

STOCK-BASED INCENTIVES: DESIGN AND IMPLICATIONS FOR FIRM PERFORMANCE

Marc Steffen Rapp

Center for Entrepreneurial and Financial Studies (CEFS)
TUM Business School, Technische Universität München
Email: msr@m-s-rapp.de

Philipp Schaller

Center for Entrepreneurial and Financial Studies (CEFS)
TUM Business School, Technische Universität München
Email: philipp.schaller@cefs.de

Michael Wolff

Center for Strategic Business Wargaming
Institut für Unternehmensführung, Universität Karlsruhe (TH)
Email: wolff@ibu.uni-karlsruhe.de

First version: February 16, 2009

This version: February 28, 2009

Abstract

We examine performance implications of stock-based incentive programs. While agency theory makes a strong case for stock-based incentives, empirical evidence of the effect on firm performance is mixed at best. Using a novel hand-collected data-set of German Prime Standard firms, we also find that on average stock-based long-term incentives do not improve firm performance. However, when we distinguish between plans with and without ambitious performance hurdles, we find that granting stock-based incentives with weak performance hurdles goes along with poor post performance, while ambitious programs boosts firm performance. We confirm these findings by using different performance measures, addressing endogeneity concerns, and controlling for various governance mechanisms like ownership and board structures, as well as other design dimensions of the stock-based incentive plans.

JEL classification: classification 1 · classification 2 · classification 3

Keywords: Incentives · management compensation · stock-based compensation · corporate governance

1 Introduction

In this paper we ask a simple question: Does granting stock-based long-term incentives (SBLTI) improve corporate performance? SBLTI are part of management compensation packages granted by US firms since the 50s of last century (e.g. [Lambert, Lanen and Larker, 1989](#)). Today, SBLTIs are nearly omnipresent in the US (e.g. [Yermack, 1995](#)) and the UK but also in other developed countries. However, examining a unique hand-collected data we find that the answer to the above question seems to be generally no. Even worse, our analysis reveals that granting plain shares or stock options seems to have negative effects for firm performance. Then, however, the good news turn out and we find that granting SBLTI with ambitious performance hurdles seems to have substantial incentive effects and results in significantly higher operative performance.

It is well known that agency arguments make a strong case for SBLTI. However, so far empirical evidence on the effect of SBLTI upon firm performance is mixed (e.g. [Palia, 2001](#); [Lam and Chng, 2006](#)). To examine performance implications of SBLTI, we analyze a sample of German listed firms where some 37% of the firms have granted SBLTI in 2006. Germany provides a particular interesting setting for an analysis of SBLTI, since these kind of management incentives emerged only in 1996 (e.g. [Bernhardt, 1999](#)). Since then only a limited number of firms have implemented SBLTI programs, although the German Corporate Governance Code (GCGC) strongly recommends these kind of incentive elements (see [Government Commission GCGC, 2008](#)). Moreover, historically accounting rules in Germany did not favor plain (or any type of) designs of SBLTI (as for instance in the US) and thus a broad variety of sometimes quite complex design structures emerged (e.g. [Korn, Paschke and Uhrig-Homburg, 2008](#)).

Identifying German firms to represent an interesting research objective brings forward a major issue. There is, unfortunately, no commercial database offering access to detailed corporate governance information (e.g. ownership structures, compensation structures or board characteristics) for German firms. Accordingly, we set up a unique database containing hand-collected data on ownership structures, compensation structures and board characteristics. Using this database, we are able to identify firms that have granted SBLTI in 2006. Moreover, the database contains detailed information about the design of these SBLTI programs. We use this information to define an *incentive index* measuring

whether the program design is characterized by ambitious performance hurdles. Thus our incentive index proxies the incentive effect of the SBLTI programs. We then examine the question whether granting SBLTI improves firm performance. Comparing firms with and without SBLTI in 2006 we find no difference in operative performance (or even slightly negative effects of SBLTIs). However, if we furthermore consider the incentive index, we find strong evidence that SBLTI programs with low incentive index (i.e. with weak performance hurdles) improve firm performance, while SBLTI programs with high incentive index (i.e. with ambitious performance hurdles) improve firm performance. The performance effect of our incentive index remains when we restrict our sample to SBLTI granting firms. Moreover, it is robust with respect to different codings of our incentive index, different performance measures, and different specifications of our regression models. Furthermore, we show that the results are robust against endogeneity concerns and concerns that it is a simple governance argument that drives the result (e.g. [Sautner and Weber, 2008](#)).

We contribute to the existing literature in several ways. First, we provide evidence, that in European countries SBLTI are not as common as in the US. Specifically, within our sample we find that less than half of the largest 400 German listed firms grant SBLTI. A detailed analysis reveals that in particular large firms with dispersed ownership structure grant SBLTI. Second, we provide evidence about the design of SBLTI plans outside the US. Similar to [Sautner and Weber \(2008\)](#) our analysis reveals significant heterogeneity between different programs. Examining this issue in more detail, we find that it in particular board characteristics determine the design of SBLTI plans. Third, we contribute to the discussion about the effect of SBLTI programs by examining the effect of ambitious performance hurdles upon firm performance. We find that only SBLTI with ambitious performance hurdles improve firm performance. Finally, this study provides the first large sample study of SBLTI in German firms that we know about.

The rest of the paper is organized as follows. Section [2](#) discusses related literature. Section [3](#) describes the data set and gives some descriptive statics on our incentive index. Section [4](#) provides our empirical analysis, which then is discussed in section [5](#). Finally, section [6](#) concludes. Further tables and some general remarks about peculiarities of the German corporate governance system are provided in the appendix.

2 Stock-based long-term incentives and firm performance

Agency theory makes a strong case for stock-based incentives. As argued by [Jensen and Meckling \(1976\)](#) and others stock-based incentives may serve as a substitute for non-perfect managerial ownership by alleviating the principal agency problem (e.g. [Fahlenbrach, 2009](#)).¹ This incentive alignment argument states that managerial stock ownership and SBLTI programs are positively related to firm performance. There are, however, some papers arguing that SBLTI are powerful mechanisms for managers to extract resources from the sphere of shareholders (e.g. [Bebchuk, Fried and Walker, 2002](#) and others). The *entrenchment effect* runs counter the *alignment effect* and it remains an empirical question which of the two effects dominates.

So far empirical evidence on the effect of SBLTI upon firm performance is mixed. On the one hand there are studies that examine the announcement effects of changes in compensation plans (e.g. [Brickley, Bhagat and Lease, 1985](#); [Defusco, Johnson and Zorn, 1990](#); [Yermack, 1995](#)). On the other hand, there are studies which evaluate the effects of stock options on (operative) firm performance on the long run. [Mehran \(1995\)](#), for instance, finds a positive correlation between firm performance and the percentage of total equity compensation, where firm performance is measured by Tobin's Q as well as return on assets. Recently, a study of [Lam and Chng \(2006\)](#) supports this correlation between equity based compensation and firm performance.² Moreover, some studies examine performance implications of the design of SBLTI. Generally, these studies focus on a single incentive design feature. [Chi and Johnson \(2008\)](#) analyse the implications of the vesting period. They find that operative performance is positively correlated with management incentives and that the extend of the correlation increases in vesting period length. Another design feature, the performance hurdle, has been analysed by [Bettis et al. \(2008\)](#). In their study they document a significant better operating performance of the firms with a performance hurdle than the performance of the control firms.

Our point of departure is the assumption that SBLTIs are used as a tool to mitigate the principal agency conflict. In line with this argument, [Rapp, Schaller and Wolff \(2008\)](#) document in a related

¹Several authors examine the relation between management ownership and corporate performance. [McConnell and Servaes \(1990\)](#), for instance, find such a concave relation while [Himmelberg, Hubbard and Palia \(1999\)](#) demonstrate that any such relation is spurious after correcting for the endogenous character of executive compensation. Several studies of managerial ownership also take SBLTI into account, e.g. [Bizjak, Brickley and Coles \(1993\)](#) and [Core and Guay \(1999\)](#).

²[Zhou \(2001\)](#) illustrates that managerial ownership and stock based compensation should be analysed simultaneously.

paper that in Germany SBLTIs are rarely used in firms with high levels of managerial ownership. However, we find that generally SBLTI do not improve firm performance. To examine the issue in more detail, we then take a closer look at the various SBLTI programs and define an incentive index measuring the ambitiousness of these programs. Therefore, we subsume various design features of SBLTI into one index to deduce implications of the overall incentive design of a SBLTI on operative firm performance. [Sautner and Weber \(2008\)](#) also aggregate various design features of SBLTI into one scoring model. However, they define their index in a different way and challenge a different research question. Consistent with the managerial power interpretation, they hypothesise that CEOs in firms with weak governance structures receive more friendly designed option plans and find that CEO-friendly stock-based incentive programs are correlated with lower subsequent performance in their sample of 83 European firms.

3 Data and definition of variables

This section describes our sample selection procedure, how we compile our data set and the way we code the incentive index. This section also gives an overview of the governance and other firm characteristics we use in our regression models. Finally, in the following first descriptive statics were provided.

3.1 Sample construction

Our initial sample consists of all 384 firms listed in the German Prime Standard at the end of 2006.³ We remove 40 companies with foreign ISIN, since they generally have different corporate governance structures. Moreover, we have to remove 5 firms in bankruptcy and 2 firms with special events and different corporate governance structures. Finally, we follow the standard procedure and remove all financial firms (40 firms). This leaves us with a final sample of 297 firms. Out of these firms 110 firms have granted SBLTIs in 2006. Accordingly, 37% of German Prime Standard firms used SBLTI in 2006.

[– Table 1 goes about here –]

³See appendix A for a discussion of German peculiarities and the German the Prime Standard.

In our regression analyses we lose at best another 17 firms due to missing data. This is mainly due to two reasons. First, we have to exclude recent IPOs, since we cannot calculate appropriate risk measures for firms with only short time series of accounting and price data. Second, we have to exclude some firms, since they did not report the governance data necessary for our analysis (in particular, some firms claimed that the composition and size of the compensation committee is confidential). For our empirical analysis we compile data from various sources. Standard firm characteristics like firm size and measures of firm performance are obtained from Thomson Financial Worldscope and Datastream. Unfortunately, there is no database offering access to detailed corporate governance information (e.g. ownership structures, compensation structures or board characteristics) for German firms. Accordingly, we set up a unique database containing hand-collected data on ownership structures, compensation structures and board characteristics. Therefore we consulted various sources, in particular annual reports, Hoppenstedt Aktienführer, Lexis-Nexis database, press search and requests to investor relation departments.

3.2 Constructing the incentive index

The index evaluates four main design elements: (i) performance hurdles, (ii) combination of performance hurdles, (iii) reference period for performance hurdles and (iv) vesting period. Moreover, the most important category performance hurdles is divided into three subcategories: (a) absolute share price performance hurdle, (b) relative share price performance hurdle and (c) accounting based performance hurdle. For each firm we score each of the six categories with 0, 1 or 2. Higher scores indicate that the respective design feature provokes higher incentives for the CEO.

As suggested by [Johnson and Tian \(2000\)](#) SBLTI should filter out stock price changes that are due to general market trends (windfall profits) and that hence are unrelated to individual performance (see also [Holmstrom, 1979](#); [Bertrand and Mullainathan, 2001](#); [Kuang and Sujs, 2006](#)). The design element to filter out this general market trend is a performance hurdle. One performance hurdle is the relative share price performance hurdle. Thereby the CEO is only rewarded for the outperformance of his firm compared to a standard stock index or better to a basket of similar firms. Especially a sector benchmark ties an executive's reward more closely to firm-specific performance, over which he has considerable

control (Bebchuk , Fried and Walker, 2002). Instead of filtering ex post, there is also the possibility to forecast the average stock rise of the market and to define this percentage ex ante so that this is a barrier for the future payoff. Thereby we rank these absolute performance hurdles according to their percentage value below respectively above the median to either score this design feature with 1 or 2. A third type of a performance hurdle is the accounting based one. Thereby the score for SBLTIs which have a transparent accounting based hurdle is 2. Programs where an accounting based hurdle exists, but is irreproducible, the subscore is 1. If a performance hurdle of a corresponding category does not exist, the subscore is always 0. Beyond, many of the programs use a absolute as well as a relative share price performance hurdle. For these programs the next category, the combination of the performance hurdles, evaluates the link between these performance hurdles. If only one of the hurdles have to be reached to get the payoff the score is 1. We assume that the best incentive is affected by programs where the CEO will be rewarded only in case of reaching all the demanded targets. Consequently, in all these cases the score is 2. The forth category, the reference period for performance hurdles focuses on temporal requirements to reach the hurdle. Simple models of the contracting view generate one important prediction: shareholders should not reward CEOs for observable firm performance that are beyond the CEO's control (e.g. Bertrand and Mullainathan, 2001). Consequently there is a higher likelihood for the CEO to get rewarded for something that is out of his control if the performance hurdle has to be reached at any time in a period instead of a sunset clause. According to this a program a reference period is scored with 1 and a reference date with 2. The fifth category is the vesting period. In Stein (1989) managers can make myopic decisions that "borrow" against future earnings to inflate current earnings. This borrowing is inefficient, reducing overall earnings and firm value. It is easy to see that longer vesting periods, which prevent managers from taking payoffs based on current stock prices, remove one of the key factors driving the myopic behavior. Furthermore Fudenberg, Hölmstrom and Milgrom (1990) model also suggests benefits to longer vesting periods. They show that if agents have an intermediate-term information advantage over principals about the long-term outcomes of their actions, it is efficient to write long-term contracts with payoffs that occur after the principals observe the long-term outcomes. The long-term contract improves upon a short-term contract because it incorporates additional information about the agent's performance as in Shavell

(1979) and [Holmstrom \(1979\)](#). Thus, if stock prices in the short term do not fully reflect an executive's performance, it is efficient to base compensation on prices in the long term after more information is revealed. [Kole \(1997\)](#) argues that long-term incentive contracts with forfeiture provisions also help firms retain executives, which is important when executives have specialized knowledge that is valuable to the firm. Empirical results confirm this correlation (e.g. [Cadman, Rusticus and Sunder, 1990](#); [Chi and Johnson, 2008](#)).

To check the validity of our results and for robustness tests, we also construct a second index, which focuses on governance related characteristics of SBLTIs. This index, which we call governance index, evaluates SBLTI programs according to their management friendliness. It considers six categories related to the payout profile (e.g. whether or not the payoff is capped) and the transparency level. A lower index score characterizes more (less) management friendly programs. A detailed description of the governance index is reported in [table 12](#) in the appendix.

3.3 Other governance variables and firm characteristics

Beside the above mentioned compensation data, we use several additional variables in our empirical analysis: measures of firm performance, measures of ownership structure, board characteristics, and firm characteristics. [table 11](#) in the appendix gives detailed definitions for all variables and their sources.

Measures of firm performance: We focus on operative performance proxied by return on equity (ROE). We examine the effect for performance in 2006 and 2007. Simultaneously, we use ROE in 2005 as a lagged performance measure in some of our regression specifications. In the course of robustness analyses we also consider a second performance measure: return on asset (ROA). All data used to calculate performance measures are collected from Thomson Financial Worldscope and Datastream.

Measures of ownership structures: To control for effects of different ownership structures, we collected ownership data all firms in our sample. In the empirical analyses, we focus on the largest shareholder, if this blockholder holds more than 10% of voting rights. Thereby we distinguish between inside ownership and outside blockholders. More precisely, we construct a variable MB CONTROL representing the fraction of voting rights held by the largest shareholder, if the largest shareholder holds

at least 10% of voting rights and is a member of the management board. The variable EXT CONTROL represents the fraction of voting rights held by the largest shareholder, if the largest shareholder holds at least 10% of voting rights and is not a member of the management board. In a second step, we defined three more variables FAMILY, INSTITUTIONAL, and STRATEGIC representing the fraction of voting rights held by the largest shareholder, if the largest shareholder is an outside blockholder holding at least 10% of voting rights and is an individual, an insitutional investor or a strategic investor, respectively. Finally, the vaiable OTHER OWNERS represents the fraction of voting rights held by the second and third largest blockholder of a firm. Information on ownership are originated in the Hoppenstedt Aktienführer and some further investigation in annual reports and the Lexis-Nexis databasse. All ownership variable are measured at the end of 2005.

Board characteristics: The German corporate governance system is characterized by a two-tier system, where the supervisory board (*Aufsichtsrat*) controls and appoints the management board (*Vorstand*) (see appendix A for more details). Compensation contracts for executive board members are generally determined within a compensation committee staffed by supervisory board members. SB CAPITAL measures the number of supervisory board members representing interests of capital suppliers of the firm. SB CODET is a variable measuring co-determination which can take the values zero (in case of no co-determination), 0.5 (in case of one-third co-determination) and 1 (in case of parity co-determination). We construct similar measures for the compensation committee. COMP COM SIZE represents the size of the compensation committee measured as the number of supervisory board members concerned with the firm's compensation policy for executives. COMP COM CODET is a dummy variable which takes the value 1 in case that employee representatives are members of the compensation committee. Finally, we allow for the outstanding role of founders of a firm for its business policy as documented by various researchers (e.g. [Anderson and Reeb \(2003a,b\)](#)). Thus, we construct two more dummy variables. While CEO FOUNDER takes the value of 1 in case that the current CEO was a member of the initial founding team of the firm, CHM FOUNDER takes the value 1 in case that the current chairman was a member of the initial founding team of the firm. All board characteristics are measured with respect to 2006.

Firm characteristics: We use several firm characteristics as control variables in our analyses. For

SIZE we use the natural logarithm of total assets. RISK is the coefficient of variation of return on equity over 2004 to 2006. MTB is the market to book ration of the firm's equity. LEV is measured by dividing long term by total assets. DIV is the number of business segment the companies are operating in. Finally, we use industry dummies to account for industry specific effects. Generally, firm characteristics are measured with respect to 2006.

3.4 Descriptive statics

In table 2 we illustrate descriptive statics on the incentive index (INC). Panel A summarizes all categories we used to construct the incentive index (INC). The index is based on 6 design elements. The first three features are different kinds of performance hurdles: absolute share price performance hurdle, relative share price performance hurdle and accounting based performance hurdle. Every performance hurdle forms a design element itself. The feature 4 represents the link between the absolute and the relative performance hurdle in a program. The fifth and sixth category take the different temporal requirements into account. Panel B provides summary statistics on the already mentioned categories. It shows that 59% of the firms have any kind of absolute share price performance hurdle. In contrast only 19% of the firms have a accounting based performance hurdle and 37% have implemented a relative share price performance hurdle. Thereby about 94% evaluate the relative share price performance on a standard stock index and only 6% use a basket of firms of the sector as benchmark. If programs have a absolute as well as a relative share price performance hurdle 39% programs demand their CEO to reach only one of the hurdles. In 61% of these cases both targets have to be reached. In 54% SBLTI with a performance hurdle provide a period to reach the target, while in 46% of the SBLTI programs a referace date is implemented. In the other 46% the hurdle has to be reached on a fixed date. In three cases (2%) the description of the programs does not say anything about a vesting period. These numbers are rather suprising compared to the US, where firms seem to refrain from using performance hurdles (e.g. [Murphy, 1999](#)).

[– Table 2 goes about here –]

As already noted, there s large heterogeneity in the design of SBLTI. This results in large heterogeneity of index scores as illustrated in figure 1. The figure reports the absolute frequencies of the

scores of our incentive index INC and our governance index GOV, which we use in the robustness section, measured over all all firms in our sample that have granted SBLTI in 2006. Due to the heterogeneity in index scores, we expect our incentive index to be a valid instrument to discriminate between weak and ambitious programs. Similarly, we expect our governance index GOV to be a valid instrument to separate management friendly programs.

[– Figure 1 goes about here –]

Table 3 reports descriptive statics for our all our variables. Panel A reports means and medians for the respective variables. Panel B reports a comparison of means distinguishing between firms granting SBLTI in 2006 (SBLTI=1) and firms not granting these types of compensation packages (SBLTI=0). We find that firms granting stock-based compensation are on average larger, have a higher market-to-book ratio, are less likely to be dominated by insiders or families but more likely by institutional investors. Moreover, they are more likely to operate under co-determination and have larger compensation committees. Panel C reports correlations between the respective variables and three variables of interest: SBLTI, INC and ROE.

[– Table 3 goes about here –]

4 Performance implications of stock-based long-term incentives

This section discusses the methodology and presents our main results.

4.1 Empirical specification

We are interested in the effect of SBLTI and their design on firm performance. In our main analysis we use ordinary least squares models to examine this issue. The dependent variable is operative firm performance measured by return on equity. Most of our analyses are done in two steps. First, we estimate a *slim specification*, where we control for standard firm characteristics and dominant blockholders. Second, we challenge these results by considering lagged firm performance, more detailed information on firm characteristics and ownership structures, as well as founder status and

board structure. To address endogeneity concerns, we also apply instrument variable (IV) estimation methods (see section 5). Generally, we estimate a firm performance model of the following form:

$$\text{FIRM PERFORMANCE} = f(\text{SBLTI, design of SBLTI, firm characteristics, ownership variables, board characteristics, other controls}), \quad (1)$$

where FIRM PERFORMANCE is measured as return on equity. For comparison and to check validity of our results we also use return on assets as dependent variable (see section 5).

In the course of our discussion, we also examine which firms actually grant SBLTI. This is done by estimating variants of the following incentive model:

$$\text{SBLTI} = f(\text{firm characteristics, ownership variables, committee characteristics, other controls}), \quad (2)$$

where SBLTI is a dummy variable which takes the value of 1 in case that the firms did grant stock-based long-term incentives in 2006.

Moreover, we examine the relation between our incentive index, firm characteristics and governance mechanisms of a firm. This is done by estimating variants of our incentive model:

$$\text{INC} = f(\text{firm characteristics, ownership variables, committee characteristics, other controls}), \quad (3)$$

where INC denotes the incentive index score.

4.2 Empirical results

Our main regression results are presented in table 4. Therein 6 different OLS- regression models are reported. Return on equity of the years 2006 and 2007 (ROE 06+ROE 07) is the dependant variable in all these models. The a-specifications controls for standard firm characteristics (SIZE, RISK, MTB LEV) and the largest blockholder (MB CONTROL, EXT CONTROL) and the b-specifications also control for lagged performance (ROE 05), diversification (DIV), more detailed ownership structures

(FAMILY, INSTITUTIONAL, STRATEGIC, OTHER OWNERS), and founder status (CEO FOUNDER, CHM FOUNDER). In model 1.1.a and 1.1.b we regress corporate performance (ROE 06+ROE 07) on the dummy variable stock-based long-term incentives (SBLTI) which indicates whether the firm grants stock-based long-term incentives or not. The regression results show that there is no significant correlation between stock-based long-term incentives (SBLTI) and firm performance (ROE 06+ROE 07). This finding is in contrast to the results of [Mehran \(1995\)](#) and [Lam and Chng \(2006\)](#) who documented a positive significant influence of stock-based long-term incentives (SBLTI). In line with the prevalent hypothesis in this field we find a positive and significant relation between managerial ownership (MB CONTROL) and firm performance (ROE 06+ROE 07) in model 1.1.a (e.g. [Jensen and Murphy, 1990](#); [McConnell and Servaes, 1990](#)), although this relationship passes the 10% significant level in model 1.1.b. Furthermore we find a positive coefficient of extern blockholder (EXT CONTROL). If we distinguish between these different owners in model 1.1.b we see that the positive performance is mainly driven by private owners (FAMILY). These results support findings of a new type of research that looks into the effects of family control. For the US, [Anderson and Reeb \(2003b\)](#) also finds a positive link between this special type of insider ownership and firm performance. Furthermore we see that size (SIZE) as well as lagged performance (ROE 05) have a positive coefficient as well. Model 1.2.a and 1.2.b tests the influence of the incentive index (INC). Our findings are that there is a significant positive correlation of the incentive index (INC) and subsequent firm performance (ROE 06+ROE 07) on a 1% significance level. In these models however we now detect a significant negative influence of stock-based long-term incentives (SBLTI) on firm performance. Our evidence on the role of the incentive design features, therefore supports the existing results analysing one of these features on its own (e.g. [Chi and Johnson, 2008](#); [Bettis et al., 2008](#)). For the other independent variables we still see the mentioned correlations of model 1.1.a and 1.1.b. Beside we also find a positive correlation between diversification (DIV) and firm performance (ROE 06+ROE 07) on an acceptable significance level in model 1.2.b. Model 1.3a and 1.3b are estimated on the subsample of firms granting stock-based long-term incentives (SBLTI). Thereby the positive link of a high incentive score of a stock-based long-term incentives (SBLTI) and firm performance (ROE 06+ROE 07) is confirmed. The correlation is still significant on a 1% level. As before we find the positive link between managerial ownership (MB

CONTROL) now also in the large model 1.3b., whereas the influence of family ownership (FAMILY) is no more statistical significant. In contrast to the models before, the correlation between leverage (LEV) and firm performance (ROE 06+ROE 07) reaches statistical significance.

[– Table 4 goes about here –]

The result of model 1.2.a of table 4 is illustrated in figure 2 below. While on average we find no effect of stock-based long-term incentives (SBLTI) on corporate performance (ROE 06+ROE 07), examining the issue in more detail we find a discriminating effect of ambitious performance hurdles. In model 1.2.a we find that stock-based long-term incentives (SBLTI) with low incentive score are related to poor future firm performance (ROE 06+ROE 07), while stock-based long-term incentives (SBLTI) with high incentive score produce superior future firm performance (ROE 06+ROE 07). Looking at the figure, we find that the effect is balanced for stock-based long-term incentives (SBLTI) programs with an incentive score of 5.

[– Figure 2 goes about here –]

5 Discussion and robustness

In this section we critically discuss the results from the previous section. Therefore, we discuss six problems in more detail. In section 5.1 we examine which firms actually grant SBLTI. In section 5.2 we challenge our results by examining the determinants of the incentive index, in particular past performance. In section 5.3 we re-examine the above results by using another measure of firm performance. In section 5.4 we address endogeneity concerns using instrument variable estimates. In section 5.5 we challenge our findings by simultaneously using a governance index. Finally, in section 5.6 we re-examine our main research question by using alternative indices.

5.1 Which firms grant stock-based long-term incentives?

The first question that is of interest in the context of our analysis is the question which firms actually grant SBLTI. From the descriptive analysis we know that some 37% of our sample firms have granted

SBLTI in 2006. In table 5 we examine this issue in more detail by estimating variants of our incentive model (2).

In the empirical analysis we use probit regression models to determine the effect of lagged performance, firm characteristics, ownership structures, active founders and supervisory board characteristics upon the probability of granting stock-based long-term incentives (SBLTI). Two findings emerge. First, large firms with high market-to-book ratio and dispersed ownership structure are more likely to grant SBLTI. Second, lagged performance does not significantly contribute to this probability. The latter result is of particular interest, since it relaxes the view that managers of poorly performing firms are less likely to accept SBLTI (and vice versa).⁴

[– Table 5 goes about here –]

5.2 What determines the Design of SBLTI?

Another possible concern might come to ones mind. Perhaps managers of well performing firms are more likely to accept ambitious performance hurdles. All coefficients of past performance (ROE 04, ROE 04+05) are negative (but insignificant). Thus, we find no evidence for the hypothesis that our results are flawed since managers of well performing firms are more likely to accept ambitious performance hurdles.

We use OLS, poisson, and ordered probit regression models to estimate variants of our incentive model (3).

[– Table 7 goes about here –]

5.3 Are the results robust to other specifications of firm performance?

The second question of interest is, whether our results are robust to alternative performance measures. In table 6 we examine this issue in more detail by using the aggregated return on assets in 2006 and 2007 (ROA 06+ROA 07) as the dependent variable in our performance model (1).

⁴Putting the findings into a broader perspective, the evidence supports the substitution hypothesis, which predicts that shareholders implement SBLTIs as a governance mechanism when other governance mechanisms (e.g. monitoring by shareholders) are weak (e.g. [Fahlenbrach, 2009](#)).

We find that granting SBLTI has on average a slightly negative effect on return on assets. However, when we control for our incentive index, the results confirm our findings from the return on equity analysis in table 4.

[– Table 6 goes about here –]

5.4 Are the results flawed by endogeneity problems?

Another issue that warrants attention is the problem of endogeneity. We challenge the OLS results of model (1) by using instrument variable (IV) estimation procedures. Table 8 reports the IV regression results.

While the models 5.1.a-c use aggregated return on equity in 2006 and 2007 (ROE 06+ROE 07) as the dependent variable, the models 5.2.a-c use aggregated return on assets in 2006 and 2007 (ROA 06+ROA 07). The a- and b-specifications of our models are estimated on the sample of all firms. The c-specifications are estimated on the subsample of firms granting stock-based long-term incentives. In each specification we allow for a maximum of two endogenous variables and use the following instruments: lagged performance (ROE 05 or ROA 05), tenure of the firm's CEO and chairman (CEO TENURE, CHM TENURE), size and structure of the compensation committee (COMP COM SIZE, COMP COM CODET) and index listing (DAX, MDAX, SDAX, TECDAX).

Again, we find that granting SBLTI does not improve firm performance per se. Moreover, we confirm our main result that our incentive index differentiates between SBLTI with poor post performance and SBLTI programs with superior post performance.

[– Table 8 goes about here –]

5.5 Are the results explained by governance arguments?

Next, we examine whether performance differences among firms with stock-based long-term incentives are simply a result of differences in governance mechanisms as argued by [Sautner and Weber \(2008\)](#). [Sautner and Weber](#) find that management friendly SBLTI programs are correlated to poor post performance. In their analysis they code a friendliness index, which aggregates performance hurdles

and governance dimensions of SBLTI programs. In order to examine whether our findings are simply driven by such governance arguments we code a second index, labeled GOV. As we can see in Table 12, the governance index GOV evaluates six governance categories related to SBLTIs. Specifically, it evaluates SBLTI programs according to their management friendliness, considering the payout profile (e.g. caps) and the transparency level. A lower index score characterizes more (less) management friendly programs.

[– Table 12 goes about here –]

In table 9 we report OLS regression results for variants of our performance model (1), where we simultaneously use the both indices as explanatory variables. In none of the specifications we find a significant effect of our governance index GOV. Thus, we find that with respect to post performance it is the incentive index that differentiates between SBLTI programs.

[– Table 9 goes about here –]

5.6 Are the results sensitive to the coding of the indices?

As a final robustness test, we coded two variants of our indices. Instead of differentiating three outcomes for each category / subcategory, we aggregate outcomes with score 1 and 2 and assign a score of 1. the alternative indices are labeled INC 2 and GOV 2. Again, we estimate various variants of our performance model (1) using the SBLTI dummy, a variant of the incentive index (INC 2) and a variant of the governance index (GOV 2).

Table 10 reports the OLSS regression results. Again, the results of table 10 confirm our main findings.

[– Table 10 goes about here –]

6 Conclusion

It is well known that agency arguments make a strong case for stock-based incentive. However, so far empirical evidence on the effect of SBLTI upon firm performance is mixed (e.g. [Palia, 2001](#); [Lam](#)

and Chng, 2006). To examine performance implications of SBLTI, we analyze a sample of German listed firms where some 37% of the firms have granted SBLTI in 2006. Germany provides a particular interesting setting for an analysis of SBLTI, since these kind of management incentives emerged only in 1996 (e.g. Bernhardt, 1999). Since then only a limited number of firms have implemented SBLTI programs, although the German Corporate Governance Code (GCGC) strongly recommends these kind of incentive elements (see Government Commission GCGC, 2008). Moreover, historically accounting rules in Germany did not favor plain (or any type of) designs of SBLTI (as for instance in the US) and thus a broad variety of sometimes quite complex design structures emerged (e.g. Korn, Paschke and Uhrig-Homburg, 2008).

Since there is no commercial database offering access to detailed corporate governance information for German firms, we set up a unique database containing hand-collected data on ownership structures, compensation structures and board characteristics. Using this database, we are able to identify firms that have granted SBLTI in 2006. Moreover, the database contains detailed information about the design of these SBLTI programs. We use this information to define an *incentive index* measuring whether the program design is characterized by ambitious performance hurdles. Thus our incentive index proxies the incentive effect of the SBLTI programs. We then examine the question whether granting SBLTI improves firm performance. Comparing firms with and without SBLTI in 2006 we find no difference in operative performance (or even slightly negative effects of SBLTIs). However, if we furthermore consider the incentive index, we find strong evidence that SBLTI programs with low incentive index (i.e. with weak performance hurdles) improve firm performance, while SBLTI programs with high incentive index (i.e. with ambitious performance hurdles) improve firm performance. The performance effect of our incentive index remains when we restrict our sample to SBLTI granting firms. Moreover, it is robust with respect to different codings of our incentive index, different performance measures, and different specifications of our regression models. Furthermore, we show that the results are robust against endogeneity concerns and concerns that it is a simple governance argument that drives the result (e.g. Sautner and Weber, 2008).

We contribute to the existing literature in several ways. First, we provide evidence, that in European countries SBLTI are not as common as in the US. Specifically, within our sample we find that less than

one half of German Prime Standard firms grant SBLTI. A detailed analysis reveals that in particular large firms with dispersed ownership structure grant SBLTI. Second, we provide evidence about the design of SBLTI plans outside the US. Similar to [Sautner and Weber \(2008\)](#) our analysis reveals significant heterogeneity between different programs. Examining this issue in more detail, we find that it in particular board characteristics determine the design of SBLTI plans. Third, we contribute to the discussion about the effect of SBLTI programs by examining the effect of ambitious performance hurdles upon firm performance. We find that only SBLTI with ambitious performance hurdles improve firm performance. Finally, this study provides the first large sample study of SBLTI in German firms that we know about.

A German peculiarities

A.1 German Prime Standard

Our sample consists of all firms listed in the German Prime Standard. Note, that in Europe firms generally can choose between two different points of access to equity capital markets. Beside an EU-regulated market most exchanges offer a market regulated by themselves. The two markets differ with respect to legal basis and status but also with respect to differences in transparency requirements. Within the EU-regulated market the Frankfurt Stock Exchange (FWB - Frankfurter Wertpapierbörse), which is the most relevant German stock exchange, allows firms to list in one of two different market segments. While firms willing to fulfill the EU-regulated minimum transparency level only have to list in the General Standard, firms opting for a listing in the Prime Standard have to fulfill additional transparency requirements. Accordingly, the Prime Standard is the market segment with the highest reporting and disclosure level at the most important German stock exchange. Since our analysis requires detailed analysis of firm and board characteristics, we restrict our sample to firms opting for Prime Standard. Herein all companies of the German stock exchange segments DAX, MDAX, SDAX and TecDAX are included.

A.2 The German board system

It is well known that the German corporate governance system is characterized by a two-tier system with two boards: the supervisory board (*Aufsichtsrat*) and the management board (*Vorstand*). According to the German Stock Corporation Act (*Aktiengesetz - AktG*) the supervisory board supervises (§111 AktG) and appoints (§84 AktG) the management board.

Beside the pure fact of the two-tier system there are two more peculiarities of the German board system to be kept in mind. First, German Stock Corporation Act regulates the minimum and the maximum number of supervisory board members. Specifically, §95 AktG says that the supervisory board has to consist of at least 3 members, must be a multiple of three with a maximum of 21 board members depending on firm size (measured in terms on subscribed capital). Second, the Co-determination Act of 1976 (*Mitbestimmungsgesetz -MitbestG*) regulates the possibility of mandatory

employee representatives within the supervisory board depending on firm size and the sector the firm is operating in. More precisely, there are different status of co-determination regulation. The Co-determination Act of 1976 generally requires for firms with regularly more than 500 German employees (more than 2,000 employees) one third (one half) of supervisory board members to be employee representatives. Moreover, MitbestG also regulates the size of the supervisory board (12, 16 or 20 directors) depending on the number of regularly engaged employees. Moreover, there is a special act for mining companies, the 1951 Coal, Iron and Steel Industry Co-Determination Act, that stipulation a fraction of one half disregarding the company's size. For more details on co-determination in Germany and the current political debate see [Michel \(2007\)](#).

Thus, for firms operating under co-determination there are two types of supervisory board members: shareholder representatives and employee representatives. The German Stock Corporation Act regulates minimum qualification conditions for supervisory board members (§100 AktG) and how they can be recalled. For instance, supervisory board members representing the interest of shareholders (*Aufsichtsratsmitglieder der Aktionäre*) can be recalled by the general meeting with 75% of valid votes (§103 AktG).

Moreover, according to §107 AktG the supervisory board has to elect a chairman (as well as a deputy) and may organize its work in committees. Except for the conciliation committee (*Vermittlungsausschuss* in accordance with §27 of the Co-determination Act for disputes between shareholder and employee representatives), the size and structure of these committees is not regulated. However, it is commonly assumed that each committee has to consist of at least two directors and even three directors to be a quorum.

References

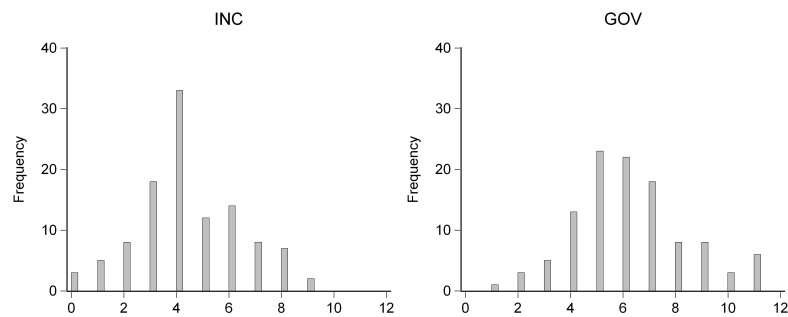
- Anderson, R.C. and D.M. Reeb (2003a)**, 'Founding-family ownership, corporate diversification, and firm leverage', in: *Journal of Law and Economics*, Vol. XLVI(?), p. 653-684.
- Anderson, R.C. and D.M. Reeb (2003b)**, 'Founding-family ownership and firm performance: Evidence from the S&P 500', in: *Journal of Finance*, Vol. 58(?), p. 1301-1328.
- Bebchuk, L.A, J.M. Fried and D.I. Walker (2002)**, 'Managerial power and rent extraction in the design of executive compensation', *Working Paper*, University of Chicago Law Review, Vol. 69(?), pp. 751-846, 2002.
Available at <http://ssrn.com/abstract=316590>.
- Bernhardt, W. (1999)**, 'Stock options for or against shareholder value? - New compensation plans for top management and the interests of the shareholders', in: *Corporate Governance: An International Review*, Vol. 7(?), p. 123-135.
- Bertrand, M. and S. Mullainathan (2001)**, 'Are CEOs rewarded for luck? The ones without principals are', in: *Quarterly Journal of Economics*, Vol. 116(3), p. 901-932.
- Bizjak, M., A. Brickley and L. Coles (1993)**, 'Stock-based incentive compensation and investment behaviour', in: *Journal of Accounting and Economics*, Vol. 16(1-3), p. 349-372.
- Bettis, J., J.M. Bizjak, J.L. Coles and S.L. Kalpathy (2008)**, 'Stock and option grants with performance-based vesting provisions', *Working Paper*, AFA 2008 New Orleans Meetings Paper.
Available at <http://ssrn.com/abstract=972424>.
- Brickley, J., S. Bhagat and R. Lease (1985)**, 'The impact of long-range managerial compensation plans on shareholder wealth', in: *Journal of Accounting and Economics*, Vol. 7(1-3), p. 115-129.
- Cadman, B., T.O. Rusticus and J. Sunder (2008)**, 'Option grant vesting periods: Determinants and consequences', *Working Paper*, Northwestern University, 2002.
- Chi, J. and S.A. Johnson (2008)**, 'The value of vesting restrictions on managerial stock and option holdings', *Working Paper*, Texas A&M University, Mays Business School, Version: December 2008.
Available at <http://ssrn.com/abstract=1136298>.
- Core, J. and W. Guay, (1999)**, 'The use of equity grants to manage optimal equity incentive levels', in: *Journal of Accounting and Economics*, Vol. 28(2), p. 151-184.
- Defusco, R., R. Johnson and T. Zorn (1990)**, 'The effects of executive stock option plans on stockholders and bondholders.', in: *Journal of Finance*, Vol. 45(2), p. 617-627.
- Elston, J.A. and L.G. Goldberg (2003)**, 'Executive compensation and agency costs in Germany', in: *Journal of Banking & Finance*, Vol. 27(?), p. 1391-1410.
- Fahlenbrach R. (2009)**, 'Shareholder Rights, Boards, and CEO Compensation', in: *Review of Finance*, Vol. 13(?), p. 81-113.
- Fudenberg, D., B. Hölmstrom and P. Milgrom (1990)**, 'Short-term contracts and long-term agency relationships', in: *Journal of Economic Theory*, Vol. 51(2), p. 1-31.
- Government Commission German Corporate Governance Code (2008)**, 'German Corporate Governance Code'.
Available at <http://www.corporate-governance-code.de/index-e.html>.
- Himmelberg, C., G. Hubbard and D. Palia (1999)**, 'Understanding the determinants of managerial ownership and the link between ownership and performance', in: *Journal of Financial Economics*, Vol. 52(3), p. 353-384.
- Holmstrom, B. (1979)**, 'Moral hazard and observability', in: *Bell Journal of Economics*, Vol. 10(?), p. 74-91.
- Jensen, M. and W. Meckling (1976)**, 'Theory of the firm: Managerial behaviour, agency costs and ownership structure.', in: *Journal of Financial Economics*, Vol. 3(?), p. 305-360.
- Jensen, M. and K. J. Murphy (1990)**, 'Performance pay and top-management incentives.', in: *Journal of Political Economy*, Vol. 98(?), p. 225-264.
- Johnson, S. and Y. Tian (2000)**, 'The value and incentive effects of nontraditional executive stock option plans', in: *Journal of Financial Economics*, Vol. 57(?), p. 3-34.
- Kole, S. (1979)**, 'The complexity of compensation contracts', in: *Journal of Financial Economics*, Vol. 43(?), p. 79-104.
- Korn, O., C. Paschke and M. Uhrig-Homburg (2008)**, 'Designing robust stock option plans', *SSRN Working paper*.
Available at <http://ssrn.com/abstract=1094081>.
- Kuang, Y. and J. Suijs (2006)**, 'Managerial incentive effects of performance-vested stock options', in: *Working Paper*, Tilburg University and University of Rotterdam, 2006.
- Lam, S. and B. Chng (2006)**, 'Do executive stock option grants have value implications for firm performance', in: *Review of Quantitative Finance and Accounting*, Vol. 26(?), p. 249-274.
- Lambert, R.A., W.N. Lanen and David F. Larcker (1989)**, 'Executive stock option plans and corporate dividend policy', in: *Journal of Financial and Quantitative Analysis*, Vol. 24, p. 409-425.
- McConnel, J.J. and H. Serveas (1990)**, 'Additional evidence on equity ownership and corporate value', in: *Journal of Financial*

Economics, Vol. 27(2), p. 595-612.

- Mehran, H. (1995)**, 'Executive compensation, ownership, and firm performance', in: *Journal of Financial Economics*, Vol. 38(?), p. 163-184.
- Michel, H. (2007)**, 'Co-determination in Germany: The recent debate', *Working Paper*, Johann Wolfgang Goethe-Universität Frankfurt, Version: March 2007.
Available at <http://www.uclouvain.be/cps/ucl/doc/etes/documents/NDW004.pdf>.
- Murphy, K.J. (1999)**, 'Executive compensation', in: Orley Ashenfelter and David Card (eds.), *Handbook of Labor Economics*, Vol. 3, Amsterdam: North-Holland.
- Murray, M.P. (2006)**, 'Avoiding invalid instruments and coping with weak instruments', in: *Journal of Economic Perspectives*, Vol. 20(4), p. 111-132.
- Palia, D. (2001)**, 'The endogeneity of managerial compensation in firm valuation: A solution', in: *Review of Financial Studies*, Vol. 14(3), p. 735-764.
- Rapp, M.S., P. Schaller and M. Wolff (2008)**, 'Existenz und Bedeutung aktienbasierter Langfristanreize im Rahmen der Vorstandsvergütung deutscher Prime Standard-Unternehmen', *Working Paper*, Version: July 2008.
Available at <http://www.managementverguetung.de>.
- Rapp, M.S. and M. Wolff (2008)**, 'Unternehmensmerkmale, Performance und Corporate Governance-Mechanismen als Determinanten der Vorstandsvergütung in deutschen Aktiengesellschaften', in: *German Working Papers in Law and Economics*, Vol. 2008, Paper 4.
Available at <http://www.bepress.com/gwp/default/vol2008/iss1/art4/>.
- Sautner, Z. and M. Weber (2008)**, 'Corporate governance and the design of stock option programs', *SSRN-Working paper*.
Available at <http://ssrn.com/abstract=825429>.
- Shavell, S. (1979)**, 'Risk sharing and incentives in the principal agent relation', in: *Bell Journal of Economics*, Vol. 10(?), p. 55-73.
- Stein, J. (1989)**, 'Efficient capital markets, inefficient firms: A model of myopic corporate behavior', in: *Quarterly Journal of Economics*, Vol. 104(?), p. 655-669.
- Yermack, D. (1995)**, 'Do corporations award CEO stock options effectively?', in: *Journal of Financial Economics*, Vol. 39(?), p. 237-269.
- Zhou, X. (2001)**, 'Understanding the determinants of managerial ownership and the link between ownership and performance: Comment', in: *Journal of Financial Economics*, Vol. 62(?), p. 559-571.

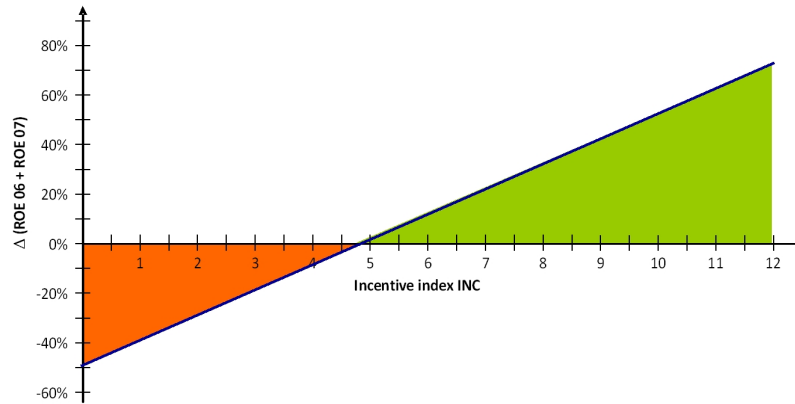
B Figures

Figure 1: Distribution of incentive and governance index



Notes: The figure illustrates absolute frequencies of index realizations for firms granting stock-based long-term incentives (SBLTIs). Our incentive index INC evaluates four categories of a firm's SBLTI program. Thereby it pays particular attention to a program's performance hurdles. The incentive is coded in a way that it characterizes more (less) ambitious programs by a higher (lower) index score. Our governance index GOV evaluates six governance categories related to SBLTIs. It evaluates SBLTI programs according to their management friendliness, considering the payout profile (e.g. caps) and the transparency level. A lower index score characterizes more (less) management friendly programs.

Figure 2: Illustration of model 1.2.a of table 4



Notes: The figure illustrates the results of model 1.2.a of table 4. On average we find no effect of stock-based long-term incentives on corporate performance (model 1.1.a/b of table 4). However, examining the issue in more detail we find a discriminating effect of ambitious performance hurdles. To measure these the extend of performance hurdles we construct our incentive index INC, which evaluates four categories of a firm's SBLTI program, in particular its performance hurdles. The incentive is coded in a way that it characterizes more (less) ambitious programs by a higher (lower) index score. In the empirical analysis we find that SBLTI programs with low incentive score are related to poor future firm performance, while SBLTI programs with high incentive score produce superior future firm performance.

C Tables

Table 1: Sample description

Description	Number of firms
Firms listed in the Prime Standard (End of 2006)	384
- Foreign ISIN	40
- Insolvency	5
- Special events	2
- Financial institutions	40
Maximum Sample	297
- Firms without stock-based long-term incentives (SBLTI=0)	187
Firms with stock-based long-term incentives (SBLTI=1)	110

Notes: The table describes our sample construction process. At the end of 2006 there are 402 shares listed in the Prime Standard. However, there are 18 firms that have issued common and preferred shares (*Vorzugsaktien*), such that there are only 384 firms listed in the Prime Standard. We then consider only firms with German ISIN, since we want to concentrate on German firms and foreign firms often have governance structures that are not comparable to the ones in German firms (e.g. Aufsichtsrat versus Verwaltungsrat). Furthermore, we had to exclude 5 bankrupt firms and 2 firms due to special events (Mobilcom AG merging with Freenet AG) and non-comparable governance structures (Princess Private Equity Holding Limited). Following the standard procedure and removing financial firms leaves us with a maximum sample of 297 firms for which we collected compensation data. Out of the remaining 297 firms 110 firms have granted stock-based long-term incentives in 2006, which corresponds to some 37% of the firms. In our regression analyses we consider a maximum of 280 firms. The reduction of firms is mainly due to the fact that we have to exclude recent IPOS, since we cannot calculate appropriate risk measures for firms with only short time series of accounting data.

Table 2: Construction of incentive index

Panel A: Description of index construction				
Category	Subcategory	Score		
		0	1	2
Performance hurdles (PH)	Absolute share price PH	Not Existent	< Median hurdle	>= Median hurdle
	Relative share price PH	Not Existent	General index	Peer group / Industry index
	Accounting PH	Not Existent	Intransparent	Transparent
Combination of PH		Not Existent	Or	And
Reference period for PH		Not Existent	X days in vesting period / at exercise date	Reference date
Vesting period		Not Existent	< Median	>= Median

Panel B: Absolute (relative) frequencies of realizations				
Category	Subcategory	Score		
		0	1	2
Performance Hurdles (PH)	Absolute share price PH	44 (40.0%)	33 (30.0%)	33 (30.0%)
	Relative share price PH	69 (62.7%)	38 (34.6%)	3 (2.7%)
	Accounting PH	90 (81.8%)	12 (11.0%)	8 (7.3%)
Combination of PH		86 (77.2%)	9 (8.2%)	15 (13.6%)
Requirements PH		23 (20.9%)	62 (56.4%)	25 (22.7%)
Vesting Period		3 (2.7%)	55 (50.0%)	52 (47.3%)

Notes: The table describes the coding of our incentive index and the the frequency of its subscores. Panel A of the table explains how we construct our incentive index (INC). The INC index aims at evaluating the incentive dimension of the SBLTI plan granted by a firm. Our incentive index aggregates subscores of four categories. It pays particular attention to performance hurdles. In the first category, we evaluate them according to three different dimensions: relative share price, absolute share price and accounting figures. In the second category, we evaluate the combination of multiple performance hurdles, i.e. whether there are multiple performance hurdles and if yes, whether they are complements or substitutes. In the third category, we look at the reference periods that apply to the the performance hurdles and evaluate their size. Finally, in our fourth category we evaluate the vesting period of the programs. For each of the categories we collect data on different variables and assign score values of 0, 1, or 2 for the variable. The INC index is simply the sum over all variable scored for the particular program. Thus, a more (less) ambitious program is characterized by a higher (lower) INC score. Panel B of the table lists the absolute and relative frequency of score realizations.

Table 3: Descriptive statics

Variable	Panel A: Means/medians		Panel B: Comparison of means			Panel C: Correlations		
	Mean	Median	SBLTI=0	SBLTI=1	t-value	SBLTI	INC	GOV
SBLTI	0.370	0.000	0.000	1.000	–	1.000		
INC	1.859	0.000	0.000	4.373	–	0.871 ***	1.000	
GOV	2.510	0.000	0.000	6.173	–	0.913 ***	0.873 ***	1.000
ROE 05	–10.054	8.515	–13.253	4.845	–0.813	0.046	0.057	0.051 ***
ROE 06	25.950	10.981	36.362	0.981	0.875	–0.053	–0.033	–0.040
ROE 07	–5.694	10.837	–12.295	5.578	–0.774	0.043	0.047	0.045 ***
ROA 05	3.201	4.944	3.889	2.858	0.453	–0.086	–0.007	–0.046 **
ROA 06	2.933	5.779	4.367	3.233	0.629	–0.069	0.000	–0.026 ***
ROA 07	3.565	5.842	4.168	2.554	0.820	–0.111 *	–0.023	–0.059 ***
SIZE	12.552	12.122	12.090	13.377	–5.144***	0.292 ***	0.288 ***	0.393 **
RISK	2.117	0.525	2.505	1.472	0.811	–0.046	–0.056	–0.039
MTB	2.735	2.163	2.566	3.019	–1.704*	0.108 *	0.082	0.064
LEV	0.133	0.079	0.140	0.122	0.644	0.019	0.046	0.062
DIV	1.788	2.000	1.741	1.869	–1.021	0.064	–0.013	0.072
MB CONTROL	0.108	0.000	0.152	0.039	4.701***	–0.286 ***	–0.270 ***	–0.290
EXT CONTROL	0.221	0.150	0.231	0.210	0.703	–0.065	–0.021	–0.058
FAMILY	0.080	0.000	0.094	0.058	1.629	–0.101	–0.050	–0.073
INSTITUTIONAL	0.072	0.000	0.048	0.113	–2.458**	0.128 **	0.106 *	0.066
STRATEGIC	0.066	0.000	0.062	0.076	–0.618	0.022	0.074	0.046
OTHER OWNERS	0.085	0.000	0.091	0.077	1.034	–0.023	0.015	–0.009
CEO FOUNDER	0.234	0.000	0.273	0.182	1.777*	–0.075	–0.080	–0.130
CHM FOUNDER	0.089	0.000	0.091	0.082	0.266	–0.035	0.024	–0.025
SB CAPITAL	5.212	5.000	4.722	6.082	–4.906***	0.292 ***	0.283 ***	0.372
SB CODET	0.323	0.000	0.267	0.409	–2.803***	0.164 ***	0.219 ***	0.263 **
COMP COM SIZE	4.000	3.000	3.850	4.252	–1.457	0.108 *	0.121 *	0.132
COMP COM CODET	0.138	0.000	0.108	0.189	–3.275***	0.186 ***	0.245 ***	0.281

Notes: The table reports descriptive statics. Panel A reports means and medians for the respective variables. Panel B reports a comparison of means distinguishing between firms granting stock-based long-term incentives (SBLTI) in 2006 (SBLTI=1) and firms that do not grant these types of compensation packages (SBLTI=0). Panel C reports correlations between the respective variables and the SBLTI dummy variable, which indicates whether or not a firm has granted SBLTIs in 2006, and our two major design indices (INC index and GOV index). All variables are described in table 11. * indicates significance at 10%, ** indicates significance at 5%, *** indicates significance at 1%.

Table 4: Analysis of performance implications

Method Dep. variable	Model 1.1.a		Model 1.1.b		Model 1.2.a		Model 1.2.b		Model 1.3.a		Model 1.3.b	
	OLS		OLS		OLS		OLS		OLS		OLS	
	ROE 06+ROE 07		ROE 06+ROE 07		ROE 06+ROE 07		ROE 06+ROE 07		ROE 06+ROE 07		ROE 06+ROE 07	
	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.
SBLTI	-5.669	(-0.5223)	-5.649	(-0.4949)	-49.004**	(-2.2079)	-41.145**	(-2.1648)				
INC					9.977***	(2.6260)	8.102***	(3.0098)	13.609***	(3.8622)	7.647**	(2.6022)
ROE 05			0.628***	(2.9073)			0.579***	(2.9694)			1.049***	(4.7698)
SIZE	9.060***	(4.1788)	6.498***	(2.7655)	8.635***	(4.0895)	6.005***	(2.5948)	11.959***	(3.2378)	10.313**	(2.2196)
RISK	-0.127	(-0.7289)	-0.023	(-0.1100)	-0.099	(-0.5397)	-0.028	(-0.1254)	2.431	(1.4609)	2.702	(1.4550)
MTB	-3.140	(-0.5950)	-0.672	(-0.1875)	-3.142	(-0.6568)	-0.803	(-0.2324)	-7.596	(-1.4763)	-0.404	(-0.1136)
LEV	-45.786	(-1.0812)	-30.444	(-0.6791)	-49.249	(-1.1557)	-34.574	(-0.7696)	-168.11**	(-2.2582)	-182.94*	(-1.8507)
DIV			5.097	(1.3525)			6.758*	(1.7531)			2.464	(0.4596)
MB CONTROL	52.491*	(1.7540)	34.918	(1.0277)	53.470*	(1.7821)	34.892	(1.0224)	304.37**	(2.2488)	240.74*	(1.6601)
EXT CONTROL	41.748**	(2.3241)			40.326**	(2.3286)			93.184**	(2.3263)		
FAMILY			51.688**	(1.9896)			48.596*	(1.8918)			43.323	(1.0381)
INSTITUTIONAL			13.554	(0.7923)			14.079	(0.8150)			41.675	(0.7028)
STRATEGIC			18.818	(0.9548)			16.028	(0.8118)			53.500	(1.1400)
OTHER OWNERS			-5.258	(-0.1462)			-14.743	(-0.4145)			15.758	(0.2899)
CEO FOUNDER			5.337	(0.3568)			4.252	(0.2875)			3.177	(0.0978)
CHM FOUNDER			-25.059	(-1.0522)			-27.485	(-1.1736)			5.505	(0.2793)
Industry dummies	yes		yes		yes		yes		yes		yes	
No. of observ.	272		270		272		270		104		103	
Adj. R^2	0.06		0.12		0.09		0.13		0.27		0.28	
F-Statistic	2.54**		2.89***		2.91***		3.00***		3.96***		3.00***	

Notes: The table reports ordinary least square regression results for our model (1). The dependent variable is the aggregated return on equity in 2006 and 2007 (ROE 06 + ROE 07). While the models 1.1.a/b and 1.2.a/b are estimated on the sample of all firms, the models 1.3.a/b are estimated on the subsample of firms granting stock-based long-term incentives. In the models 1.1.a/b we regress corporate performance on SBLTI (a dummy variable indicating whether or not the firm grants stock-based long-term incentives). In the models 1.2.a/b we simultaneously use our incentive index INC (an index that characterizes more (less) ambitious programs by a higher (lower) index score). In the models 1.3.a/b only use our incentive index INC. In each of the models we control for various firm characteristics. While our a-specifications control for standard firm characteristics (SIZE, RISK, MTB, LEV) and the largest blockholder (MB CONTROL, EXT CONTROL), b-specifications also control for lagged performance (ROE 05), diversification (DIV), more detailed ownership structures (FAMILY, INSTITUTIONAL, STRATEGIC, OTHER OWNERS), and founder status (CEO FOUNDER, CHM FOUNDER). We use 8 industry dummies in all regressions. The reported results remain robust to specifications where we use return on equity in 2006 (ROE 06) or return on equity in 2007 (ROE 07) as dependent variable. All variables are described in detail in table 11. Values in parentheses are heteroscedasticity robust t-statistics. * indicates significance at 10%, ** indicates significance at 5%, *** indicates significance at 1%.

Table 5: Analysis of SBLTI

Method Dep. variable	Model 2.1		Model 2.2		Model 2.3		Model 2.4	
	Probit SBLTI		Probit SBLTI		Probit SBLTI		Probit SBLTI	
ROE 05							0.002	(1.0100)
SIZE	0.188***	(4.2572)	0.194***	(2.7413)	0.185***	(2.6020)	0.177**	(2.4629)
RISK	-0.000	(-0.0305)	-0.000	(-0.0134)	-0.000	(-0.0288)	0.000	(0.0894)
MTB	0.064*	(1.8222)	0.064*	(1.8192)	0.067*	(1.8738)	0.077**	(2.0664)
LEV	-0.621	(-0.8358)	-0.638	(-0.8412)	-0.796	(-1.0914)	-0.714	(-0.9822)
DIV			-0.059	(-0.7156)	-0.064	(-0.7763)	-0.061	(-0.7236)
MB CONTROL	-2.345***	(-4.5047)	-2.378***	(-4.2697)	-2.485***	(-4.3978)	-2.570***	(-4.4509)
EXT CONTROL	-1.036***	(-2.7863)	-1.001***	(-2.6036)				
FAMILY					-1.545***	(-2.9797)	-1.635***	(-3.0717)
INSTITUTIONAL					0.303	(0.7400)	0.254	(0.6202)
STRATEGIC					-0.748	(-1.5825)	-0.812*	(-1.7032)
OTHER OWNERS					-1.531**	(-2.1061)	-1.536**	(-2.0902)
CEO FOUNDER			0.172	(0.7251)	0.218	(0.9093)	0.199	(0.8244)
CHM FOUNDER			-0.061	(-0.2078)	0.150	(0.5038)	0.139	(0.4649)
SB SIZE			0.059	(1.1539)	0.076	(1.4338)	0.081	(1.5230)
SB CODET			-0.244	(-0.7946)	-0.133	(-0.4382)	-0.149	(-0.4926)
Industry dummies	yes		yes		yes		yes	
No. of observations	280		278		278		278	
Observations with SBLTI = 0	175		174		174		174	
Observations with SBLTI = 1	105		104		104		104	
McFadden R^2	0.170		0.177		0.203		0.206	
LR-statistic	63.14***		65.16***		74.63***		75.56***	
PPC	—		—		—		—	

Notes: The table reports regression results for our model (2). We use probit regression models to determine the effect of lagged performance, firm characteristics, ownership structures, active founders and supervisory board characteristics upon the probability of granting stock-based long-term incentives (SBLTI). Model 2.1 considers standard firm characteristics (SIZE, RISK, MTB, LEV) and the largest blockholder (MB CONTROL, EXT CONTROL). Model 2.2 also controls founder status (CEO FOUNDER, CHM FOUNDER) and supervisory board characteristics (SB SIZE, SB CODET). Model 2.3 uses more detailed information on ownership structures (FAMILY, INSTITUTIONAL, STRATEGIC, OTHER OWNERS). Model 2.4 extends model 2.3 by adding lagged performance (ROE 05). We use 8 industry dummies in all regressions. All variables are described in table 11. Despite McFadden R^2 , we also report the LR-statistic and the proportional change criterion (PCC). Values in parentheses are Huber/White QML robust z-statistics. * indicates significance at 10%, ** indicates significance at 5%, *** indicates significance at 1%.

Table 6: Robustness check using return on asset

Method Dep. variable	Model 3.1.a		Model 3.1.b		Model 3.2.a		Model 3.2.b		Model 3.3.a		Model 3.3.b	
	OLS		OLS		OLS		OLS		OLS		OLS	
	ROA 06+ROA 07		ROA 06+ROA 07		ROA 06+ROA 07		ROA 06+ROA 07		ROA 06+ROA 07		ROA 06+ROA 07	
	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.
SBLTI	-6.895**	(-1.9940)	-4.003	(-1.4504)	-20.761***	(-3.3266)	-14.366***	(-2.6645)	3.554***	(3.5917)	1.594	(1.5472)
INC					3.196***	(3.2618)	2.341**	(2.5823)				
ROA 05			0.802**	(2.4041)			0.769**	(2.3063)			1.419***	(5.0415)
SIZE	3.250***	(3.4825)	1.622**	(2.2065)	3.116***	(3.3976)	1.489**	(2.0364)	4.222***	(3.1563)	1.907**	(2.1441)
RISK	-0.060	(-1.1964)	-0.025	(-0.4399)	-0.051	(-0.8611)	-0.026	(-0.4140)	0.620*	(1.6900)	0.307	(1.0182)
MTB	0.863	(0.8390)	0.906	(1.1356)	0.864	(0.8848)	0.923	(1.1735)	-0.297	(-0.2151)	0.278	(0.3002)
LEV	-5.135	(-0.4887)	-5.540	(-0.5891)	-6.181	(-0.5862)	-6.465	(-0.6825)	-24.340	(-1.3006)	-20.475	(-1.1748)
DIV			0.722	(0.6871)			1.224	(1.1323)			0.341	(0.3483)
MB CONTROL	12.828*	(1.7366)	6.386	(0.9103)	13.186*	(1.7853)	6.207	(0.8873)	71.939***	(3.7011)	39.156*	(1.8962)
EXT CONTROL	7.470	(1.3951)			7.034	(1.3177)			14.634*	(1.6853)		
FAMILY			13.086*	(1.7936)			12.059*	(1.6699)			1.296	(0.1217)
INSTITUTIONAL			-1.816	(-0.3714)			-1.840	(-0.3754)			-13.280	(-1.4667)
STRATEGIC			1.689	(0.2722)			0.657	(0.1053)			-3.082	(-0.4449)
OTHER OWNERS			-5.642	(-0.3913)			-8.844	(-0.6053)			4.026	(0.2164)
CEO FOUNDER			-1.734	(-0.4438)			-2.094	(-0.5418)			-8.030	(-1.2875)
CHM FOUNDER			-6.200	(-1.1717)			-7.018	(-1.3837)			-3.685	(-0.5571)
Industry dummies	yes		yes		yes		yes		yes		yes	
No. of observ.	271		269		271		269		104		103	
Adj. R^2	0.08		0.22		0.10		0.23		0.24		0.57	
F-Statistic	2.87***		4.85***		3.23***		4.89***		3.57***		7.90***	

Notes: We examine whether the results of table 4 are sensitive with respect to the used performance measure. The table reports ordinary least square regression results for our model (1). The dependent performance variable is the aggregated return on assets in 2006 and 2007 (ROA 06 + ROA 07). While the models 3.1.a/b and 3.2.a/b are estimated on the sample of all firms, the models 3.3.a/b are estimated on the subsample of firms granting stock-based long-term incentives. In the models 3.1.a/b we regress corporate performance on SBLTI (a dummy variable indicating whether or not the firm grants stock-based long-term incentives). In the models 3.2.a/b we simultaneously use our incentive index INC (an index that characterizes more (less) ambitious programs by a higher (lower) index score). In the models 3.3.a/b only use our incentive index INC. In each of the models we control for various firm characteristics. While our a-specifications control for standard firm characteristics (SIZE, RISK, MTB, LEV) and the largest blockholder (MB CONTROL, EXT CONTROL), b-specifications also control for lagged performance (ROE 05), diversification (DIV), more detailed ownership structures (FAMILY, INSTITUTIONAL, STRATEGIC, OTHER OWNERS), and founder status (CEO FOUNDER, CHM FOUNDER). We use 8 industry dummies in all regressions. All variables are described in detail in table 11. Values in parentheses are heteroscedasticity robust t-statistics. * indicates significance at 10%, ** indicates significance at 5%, *** indicates significance at 1%.

Table 7: Analysis of incentive index

Method Dep. variable	Model 4.1		Model 4.2		Model 4.3		Model 4.4		Model 4.5		Model 4.6	
	OLS INC		OLS INC		POISSON INC		POISSON INC		ORDERED PROBIT INC		ORDERED PROBIT INC	
	coeff.	t-stat.	coeff.	t-stat.	coeff.	z-stat.	coeff.	z-stat.	coeff.	z-stat.	coeff.	z-stat.
ROE 04	-0.000	(-1.0988)			-0.000	(-1.0760)			-0.000	(-1.0457)		
ROE 04 + ROE 05			-0.000	(-0.9249)			-0.000	(-0.8623)			-0.000	(-0.8565)
SIZE	-0.073	(-0.6097)	-0.072	(-0.5999)	-0.014	(-0.6873)	-0.014	(-0.6767)	-0.027	(-0.3793)	-0.026	(-0.3677)
RISK	-0.049	(-1.3235)	-0.049	(-1.3212)	-0.012	(-1.2161)	-0.012	(-1.2149)	-0.036	(-1.6532)	-0.035	(-1.6503)
MTB	-0.037	(-0.3146)	-0.038	(-0.3224)	-0.011	(-0.4027)	-0.011	(-0.4091)	-0.027	(-0.3709)	-0.028	(-0.3793)
LEV	0.076	(0.0375)	0.072	(0.0356)	0.033	(0.0857)	0.032	(0.0839)	-0.039	(-0.0324)	-0.042	(-0.0346)
DIV	-0.257*	(-1.8235)	-0.259*	(-1.8335)	-0.071**	(-2.0163)	-0.071**	(-2.0252)	-0.191**	(-2.1191)	-0.192**	(-2.1304)
MB CONTROL	0.238	(0.2051)	0.246	(0.2123)	0.001	(0.0051)	0.003	(0.0122)	0.162	(0.2255)	0.168	(0.2329)
EXT CONTROL												
FAMILY	1.324	(0.8275)	1.330	(0.8311)	0.282	(0.9794)	0.283	(0.9822)	0.873	(0.9443)	0.877	(0.9485)
INSTITUTIONAL	0.562	(0.7031)	0.559	(0.6992)	0.105	(0.6405)	0.104	(0.6372)	0.408	(0.8690)	0.406	(0.8637)
STRATEGIC	2.246**	(2.1789)	2.246**	(2.1790)	0.427**	(2.3610)	0.427**	(2.3611)	1.493**	(2.4568)	1.492**	(2.4560)
OTHER OWNERS	3.844*	(1.8374)	3.816*	(1.8213)	0.832**	(2.1713)	0.826**	(2.1518)	2.664**	(2.0933)	2.643**	(2.0744)
CEO FOUNDER	0.690	(1.3893)	0.687	(1.3787)	0.157	(1.4327)	0.156	(1.4220)	0.492	(1.6151)	0.490	(1.6034)
CHM FOUNDER	2.179***	(2.8070)	2.177***	(2.8044)	0.454***	(3.4355)	0.454***	(3.4339)	1.449***	(2.8713)	1.447***	(2.8688)
COMP COM SIZE	-0.110*	(-1.6745)	-0.110*	(-1.6830)	-0.024**	(-1.9881)	-0.024**	(-1.9967)	-0.072*	(-1.8702)	-0.073*	(-1.8806)
COMP COM CODET	3.421***	(2.9060)	3.424***	(2.9055)	0.733***	(2.8668)	0.734***	(2.8688)	2.124***	(2.9432)	2.125***	(2.9423)
Industry dummies	yes		yes		yes		yes		yes		yes	
No. of observations	104		101		101		101		101		101	
Adj. R^2 / Pseudo R^2	0.20		0.21		0.22		0.22		0.11		0.11	
F- / LR-Statistic	2.23***		2.23***		30.23*		30.20*		46.00***		45.94***	

Notes: The table reports regression results for our model (3). We use OLS, poisson, and ordered probit regression models to determine the effect of lagged performance, firm characteristics, ownership structures, active founders and supervisory board characteristics upon our incentive index INC (an index that characterizes more (less) ambitious programs by a higher (lower) index score). While the models 4.1, 4.3 and 4.5 use two-period lagged return on equity as explanatory variable, the other use the sum of two-period lagged return on equity and one-period lagged return on equity (ROE 04+ROE 05) as explanatory variable. All models are estimated on the sample of all firms granting of stock-based long-term incentives in 2006 and consider standard firm characteristics (SIZE, RISK, MTB, LEV), detailed information on ownership structures (FAMILY, INSTITUTIONAL, STRATEGIC, OTHER OWNERS), founder status (CEO FOUNDER, CHM FOUNDER) and compensation committee characteristics (COMP COM SIZE, COMP COM CODET). We use 8 industry dummies in all regressions. All variables are described in table 11. We report adj. R^2 and Pseudo R^2 , as well as the corresponding F- and LR-statistic. Values in parentheses are robust t-statistics and z-statistics, respectively. * indicates significance at 10%, ** indicates significance at 5%, *** indicates significance at 1%.

Table 8: Challenging endogeneity concerns using instrument variable estimation

Method Dep. variable	Model 5.1.a		Model 5.1.b		Model 5.1.c		Model 5.2.a		Model 5.2.b		Model 5.2.c	
	2SLS		2SLS		2SLS		2SLS		2SLS		2SLS	
	ROE 06+ROE 07		ROE 06+ROE 07		ROE 06+ROE 07		ROA 06+ROA 07		ROA 06+ROA 07		ROA 06+ROA 07	
	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.
SBLTI	38.272	(0.7063)	-224.61**	(-2.2293)			-45.376**	(-1.9725)	-133.60***	(-2.9258)		
INC			49.699***	(3.4036)	38.903***	(3.1057)			22.866**	(2.4299)	21.046*	(1.8874)
GOV					-0.327	(-0.0155)					-1.603	(-0.1549)
SIZE	7.030*	(1.8033)	8.629*	(1.9529)	12.451	(1.4770)	5.323***	(2.8304)	4.171*	(1.9317)	4.795	(1.0476)
RISK	-0.154	(-0.8529)	0.012	(0.0411)	4.294	(1.5785)	-0.066	(-0.9573)	0.006	(0.0422)	1.943	(1.2665)
MTB	-4.218	(-0.7007)	-3.200	(-0.9449)	-7.705**	(-1.9860)	1.560	(1.5353)	1.371	(0.7690)	-0.446	(-0.1408)
LEV	-30.532	(-0.6390)	-60.288	(-1.0567)	-198.57**	(-2.1433)	-13.717	(-0.9710)	-19.154	(-1.0061)	-45.605	(-0.9688)
MB CONTROL	82.551	(1.4978)	62.933	(1.1324)	336.03**	(2.3662)	-16.630	(-0.9555)	-3.566	(-0.1767)	89.103**	(2.4879)
EXT CONTROL	55.519*	(1.8419)	34.678	(1.1526)	75.825	(1.4529)	-6.687	(-0.6792)	-5.033	(-0.3753)	3.542	(0.1605)
Industry dummies	yes		yes		yes		yes		yes		yes	
No. of observ.	249		249		99		247		247		99	

Notes: We challenge the OLS results of model (1) reported in table 4 by using instrument variable (IV) estimation procedures. The table reports the IV regression results for our model (1). While the models 5.1.a-c use aggregated return on equity in 2006 and 2007 (ROE 06 + ROE 07) as the dependent variable, the models 5.2.a-c use aggregated return on assets in 2006 and 2007 (ROA 06 + ROA 07). The a- and b-specifications of our models are estimated on the sample of all firms. The c-specifications are estimated on the subsample of firms granting stock-based long-term incentives. In each specification we allow for a maximum of two endogenous variables and use the following instruments: lagged performance (ROE 05 or ROA 05), tenure of the firm's CEO and chairman (CEO TENURE, CHM TENURE), size and structure of the compensation committee (COMP COM SIZE, COMP COM CODET) and index listing (DAX, MDAX, SDAX, TECDAX). Despite our compensation variables, we control for standard firm characteristics (SIZE, RISK, MTB, LEV) and the largest blockholder (MB CONTROL, EXT CONTROL) and use 8 industry dummies. All variables are described in detail in table 11. Values in parentheses are heteroscedasticity robust t-statistics. * indicates significance at 10%, ** indicates significance at 5%, *** indicates significance at 1%.

Table 9: Adding a governance index to the analysis

Method Dep. variable	Model 6.1.a		Model 6.1.b		Model 6.2.a		Model 6.2.b		Model 6.3.a		Model 6.3.b	
	OLS		OLS		OLS		OLS		OLS		=LS	
	ROE 06+ROE 07		ROE 06+ROE 07		ROE 06+ROE 07		ROE 06+ROE 07		ROA 06+ROA 07		ROA 06+ROA 07	
	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.
SBLTI	-44.030	(-1.4423)	-36.198	(-1.2118)					-20.639**	(-2.5268)	-14.117*	(-1.9036)
INC	10.469***	(2.6739)	8.588***	(2.9786)	14.316***	(3.3720)	7.880**	(2.1324)	3.208***	(3.0407)	2.366**	(2.5056)
GOV	-1.207	(-0.3572)	-1.188	(-0.3235)	-1.627	(-0.5093)	-0.524	(-0.1469)	-0.029	(-0.0280)	-0.060	(-0.0616)
ROE/ROA 05			0.579***	(2.9655)			1.048***	(4.7328)			0.768**	(2.2994)
SIZE	8.883***	(3.6175)	6.249**	(2.3971)	12.550***	(2.9052)	10.495**	(2.0703)	3.122***	(3.2389)	1.501*	(1.8685)
RISK	-0.093	(-0.4905)	-0.023	(-0.1022)	2.578	(1.4114)	2.747	(1.4172)	-0.051	(-0.8504)	-0.025	(-0.4075)
MTB	-3.186	(-0.6670)	-0.844	(-0.2458)	-7.671	(-1.4942)	-0.439	(-0.1250)	0.863	(0.8872)	0.921	(1.1785)
LEV	-49.161	(-1.1487)	-34.431	(-0.7639)	-167.97**	(-2.2738)	-182.55*	(-1.8505)	-6.179	(-0.5850)	-6.458	(-0.6813)
DIV			6.698*	(1.6877)			2.382	(0.4207)			1.221	(1.1123)
MB CONTROL	53.059*	(1.8137)	34.430	(1.0399)	301.63**	(2.2803)	239.71*	(1.6916)	13.176*	(1.7788)	6.185	(0.8841)
EXT CONTROL	39.731**	(2.3005)			92.462**	(2.3136)			7.020	(1.3028)		
FAMILY			48.155*	(1.8926)			43.788	(1.0495)			12.038*	(1.6711)
INSTITUTIONAL			13.134	(0.7286)			40.982	(0.6795)			-1.887	(-0.3758)
STRATEGIC			15.090	(0.7497)			52.757	(1.0964)			0.610	(0.0960)
OTHER OWNERS			-14.957	(-0.4191)			15.104	(0.2701)			-8.857	(-0.6034)
CEO FOUNDER			4.017	(0.2661)			2.878	(0.0859)			-2.106	(-0.5416)
CHM FOUNDER			-27.564	(-1.1710)			5.054	(0.2487)			-7.023	(-1.3777)
Industry dummies	yes		yes		yes		yes		yes		yes	
No. of observ.	272		270		104		103		271		269	
Adj. R^2	0.08		0.13		0.26		0.27		0.10		0.23	
F-Statistic	2.72		2.86		3.65		2.83		3.00		4.64	

Notes: We examine whether the performance differences among firms with stock-based long-term incentives are simply a result of differences in governance mechanisms as argued by [Sautner and Weber \(2008\)](#). Therefore, the table reports regression results for our model (1) using our incentive index INC (an index that characterizes more (less) ambitious programs by a higher (lower) index score) and our governance index GOV (an index that characterizes more (less) management friendly programs by a lower (higher) index score) simultaneously. The dependent variable is the aggregated return on equity in 2006 and 2007 (ROE 06 + ROE 07) and aggregated return on assets in 2006 and 2007 (ROA 06 + ROA 07). While the models 6.1.a/b and 6.2.a/b are estimated on the sample of all firms, the model 6.2.a/b are estimated on the subsample of firms granting stock-based long-term incentives. In each of the models we control for various firm characteristics. While our a-specifications control for standard firm characteristics (SIZE, RISK, MTB, LEV) and the largest blockholder (MB CONTROL, EXT CONTROL), b-specifications also control for lagged performance (ROE 05 or ROA 05), diversification (DIV), more detailed ownership structures (FAMILY, INSTITUTIONAL, STRATEGIC, OTHER OWNERS), and founder status (CEO FOUNDER, CHM FOUNDER). We use 8 industry dummies in all regressions. The reported results remain robust to specifications where we use return on equity in 2006 (ROE 06) or return on equity in 2007 (ROE 07) as dependent variable. All variables are described in detail in table 11. Values in parentheses are heteroscedasticity robust t-statistics. * indicates significance at 10%, ** indicates significance at 5%, *** indicates significance at 1%.

Table 10: Challenging the index coding

Method Dep. variable	Model 7.1.a		Model 7.1.b		Model 7.1.c		Model 7.1.d		Model 7.2.a		Model 7.2.b	
	OLS		OLS		OLS		OLS		OLS		OLS	
	ROE 06+ROE 07		ROE 06+ROE 07		ROE 06+ROE 07		ROE 06+ROE 07		ROA 06+ROA 07		ROA 06+ROA 07	
	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.
SBLTI	-22.595	(-1.4609)	-18.857	(-1.2650)	-16.045	(-0.9071)	-14.201	(-0.8099)	-11.298**	(-2.0038)	-7.857*	(-1.6534)
INC_2	14.207**	(2.1653)	10.854**	(2.1148)	16.249**	(2.3593)	12.367**	(2.2948)	5.720**	(2.3187)	3.680*	(1.9244)
GOV_2					-5.055	(-1.0854)	-3.582	(-0.7939)	-1.345	(-0.8472)	-0.369	(-0.2787)
ROE 05/ROA 05			0.608***	(2.9406)			0.606***	(2.9275)			0.784**	(2.3550)
SIZE	8.301***	(3.8706)	5.806**	(2.4401)	9.013***	(3.5625)	6.294**	(2.3205)	3.166***	(3.2153)	1.456*	(1.7849)
RISK	-0.108	(-0.6043)	-0.024	(-0.1101)	-0.096	(-0.5086)	-0.018	(-0.0792)	-0.050	(-0.8488)	-0.024	(-0.4011)
MTB	-3.245	(-0.6399)	-0.791	(-0.2235)	-3.302	(-0.6512)	-0.835	(-0.2363)	0.811	(0.8180)	0.889	(1.1328)
LEV	-47.721	(-1.1211)	-32.438	(-0.7217)	-47.420	(-1.1052)	-32.008	(-0.7090)	-5.675	(-0.5350)	-5.986	(-0.6320)
DIV			6.016	(1.5313)			6.025	(1.5237)			1.034	(0.9366)
MB CONTROL	52.094*	(1.7418)	34.248	(1.0032)	51.105*	(1.7448)	33.438	(1.0008)	12.480*	(1.7102)	6.032	(0.8611)
EXT CONTROL	42.765**	(2.3714)			41.424**	(2.3460)			7.507	(1.3925)		
FAMILY			50.614*	(1.9555)			49.741*	(1.9473)			12.627*	(1.7486)
INSTITUTIONAL			14.589	(0.8439)			12.492	(0.7366)			-1.774	(-0.3591)
STRATEGIC			18.616	(0.9324)			17.389	(0.8822)			1.410	(0.2244)
OTHER OWNERS			-9.411	(-0.2639)			-10.378	(-0.2901)			-7.403	(-0.5096)
CEO FOUNDER			4.534	(0.3046)			4.051	(0.2710)			-2.058	(-0.5264)
CHM FOUNDER			-26.820	(-1.1374)			-26.882	(-1.1393)			-6.838	(-1.3223)
Industry dummies	yes		yes		yes		yes		yes		yes	
No. of observ.	272		270		272		270		271		269	
Adj. R^2	0.07		0.12		0.07		0.12		0.09		0.22	
F-Statistic	2.63		2.86		2.49		2.74		2.85		4.53	

Notes: We challenge the results reported in table 4 by using variants of our indices. The table reports the OLS regression results for our model (1) using the SBLTI dummy, a variant of the incentive index (INC_2) and a variant of the governance index (GOV_2). While the models 7.1.a-d use the aggregated return on equity in 2006 and 2007 (ROE 06 + ROE 07) as the dependent variable, the models 7.2.a/b use aggregated return on assets in 2006 and 2007 (ROA 06 + ROA 07). In the models 7.1.a/b we regress corporate performance on SBLTI (a dummy variable indicating whether or not the firm grants stock-based long-term incentives) and INC_2, which is a variant of our incentive index INC (an index that characterizes more (less) ambitious programs by a higher (lower) index score). In the remaining models we simultaneously use GOV_2, which is a variant of our governance index GOV (an index that characterizes more (less) management friendly programs by a lower (higher) index score). All six models are estimated on the sample of all firms. In each of the models we control for various firm characteristics. While our a-specifications control for standard firm characteristics (SIZE, RISK, MTB, LEV) and the largest blockholder (MB CONTROL, EXT CONTROL), b-specifications also control for lagged performance (ROE 05 or ROA 05), diversification (DIV), more detailed ownership structures (FAMILY, INSTITUTIONAL, STRATEGIC, OTHER OWNERS), and founder status (CEO FOUNDER, CHM FOUNDER). We use 8 industry dummies in all regressions. The reported results remain robust to specifications where we use return on equity in 2006 (ROE 06) or return on equity in 2007 (ROE 07) as dependent variable. All variables are described in detail in table 11. Values in parentheses are heteroscedasticity robust t-statistics. * indicates significance at 10%, ** indicates significance at 5%, *** indicates significance at 1%.

Table 11: Definition of variables and data sources

Variable	Description
SBLTI	Dummy variable which takes the value 1 in case that the firm grants stock-based long-term incentives in 2006
INC	Index measuring the incentive dimension of stock-based long-term incentives granted in 2006
GOV	Index measuring governance dimension of stock-based long-term incentives granted in 2006
ROE YY	Return on equity (in %) in year YY [defined as (Income Before Preferred Dividends - Preferred Dividends)/TotalCommonEquity*100]
ROA YY	Return on assets (in %) in year YY [defined as (Net Income before Preferred Dividends + ((Interest Expense on Debt-Interest Capitalized) * (1-Tax Rate))) / Last Year's Total Assets * 100]
SIZE	Logarithm (ln) of Total Assets
RISK	Operational risk proxied by the absolute value of coefficient of variation of return on equity measured from 2004 to 2006
MTB	Market-to-book value of equity measured as year end market cap divided by common equity
LEV	Leverage measured by long-term debt dividend by total assets
DIV	Diversification proxied by the number of business segments the firm is operating in
MB CONTROL	Fraction of voting rights held by the largest shareholder, if the largest shareholder holds at least 10% of voting rights and is a member of the management board
EXT CONTROL	Fraction of voting rights held by the largest shareholder, if the largest shareholder holds at least 10% of voting rights and is not a member of the management board
FAMILY	Fraction of voting rights held by the largest shareholder, if the largest shareholder is an individual that does not serve on the management board and holds at least 10% of voting rights
INSTITUTIONAL	Fraction of voting rights held by the largest shareholder, if the largest shareholder is an institutional investor and holds at least 10% of voting rights
STRATEGIC	Fraction of voting rights held by the largest shareholder, if the largest shareholder is a strategic entity (widely held firm, charity, government, etc.) and holds at least 10% of voting rights
OTHER OWNERS	Fraction of voting rights held by the second and third largest blockholder
CEO FOUNDER	Dummy variable which takes the value 1 in case that the current CEO was a member of the firm's founding team
CEO TENURE	Variable measuring the tenure of the firm's current CEO
CHM FOUNDER	Dummy variable which takes the value 1 in case that the current chairman was a member of the firm's founding team
CHM TENURE	Variable measuring the tenure of the firm's current chairman
SB CAPITAL	Number of supervisory board members representing interests of capital suppliers of the firm
SB CODET	Variable measuring co-determination which can take the values zero (in case of no co-determination), 0.5 (in case of one-third co-determination) and 1 (in case of parity co-determination)
COMP COM SIZE	Size of compensation committee measured as the number of supervisory board members concerned with the firm's compensation policy
COMP COM CODET	Dummy variable which takes the value 1 in case that employee representatives are members of the compensation committee
Industry	8 dummy variables for different industries based on the Prime Standard industry classification of Deutsche Börse AG
DAX, MDAX, SDAX, TECDAX	Dummy variables taking the value 1 in case that the firm is listed in the DAX, MDAX, SDAX, and TECDAX, respectively

Notes: The table describes the set of variables that we use in our empirical analyses. While we retrieve accounting data from Thomson Financial Worldscope and Datastream, all governance variables like ownership data, board characteristics and compensation data are hand-collected from various sources. Among others, we used annual reports, press releases, IR requests, Hoppenstedt Aktienführer, SEC releases, ISA plus/ Deloitte and Deutsche Börse Weighting Files.

Table 12: Construction of government index

Panel A: Description of index construction			
Category	Score		
	0	1	2
Functionality PH	Not Existent	Direct PH	Indirect PH
Exercise Slot	Not Existent	Exercise Slot	Reference Date
Exercise Period	Flexible Exercise Period ($\geq M$)	Flexible Exercise Period ($< M$)	Reference Date
Individual Disclosure/Detailed Disclosure Compensation	Not Any	One of Both	Both
Disclosure Evaluation Model/ Parameters	Not Any	One of Both	Both
Cap	Not Existent	Intransparent	Transparent

Panel B: Absolute (relative) frequencies of realizations			
Category	Score		
	0	1	2
Functionality PH	14 (12.7%)	78 (70.9%)	18 (16.4%)
Exercise Slot	42 (38.2%)	41 (37.3%)	27 (24.6%)
Exercise Period	52 (47.3%)	37 (33.6%)	21 (19.1%)
Individual Disclosure/Detailed Disclosure Compensation	90 (81.8%)	16 (14.6%)	4 (3.6%)
Disclosure Evaluation Model/ Parameters	17 (15.5%)	55 (50.0%)	38 (34.6%)
Cap	70 (63.6%)	16 (14.6%)	24 (21.8%)

Notes: The table describes the coding of our governance index and the the frequency of its subscores. Panel A of the table explains how we construct our governance index (GOV). The GOV index aims at evaluating the governance dimension of the SBLTI plan granted by a firm. Panel B of the table lists the absolute and relative frequency of score realizations.