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Index Membership vs. Loss of Voting Power:

The Unification of Dual-Class Shares

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Abstract: A change in the index selection rules of Deutsche Börse provides a unique opportunity to investigate the drivers behind the decision to abolish dual-class shares. As of June 2002, selection is based on the market capitalization of the free-float of the more liquid share class rather than the overall market capitalization. Hence, firms have had to reassess the benefits from their dual-class shares by weighing them against the cost from foregone index weight associated with having two share classes. Our findings suggest that index membership significantly affects the controlling shareholder's motivation to unify preferred and common stock.

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1. Introduction

This paper links the literature on dual-class stock unifications with that on index membership. The literature on why firms issue dual-class shares and why firms abolish them once they have been issued is as yet relatively sparse (Adams and Ferreira 2008). Although the former decision seems to be driven by the controlling shareholder's desire to retain voting power while reducing cash-flow risk (see e.g., DeAngelo and DeAngelo 1985), little is known as to why firms make the latter decision. The few studies that investigate dual-class unifications (Maury and Pajuste 2011; Dittmann and Ulbricht 2008; Hauser and Lauterbach 2004; Lauterbach and Pajuste 2015; Lauterbach and Pajuste 2017) suggest that improving access to external financing is an important motive whereas the existence of private benefits of control is a deterrent.

This paper extends this literature by studying a major reform of how German firms are selected for membership of the various stock market indices. In August 2000, Deutsche Börse announced new index weighting rules for its major stock indices. Under the old rules index membership was based on the firm's *aggregate* market capitalization. The changes caused by the reform, which became effective in June 2002, were twofold. First, only the most liquid or largest class now forms the basis for selection into an index. Second, only the free float of that class is taken into account when determining index membership.

As a consequence, firms with more than one class of shares outstanding included in a selection index faced the danger of losing their current index position or, worse even, faced the danger of dropping out of the index. For example, DAX index member SAP was set to lose massively. At the announcement of the new rules in August 2000 and assuming the new rules had been effective immediately, SAP's weight in the DAX would have fallen by almost 40% from 9.51% to 5.64%. More generally, companies whose equity was split fairly equally between the two classes, i.e. the

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non-voting shares and the voting shares, and with little free float were adversely affected. Conversely, those with their equity in mainly one class and a large free float ranked among the winners.

Why should firms care about index membership and weight? As the mere gain or loss of membership does not provide any additional information on the firm's fundamental value, any such change in membership should therefore be valuation neutral. However, several studies document that index inclusions cause positive whereas deletions cause negative abnormal returns.[4] As to index weight, Kaul et al. (2000) find that a change in the index weighting rules of the Toronto Stock Exchange (TSE), that redefined the weighting-relevant free float, caused valuation increases for those firms that experienced an increase in their index weight in the TSE 300 index. One important reason for these market reactions is changes in investor demand for the firm's stock, in particular demand by index fund managers (see e.g., Shleifer 1986; Barberis et al. 2005, and Claessens and Yafeh 2013). Several other reasons, all of which have empirical support, have been advanced to explain these market reactions, including investor awareness (Merton 1987), price pressure (Harris and Gurel 1986), improved liquidity (Amihud and Mendelson 1986) and information signals about the firm's prospects (Denis et al. 2003).

We hypothesize that the regulatory changes that became effective in 2002 forced the large shareholders of firms with dual-class shares to reassess the benefits from index membership by weighing them against the foregone private benefits of control caused by the unification. Anecdotal

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[4] Studies that examine the effect of index inclusions or deletions include Denis et al. (2003), Hrazdil and Scott (2009), Goetzmann and Garry (1986), Jain (1987), Lynch and Mendenhall (1997) and Chen et al. (2004). While there is a large body of literature on the US stock markets, there are only few empirical studies on the effects of index inclusion and deletion in the German market (see e.g., Gerke et al. 2001; Deininger et al. 2002).

evidence suggests that some firms conducted this reassessment well before the implementation of the new rules. For example, SAP unified its stock in 2001, i.e. one year before the implementation of the rules, justifying the move by its endeavor to keep its index weight.[5]

The paper's main contribution is to study the trade-off faced by large controlling shareholders between the benefits from a dual-class stock unification and the costs from losing voting power. We estimate the probability of conversion – conditional on different levels of reduction in index weight – for various levels of the hypothetical voting loss the controlling shareholder would experience upon conversion. We find that the large shareholder is more likely to accept a reduction in index weight, and hence less likely to unify the dual-class shares, the higher his hypothetical voting loss due to the conversion. This suggests that beyond a certain threshold of voting power the private benefits of control foregone by the large shareholder exceed his share of the benefits from unification. Similar to the wealth effects accruing to the holders of the non-voting stock that have been documented for German stock unifications before the reform (see e.g. Dittmann and Ulbricht 2007), we observe such wealth effects at the announcement of the regulatory change. Finally, and in line with anecdotal evidence, we find that the danger of dropping out of the index is an important reason for conversion. However, the opportunity to move up an index seems unrelated to unification decisions.

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[5] During summer 2000, the CEO (i.e., the chairman of the management board), Hasso Plattner, denied that SAP was to convert its preference shares into ordinary shares: "We will keep the preference shares" ("Es wird weiter Vorzugsaktien geben"). A year later, Henning Kagermann (member of the management board of SAP) justified the decision to convert in the magazine Focus (June 7, 2001) as follows: "Thereby we avoid the risk of seeing SAP lose its position in the DAX index" ("Damit wird das Risiko einer Rückgewichtung der SAP-Aktie im Dax-Index vermieden").

Our study is related to Dittmann and Ulbricht (2008), who study the timing and the announcement effects of German stock unifications for 1990 to 2001, a period during which the index rules remained the same. In contrast, we focus on an exogenous shock which forced the controlling shareholder to reconsider the benefits from maintaining dual-class shares in the light of the potential costs caused by a reduction in index weight.

The rest of the paper is structured as follows. The next section reviews the literature on dual-class stock unifications. This is followed by a discussion of the institutional background before and after the regulatory change in Section 3. Section 4 describes the dataset and provides descriptive statistics. Section 5 explores the stock market's reaction to the regulatory change and to the actual unifications. Section 6 reviews the motives behind the decision to unify a firm's shares and develops several testable hypotheses. Section 7 presents the empirical analysis. Section 8 concludes.

2. Literature Review

Adams and Ferreira (2008) survey the empirical literature on disproportional ownership. They conclude that "few papers directly tackle the issue of the determinants of dual-class structures ... Consequently, we still know very little about this issue" (Adams and Ferreira 2008, p.62). Papers on the determinants of the decision to separate cash flow rights from voting rights include Lehn et al. (1990), Amoako-Adu and Smith (2001) and Gompers et al. (2010). Lehn et al. (1990) investigate the choice between dual-class recapitalizations and going private transactions as means to consolidate corporate control. Both transactions mainly differ in the allocation of cash flow rights to the controlling shareholder. They find that firms with better growth opportunities are more likely to undergo a dual-class recapitalization, compared to firms going private, as they want to maintain

their access to the stock market. Amoako-Adu and Smith (2001) examine the determinants of dual-class stock structures for Canadian initial public offerings (IPOs). They find that a large family stake before the IPO increases the probability of a dual-class share structure after the IPO. Finally, Gompers et al. (2010) find that US firms with greater private benefits of control are more likely to have a dual-class structure.

There are even fewer papers that study dual-class stock unifications. Studies on US firms, such as Ang and Megginson (1989) and Kunz (2002), do not find evidence of significant shareholder wealth effects from unifications. In contrast, the only two published studies on Germany (Maury and Pajuste 2011 and Dittmann and Ulbricht 2008) find significant wealth effects. Dittmann and Ulbricht (2008) analyse 89 German firms with dual-class shares between 1990 and 2001 of which 31 unify their stock. They document not only that dual-class stock unifications generate significantly positive shareholder wealth effects, but also that the percentage of voting shares held by the largest shareholder, as well as the hypothetical loss of that shareholder's voting power after the conversion, reduces the likelihood of unifying the shares. They also find that a lack of dividend payments in the recent past increases the likelihood of conversion, suggesting that firms are more likely to unify their stock if they are financially constrained.

Maury and Pajuste (2011) explore the probability of stock unification in a cross-country study of seven Western European countries covering 493 non-financial dual-class stock firms from 1996 to 2002.[6] They confirm Dittmann and Ulbricht's (2008) results of both the fraction of voting shares of the largest shareholder and the wedge between his control and ownership rights reducing the

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[6] Their regression results are based on a reduced sample of 382 firms.

likelihood of a stock unification. In contrast, their proxies for financing needs, such as the market-to-book ratio and proceeds from new equity issues, increase that likelihood.

Lauterbach and Yafeh (2011) examine 80 Israeli stock unifications during the 1990s, paying special attention to post-unification changes in voting power and control structure. They not only find that controlling shareholders offset the dilution of voting power by adjusting their shareholdings before and after the unification, but also that typically their identity does not change as a result of the unification process.

Our study extends this literature in a major way by analysing the decision to unify dual-class shares in a situation, i.e. the 2002 change to the listing rules of Deutsche Börse, where the status quo is associated with substantial costs in terms of reduced index weight, forcing the controlling shareholder to reassess the benefits from keeping voting power versus the costs of reduced index weight.

Our study differs from Hauser and Lauterbach (2004) and Bigelli et al. (2011). Hauser and Lauterbach (2004) analyse 84 Israeli unifications. They find that the compensation paid to the large shareholder for the loss in voting rights depends on three factors. First, the compensation increases with the large shareholder's percentage of votes. Second, it decreases if there is institutional ownership. Third, it is higher for family-controlled firms. In addition, the large shareholder is compensated for the loss of votes even if this loss does not reduce his percentage of the votes below a majority. Bigelli et al. (2011) study 47 dual-class unifications by 42 Italian firms between 1974 and 2008. They observe that the market response to the unification is positive for non-voting shares. They also find that the price reaction for the shares is only significantly negative if the controlling shareholder held non-voting shares prior to the announcement. For this subsample of firms, they also show that the likelihood of receiving compensation for the loss of their voting privileges is

significantly lower, providing a possible explanation for the negative market responses. They suggest that owning non-voting shares during unifications allows controlling shareholders to benefit from the associated increases in share prices.

Finally, our study also differs from Lauterbach and Pajuste (2017), who study the impact of media pressure on the likelihood of stock unifications in seven Western European countries from 1996 to 2002. They find that the likelihood increases with media pressure and that seven years after the unification the decrease in the percentage of votes held by the controlling shareholder is greater for firms under intense media pressure. In our study, we find another motive for firms to unify their stock: a reduction in the firm's index weight.

3. Institutional Background

This section describes the characteristics of German dual-class shares, more specifically non-voting shares, as well as the various selection indices. It also discusses the 2002 changes to the index selection rules in more detail. The German Stock Corporation Act (§139 AktG) allows firms to issue non-voting shares, also called preference shares[7] for up to 50% of their total book value of equity.[8] In contrast to voting shares which confer one vote each, these shares do not confer any voting rights. However, they confer the right to a guaranteed dividend amount, which is normally a percentage of their face value. This guaranteed dividend amount must be paid out of profits before

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[7] Since 1998 the issuance of multiple-voting shares has been prohibited by German law (see KonTraG ("Gesetz zur Kontrolle und Transparenz im Unternehmensbereich"). Existing multiple-voting shares lost their validity on May 30, 2003, unless approved by the shareholders' meeting (§5 EGAktG).

[8] The average (median) firm, included in a selection index during our sample period, has 33.77% (38.80%) of its total book value of equity in the form of non-voting preference shares.

any dividend can be paid to the holders of the voting shares. If the remaining earnings are sufficient, the dividend amount paid to the holders of the non-voting shares is then also distributed to the voting shareholders. Finally, what remains is distributed equally among all shareholders. If the firm cannot afford the guaranteed dividend amount, the latter is carried over to the next year. If it has been carried over twice, then the non-voting shares confer voting rights until the firm has paid these arrears. Finally, non-voting shares are also senior to voting shares in case of liquidation and bankruptcy.

Deutsche Börse distinguishes between two types of indices: all-share indices and selection indices. While the former include *all* the shares in a given market segment, the latter comprise only a *limited* number of shares. We focus on the latter. The selection indices are hierarchically structured: The DAX index tracks the largest and most actively traded firms on the Frankfurt Stock Exchange (blue chip stocks), followed by the MDAX (the 50 mid cap stocks) and SDAX (the 50 small cap stocks) indices. The TecDAX index ranks below the DAX and covers the 30 largest and most liquid technology stocks.[9] To be included in one of the selection indices, companies must fulfill certain criteria. Two of the criteria for inclusion are that the shares trade on the Prime Standard segment[10] of the Frankfurt Stock Exchange and that they are continuously traded on Xetra, an electronic

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[9] TecDAX started in March 2003 and replaced Nemax50 as the reference index for technology shares. Hence, we base ourselves on the latter for the pre-2003 period but the former for the remainder of the period of study.

[10] This criterion came into effect on January 1, 2003. Companies which are part of the Prime Standard segment have to fulfill the highest transparency requirements in the EU. They have to publish company reports on a quarterly basis in both German and English, follow international accounting standards (IFRS/IAS or US-GAAP), release a financial calendar, conduct at least one analyst conference per year and publish their ad-hoc disclosures in both German and English.

trading platform. For all those firms that either are already included in a selection index or qualify

for inclusion Deutsche Börse publishes monthly so-called "equity index rankings". The key criteria

for these rankings are order-book turnover at Frankfurt and market capitalization. The rankings

form the basis at the quarterly meetings of the Working Committee for Equity Indices for the

decision on whether a particular firm is to be included in or excluded from one of Deutsche Börse's

selection indices. Table 1 shows the list of selection indices and reports the definition and

composition of each selection index.

Table 1: Selection Indices

Selection index	No. of members	Description
DAX	30	It tracks the 30 largest and most actively traded firms at the Frankfurt Stock Exchange (blue chip stocks) and covers roughly 80 percent of the tradable equity in Germany.
TecDAX	30	It ranks below the DAX and provides coverage for the 30 largest and most liquid technology sector ("new economy") stocks. It started in March 2003 and replaced the Nemax50 as the reference index for high tech firms.
MDAX	50	It ranks below the DAX and covers the 50 mid-cap stocks from mature ("old economy") sectors. It was downsized from 70 to 50 companies on March 24th, 2003
SDAX	50	It ranks below the MDAX and comprises the next 50 stocks from the mature ("old economy") sectors. It was downsized from 100 to 50 companies on June 24th, 2002.
Nemax50	50	It was the stock market index of the Neuer Markt and represented the 50 largest stocks from the technology ("new economy") sector. It was discontinued on December 31, 2004, as a result of the dissolution of the Neuer Markt.

Notes: Table 1 provides an overview of the selection indices of Deutsche Börse. The rank of firms
within a given index is based on the market capitalization of the free float and stock turnover.

In August 2000, Deutsche Börse announced changes to the selection criteria for all its selection

indices, which became effective in June 2002. Until then, the main criterion for the inclusion in a

selection index was the firm's market capitalization which was computed by multiplying the

number of *all* its issued shares, i.e. the sum of non-voting shares and voting shares for dual-class

firms, multiplied by the price of the more liquid class.[11] Since the change, *only* the free float of the most highly capitalized or most liquid class of shares, i.e. *either* the non-voting stock *or* the voting stock, has formed the basis for the determination of the firm's market capitalization.

There are two main ways of unifying dual-class shares. First, the non-voting shares may be converted into ordinary voting shares by amending the firm's articles of association. This change requires the approval of the general shareholders' meeting and requires a special resolution to be passed by the bearers of the non-voting shares in a separate meeting. Second, the company may repurchase the non-voting shares and then subsequently replace them by issuing new voting shares. In this case, the non-voting shares must be cancelled out. This requires the court's authorization as it is a reduction of the firm's equity capital. It can be done only by proving that the capital is adequate, otherwise creditors are harmed and may sue the directors.[12]

4. Dataset and Descriptive Statistics

We start with all the 91 German companies with dual-class shares that are listed on Deutsche Börse's CDAX segment[13] between January 2000 and December 2008. The period of study begins in 2000 to capture the run-up prior to the change in the rules. The official announcement of the regulatory change was made on August 8, 2000, but since it was published after the market's close, the effective event date is August 9.

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[11] The liquidity of a stock is measured by its turnover on the exchange.

[12] We are grateful to an anonymous referee for pointing this out.

[13] The CDAX tracks all German companies listed on the Frankfurt Stock Exchange in the Prime and General Standard. It provides a performance measure of the overall German equity market.

Of the 91 firms, 30 convert their non-voting shares into voting shares at some point during the period of study. We exclude one firm that makes the decision to convert in 1999, another one that converts its non-voting shares immediately following its IPO and four firms with insufficient data. We arrive at a final sample of 85 firms, 25 of which abolish their dual-class shares during the period of study. Our sample size is comparable to that in Dittmann and Ulbricht (2008): they have 89 firms, for 1990-2001, of which 31 convert their non-voting shares. Nineteen of our sample firms, or 35% of the subsample of the 54 firms that have been listed in one of the selection indices of Deutsche Börse, decide to convert, compared to only 6 firms or 19% of the remaining firms. The remainder of the analysis focuses on those 54 firms that are included in a selection index as these are the firms that are affected by the change in rules, generating 229 firm-year observations.[14]

The aforementioned changes in index weighting rules were introduced in June 2002. However, the intention to change the rules had already been the subject of speculation before that date while the changes were officially announced in August 2000. Well aware of the impending changes, many firms may have chosen to convert prior to the actual implementation of the new selection rules.

Table 2: Announcement dates of stock unifications between 2000 and 2008

Company Name	Date of Announcement	Relative Index Position in the Month of the Announcement	Index
AdCapital AG	06.04.2001	0.64	SDAX
Escada AG	17.07.2002	0.04	MDAX
Fielmann AG	04.05.2000	0.09	MDAX
Fresenius Medical Care AG	04.05.2005	0.00	DAX
Heidelberg Cement	15.03.2002	0.81	MDAX
Herlitz AG	14.04.2000	0.12	SDAX
Hypo Real Estate Holding AG	12.04.2005	0.96	MDAX
Koenig und Bauer AG	19.04.2001	0.90	SDAX

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[14] If a company drops out of a selection index over time, then it is no longer part of our sample.

Krones AG	25.03.2004	0.18	MDAX
Man AG	21.03.2002	0.00	DAX
Marschollek, Lautenschläger und Partner AG	30.09.2000	1.00	MDAX
Metro AG	22.05.2000	0.02	EuroStoxx50
Rheinmetall AG	21.03.2005	0.45	MDAX
Rhoen-Klinikum AG	27.04.2005	0.20	MDAX
SAP AG	28.02.2001	0.66	DAX
Stada Arzneimittel AG	24.04.2001[y]	0.98	SDAX
Stada Arzneimittel AG	2003[z]		
Südzucker AG	07.06.2001	0.49	MDAX
Gerry Weber AG	13.04.2000	0.37	SDAX

Notes: The dates for the announcements are gathered from the website of the German Association for Ad-Hoc Announcements ("Deutsche Gesellschaft für Ad-hoc-Publizität" (DGAP), www.dgap.de), company websites and newspaper articles. The relative index position is calculated as follows. MLP is the firm with the highest index weight in its respective index (under the new rules), hence it gets a "1". Ad Capital gets a 0.64 as 64% percent of the other firms in the index have a lower index weight compared to Ad Capital. [y] This relates to a partial conversion. [z] We failed to identify the correct announcement date. Therefore, we decided to exclude this case from the event study analysis.

Table 2 shows that the majority of unifications occurred indeed between 2000 and 2002.[15] Hence, we simulate the decision problem the firm and its controlling shareholder was facing by recalculating index weightings on a monthly basis prior to the implementation of the changes, but based on the new rules. In other words, instead of using actual historical data, we calculate the market capitalization of the free float of the larger or more liquid class of shares and use this information to determine the weighting of the firm in its current index under the new rules.[16] These calculations illustrate the firm's situation had the new rules already been implemented. In contrast, the weightings used in the paper subsequent to the change in rules are the actual weightings of

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[15] In addition, Table 2 provides the relative position for each firm in the index at the time of the dual-class unification announcement and its respective index membership.

[16] More specifically, we computed the hypothetical free-float market capitalization for all companies included in an index and this was done for all single- and dual-class firms (for the latter, the free-float market capitalization was calculated only for the most liquid stock class).

Deutsche Börse. In addition, we calculate the hypothetical index weight if the non-voting shares were converted into voting shares.[17] The opportunity costs in terms of index weight of retaining the dual-class shares are then defined as the difference between the new hypothetical index weight and the actual weight.[18] We refer to this difference as the index "weight penalty". In addition, we determine for each firm the quantile to which the firm belongs within its selection index. The quantile is based on the firm's rank or position within its index in terms of its index weighting. If the median monthly rank for a firm within a given year is in the 5% quantile, we consider it to be in danger of dropping out of its index during that year. If its median rank for a year is in the 95% quantile, we consider that the firm has the chance to move up one index during that year.

Data on ownership and control as well as the numbers of voting and non-voting shares outstanding are collected from the Hoppenstedt annual stock guides.[19] We determine ultimate control following the procedure used by Correia da Silva et al. (2004) and Goergen et al. (2005). Their definition of a controlling shareholder is the largest shareholder with a stake of at least 25% of the voting rights. If there is no shareholder holding at least 25% of the votes, the company is considered to be widely held. This procedure accounts for control that is held indirectly via chains of control or pyramids of ownership. The ultimate controlling shareholder is situated at the first tier if it is a bank, insurance company, the German state, a foreign investor, or a family/individual. In all other cases, the ultimate controlling shareholder is said to be at a higher tier and this tier is reached once the

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[17] In case there was only one class of stocks traded on the market, the number of all voting and non-voting stock is multiplied by the share price of the most liquid stock.

[18] Before the implementation of the new rules, the "actual weight" is the estimated weight.

[19] For the few cases where the large shareholder's ownership of preference shares outstanding was not disclosed, we contact the firm's investor relations department.

tier above does not include any controlling shareholder or the controlling shareholder at that tier is a widely held bank or insurance company, the German state, a foreign investor, or a family/individual. In order to determine the control of intermediate companies that are not listed on a stock exchange, we consult Commerzbank's "Wer gehört zu wem" handbooks. As in Dittman and Ulbricht (2007), we calculate the hypothetical loss of the controlling shareholder's voting power if the non-voting shares were to be converted into voting shares. It is defined as the difference between the percentage of voting shares and the percentage of non-voting shares held by the controlling shareholder, multiplied by the proportion of non-voting shares. All remaining data are collected from Thomson Financial. Table 3 reports the definitions of all the variables used in this paper.

Table 3: Definition of the variables

Variable	Definition
Conversion	Dummy variable that is set to one for the year in which the firm decides to unify its shares, and zero otherwise. Observations for the years after the year of the conversion are excluded from the regression analysis.
Vote loss	The difference between the percentage of voting shares and non-voting shares held by the controlling shareholder, multiplied by the proportion of non-voting shares.
Weight penalty	The amount of index weight foregone by retaining the dual-class share structure. It is defined as the difference between the hypothetical index weight in percent if the non-voting shares were converted into voting shares and the actual weight in percent; e.g. if the hypothetical index weight is 0.5% and the actual weight is 0.1%, this corresponds to an increase of 0.4 percentage points in weight penalty. This difference is calculated on a monthly basis. Weight penalty is measured as the median value of these differences over the 12 months in the preceding calendar year.
Danger	Dummy variable that is set to one if the median of the firm's quantile rank in its index in the year before the unification is in the 5% quantile, and zero otherwise. This dummy measures the potential for the firm to drop by one index.
Chance	Dummy variable that is set to one if the median of the firm's quantile rank in its index in the year before the unification takes is in the 95% quantile, and zero otherwise. This dummy measures the potential for the firm to move up one index.
Firm size	Natural logarithm of total assets
Tangibility	Net property, plant & equipment divided by the firm's total assets in (t-1).
Financial investor	Dummy variable that is set to one if the largest shareholder holding more than 25% of the votes is a financial institution (i.e. bank or insurance company).

Panel A of Table 4 reports the percentage of firm-year observations where the (ultimate) largest shareholder's stake exceeds the 25% voting threshold adopted by this study. For the sake of comparison, we also report the equivalent percentage for the higher threshold of 50%. Panel B reports the summary statistics for the voting rights, the cash flow rights, the hypothesized vote loss of the largest shareholder, the hypothesized weight penalty, total assets and the tangibility (defined as net property, plant & equipment divided by the firm's total assets). Finally, Panel C reports summary statistics for the firms that decide to unify and those that keep their dual-class structure.

Panel A suggests that voting power, as measured by the voting rights of the controlling shareholder, is highly concentrated: for 88.2% of all the firm-year observations voting power exceeds 25% of the votes and for 71.6% voting power exceeds 50% of the votes. Existing studies also document a high concentration of voting power in listed German companies. For example, Becht and Böhmer (2003) find that more than 82% of firms have a large shareholder holding at least 25% of the votes for their sample of 372 companies in 1996. Likewise, for a sample of 171 companies in 1990 Franks and Mayer (2001) report that 85.4% of firms have a single large shareholder with more than 25% of the votes and 57.3% of firms have a majority shareholder.

Panel B suggests that, while the largest shareholder owns roughly 65% of the votes, he only owns 41% of the cash flow rights. On average, the hypothesized vote loss is 22% and the weight penalty amounts to 0.33%. For the average firm a change in 0.33 percentage points corresponds to a 36% change in the relative weight. Before we proceed with the discussion of the reasons that may lead firms to unify their shares, we explore the stock market reaction to the change in rules.

Table 4: Descriptive statistics

Panel A. Percentage and number of firm-year observations where the largest shareholder holds at least 25% and 50% of the votes, respectively

Minimum stake held by largest shareholder	%	#
25%	88.2	202
50%	71.6	164

Panel B. Summary statistics

Variable	Mean	Median	S.D.	Min	Max
Voting rights of largest shareholder [%]	64.7	65.6	28.6	0	100
Preference shares held by the largest shareholder [%]	5.46	0	16.12	0	100
Cash flow rights of largest shareholder [%]	40.5	41.8	20.5	0	97.8
Vote loss [%]	22.3	23.2	16.1	0	50.0
Weight penalty [%]	0.33	0.12	0.57	0	5.91
Financial investor [%]	6.55				
Total assets (m euros)	31300	1500	102000	72.6	697000
Tangibility	0.33	0.28	0.21	0.00	1.56

Panel C. Summary statistics of firms that decide to unify and those that decide to keep the dual-class share structure

Variable	DC-Unification		No DC-Unification	
	Mean	Median	Mean	Median
Voting rights of largest shareholder [%]	46.69	50.76	66.41	68.26
Preference shares held by the largest shareholder [%]	2.45	0	5.73	0
Cash flow rights of largest shareholder [%]	28.12	26.55	41.60	42.79
Vote loss [%]	13.64	10.76	23.06	23.45
Weight penalty [%]	0.76	0.40	0.29	0.11
Financial investor [%]	10.53		6.19	
Total assets (m euros)	11100	1150	33100	1590
Tangibility	0.25	0.21	0.34	0.30

Notes: The variables are defined as in Table 3. The table is based on the 229 firm-year observations for all the 54 dual-class firms that are part of a selection index. Panel A reports the percentage and number of firm-year observations where the largest shareholder holds at least 25% and 50% of the votes, respectively. Panel B reports descriptive statistics for the variables used in the regression analysis. The ownership variables refer to the situation before the dual-class unification. Panel C reports summary statistics for the firms that decide to unify and those that keep their dual-class structure.

Panel C suggests that for firms that unify their dual-class shares the large shareholder holds fewer votes on average (47%) than firms that do not unify (66%). The large shareholder also holds fewer preference shares (2% vs. 6%) and fewer cash flow rights (28% vs. 42%). As expected, the vote

loss for firms that unify is lower (14% vs. 23%), the weight penalty is greater (0.76% vs. 0.29%) and ownership by financial investors is also greater. Finally, firms that unify are smaller in size, as measured by total assets, and have greater tangibility. Among those firms that unify their dual-class shares, 5 firms decided to unify several years after the announcement of the rules in 2004 and 2005. In unreported results, we find some evidence that these firms were larger, had a lower weight penalty and a higher vote loss. It is highly likely that these firms had fewer incentives to unify early because they would have suffered from a higher vote loss and would have felt less pressure to unify because of a comparatively lower weight penalty.

5. Event Study

This section explores whether there are wealth effects associated with the regulatory change. The reasons for doing this are twofold. First, we aim to assess whether the announcement of the new rules exerted pressure on dual-class firms to unify their shares. This would be the case if there is a positive market reaction surrounding *the announcement of the new rules*. Second, we aim to assess whether investors react positively to *the announcements of actual dual-class stock unifications*, attributing value to these unifications.

To this effect we run two distinct event studies. The two event studies are based on market model regressions. The estimation window for the parameters underlying the model is the 250 trading days ending 21 trading days prior to the announcement. The event windows used in this paper include [-20, 20], [-20, 0], [-1, 1] and [0, 0]. We use the CDAX, which comprises all German companies listed on the Prime and General Standard segments of the Frankfurt Stock Exchange, as a proxy for the market portfolio. Using the CDAX rather than one of the selection indices deals with the issue that the various selection indices may have been affected by the regulatory change

and/or the actual conversions. The dates for the announcements of the actual conversions are gathered from the website of the German Association for Ad-Hoc Announcements ("Deutsche Gesellschaft für Ad-hoc-Publizität" (DGAP), www.dgap.de), company websites and newspaper articles.

For the event study on the regulatory changes[20] (Panel A of Table 5), we use the modified version of Boehmer et al.'s (1991) test statistic, as proposed by Kolari and Pynnönen (2010), to assess the significance of the announcement returns. This test specifically adjusts for the clustering of the observations – the announcement date of the new rules is the same for all the firms – by accounting for cross-sectional correlation of the abnormal returns in the estimation window. For the event study on the actual conversions (Panel B of Table 5), we evaluate the significance of the announcement returns based on Boehmer et al.'s (1991) standardized cross-sectional t-statistic, which compared to the test by Patell (1976), also accounts for event-induced variance. In line with prior work, we separately report the announcement returns for the sample firms' voting and non-voting shares.

Panel A of Table 5 presents the (cumulative) average abnormal returns ((C)AARs) for all the firms with dual-class stocks that were included in a selection index around the time of the announcement of the regulatory change, i.e. August 9, 2000. The CAARs in Panel A are those for the 30 dual-class firms with listed non-voting shares and the 15 dual-class firms with listed voting shares

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[20] The announcement concerning the downsizing of the SDAX was made in August 2001, i.e. one year later than the regulatory changes. Hence, our event study is not contaminated by this downsizing.

included in the selection index.[21,22] We start by analyzing the CAARs for the actually listed share category. There is no market reaction on the event day as evidenced by the insignificant AAR of 0.44%. However, when the event window is extended to include the 20 days preceding the announcement of the change to the rules, the CAAR increases to 4.15% and becomes significant at the 10% level.[23] When the event window is further extended to cover the 20 days following the announcement day, the CAAR increases to 5.35% and is significant at the 5% level. Panel A also suggests that the positive announcement effect is mainly due to the non-voting shares. Indeed, the CAAR over the entire 41-day window amounts to 5.67% and is significant at the 5% level for the non-voting shares compared to 3.74% and significance at the 10% level only for the voting shares.[24]

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[21] This is a snapshot of all dual-class firms included in a selection index in August 2000. As a result, the sample size differs from the one described on p.11 that covers the whole observation period.

[22] We decided to exclude three firms due to possible confounding events. One firm was founded in 2000 and could therefore not be included. Another one changed its legal status in August 2000, at the same time as the announcement of the regulatory change. A third firm had a stock split in July 2000.

[23] The large event window is chosen to capture the pre-announcement effects. There is clear evidence of such pre-announcement effects in 2000. In that year, speculations about new weighting rules arose after Stoxx Ltd. announced that henceforward weighting in its Euro Stoxx index would be based only on the free float of the market capitalization of one of its classes of shares. Though Deutsche Börse officially denied intentions to adopt similar rules for its major stock indices (see Süddeutsche Zeitung (July 5, 2000, p.29) and dpa-AFX (July 12, 2000)), rumors intensified in mid-July as various newspaper articles speculated about a change in the listing rules and identified potential index winners and losers. See Börsen-Zeitung (July 13, 2000, p.3), Financial Times Deutschland (July 17, 2000, p.28) and Financial Times Deutschland (July 17, 2000, p.1).

[24] We re-ran the event study including only non-selection index dual class firms. In the days surrounding the announcement of the change, we observe no significant market reactions for non-selection-index dual class firms.

Panel B of Table 5 reports the announcement returns around the actual conversion announcements. We find significantly positive announcement returns for the non-voting shares ranging from 4.7% on the announcement date to 8.6% over the [-20, 0] window. Previous work on Germany by Dittmann and Ulbricht (2008) also documents sizeable wealth effects generated by the conversion of non-voting shares. They justify the observed increases in shareholder value by the improved corporate governance and enhanced liquidity of the stock. We do not observe consistently significant abnormal returns for the voting shares, whatever the event window. However, given that we observe a significantly positive market reaction for the case of the voting shares for some event windows in Panel A suggests that the jury is still out there as to the benefits of dual-class unifications for the holders of voting shares.

Table 5: Event study results

Panel A. Cumulative average abnormal returns at the announcement of the regulatory change in August 2000

CAARs for the actually listed share category

Event window	CAAR	Positive : Negative	Adj. BMP t-statistic
[-20, 20]	5.35%	29 : 16	1.997**
[-20, 0]	4.15%	29 : 16	1.671*
[-1, 1]	1.06%	26 : 19	1.188
[0, 0]	0.44%	25 : 20	0.931

CAARs for non-voting shares

Event window	CAAR	Positive : Negative	Adj. BMP t-statistic
[-20, 20]	5.67%	29 : 12	2.284**
[-20, 0]	4.50%	27 : 14	1.975**
[-1, 1]	0.87%	23 : 18	0.866
[0, 0]	0.62%	26 : 15	1.223

CAARs for voting shares

Event window	CAAR	Positive : Negative	Adj. BMP t-statistic
[-20, 20]	3.74%	18 : 14	1.701*
[-20, 0]	3.37%	21 : 11	1.640*
[-1, 1]	1.28%	19 : 13	1.635
[0, 0]	0.14%	18 : 14	0.321

Panel B. Cumulative average abnormal returns at the announcement of a stock unification between 2000 and 2008

Since only selection-index dual class firms have been affected by the regulatory change, the market does not expect non-selection index dual class firms to convert their shares.

CAARs for non-voting shares			
Event window	CAAR	Positive : Negative	BMP t-statistic
[-20, 20]	7.35%	13 : 4	3.126***
[-20, 0]	8.61%	13 : 4	3.952***
[-1, 1]	5.29%	12 : 5	2.770***
[0, 0]	4.66%	12 : 5	2.127**

CAARs for voting shares			
Event window	CAAR	Positive : Negative	BMP t-statistic
[-20, 20]	0.47%	7 : 10	0.346
[-20, 0]	2.69%	9 : 8	0.757
[-1, 1]	1.88%	10 : 7	1.016
[0, 0]	1.04%	8 : 9	0.264

Notes: Table 5 presents cumulative average abnormal returns (CAARs) around the announcement day for actual stock unifications as well as around the announcement day of the change in rules. CAARs are reported for four distinct event windows: [-20, 20], [-20, 0], [-1, 1] and [0, 0]. Panel A presents CAARs around the announcement of the regulatory change. The t-statistic is the modified version of Boehmer et al.'s test proposed by Kolari and Pynnönen (2010) (Adj. BMP t-statistic). Note that not each stock class is traded. Hence, when we extend the analysis to both classes of dual-class firms, the number of observations for non-voting and voting shares is different. Panel B reports the CAARs for stock unifications between 2000 and 2008. The relevant test statistic is the one proposed by Boehmer et al. (1991) (BMP t-statistic). ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

To conclude, two important findings emerge from this section. First, the market responds positively to the regulatory change announced by Deutsche Börse. In the days surrounding the announcement of the change, we observe significantly positive market reactions for our sample firms. We interpret this as a sign that the market perceives that the regulatory change increases the likelihood of firms converting their shares and that in turn this puts firms under pressure to consider unification. Second and in line with previous work, we find significantly positive market reactions around actual stock unifications.

6. Motives for the Unification of Dual-Class Shares

This section develops a set of hypotheses on the motives for the unification of dual-class shares. The new index weighting rules for the German selection indices, which were announced by Deutsche Börse in August 2000 and became effective in June 2002, forced firms and their large

shareholders alike to reassess the benefits from their dual-class structure by weighing them against the foregone index weight associated with having dual-class stock. This leads us to our first hypothesis.

Hypothesis 1 (Weight Penalty): The higher the hypothetical weight penalty upon conversion, the more likely a firm will abolish its dual-class share structure.

As evidenced in Section 5 by the positive announcement effect, the unification of dual-class stock will likely increase firm value. This suggests that shareholders of German firms prefer single-class stock over dual-class stock. However, self-interested, large shareholders of dual-class firms may enforce the status quo at the expense of the minority shareholders in order to safeguard their private benefits of control. The theoretical literature (see e.g., Grossman and Hart 1988) as well as the empirical literature (see e.g., Adams and Ferreira 2008) suggest that the expropriation of minority shareholders is more likely for firms with a large shareholder that holds more voting rights than cash flow rights. The dual-class structure allows the large shareholder to retain a substantial impact on the firm without having to own the equivalent stake in cash-flow rights. The unification of the voting and non-voting shares would then typically cause the large shareholder to experience a substantial loss of voting power. This discussion leads us to the following hypothesis.

Hypothesis 2 (Voting Loss): The larger the loss of voting power suffered by the large shareholder the greater is the loss of private benefits of control and hence the lower is the likelihood of a dual-class unification.

7. Empirical Analysis

To test our hypotheses about firms reassessing the costs and benefits of having more than one class of shares, we run a series of pooled cross-sectional logistic regressions:

$$F(x\beta) = P(y = 1 \,|x) = \frac{\exp(\beta_1 x_1 + \beta_2 x_2 + X\beta)}{1 + \exp(\beta_1 x_1 + \beta_2 x_2 + X\beta)}$$

where y is a binary variable that takes the value 1 if the company unifies its share classes, and 0 otherwise. Our variables of interest are x_1, the "Voting Loss" and x_2, the "Weight Penalty". "Voting Loss" refers to the hypothetical loss of the controlling shareholder's voting power if the non-voting shares were converted into voting shares and "Weight Penalty" is the reduction in index weight that is associated with retaining a dual-class structure. The vector X contains the constant term and further explanatory variables.

We use five different variations or specifications of the above equation. Specification (1) is the base specification as above. In addition, specification (2) includes the interaction between "Voting Loss" and "Weight Penalty". Financial investors, i.e. banks and insurance companies, may have fewer incentives to extract private benefits of control and hence may increase the likelihood of unification (Maury and Pajuste 2011). Therefore, specification (3) also includes the Financial Investor dummy variable (see below for further details). As to the weight penalty, a special case arises when firms are in danger of dropping out of their index. In this case, a conversion might enable the firm to retain its index membership. Further, the heaviest-weighted firms within an index may move up one index by converting their shares. Specifications (4) and (5) thus include two further dummy variables, "Danger" and "Chance", characterizing a firm's relative position in its index. While "Danger" indicates cases where a firm is in danger of dropping from its current index due to its low relative rank, "Chance" indicates situations where a firm is at the high end of the index and thus has a chance to move up to the next highest index. [25]

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[25] The findings must be considered with the caveat that relatively few observations in our sample qualify as being in danger of dropping out of or having the chance to move up an index: 10 firms are in danger of dropping out of their

Moving onto the control variables, Maury and Pajuste (2011) argue that, because dual-class shares typically trade at a discount and thereby increase the cost of raising equity (Dyck and Zingales 2004), a larger need for external capital is an important factor in explaining the decision of firms to abolish their dual-class structure. Firms with more tangible assets may be able to attract more external financing as tangible assets are easier to value, and hence ideal collateral reducing the expected costs of financial distress (Almeida and Campello 2007). Therefore, we add the tangibility of assets to proxy for the fact that firms with a high tangibility are less dependent on the equity market and hence are less likely to unify their shares. We also add firm size to all five specifications, measured as the natural logarithm of total assets. Table 6 presents the regression results.

Table 6: Logit estimates

Variable	(1)	(2)	(3)	(4)	(5)
Vote Loss	-0.005	-0.006	-0.006	-0.006	-0.006
	[-3.95***]	[-4.12***]	[-3.92***]	[-3.80***]	[-3.62***]
Weight Penalty	0.050	0.066	0.069	0.073	0.071
	[2.57***]	[2.99**]	[3.29***]	[3.47***]	[3.32***]
Firm size	-0.025	-0.025	-0.026	-0.029	-0.030
	[-3.09***]	[-3.04***]	[-3.20***]	[-3.42***]	[-3.50***]
Tangibility	-0.201	-0.208	-0.228	-0.210	-0.207
	[-2.31**]	[-2.50**]	[-2.93***]	[-2.60***]	[-2.75***]
Financial Investor			0.057	0.039	0.040
			[1.95*]	[1.11]	[1.12]
Danger				0.100	0.102
				[2.96***]	[3.05***]
Chance					0.034
					[0.30]
Vote Loss*Weight Penalty		-0.006	-0.006	-0.006	-0.006
		[-1.70*]	[-1.75*]	[-1.65*]	[-1.58]
Pseudo R^2	0.1931	0.2009	0.2078	0.2435	0.2448

Notes: Table 6 presents the results on the determinants of the probability to adopt a single-class share structure. We estimate the relationship for firms that are in a selection index. The sample comprises 229 firm-year observations with 54 dual-class firms of which 19 firms decide to unify over the period 2000-2008.

index (this amounts to 7.4% or 17 firm-year observations of the sample) and 4 firms have the chance to move up (this amounts to 2.6% or 6 firm-year observations of the sample).

Firms are excluded from the sample after unification. The regressors are lagged by one period. We report average marginal effects (AME). The interaction effect Vote Loss*Weight Penalty is defined as the change in the predicted probability of unification for a change in both the loss of voting rights and the foregone index weight. The definitions of the variables are provided in Table 1. Z-statistics are based on cluster-robust standard errors and appear in brackets below the slope estimates. ***, ** and * denotes statistical significance at the 1%, 5% and 10% level, respectively.

The findings suggest that the reduction in index weight associated with retaining the dual-class structure is indeed a determinant of the firm's decision to convert its shares. "Weight penalty" is positive and highly significant in all five specifications. This evidence is highly supportive of our main hypothesis, Hypothesis 1.[26]

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[26] It would be desirable to control for firm fixed effects in our framework. Unfortunately, this is not feasible due to several reasons. Simply including firm fixed effects in the estimation equation would lead to inconsistent and biased unconditional maximum likelihood estimates of not only the fixed effects but also of the common parameters (so-called incidental parameter problem). For a fixed number of time periods (T), the estimators of the fixed effects will be inconsistent if the number of firms increases. Due to the fact that the estimators of the common parameters depend on the estimates of the fixed effects, the inconsistency directly translates into the estimates of the common parameters. Furthermore, e.g., Greene (2004) documents substantial biases in the parameter estimates if the number of time periods is small. For T=2, analytical evidence shows that the bias amounts to 100 percent. The size of the bias decreases by increasing the number of time periods, but still amounts to roughly 20 percent for T=8 in Greene's simulations. As pointed out by Dittmann and Ulbricht (2008), an extension of the periods of study would not solve the problem as firms will drop out of the sample after unification. Alternatively, conditioning out firm fixed effects by using a conditional logit approach would also cause severe problems as firms without variation in the dependent variable are excluded. This would lead to a significantly reduced number of observations. Another potential way forward would be to employ the Mundlak (1978) and Chamberlain (1980) device. This would involve modeling individual heterogeneity by means of the time-varying independent variables which would be included as additional variables on the right hand side of each equation. Given the relatively small number of conversions, we refrain from using this approach, as it

Further, the loss of voting power incurred by the ultimate controlling shareholder has a significantly negative impact on the likelihood to convert. The effect is significant at the 1% level in all five specifications, providing strong support for Hypothesis 2. This suggests that the large shareholder is less likely to agree to convert his firm's non-voting shares if he has more private benefits to lose.

Further, the effect of asset tangibility is significant, at the 5% level or better, suggesting that less equity dependence decreases the likelihood of the firm converting its non-voting stock. Hence, similar to prior studies (see Maury and Pajuste 2011 and Dittmann and Ulbricht 2008), we find that the large shareholder's desire to safeguard his private benefits of control and equity dependence in terms of financing are important explanatory variables of the decision to convert. In addition, we document that firms with large financial investors are more likely to unify their shares (significant at the 10% level in specification (3)).[27] This finding is in line with Maury and Pajuste (2011). "Danger" is significant at the 1% level, indicating that a conversion is a measure of last resort to safeguard index membership for firms in danger of dropping out. On the contrary, we find no evidence that the chance to move up one index has a significant impact on the likelihood of conversion. These results are in line with anecdotal evidence, which suggests that a drop in the relative position within the index as well as the exclusion from the index are major concerns for companies whereas moving up one index is not a matter for consideration.

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would lead to an increased number of parameters which would have to be estimated. As there is relatively little variation in some of the independent variables, this approach might cause additional problems.

[27] In unreported regressions, we also test for the impact of institutional investors (such as hedge funds, private equity funds etc.) but do not find a significant impact on the probability to unify. In addition, we test for the effect of belonging to a more prestigious selection index but we fail to find evidence of such an effect.

So far, our analysis has shown that the foregone gain in index weight has a positive impact on the likelihood of a conversion whereas the voting loss for the large shareholder has a negative impact on that likelihood. We now turn our attention to the trade-off the large shareholder faces between the main benefit from converting the non-voting shares, i.e. maintaining the firm's position within the index, and keeping voting power.

Our specifications (2) to (5) include the interaction between "Vote Loss" and "Weight Penalty". Further details are provided in the Appendix. The interaction effect is negative and significant at the 10% level in three of the four specifications that include the term, i.e. specifications (2), (3) and (4). Taking into account the small sample size, a significance at the level of 10% seems to be relatively high.[28]

We illustrate the trade-off between converting the non-voting shares to maintain or strengthen the index weight and keeping voting power by using a plot of predicted conditional probabilities of conversion for different levels of voting loss. We distinguish between high, intermediate and low levels of weight penalty (see Figure 1). High levels of weight penalty are defined as those in the 75% percentile, intermediate ones as those in the 50% percentile and low ones as those in the 25% percentile. The difference between the probabilities of conversion for firms with a high weight penalty and those with a low weight penalty is positive, i.e., the marginal effect of the weight penalty is positive. However, this difference decreases as the vote loss increases, reflecting the negative interaction effect. Hence, the impact of the weight penalty on the probability of conversion becomes smaller as the loss of voting rights becomes greater.

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[28] Additionally, McClelland and Judd (1993), among others, point out that interactions tend to be difficult to find in non-experimental data and that the power to detect these effects is usually lower than detecting main effects. This leads us to accept a significance level of 10%.

Figure 1 – Conditional predicted probabilities of conversion based on different hypothetical weight penalties
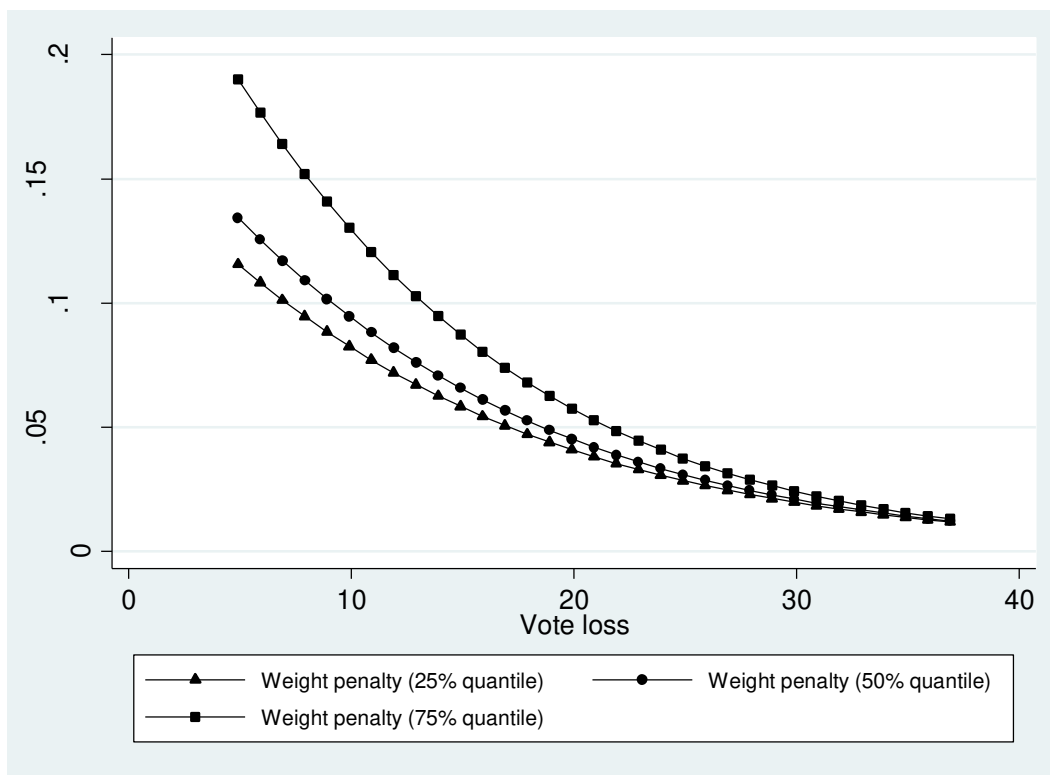
Notes: This figure depicts the decrease in the probability of conversion, based on different hypothetical weight penalties (75% quantile, 50% quantile and 25% quantile), brought about by different levels of vote loss (x-axis).

Figure 1 suggests that the larger the voting loss of the controlling shareholder the greater are his private benefits of control and the less he is concerned about the costs from the reduction in the firm's index weight. In contrast, controlling shareholders who experience only a small loss of voting power are more likely to convert than to forfeit index weight.

Another way of interpreting the differences between the curves is that they represent the large shareholder's sensitivity towards loss of index weight: Figure 1 then indicates that this sensitivity decreases with increasing voting loss. Put differently, if the large shareholder loses a substantial fraction of the votes (bottom right corner of the graph), he does not care much about the index weight gain from conversion. Conversion is just too costly in terms of the private benefits that are foregone. Bearing in mind the difference in slopes between the three curves, for firms whose index

weight penalty is more pronounced the probability of conversion decreases faster with increases in the percentage of voting loss by the large shareholder compared to firms with a comparatively small weight penalty. This pattern is in line with what one expects in the presence of a trade-off faced by the large shareholder between diluting voting power and tolerating a reduction in index weight.

Figure 2 complements Figure 1. Whereas Figure 1 depicts the probability of conversion relative to different levels of vote loss (x-axis), Figure 2 shows the probability of conversion relative to different levels of weight penalty. The three curves in Figure 2 refer to the 25% quantile, the 50% quantile and the 75% quantile, respectively.

The difference between the probabilities of conversion for firms with a low and high vote loss is negative, i.e., the marginal effect of vote loss is negative. Contrary to Figure 1 the curve representing the 75% quantile (of the vote loss) is now the lowest, rather than the highest, of all three curves. The difference between the curves further increases if we increase the weight penalty. This is the case because the probability of conversion increases faster for firms with a small vote loss as the weight penalty increases compared to firms with a high vote loss, i.e., each increase in the index weight penalty has less of an impact the higher the vote loss that accompanies the weight penalty. Put differently, the percentage of votes that are lost by converting does not make a difference if the foregone index weight caused by the status quo is small – the controlling shareholder is then extremely reluctant to unify. However, if the foregone index weight is large, the large shareholder's decision to convert will depend strongly on how many votes are lost in case of conversion.

Figure 2 – Conditional predicted probabilities of conversion based on different levels of vote loss
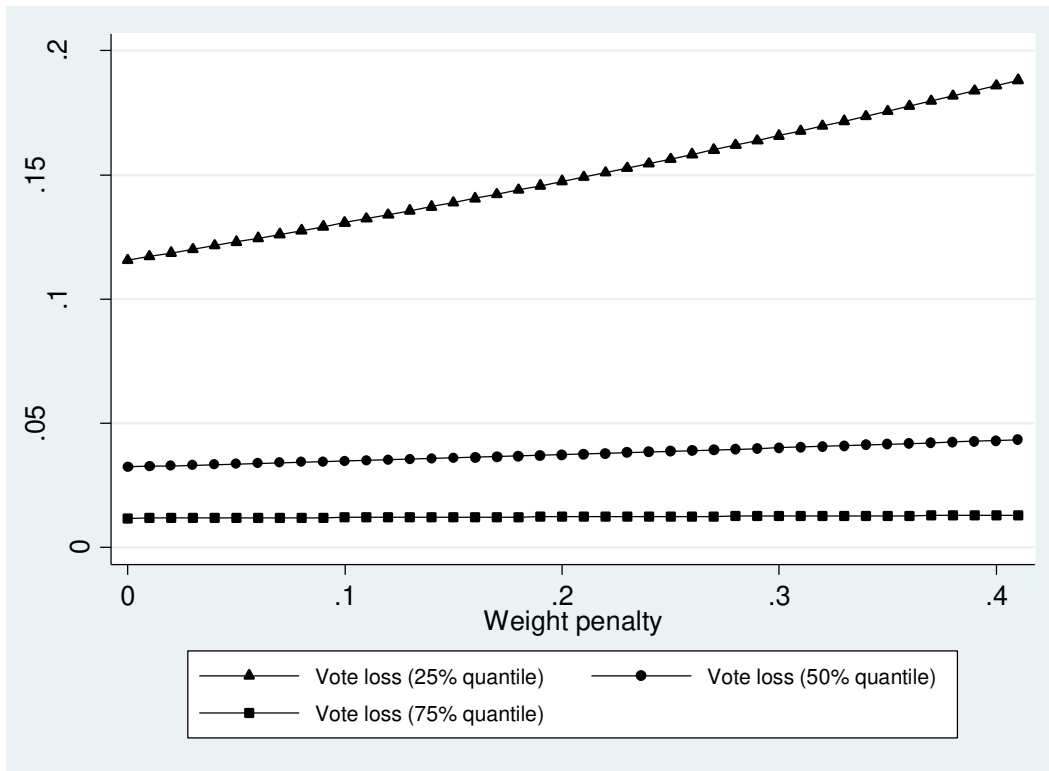
Notes: This figure depicts the decrease in the probability of conversion, based on different levels of vote loss (75% quantile, 50% quantile and 25% quantile), brought about by different levels of weight penalty (x-axis).

In summary, we document that the index weight significantly affects the controlling shareholder's motivation to unify the non-voting and voting stock. However, this motivation also depends on the level of vote loss the controlling shareholder would experience if he agreed to a stock unification.

8. Conclusion

During summer 2000, Deutsche Börse changed the rules on how firms are selected for membership of its selection indices. First, only the most liquid or largest share class now forms the basis for selection into an index. Second, only the free float of that class is taken into account when

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determining index membership. As a consequence of the new rules firms with dual-class stock faced the danger of losing large amounts of index weight. Within this context, this study examines the probability of dual-class stock unifications. There is evidence that firms were under pressure to unify their dual-class stock. Indeed, both the announcements of actual unifications as well as the announcement of the new rules generated significant positive abnormal returns.

We find that both the desire to safeguard or strengthen index weight and the danger of losing index membership have a significant impact on the probability of a dual-class stock unification. Similar to studies on dual-class stock unifications before the change in rules, we observe that firms are less likely to abolish their dual-class shares if they are less reliant on equity financing. We also find that the existence of private benefits of control makes it less likely for firms to unify their shares.

More importantly, our findings suggest that the large shareholder faces a trade-off between safeguarding the existing private benefits of control and the costs associated with an index weight loss when deciding on a conversion. The greater the private benefits, the less likely there will be a conversion. In other words, forfeiting index weight may be the lesser of two evils if the alternative is losing voting power.

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Appendix

The interaction between "Vote Loss" and "Weight Penalty" is equal to:

$$F(x\beta) = P(y = 1 \mid x) = \frac{\exp(\beta_1 x_1 + \beta_2 x_2 + \beta_{12} x_1 x_2 + X\beta)}{1 + \exp(\beta_1 x_1 + \beta_2 x_2 + \beta_{12} x_1 x_2 + X\beta)}$$

The inclusion of this interaction allows us to explore whether the effect of the weight penalty varies in line with the vote loss (and vice versa). Since the interaction effect in non-linear models cannot be easily evaluated on the basis of the sign, magnitude, or statistical significance of the coefficient on the interaction term, we take the cross-partial derivative of the expected probability of conversion (Norton et al., 2004):

$$\frac{\partial P(y = 1 \mid x)}{\partial x_1 \, \partial x_2} = \beta_{12} \left(F(x\beta) * \left(1 - F(x\beta)\right)\right)$$

$$+ (\beta_1 + \beta_{12} x_2)(\beta_2 + \beta_{12} x_1)(F(x\beta)(1 - F(x\beta))(1 - 2F(x\beta)))$$

The statistical significance is also based on the entire cross derivative.