their holdings prior to the announcement. Thus, net run-up is included in the ΔCOE, equity issue and investment regressions. We include the term premium as a proxy for the slope of the term structure in the debt issue regression. This allows us to control for the fact that the interest rate environment in the early 1980s was very different from that in the 1990s. According to the trade-off theory, the benefits of debt are smaller the riskier the cash flows. We use earnings volatility, measured as the standard deviation of earnings over the five years prior to the index addition, as a proxy for the tax benefits and bankruptcy cost of debt. Given that the trade-off theory is concerned with debt minus cash, we also include earnings volatility in the cash regression.

In all corporate policy regressions, we control for the effects of size and market-to-book and level of cash holdings in year -1. If there is an optimal cash leverage, then it is possible that the changes in cash holdings reflect mean reversion. Finally, we include identifying instruments for each equation separately. In the ΔCOE regression we add the prior stock return volatility measured over the 12 months before the index addition. According to Pastor and Veronesi (2003), higher return volatility implies higher informational uncertainty and, according to Baker and Savasoglu (2002), higher arbitrage risk. These effects are expected to weaken arbitrage, thus accentuate the change the cost of capital around the event. We argue that the prior stock return volatility does not affect the net corporate policies because the risk factor is controlled for by the matching procedure. In the net stock issues equation we add the lagged dividend to asset ratio. John and Williams (1985) predict a positive correlation arguing that dividends serve to reveal the true value of the stock and making equity issues less costly. On the contrary, Loderer and Mauer (1992) find evidence rejecting this hypothesis. Thus, we expect the difference between the sample and matching firm's stock issue to be negatively affected by the level of the dividend.

The identifying instrument in the net debt regression is the lagged level of the ratings. We expect firms with lower ratings to be more likely to differ from their matching sample firms because debt issues are more difficult/expensive for such firms. Since firms that do not have a debt rating cannot be fitted into this ordinal rating variable, we add separately a dummy variable equal to 1 if the firm is rated. The identifying instrument in the net cash change regression is the sales volatility, measured as the standard deviation of the logarithm of sales over the five years prior to the index addition. A higher sales volatility is expected to negatively affect the change in net cash, because firms with higher sales volatility hold a higher cash-to-asset ratio, and thus any change is expected to be relatively smaller. In the net investment regression, we include the ratio of investment to total assets of the event firm in year -1. This allows us to control for the possibility that investment — which includes acquisitions — is lumpy. We expect it to be positively related to net investment.[26] We do not expect the lagged investment to affect current net financing decisions. In the first-stage regression, we use as instrumental variables all the exogenous variables plus year dummies.[27] The R-squares of the first-stage regressions (not reported) are between 12% (net debt issue regression) and 41% (net equity issue regression).

[26] Imposing this structure on the system of equations makes all equations overidentified. Also, the rank conditions are satisfied since we excluded at least four exogenous variables from each equation. See subsection 3.2.5 for a discussion of the robustness tests of the 3SLS estimation.

[27] As shown in Baltagi (1998, p. 278), all exogenous variables need to be included in each first-stage regression.

Appendix (continued)

Definition of the variables

Panel A. Measures of Cost of Equity Change and Abnormal Return

$Beta_{Mkt}$ $Beta_{SMB}$ $Beta_{HML}$	$Beta_{Mkt}$, $Beta_{SMB}$ and $Beta_{HML}$ are the factor loadings in the Fama-French three-factor model. We use the firm's daily return in the 24 (12) months before the event to estimate the parameters of the regression model before the index addition announcement, and use the firm's daily return in the 24 (12) months after the event to estimate the parameter of the regression model after the index addition announcement, where month 0 is the month of the index addition announcement.
Cost of Equity Change	Cost of Equity Change is obtained by evaluating the change of risk characteristics ($Beta_{Mkt}$ Change, $Beta_{SMB}$ Change, $Beta_{HML}$ Change) at the average market, SMB, HML risk premium over the 60 months prior to the event months or in the period 1977 to 2000, respectively.
Announcement Return	Announcement Return is defined as the cumulative abnormal return from day -5 to day +5 of the announcement of S&P 500 addition using the market model with the CRSP equally weighted index as the market return. In estimating the market model, we use the firm's daily return and the return on CRSP equally weighted index over days -300 to -46, where date 0 is the S&P 500 announcement date.

Panel B. Measures of Corporate Financial Policies

Net Leverage Change	Net Leverage Change is defined as the leverage change of event firms minus the leverage change of comparable firms. Leverage change is defined as leverage at year +1 minus leverage at year -1, where leverage=(book value of assets (#6) minus book value of equity (#6-#181-#10+#35+#79)) / book value of assets (#6), where year 0 is the event year.
Net Stock Issue	Net Stock Issue is defined as the stock issue of event firms minus the stock issue of comparable firms. Stock issue is defined as the average of year 0 and year +1 common and preferred stock issued minus common and preferred stock repurchased (#108-#115) / book value of assets (#6), where year 0 is the event year.
Net Debt Issue	Net Debt Issue is defined as the debt issue of event firms minus the debt issue of comparable firms. Debt issue is defined as the average of year 0 and year +1 long-term debt issued minus long-term debt retired (#111-#114) plus changes in short-term debt (#301) / book value of assets (#6), where year 0 is the event year.
Net Cash Change	Net Cash Change is defined as the cash change of event firms minus the cash change of comparable firms. Cash change is defined as cash ratio at year +1 minus cash ratio at year -1, where year 0 is the event year. Cash ratio=cash and short-term investment (#1) / book value of assets (#6)
Net Investment	Net Investment is defined as the investment of event firms minus the investment of comparable firms. Investment is defined as the average of year 0 and year +1 capital expenditure (#128) plus acquisition (#129) / book value of assets (#6), where year 0 is the event year.
$Leverage_{t-1}$	$Leverage_{t-1}$ is defined as the leverage at year -1, where year 0 is the event year. Leverage=(book value of assets (#6) minus book value of equity (#6-#181-#10+#35+#79)) / book value of assets (#6).
$Cash_{t-1}$	$Cash_{t-1}$ is defined as the cash ratio at year -1, where cash ratio=cash and short-term investment (#1) / book value of assets (#6), where year 0 is the event year.
$Investment_{t-1}$	$Investment_{t-1}$ is defined as the investment at year -1. Investment is defined as the average of year 0 and year +1 capital expenditure (#128) plus acquisition (#129) / book value of assets (#6), where year 0 is the event year.
$Size_{t-1}$	$Size_{t-1}$ is defined as the log of the book value of assets (#6) at year -1, where year 0 is the event year.
M/B_{t-1}	M/B_{t-1} is defined as the market to book ratio at year -1, where the market-to-book ratio is the market value of equity (#25*#199) plus the book value of assets (#6) minus the book value of common equity (#60) / book value of assets (#6), where year 0 is the event year.

Panel C. Control Variables

Instowner Change	Instowner Change is defined as the institutional ownership at quarter +1 minus institutional ownership at quarter -1, where institutional ownership is the total number of shares owned by institutions as reported by TFN/Institutional divided by the number of shares outstanding.
Liquidity Change	Liquidity Change is the average monthly volume in (+1, +12) months minus the average monthly volume in (-12, -1) months, where volume is number of shares traded divided by number of shares outstanding and month 0 is the month in which the index addition was announced.
Insider Ownership	Insider Ownership is defined as the level of insider ownership at year -1.
Net Analyst Change	Net Analyst Change is defined as the analyst change of event firms minus the analyst change of comparable firms. Analyst change is defined as the number of analysts at year +1 minus the number of analysts at year -1, where the number of analysts is the number of analysts of the first one-year forecast for a certain fiscal year. The data is from IBES.
Net Rating Change	Net Rating Change is defined as the rating change of event firms minus the rating change of comparable firms. Rating change is defined as (-1) $\times$ credit rating at year +1 minus credit rating at year -1, where credit rating=S&P long-term domestic issuer credit rating (#280). When the rating data is not available in Compustat, we use the rating data in SDC. For the firms with missing rating in either year +1 or year -1, we set the rating change to zero.
Prior Market Return	Prior Market Return is defined as the sum of the monthly value-weighted market return in the interval -7 to -1 months.
Prior Market Volatility	Prior Market Volatility is defined as the standard deviation of the daily value-weighted market return in the interval -7 to -1 months.
Term Premia	Term Premia is defined as 10-year Treasury constant maturity rate minus 1-year Treasury constant maturity rate in the month prior to the event.
Net Run-up	Net Run-up is defined as the run-up of event firms minus run-up of comparable firms. Run-up is defined as the sum of the firm's monthly return in the interval -7 to -1 months.
Stock Return Volatility	Stock Return Volatility is defined as the standard deviation of the daily stock return in the (-24, -12) months.
Rating	Rating is defined as the credit rating, where credit ratings are from S&P as reported in Compustat (#280) and SDC. We multiply the rating by -1. The best-rated firms thus have the highest value, which is -2. Lower-rated firms have a lower rating, i.e., more negative. If a firm's rating is missing, it is set equal to the median of the non-missing ratings of the matching firms.
Sales Volatility	Sales Volatility is defined as the standard deviation of the logarithm of sales (#12) in the prior five years.
Earnings Volatility	Earnings Volatility is defined as the standard deviation of the cash flow (#13) divided by assets (#6) in the prior five years.
Dividends	Dividends are defined as the dividends (#21) divided by assets (#6).
$Liquidity_{t-1}$	$Liquidity_{t-1}$ is defined as the average monthly volume in (-12, -1) months, where volume is number of shares traded divided by number of shares outstanding.

Panel D. Long-Run Abnormal Return

Long-run Abnormal Return (+1, +12) months Long-run Abnormal Return (+1, +24) months Long-run Abnormal Return (+1, +36) months	Long-run Abnormal Return (+1, X) months is defined as the sum of the difference between actual return and expected return in (+1, X) months after the index addition announcement, where X is 12, 24 or 36, respectively. The expected return is obtained by using the factor loadings in the Fama-French three-factor model estimated in the period of (-60, -1) months, using the firm's monthly return.

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Table 1
Univariate Statistics on Abnormal Return, Institutional Ownership and Cost of Equity Change

The table reports univariate statistics on a sample of 222 firms that were added to the S&P500 index between 1981 and 1997. Panel A shows univariate statistics on the change in the cost of equity. We estimate the change of beta using the model: $(R_{i,t} - R_{f,t}) = a + b_1 \times (R_{m,t} - R_{f,t}) + b_2 \times SMB_t + b_3 \times HML_t + c_1 \times After_t \times (R_{m,t} - R_{f,t}) + c2 \times After_t \times SMB_t + c3 \times After_t \times HML_t + \varepsilon_t$, where $After_t$ is a dummy variable that is 1 after the index addition and 0 before the index addition. b_1, b_2, and b_3 are the betas before the index addition. c_1, c_2, and c_3 are the change of the betas after the index addition. The period for estimating betas is indicated in the table. *Change in cost of equity* is obtained by evaluating the change of betas at the average risk premium over the periods indicated in the table. Panel B shows univariate statistics on the cost of equity and the abnormal announcement return. Cost of Equity is calculated using the Fama-French three-factor model over the 24 months prior to the event. The betas were multiplied by the average risk premium over the 60 months prior to the event. *Announcement Return* is the cumulative abnormal return from day -5 to day +5, where day 0 is the announcement of the S&P 500 index addition, using the market model with the CRSP equally weighted index as the market return.

Panel A. Cost of Equity Change With Different Methods of Calculation

Period for Estimating Changes of Betas	Period for Average Risk Premium	Cost of Equity Change (Mean)	Mean Test
(-24, -1) and (+1, +24) months	(-60, -1) months	-0.0126	0.03
(-24, -1) and (+1, +24) months	From 1977 to 2000	-0.0114	0.01
(-12, -1) and (+1, +12) months	(-60, -1) months	-0.0168	0.02
(-12, -1) and (+1, +12) months	From 1977 to 2000	-0.0124	0.02

Panel B. Cost of Equity and Abnormal Return

Variable	Mean	Median	25th Percentile	75th Percentile	Standard Deviation	Mean Test	Median Test
Cost of Equity	0.1605	0.1610	0.1026	0.2169	0.0788	0.01	0.01
Announcement Return	0.0321	0.0378	-0.0041	0.0713	0.0661	0.01	0.01

Table 2
Univariate Statistics on Corporate Financial Policies and Control Variables

The table reports univariate statistics of 222 companies that are added to the S&P 500 index. *Leverage Change* is the leverage at year +1 minus the leverage at year -1, where leverage is defined as the book value of assets minus book value of equity, divided by book value of assets. *Stock Issue* is the average of year 0 and year +1 common and preferred stock issued minus common and preferred stock repurchased divided by assets. *Debt Issue* is the average of year 0 and year +1 long-term debt issued minus long-term debt retired plus changes in short-term debt divided by assets. *Cash Change* is the cash ratio at year +1 minus the cash ratio at year -1, where the cash ratio is defined as cash and short-term investment divided by assets. *Investment* is the average of year 0 and year +1 capital expenditures plus acquisitions divided by assets. *Size* is the natural log of assets. *M/B* is the market-to-book ratio, measured as the market value of equity plus the book value of assets, minus the book value of common equity, divided by the book value of assets. *Instowner Change* is the institutional ownership at quarter +1 minus institutional ownership at quarter -1, where institutional ownership is the total number of shares owned by institutions as reported by TFN/Institutional divided by the number of shares outstanding. *Liquidity Change* is the average monthly volume in (+1, +12) months minus the average monthly volume in (-12, -1) months, where volume is number of shares traded divided by number of shares outstanding and month 0 is the month in which the index addition was announced. *Insider Ownership* is the total number of shares owned by insiders divided by the number of shares outstanding. *Analyst Change* is the number of analysts at year +1 minus the number of analysts at year -1. *Rating Change* is defined as (-1) × credit rating at year +1 minus credit rating at year -1. Credit ratings are from S&P as reported in Compustat and SDC. *Prior Market Return* is the sum of the monthly value-weighted market return in the interval -7 to -1 months. *Prior Market Volatility* is the standard deviation of the daily value-weighted market return in the interval -7 to -1 months. *Term Premia* is the 10-year Treasury constant maturity rate minus the 1-year Treasury constant maturity rate in the month prior to the event. *Run-up* is the sum of the firm's monthly return in the interval -7 to -1 months. *KZ-Index* is calculated as KZ-Index = -1.002 x cash flow/assets – 39.368 x dividends/assets – 1.315 x cash balances/assets + 3.139 x leverage (long- and short-term debt divided by long- and short-term debt plus book value of equity). *Stock Return Volatility* is the standard deviation of the daily stock return in the (-24, -12) months. *Rating* is the (-1) x credit rating, where credit ratings are from S&P as reported in Compustat and SDC. The multiplication by -1 is for ease of interpreting the regression coefficients. The best-rated companies have the highest value, which is -2. Lower-rated firms have a lower rating, i.e., more negative. *Sales Volatility* is the standard deviation of the logarithm of sales in the prior five years. *Dividends* is the dividends divided by assets. *Earnings Volatility* is standard deviation of the cash flow divided by assets in the prior five years. *Liquidity* is number of shares traded divided by number of shares outstanding. *Net* refers to a variable value net of the comparable firm's value by taking the difference.

Variable	Mean	Median	Mean Test	Median Test
Net Leverage Change	-0.0167	-0.0277	0.04	0.01
Net Stock Issue	0.0056	0.0048	0.20	0.03
Net Debt Issue	0.0045	-0.0022	0.33	0.56
Net Cash Change	0.0045	-0.0014	0.47	0.57
Net Investment	0.0129	-0.0005	0.02	0.08
Leverage $_{t-1}$	0.4208	0.4132	0.01	0.01
Cash $_{t-1}$	0.1200	0.0769	0.01	0.01
Investment $_{t-1}$	0.1275	0.1036	0.01	0.01
Size $_{t-1}$	20.543	20.450	0.01	0.01
M/B $_{t-1}$	2.3338	1.8881	0.01	0.01
Instowner Change	0.0140	0.0103	0.01	0.01
Liquidity Change	0.0124	0.0081	0.01	0.01
Insider Ownership	0.1473	0.0800	0.01	0.01
Net Analyst Change	1.7988	1.3333	0.01	0.01
Net Rating Change	0.0961	0.0000	0.18	0.08
Prior Market Return	0.0841	0.0811	0.01	0.01
Prior Market Volatility	0.0080	0.0072	0.01	0.01
Term Premia	1.0488	1.1850	0.01	0.01
Net Run-up	0.0894	0.0621	0.01	0.01
KZ Index	-0.2803	-0.1983	0.01	0.01
Stock Return Volatility	0.0224	0.0209	0.01	0.01
Rating $_{t-1}$	-9.3739	-9.0000	0.01	0.01
Sales Volatility	0.3651	0.2768	0.01	0.01
Dividends $_{t-1}$	0.0160	0.0140	0.01	0.01
Earnings Volatility	0.0354	0.0264	0.01	0.01
Liquidity $_{t-1}$	0.0946	0.0620	0.01	0.01

Table 3
Correlation of Corporate Financial Policies

The table reports correlation of corporate financial policies of a sample of 222 firms added to the S&P500 index between 1981 and 1997. *Stock Issue* is the average of year 0 and year +1 common and preferred stock issued minus common and preferred stock repurchased divided by assets. *Debt Issue* is the average of year 0 and year +1 long-term debt issued minus long-term debt retired plus changes in short-term debt divided by assets. *Cash Change* is the cash ratio at year +1 minus the cash ratio at year -1, where the cash ratio is defined as cash and short-term investment divided by assets. *Investment* is the average of year 0 and year +1 capital expenditures plus acquisitions divided by assets.

	Stock Issue	Debt Issue	Cash Change
Debt Issue	0.149		
	(0.03)		
Cash Change	0.049	-0.048	
	(0.47)	(0.48)	
Investment	0.310	0.550	-0.178
	(0.01)	(0.01)	(0.01)

Table 4
Changes in Corporate Financial Policies and Cost of Equity Change

The table reports coefficients (coef) and p-values in brackets based on a system of five equations, estimated using 3SLS. The sample consists of 222 companies that were added to the S&P 500 index in the years 1981 through 1997. *Cost of Equity Change* is estimated by using the change of betas in the period of (-24, -1) months and (+1, +24) months, and the period of (-60, -1) months for average risk premium. *Liquidity Change* is the average monthly volume in (+1, +12) months minus the average monthly volume in (-12, -1) months, where volume is number of shares traded divided by number of shares outstanding. *Instowner Change* is the institutional ownership at quarter +1 minus institutional ownership at quarter -1, where institutional ownership is the total number of shares owned by institutions as reported by TFN/Institutional divided by the number of shares outstanding. *Insider Ownership* is the total number of shares owned by insiders divided by the number of shares outstanding. *Analyst Change* is the number of analysts at year +1 minus the number of analysts at year -1. *Rating Change* is defined as (-1) × credit rating at year +1 minus credit rating at year -1. Credit ratings are from S&P as reported in Compustat and SDC. *Stock Issue* is the average of year 0 and year +1 common and preferred stock issued minus common and preferred stock repurchased divided by assets. *Debt Issue* is the average of year 0 and year +1 long-term debt issued minus long-term debt retired plus changes in short-term debt divided by assets. *Cash Change* is the cash ratio at year +1 minus the cash ratio at year -1, where the cash ratio is defined as cash and short-term investment divided by assets. *Investment* is the average of year 0 and year +1 capital expenditures plus acquisitions divided by assets. *Prior Market Return* is the sum of the monthly value-weighted market return in the interval -7 to -1 months. *Prior Market Volatility* is the standard deviation of the daily value-weighted market return in the interval -7 to -1 months. *Run-up* is the sum of the firm's monthly return in the interval -7 to -1 months. *Term Premia* is the 10-year Treasury constant maturity rate minus the 1-year Treasury constant maturity rate in the month prior to the event. *Earnings Volatility* is standard deviation of the cash flow divided by assets in the prior five years. *Rating Dummy* is 1 if the rating is available and 0 otherwise. *Liquidity* is number of shares traded divided by number of shares outstanding. *Size* is the natural log of assets. *M/B* is the market-to-book ratio, measured as the market value of equity plus the book value of assets, minus the book value of common equity, divided by the book value of assets. *Stock Return Volatility* is the standard deviation of the daily stock return in the (-12, -1) months. *Dividends* is the dividends divided by assets. *Rating* is (-1) × credit rating, where credit ratings are from S&P as reported in Compustat and SDC. *Sales Volatility* is the standard deviation of the logarithm of sales in the prior five years. *Net* refers to a variable value net of the comparable firm's value by taking the difference.

	Cost of Equity Change		Net Stock Issue		Net Debt Issue		Net Cash Change		Net Investment	
	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value
Intercept	-0.003	(0.91)	0.180	(0.11)	-0.073	(0.49)	0.162	(0.21)	-0.133	(0.23)
Cost of Equity Change			-0.442	(0.00)	-0.108	(0.40)	0.199	(0.22)	-0.384	(0.00)
Instowner Change	-0.007	(0.95)	-0.005	(0.96)	0.144	(0.07)	0.208	(0.06)	-0.256	(0.01)
Liquidity Change	-0.164	(0.19)	-0.120	(0.21)						
Insider Ownership	0.016	(0.71)	0.044	(0.22)	0.046	(0.16)	-0.113	(0.01)	0.010	(0.79)
Net Analyst Change	0.002	(0.33)	0.004	(0.01)	0.002	(0.08)	-0.003	(0.02)	0.002	(0.26)
Net Rating Change	-0.008	(0.22)	-0.009	(0.08)	-0.006	(0.20)	0.014	(0.02)	-0.008	(0.13)
Net Stock Issue	-0.387	(0.02)			-0.459	(0.01)	0.547	(0.00)	-0.046	(0.76)
Net Debt Issue	-0.314	(0.36)	-0.766	(0.00)			0.257	(0.43)	0.468	(0.08)
Net Cash Change	0.439	(0.01)	0.468	(0.01)	-0.003	(0.99)			0.522	(0.00)
Net Investment	-0.280	(0.13)	0.136	(0.37)	0.397	(0.00)	0.103	(0.55)		
Prior Market Return	0.040	(0.50)	0.042	(0.39)	-0.049	(0.26)				
Prior Market Volatility	0.620	(0.74)	-0.982	(0.50)	0.122	(0.93)				
Net Runup	-0.036	(0.15)	0.029	(0.08)					0.067	(0.00)
Term Premia					0.003	(0.41)				
Earnings Volatility					-0.352	(0.01)	0.327	(0.07)		
Rating dummy					0.008	(0.40)				
Liquidity $_{t-1}$			-0.094	(0.07)						
Size $_{t-1}$			-0.009	(0.10)	0.000	(0.99)	-0.007	(0.24)	0.005	(0.37)
M/B $_{t-1}$			0.004	(0.29)	-0.001	(0.81)	0.021	(0.01)	0.001	(0.87)
Cash $_{t-1}$			-0.018	(0.76)	-0.016	(0.76)	-0.237	(0.01)	0.060	(0.31)
Stock Return Volatility	-0.561	(0.53)								
Dividend $_{t-1}$			-0.668	(0.02)						
Rating $_{t-1}$					-0.008	(0.00)				
Sales Volatility							-0.079	(0.00)		
Investment $_{t-1}$									0.227	(0.00)
Basmann test (p-value)	0.58		0.12		0.48		0.86		0.98	
System R-square					0.27					

Table 5
Changes in Corporate Financial Policies around S&P 500 Index Addition

The table reports coefficients and p-values in brackets based on a system of five equations, estimated using 3SLS. The sample consists of 222 companies that were added to the S&P500 index in the years 1981 through 1997. *Announcement Return* is the cumulative abnormal return from day -5 to day +5 of the announcement of S&P 500 addition using the market model with the CRSP equally weighted index as the market return. *Liquidity Change* is the average monthly volume in (+1, +12) months minus the average monthly volume in (-12, -1) months, where volume is number of shares traded divided by number of shares outstanding. *Instowner Change* is the institutional ownership at quarter +1 minus institutional ownership at quarter -1, where institutional ownership is the total number of shares owned by institutions as reported by TFN/Institutional divided by the number of shares outstanding. *Insider Ownership* is the total number of shares owned by insiders divided by the number of shares outstanding. *Analyst Change* is the number of analysts at year +1 minus the number of analysts at year -1. *Rating Change* is defined as (-1) × credit rating at year +1 minus credit rating at year -1. Credit ratings are from S&P as reported in Compustat and SDC. *Stock Issue* is the average of year 0 and year +1 common and preferred stock issued minus common and preferred stock repurchased divided by assets. *Debt Issue* is the average of year 0 and year +1 long-term debt issued minus long-term debt retired plus changes in short-term debt divided by assets. *Cash Change* is the cash ratio at year +1 minus the cash ratio at year -1, where the cash ratio is defined as cash and short-term investment divided by assets. *Investment* is the average of year 0 and year +1 capital expenditures plus acquisitions divided by assets. *Prior Market Return* is the sum of the monthly value-weighted market return in the interval -7 to -1 months. *Prior Market Volatility* is the standard deviation of the daily value-weighted market return in the interval -7 to -1 months. *Run-up* is the sum of the firm's monthly return in the interval -7 to -1 months. *Term Premia* is the 10-year Treasury constant maturity rate minus the 1-year Treasury constant maturity rate in the month prior to the event. *Earnings Volatility* is standard deviation of the cash flow divided by assets in the prior five years. *Rating Dummy* is 1 if the rating is available and 0 otherwise. *Liquidity* is number of shares traded divided by number of shares outstanding. *Size* is the natural log of assets. *M/B* is the market-to-book ratio, measured as the market value of equity plus the book value of assets, minus the book value of common equity, divided by the book value of assets. *Stock Return Volatility* is the standard deviation of the daily stock return in the (-12, -1) months. *Dividends* is the dividends divided by assets. *Rating* is (-1) x credit rating, where credit ratings are from S&P as reported in Compustat and SDC. *Sales Volatility* is the standard deviation of the logarithm of sales in the prior five years. *Net* refers to a variable value net of the comparable firm's value by taking the difference.

Variable	Announcement Return		Net Stock Issue		Net Debt Issue		Net Cash Change		Net Investment	
	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value
Intercept	0.071	(0.01)	-0.041	(0.74)	0.124	(0.30)	0.163	(0.21)	-0.255	(0.03)
Announcement Return			0.811	(0.01)	-0.338	(0.11)	-0.575	(0.03)	0.515	(0.03)
Instowner Change	0.239	(0.01)	-0.283	(0.02)	0.279	(0.01)	0.400	(0.01)	-0.437	(0.01)
Liquidity Change	0.063	(0.50)	-0.050	(0.60)						
Insider Ownership	-0.001	(0.97)	0.089	(0.02)	0.000	(0.99)	-0.111	(0.01)	0.035	(0.36)
Net Analyst Change	0.001	(0.20)	0.004	(0.01)	0.001	(0.25)	-0.003	(0.09)	0.001	(0.27)
Net Rating Change	0.005	(0.24)	-0.012	(0.03)	0.000	(0.98)	0.014	(0.02)	-0.009	(0.11)
Net Stock Issue					-0.247	(0.05)	0.506	(0.01)	0.003	(0.98)
Net Debt Issue			-0.357	(0.18)			-0.398	(0.19)	0.887	(0.01)
Net Cash Change			0.569	(0.01)	-0.295	(0.08)			0.517	(0.01)
Net Investment			0.203	(0.12)	0.360	(0.01)	0.146	(0.32)		
Prior Market Return	0.011	(0.79)	0.004	(0.93)	-0.056	(0.17)				
Prior Market Volatility	0.987	(0.47)	1.471	(0.33)	-0.712	(0.60)				
Net Run-up	-0.013	(0.47)	0.029	(0.16)					0.056	(0.01)
Term Premia	-0.004	(0.28)			0.004	(0.27)				
Earnings Volatility					-0.316	(0.03)	0.305	(0.08)		
Rating Dummy					0.014	(0.17)				
Liquidity $_{t-1}$			-0.170	(0.01)						
Size $_{t-1}$			0.001	(0.91)	-0.008	(0.13)	-0.006	(0.33)	0.009	(0.08)
M/B $_{t-1}$			-0.003	(0.51)	0.004	(0.35)	0.016	(0.01)	-0.006	(0.18)
Cash $_{t-1}$			0.137	(0.06)	-0.109	(0.10)	-0.266	(0.01)	0.169	(0.02)
Stock Return Volatility	-2.248	(0.01)								
Dividend $_{t-1}$			-1.074	(0.01)						
Rating $_{t-1}$					-0.007	(0.01)				
Sales Volatility							-0.058	(0.01)		
Investment $_{t-1}$									0.301	(0.01)
Basmann's test (p-value)	0.66		0.12		0.79		0.74		0.98	
System R-square					0.25					

Table 6
Stock Issue and Financing Deficit

The table reports uses the sample of 222 firms that are added to the S&P500 index between 1981 and 1997. Panel A shows univariate statistics on stock issue, debt issue and financing deficit in the seven years around the index addition (-3,+3), where year 0 is the year of the index addition event. *Stock Issue* is common and preferred stock issued net of repurchases divided by assets (ΔE). *Debt Issue* is long-term debt issued net of retirements divided by assets (ΔD). The *Financing Deficit* (DEF) is the sum of dividends (DIV), investment (I), change in working capital (ΔW = change in operating working capital + changes in cash + changes in short term debt), minus the cash flow after interest and taxes (C), divided by assets. DEF = ΔD + ΔE. Panel B shows coefficients and p-values underneath from OLS regressions. *After-dummy* is a dummy variable equal to 1 for the year 0 and year +1, and 0 otherwise. *Net* refers to a variable value net of the comparable firm's value by taking the difference.

Panel A. Stock Issue, Debt Issue and Financing Deficit

Variable	Mean
Stock issue $_{(-3,+3)}$	0.012
Debt issue $_{(-3,+3)}$	0.023
Financing Deficit $_{(-3,+3)}$	0.035

Panel B. Regressions

	Stock Issue	Stock Issue	Stock Issue	Net Stock Issue	Net Stock Issue	Net Stock Issue
Intercept	-0.001	-0.001	0.003	-0.003	-0.003	-0.003
	(0.44)	(0.49)	(0.15)	(0.04)	(0.04)	(0.10)
Financing Deficit	0.373	0.333				
	(0.01)	(0.01)				
Financing Deficit x After-dummy		0.134				
		(0.01)				
Investment			0.310			
			(0.01)			
Investment x After-dummy			0.140			
			(0.01)			
(DIV+ΔW-C)			0.343			
			(0.01)			
(DIV+ΔW-C) x After-dummy			0.167			
			(0.01)			
Net Financing Deficit				0.398	0.375	
				(0.01)	(0.01)	
Net Financing Deficit x After-dummy					0.085	
					(0.01)	
Net Investment						0.328
						(0.01)
Net Investment x After-dummy						0.138
						(0.01)
Net (DIV+ΔW-C)						0.401
						(0.01)
Net (DIV+ΔW-C) x After-dummy						0.050
						(0.17)
Adjusted R-square	0.35	0.36	0.37	0.37	0.38	0.38

Table 7
Long-run Abnormal Return and the Correlation with Corporate Financial Policies

Variables are defined in the Appendix in detail. The table reports long-term abnormal return and the correlation with corporate financial policies of a sample of 222 firms added to the S&P500 index between 1981 and 1997. Panel A shows univariate statistics on long-run abnormal return. *Long-run Abnormal Return* (+1, 12) months*, Long-run Abnormal Return* (+1, 24) months*,* and *Long-run Abnormal Return* (+1, 36) months are defined as the sum of the difference between actual return and expected return in (+1, 12), (+1, 24) and (+1, 36) months after the index addition announcement, where month 0 is the month of the S&P 500 index addition announcement. The expected return is obtained by using the factor loadings in the Fama-French three-factor model estimated in the period of (-60, -1) months, using firm's monthly return. Panel B shows the correlation between long-term abnormal return and corporate financial policies. *Stock Issue* is the average of year 0 and year +1 common and preferred stock issued minus common and preferred stock repurchased divided by assets. *Debt Issue* is the average of year 0 and year +1 long-term debt issued minus long-term debt retired plus changes in short-term debt divided by assets. *Cash Change* is the cash ratio at year +1 minus the cash ratio at year -1, where the cash ratio is defined as cash and short-term investment divided by assets. *Investment* is the average of year 0 and year +1 capital expenditures plus acquisitions divided by assets. *Net* refers to a variable value net of the comparable firm's value by taking the difference.

Panel A. Univariate Statistics on Long-run Abnormal Returns

	Mean	p-value
Long-run Abnormal Return (+1, +12) months	0.97%	0.70
Long-run Abnormal Return (+1, +24) months	-0.42%	0.91
Long-run Abnormal Return (+1, +36) months	0.82%	0.87

Panel B. Correlation between Long-run Abnormal Return and Corporate Financial Policies

	Correlation coefficient (p-value)			
	Net Stock Issue	Net Debt Issue	Net Cash Change	Net Investment
Long-run Abnormal Return (+1, +12) months	-0.062	-0.127	0.199	-0.085
	(0.36)	(0.06)	(0.01)	(0.21)
Long-run Abnormal Return (+1, +24) months	-0.114	-0.187	0.207	-0.143
	(0.09)	(0.01)	(0.01)	(0.03)
Long-run Abnormal Return (+1, +36) months	-0.171	-0.174	0.199	-0.130
	(0.01)	(0.01)	(0.01)	(0.05)

Table 8
Long-run Abnormal Return Using the Fama-French Three-factor Model with Ibbotson's RATS Method

Variables are defined in the Appendix in detail. The table reports monthly cumulative average abnormal return in percent using Ibbotson's (1975) returns across time and security (RATS) method combined with the Fama-French (1993) three-factor model for the sample of 222 firms added to the S&P500 index between 1981 and 1997 and various subsamples (number of observations in parentheses). The following regression is run each event-month j:

$$\left(R_{i,t} - R_{f,t}\right) = aj + b_j\left(R_{m,t} - R_{f,t}\right) + cjSMB_t + djHML_t + \varepsilon_{i,t}\ ,$$

where $R_{i,t}$ is the monthly return on security i in calendar month t that corresponds to the event month j with j=0 being the month of the S&P 500 index addition announcement. $R_{f,t}$ and $R_{m,t}$ are the risk-free rate and the return on the equally weighted CRSP index, respectively. SMB_t and HML_t are the monthly return on the size and book-to-market factor in month t, respectively. The numbers reported are sums of the intercepts a_t of cross-sectional regressions over the relevant event-time periods expressed in percentage terms. The significance levels of the window cumulative abnormal returns are indicated by $, *, **, and ***, and correspond to a significance level of 10%, 5%, 1%, and 0.1%, respectively, using a two-tailed test.

Months Relative to S&P 500 Index Addition	Entire Sample (Obs: 222)	Subsample: Net Stock Issue>0 (Obs: 126)	Subsample: Net Stock Issue>0 and Net Investment>0 (Obs: 72)	Subsample: Net Stock Issue>0 and Net Investment<0 (Obs: 54)	Subsample: Net Stock Issue>0 and Net Debt Issue<0 (Obs: 70)	Subsample: Net Stock Issue>0 and Net Cash Change>0 (Obs: 64)
(+1,+1)	-0.80	-1.09	-0.84	-1.58	-0.41	-2.80**
(+1,+2)	-1.98*	-2.16$	-2.10	-2.35	-1.25	-3.54*
(+1,+3)	-1.11	-0.13	-0.85	0.44	1.17	-1.64
(+1,+4)	-0.78	-0.86	-1.83	0.11	0.43	-0.44
(+1,+5)	-0.36	-1.64	-3.84	0.77	1.74	-1.85
(+1,+6)	0.01	-1.74	-4.34	1.62	2.14	-1.26
(+1,+7)	0.27	-1.46	-5.10	2.54	3.08	-0.36
(+1,+8)	-0.02	-1.69	-6.72*	4.50	3.12	1.26
(+1,+9)	-1.25	-3.03	-8.41*	3.81	1.55	0.30
(+1,+10)	-0.77	-3.30	-8.41*	3.13	2.11	-1.13
(+1,+11)	-0.01	-2.67	-7.07$	2.89	3.65	-0.22
(+1,+12)	-0.77	-3.90	-7.70$	0.83	2.01	-1.64
(+1,+13)	-1.29	-4.90	-9.49*	1.00	0.67	-2.71
(+1,+14)	-2.72	-6.60$	-12.33**	0.98	-0.25	-4.98
(+1,+15)	-3.14	-7.25*	-13.06**	0.01	-1.94	-6.82
(+1,+16)	-2.87	-8.16*	-13.35**	-2.41	-2.79	-9.36$
(+1,+17)	-3.07	-8.35*	-15.54**	-0.48	-2.89	-9.70$
(+1,+18)	-4.12	-8.48*	-15.23**	-1.34	-3.49	-8.61
(+1,+19)	-4.32	-8.43*	-14.57**	-1.93	-3.42	-9.27
(+1,+20)	-4.49	-8.29*	-14.27*	-2.24	-3.95	-9.16
(+1,+21)	-4.36	-8.43*	-14.78*	-1.83	-2.48	-9.18
(+1,+22)	-3.09	-6.60	-13.90*	1.08	-0.53	-4.86
(+1,+23)	-2.35	-6.56	-13.87*	1.16	0.93	-4.69
(+1,+24)	-2.36	-7.13	-13.71*	-0.67	-0.39	-6.12
(+1,+25)	-2.84	-8.06$	-15.06*	-1.49	-1.64	-6.79
(+1,+26)	-3.17	-8.05$	-14.99*	-1.22	-1.80	-5.88
(+1,+27)	-3.09	-8.46$	-15.47*	-1.48	-2.57	-7.65
(+1,+28)	-2.69	-8.96$	-15.38*	-2.74	-2.27	-8.76
(+1,+29)	-1.81	-8.10	-15.14*	-0.81	-1.85	-7.50
(+1,+30)	-1.69	-8.06	-15.24*	-0.21	-1.22	-7.43
(+1,+31)	-3.27	-9.92$	-15.78*	-3.90	-2.90	-8.87
(+1,+32)	-3.66	-10.77*	-15.75*	-5.96	-4.62	-10.08
(+1,+33)	-3.83	-9.69$	-15.06*	-4.77	-5.15	-6.85
(+1,+34)	-2.03	-8.15	-13.71$	-3.46	-3.33	-4.58
(+1,+35)	-2.27	-7.86	-13.97$	-2.62	-2.21	-6.28
(+1,+36)	-3.29	-9.23$	-16.56*	-2.46	-2.82	-6.48

Table 9
Change in the Cost of Equity at Different Horizons

The table reports univariate statistics of the change in the cost of equity for a sample of 222 firms that are added to the S&P500 index between 1981 and 1997. We estimate the change of beta using the model: $(R_{i,t} - R_{f,t}) = a + b_1 \times (R_{m,t} - R_{f,t}) + b_2 \times SMB_t + b_3 \times HML_t + c_1 \times After_t \times (R_{m,t} - R_{f,t}) + c2 \times After_t \times SMB_t + c3 \times After_t \times HML_t + \varepsilon_t$, where $After_t$ is a dummy variable that is 1 after the index addition and 0 before the index addition. b_1, b_2 and b_3 are the betas before the index addition. c_1, c_2 and c_3 are the change of the betas after the index addition. The period for estimating betas is indicated in the table. *Change in Cost of Equity* is obtained by evaluating the change of betas at the average risk premium over the periods indicated in the table. We separately consider firms where net equity issues >0 (Panel A: 126 events) and firms where net equity issues>0 and net investment>0 (Panel B: 72 events).

Panel A. Firms that Issue Equity After the Index Addition

Period for estimating changes of betas	Period for average risk premium	Cost of Equity Change (Mean)	Mean Test
(-24, -1) and (+1, +12) months	(-60, -1) months	-0.0224	0.02
(-24, -1) and (+13, +24) months	(-60, -1) months	-0.0114	0.23
(-24, -1) and (+25, +36) months	(-60, -1) months	0.0055	0.63

Panel B. Firms that Issue Equity and Increase Investment After the Index Addition

Period for estimating changes of betas	Period for average risk premium	Cost of Equity Change (Mean)	Mean Test
(-24, -1) and (+1, +12) months	(-60, -1) months	-0.0219	0.08
(-24, -1) and (+13, +24) months	(-60, -1) months	-0.0042	0.75
(-24, -1) and (+25, +36) months	(-60, -1) months	0.0209	0.20

Table 10
Cost of Equity Change and "Equity Dependence"

The table reports coefficients (coef) and p-values in brackets based on a system of five equations, estimated using 3SLS. The sample consists of 222 companies that were added to the S&P 500 index in the years 1981 through 1997. *Cost of Equity Change* is estimated by using the change of betas in the period of (-24, -1) months and (+1, +24) months, and the period of (-60, -1) months for average risk premium. *KZ Dummy* is a dummy variable equal to 1 for firms whose KZ-index is above the sample median and 0 otherwise. The definition of the KZ-Index is given in the Appendix. *Instowner Change* is the institutional ownership at quarter +1 minus institutional ownership at quarter -1, where institutional ownership is the total number of shares owned by institutions as reported by TFN/Institutional divided by the number of shares outstanding. *Liquidity Change* is the average monthly volume in (+1, +12) months minus the average monthly volume in (-12, -1) months, where volume is number of shares traded divided by number of shares outstanding. *Insider Ownership* is the total number of shares owned by insiders divided by the number of shares outstanding. *Analyst Change* is the number of analysts at year +1 minus the number of analysts at year -1. *Rating Change* is defined as (-1) × credit rating at year +1 minus credit rating at year -1. Credit ratings are from S&P as reported in Compustat and SDC. *Stock Issue* is the average of year 0 and year +1 common and preferred stock issued minus common and preferred stock repurchased divided by assets. *Debt Issue* is the average of year 0 and year +1 long-term debt issued minus long-term debt retired plus changes in short-term debt divided by assets. *Cash Change* is the cash ratio at year +1 minus the cash ratio at year -1, where the cash ratio is defined as cash and short-term investment divided by assets. *Investment* is the average of year 0 and year +1 capital expenditures plus acquisitions divided by assets. *Prior Market Return* is the sum of the monthly value-weighted market return in the interval -7 to -1 months. *Prior Market Volatility* is the standard deviation of the daily value-weighted market return in the interval -7 to -1 months. *Run-up* is the sum of the firm's monthly return in the interval -7 to -1 months. *Term Premia* is the 10-year Treasury constant maturity rate minus the 1-year Treasury constant maturity rate in the month prior to the event. *Earnings Volatility* is standard deviation of the cash flow divided by assets in the prior five years. *Rating Dummy* is 1 if the rating is available and 0 otherwise. *Liquidity* is number of shares traded divided by number of shares outstanding. *Size* is the natural log of assets. *M/B* is the market-to-book ratio, measured as the market value of equity plus the book value of assets, minus the book value of common equity, divided by the book value of assets. *Stock Return Volatility* is the standard deviation of the daily stock return in (-12, -1) months. *Dividends* is the dividends divided by assets. *Rating* is (-1) × credit rating, where credit ratings are from S&P as reported in Compustat and SDC. *Sales Volatility* is the standard deviation of the logarithm of sales in the prior five years. *Net* refers to a variable value net of the comparable firm's value by taking the difference. *F-test* refers to the F test on the null hypothesis that the sum of the estimates on Cost of Equity Change and Cost of Equity Change * KZ dummy is zero.

	Cost of Equity Change		Net Stock Issue		Net Debt Issue		Net Cash Change		Net Investment	
	coef	p-value	coef	p-value	coef	p-value	coef	p-value	coef	p-value
Intercept	0.003	(0.92)	0.193	(0.12)	-0.071	(0.51)	0.153	(0.25)	-0.137	(0.22)
Cost of Equity Change			-0.239	(0.14)	0.020	(0.88)	0.179	(0.30)	-0.192	(0.18)
KZ dummy			0.030	(0.07)	0.010	(0.43)	-0.018	(0.26)	-0.002	(0.90)
Cost of Equity Change x KZ dummy			-0.196	(0.04)	-0.099	(0.23)	-0.097	(0.37)	-0.137	(0.13)
Instowner Change	0.007	(0.95)	-0.001	(0.99)	0.145	(0.07)	0.205	(0.06)	-0.249	(0.01)
Liquidity Change	-0.205	(0.10)	-0.149	(0.13)						
Insider Ownership	-0.016	(0.69)	0.070	(0.08)	0.054	(0.12)	-0.122	(0.00)	-0.006	(0.87)
Net Analyst Change	0.000	(0.92)	0.004	(0.01)	0.002	(0.07)	-0.003	(0.03)	0.001	(0.58)
Net Rating Change	-0.005	(0.43)	-0.011	(0.05)	-0.006	(0.20)	0.013	(0.02)	-0.006	(0.24)
Net Stock Issue	-0.167	(0.31)			-0.474	(0.01)	0.520	(0.00)	0.107	(0.45)
Net Debt Issue	0.037	(0.91)	-0.838	(0.00)			0.214	(0.55)	0.707	(0.01)
Net Cash Change	0.218	(0.17)	0.594	(0.01)	0.023	(0.91)			0.358	(0.07)
Net Investment	-0.283	(0.12)	0.218	(0.16)	0.445	(0.00)	0.054	(0.75)		
Prior Market Return	0.052	(0.38)	0.047	(0.35)	-0.039	(0.35)				
Prior Market Volatility	1.491	(0.41)	-0.842	(0.56)	0.145	(0.91)				
Net Runup	-0.042	(0.08)	0.028	(0.09)					0.065	(0.00)
Term Premia					0.003	(0.45)				
Earnings Volatility					-0.316	(0.01)	0.346	(0.05)		
Rating dummy					0.005	(0.60)				
Liquidity $_{t-1}$			-0.108	(0.05)						
Size $_{t-1}$			-0.010	(0.08)	0.000	(0.97)	-0.006	(0.34)	0.005	(0.35)
M/B $_{t-1}$			0.002	(0.65)	-0.001	(0.75)	0.021	(0.01)	0.001	(0.88)
Cash $_{t-1}$			0.069	(0.35)	0.009	(0.89)	-0.269	(0.01)	0.054	(0.41)
Stock Return Volatility	-0.890	(0.34)								
Dividend $_{t-1}$			-0.870	(0.01)						
Rating $_{t-1}$					-0.007	(0.00)				
Sales Volatility							-0.072	(0.00)		
Investment $_{t-1}$									0.215	(0.00)
F-test (p-value)			0.02		0.60		0.67		0.04	
Basmann test (p-value)	0.20		0.13		0.49		0.90		0.95	
System R square					0.27					

Table 11
Long-run Abnormal Return and Financial Constraints

This table shows the long term abnormal return in the subsample with higher or lower financial constraints measured by the KZ-index. The definition of the KZ-index is given in the Appendix. *High KZ* are the sample firms with a KZ-index above the sample median KZ-index. *Low KZ* are the firms with a KZ-index below the sample median KZ-index. The variables are defined in the Appendix in detail. The table reports monthly cumulative average abnormal return in percent using Ibbotson's (1975) returns across time and security (RATS) method combined with the Fama-French (1993) three-factor model for the sample of 222 firms added to the S&P 500 index between 1981 and 1997 and various subsamples (number of observations in parentheses). The following regression is run each event-month j:

$$\left(R_{i,t} - R_{f,t}\right) = aj + b_j\left(R_{m,t} - R_{f,t}\right) + cjSMB_t + djHML_t + \varepsilon_{i,t}\ ,$$

where $R_{i,t}$ is the monthly return on security i in calendar month t that corresponds to the event month j with j=0 being the month of the S&P 500 index addition announcement. $R_{f,t}$ and $R_{m,t}$ are the risk-free rate and the return on the equally weighted CRSP index, respectively. SMB_t and HML_t are the monthly return on the size and book-to-market factor in month t, respectively. The numbers reported are sums of the intercepts a_t of cross-sectional regressions over the relevant event-time periods expressed in percentage terms. The significance levels of the window cumulative abnormal returns are indicated by $, *, **, ***, and correspond to a significance level of 10%, 5%, 1%, 0.1%, respectively, using a two-tailed test.

Months Relative to S&P 500 Index Addition	Entire Sample		Subsample: Net Stock Issue>0 and Net Investment>0		Sub-sample: Net Stock Issue>0 and Net Investment<0
	High KZ (Obs: 111)	Low KZ (Obs: 111)	High KZ (Obs: 40)	Low KZ (Obs: 32)	Low KZ (Obs: 25)
(+1,+1)	-1.15	-0.58	-1.54	-0.07	-0.73
(+1,+2)	-3.70**	-0.44	-4.25*	0.85	-0.67
(+1,+3)	-3.46*	1.04	-4.32$	2.52	2.60
(+1,+4)	-3.43$	1.55	-4.28	0.39	2.94
(+1,+5)	-4.16*	3.06	-7.59*	-0.27	4.59
(+1,+6)	-4.96*	4.94*	-8.40*	-0.45	8.08
(+1,+7)	-6.23*	6.29*	-11.10**	1.16	8.04
(+1,+8)	-7.65**	7.21**	-13.17**	-0.42	10.12
(+1,+9)	-9.52***	6.58*	-13.46**	-5.02	11.59$
(+1,+10)	-9.35**	7.39*	-12.95*	-5.51	10.59
(+1,+11)	-10.24**	9.89**	-12.69*	-2.96	13.72$
(+1,+12)	-12.00***	10.00**	-12.72*	-5.05	12.24$
(+1,+13)	-13.68***	10.59**	-13.42*	-8.86	14.80$
(+1,+14)	-14.99***	9.06*	-15.82*	-12.12$	14.25$
(+1,+15)	-15.98***	9.22*	-16.04*	-13.00$	15.00$
(+1,+16)	-15.40***	9.20*	-16.94*	-13.20$	11.77
(+1,+17)	-16.41***	9.75*	-20.70**	-13.59$	14.50
(+1,+18)	-18.92***	10.16*	-18.82*	-14.13$	16.21$
(+1,+19)	-19.60***	10.74*	-17.62*	-13.49	15.08
(+1,+20)	-19.19***	9.76*	-16.55*	-16.81*	15.05
(+1,+21)	-18.83***	9.64*	-17.51*	-16.95$	13.87
(+1,+22)	-17.65***	11.24*	-16.73*	-15.53$	15.94
(+1,+23)	-17.36***	12.53**	-17.00*	-15.03$	16.44
(+1,+24)	-18.35***	13.35**	-17.54*	-13.27	18.32$
(+1,+25)	-18.76***	12.72**	-18.10*	-15.53$	16.61
(+1,+26)	-19.31***	12.93**	-18.43*	-14.68	16.87
(+1,+27)	-19.08***	13.14**	-18.33*	-16.50$	18.23
(+1,+28)	-18.90***	13.76**	-18.62*	-17.00$	16.78
(+1,+29)	-18.55***	15.59**	-19.30*	-14.76	21.31$
(+1,+30)	-19.07***	16.32**	-20.40*	-12.85	20.94$
(+1,+31)	-20.55***	14.83**	-21.38*	-12.82	17.65
(+1,+32)	-20.08***	13.51*	-21.21*	-12.92	14.18
(+1,+33)	-20.78***	13.83*	-20.91*	-12.36	14.63
(+1,+34)	-20.11***	16.27**	-19.29$	-11.32	15.92
(+1,+35)	-20.75***	17.46**	-19.97$	-9.99	19.17
(+1,+36)	-21.31***	16.14**	-22.79*	-12.35	19.69