Index Membership vs. Loss of Control: 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 in the light of the costs from dropping out of their index. Our findings suggest that index membership significantly affects the controlling shareholder's motivation to unify preferred and common stock.

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I. Introduction

This paper links the literature on dual-class stock unifications with that on index inclusions and deletions. It does so by studying the factors that push German firms to unify their dual-class shares around a major change in the selection rules of Deutsche Börse. This change forced firms to reassess the benefits from having more than one class of shares. To date, the literature on the factors influencing the decision to issue dual-class shares and the factors influencing the decision to abolish them once they have been issued is relatively sparse (Adams and Ferreira (2008)). Although the consensus tends to be that the former decision is driven by the controlling shareholder's desire to retain control while diversifying 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 (2007); Hauser and Lauterbach (2004); Lauterbach and Pajuste (2011)) suggest that improving access to outside equity 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 the way German firms are selected for membership of the various stock market indices. This reform allows us to investigate in great detail the decision of firms to abolish dual-class shares. In August 2000, Deutsche Börse announced new index weighting rules for the major German stock indices. Under the original 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 of the change in regulation, firms included in a selection index with more than one class of shares outstanding faced the danger of losing their current index position or worse even dropping out of the index altogether. For example, DAX index member SAP was set to lose massively as a result of the regulatory change. 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 been reduced by almost 40% from 9.51% to 5.64%. The weight of Fresenius Medical Care, also a member of the DAX, would have dropped from 0.82% to 0.51%, leaving the firm in a precarious position as to keeping its index membership. More generally, companies whose equity was split fairly equally between the two classes of shares, i.e. the class of the non-voting shares and that of the voting shares, and with little free float were adversely affected by the change. Conversely, those with their equity in the form of mainly one class of shares and a large free float ranked among the winners in the index shake-up.

However, why should firms care about index membership? As the mere gain or loss of membership does not provide any additional information on the firm's fundamental value, any such occurrence should therefore be valuation neutral. However, a series of studies (see e.g. Denis et al. (2003), and Hrazdil and Scott (2009)) document that index inclusions and deletions cause positive and negative abnormal returns, respectively.[4] For the case of the S&P 500, Jain (1987) argues that index inclusions and exclusions are not valuation neutral as they convey new information on the firm's prospects. He finds that inclusions generate positive abnormal returns whereas exclusions generate negative abnormal returns. One important reason for these market

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

reactions is changes in the demand for the concerned stock by investors, in particular index fund managers (see e.g. Barberis et al. (2005), and Claessens and Yafeh, (2011)). Several other reasons, all of which have empirical support, have been advanced to explain these market reactions, including investor awareness (Merton (1987)), a lack of perfect substitutes (Shleifer (1986)), 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 effective from 2002 forced large shareholders of firms with dual-class shares to reassess the benefits from index membership and to weigh them against the foregone control caused by the unification of the dual class structure. Anecdotal evidence suggests that some firms conducted this reassessment well in advance of the actual implementation of the new rules. For example, SAP – even though one year prior to the announcement of the new rules in August 2000 it denied considering the unification of its dual-class shares – converted its preferred stock into common 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] Further evidence from Italy suggests that securing index membership is indeed an important motivation for the unification of dual-class shares. Indeed, Bigelli et al. (2011) cite this reason as one of the reasons stated by Italian firms conducting dual-class stock unifications from 1974 to 2008.

[5] During summer 2000, the CEO (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 7th, 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").

The paper's main contribution is to link the literature on dual-class stock unifications with that on index inclusions and deletions. In other words, the paper studies how the trade-off faced by the large, controlling shareholder between the benefits from a dual-class stock unification and the costs from losing control is influenced by the potential loss of index membership. More specifically, is the large shareholder's decision as to whether to convert or not influenced by the danger of dropping out of its index? In order to answer this question, we estimate the probability of conversion – conditional on the firm being in danger of dropping out of its index – for various levels of voting rights held by the controlling shareholder. Our results suggest that the large shareholder is less likely to react to the potential loss of index membership the higher his voting power. This suggests that beyond a certain threshold the private benefits of control foregone by the large shareholder exceed his share of the benefits from unifying the dual-class stock and avoiding the loss of index membership. Similar to the wealth effects accruing to the holders of the non-voting stock that have been documented for the case of regular German stock unifications (see e.g. Dittmann and Ulbricht (2007)), we observe such wealth effects at the announcement of the regulatory change. Finally, while the danger of dropping out of the index is an important reason for conversion, the opportunity to move up an index does not seem to motivate unifications.

The paper that is most closely related to ours is Dittmann and Ulbricht (2007). They 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, our study focuses on an exogenous shock which forced firms' controlling shareholders to reconsider the benefits from maintaining their dual-class shares in the light of the potential costs caused by a drop from their index. Our study also differs from other recent studies on dual-class unifications. These include two studies on the value of the superior voting rights. Both studies are on countries that have higher private

benefits of control as proxied by the price of a voting right (see Dyck and Zingales (2004)). One of these studies is Hauser and Lauterbach (2004) who analyse 84 Israeli unifications. They find that the compensation paid to the large shareholder for the loss of the superior voting rights depends on four factors. First, the compensation increases in line with the percentage of votes held by the large shareholder. Second, its size decreases if some of the firm's shares are held by institutional shareholders, suggesting that the latter pursue public interest. Third, the price of the votes is higher for family-controlled firms. Finally, 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. Potential reasons for this include the increase in the period during which the large shareholder keeps control and the increase in the present value of the private benefits of control. The second study is Bigelli et al. (2011). They study 47 dual-class unifications conducted by 42 Italian firms between 1974 and 2008. They observe a positive market reaction to the unification for the non-voting shares, but a negative one for the voting shares. They find that the negative price reaction for the voting shares is mainly driven by a sub-sample of firms whose controlling shareholder purchased non-voting shares just before the unification, therefore benefiting from the increase in the price of the non-voting shares without the need for compensation. The lack of compensation then hurts the other voting shareholders and hence the negative price reaction. In contrast to Israel and Italy where voting shares trade at a premium of 27% and 37%, respectively, for Germany the price difference between voting stock and non-voting stock is only 10%. Further, we also do not observe a negative price reaction of the voting shares at the announcement of the unification. Finally, our study also differs from Lauterbach and Pajuste (2011). They 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 subject to intense media pressure. For the case of our study, the pressure on the dual-class firms to convert is of a different type and consists of the potential loss of index membership.

The rest of the paper is structured as follows. The next section reviews the relevant literature on dual-class stock unifications. This is followed by a discussion of the institutional background before as well as after the regulatory change. 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, develops several testable hypotheses and discusses the relevant econometric issues. The results from the estimation of the probability of conversion and the impact of the perceived probability of conversion on the market reaction at the announcement of the regulatory change are discussed in Section 7. Section 8 concludes.

II. Literature Review

In their recent survey of empirical studies on disproportional ownership, Adams and Ferreira (2008, p. 62) conclude that only "few papers directly tackle the issue of the determinants of dual-class structures ... Consequently, we still know very little about this issue". Papers that study 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 those firms

want to maintain their access to financing via the stock market. Amoako-Adu and Smith (2001) examine the determinants of dual-class stock structures for Canadian initial public offerings (IPOs). Their main finding is 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) study a large sample of American dual-class firms. Controlling for reverse causality they find that firms with higher potential private benefits of control are more likely to have a dual-class structure.

There are even fewer papers that study the determinants of 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 (2007)) find significant wealth effects. Dittmann and Ulbricht (2007) analyse 89 German firms with dual-class shares between 1990 and 2001 of which 31 convert their non-voting shares into voting shares. They do not only document that dual-class stock unifications generate significantly positive shareholder wealth effects, but they also show that the percentage of voting shares held by the largest shareholder as well as the hypothetical loss of the controlling shareholder's voting power after the conversion reduces the likelihood of unifying shares. They also find that firms are more likely to unify their stock if they have not paid dividends on the non-voting shares for at least two consecutive years.

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 (2007) results as they show that both the fraction of voting shares of the largest shareholder and the wedge between his control and ownership rights reduce the likelihood of a stock unification. They find that their proxies for financing

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

needs, such as the market-to-book ratio and proceeds from new equity issues, also have a positive impact on the probability of abolishing the non-voting shares.

Our study extends this literature in a major way by analysing the decision to unify dual class shares in the situation where the firm is in danger of dropping out of its index, forcing the controlling shareholder to reassess the benefits of staying in control versus the costs caused by the loss of index membership. The situation considered by our study is the 2002 changes to the listing rules of Deutsche Börse.

III. Institutional Background

This section reviews the characteristics of German 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. In contrast to voting shares which confer one vote each, these shares do not confer voting rights to their holders. 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 any dividend can be paid to the holders of the voting shares. If the remaining profits are sufficient, the dividend amount accruing to the holders of the non-voting shares is then increased by the amount of the dividend paid to the voting shareholders. If the firm cannot afford the guaranteed dividend

[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).

amount, the latter is cumulative and carried over to the next year. If it has been carried over twice, then the non-voting shares receive temporary voting rights until the firm has repaid 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 firms. Companies that wish to be included in one of the selection indices, i.e. DAX, MDAX, SDAX and TecDAX,[8] must fulfil certain criteria. Two of the criteria for inclusion are that the shares trade on the Prime Standard segment[9] of the Frankfurt Stock Exchange and that they are continuously traded on Xetra, an electronic trading platform. For all those firms that are either 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 reviews the definition and composition of each selection index.

[8] 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.

[9] This criterion came into effect on January 1st, 2003. Companies which are part of the Prime Standard segment have to fulfil the highest transparency requirements in the EU. They have to publish company reportson 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 also publish their ad-hoc disclosures in both German and English.

(Insert Table 1 about here)

In August 2000, the executive board of Deutsche Börse announced changes to the selection criteria for all its selection indices. The changes 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.[10] Since the change, *only* the free-float of the more highly capitalized or more 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 abolishing a dual-class share structure. First, the non-voting shares may be converted into ordinary voting shares by amending the firm's articles of association. This change requires a special resolution to be passed by the holders of the non-voting shares at the shareholders' meeting. Second, the company may repurchase the non-voting shares and then subsequently replace them by issuing new voting shares. In this case, the approval of the holders of the non-voting equity is not required. Hence, it is perfectly possible for the controlling shareholder to take the decision of unifying the dual-class structure without consulting the holders of the non-voting shares.

[10] The liquidity of a stock is based on its turnover on the exchange.

IV. Dataset and Descriptive Statistics

We start with all the 91 German companies with a dual-class share structure that are listed on Deutsche Börse's CDAX segment[11] 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.

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 share structure during the period of study. Our sample size is comparable to that in Dittmann and Ulbricht (2007): 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 aforementioned change in index weighting rules was introduced in June 2002. However, the intention to change the rules had already been the subject of speculation before that date while the change was officially announced in August 2000. Well aware of the impending change, many firms may have chosen to convert prior to the actual implementation of the new selection rules. Hence, we simulate the decision problem the firm and its controlling shareholder was facing by recalculating index weightings prior to the implementation of the change, but based on the new

[11] 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.

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 hypothetical weighting of the firm in its current index under the new rules. These calculations illustrate the firm's situation had the new rules already been implemented and they enable us to determine whether the firm would have been in danger of dropping out of its index.[12]

For each month 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% (or 10% or 15%) 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% (or 90% or 85%) quantile, we consider the firm to have 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.[13] 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 allows for control to be 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

[12] In contrast, the weightings used in the paper subsequent to the change in rules are the actual weightings provided by Deutsche Börse.

[13] For the few cases where the information on the numbers of preference and ordinary shares outstanding is not clear, we contact the firm's investor relations department.

all other cases, the ultimate controlling shareholder is said to be at a higher tier and this tier is reached once the tier above does not include any controlling shareholder or the controlling shareholder at that tier is a bank, insurance company, the German state, a foreign investor, or a family/individual. All remaining data are collected from Thomson Financial. 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. Table 2 reports the definitions of all the variables used in this paper.

(Insert Table 2 about here)

Panel A of Table 3 reports the percentage of firm-year observations where the largest shareholder's stake exceeds a given threshold of the votes (25% and 50%, respectively). Panel B reports the summary statistics for the voting rights and cash flow rights of the largest shareholder as well as the total assets and the market-to-book ratio. The figures in Panel A and Panel B are given for all of the firm-year observations as well as the subsample of firm-year observations relating to firms that are part of one of the selection indices. Panel A suggests that control, as measured by the voting rights of the (ultimate) controlling shareholder, is highly concentrated: for 91.8% of all the firm-year observations control exceeds 25% of the votes and for 79.5% control exceeds 50% of the votes. The equivalent figures for the subsample of firms that are part of one of the selection indices are slightly lower with 87.9% and 71.4%. Existing studies also document a high concentration of control in listed German companies. For example, Becht and Böhmer (1999) 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 the concentration of voting rights is even greater in our sample. On average, the largest shareholder owns roughly 72% of the votes and only 50% of the cash flow rights. As above, the equivalent figures for the subsample of firms that are part of one of the selection indices are lower with 64% and 41%. Hence, compared to the voting rights they hold, the largest shareholders own a relatively small percentage of cash flow rights. Before we discuss the reasons that may lead firms to unify their shares, we explore the stock market reaction to the change in rules.

(Insert Table 3 about here)

V. Event Study

The aim of this section is to explore the wealth effects associated with the regulatory change announced by Deutsche Börse. We do so by running two distinct event studies. The first event study focuses on the announcement of the regulatory change. We hypothesize that the announcement of the new rules exerted pressure on dual-class firms to unify their shares. Consequently, we expect a market reaction surrounding the announcement of the new rules. The second event study focuses on the announcements of actual dual-class stock unifications: we show that investors attribute value to these unifications.

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 days prior to the announcement whereas 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 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 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), corporate websites and newspapers articles.

For the event study on the regulatory changes (Panel A of Table 4), we use the modified version of Boehmer et al.'s (1991) test statistic proposed by Kolari and Pynnönen (2010) to assess the significance of the announcement returns. This test specifically addresses 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 among abnormal returns in the estimation window. For the event study on the actual conversions (Panel B of Table 4), 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 4 presents the cumulative abnormal returns (CARs) 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 CARs 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 included in the

index.[14] There is no market reaction on the event day as evidenced by the insignificant CAR 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 CAR increases to 4.15% and becomes significant at the 10% level. When the event window is further extended to cover the 20 days following the announcement day, the CAR 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 CAR 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.

Panel B of Table 4 reports the announcement returns around the actual conversion announcements. Previous work on Germany by Dittmann and Ulbricht (2007) documents sizeable wealth effects generated by the conversion of non-voting shares. This study justifies the observed increases in shareholder value by the improved corporate governance and enhanced liquidity of the stock. There is a significantly positive announcement return for the non-voting shares ranging from 4.7% on the announcement date to 8.6% over the [-20, 0] window. Afterwards, i.e. for the [0, 20] window, abnormal returns are in the region of about 7-8%. In contrast, we do not observe significant abnormal returns for the voting shares whatever the event window. This suggests that the wealth effects of stock unifications accrue exclusively to the holders of the non-voting shares. Our results are in line with those of Dittmann and Ulbricht (2007) who also find significant abnormal returns for the non-voting shares, but none for the voting shares.

[14] We lose three observations. One firm was founded in 2000 only 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. We decided to exclude these firms due to the possible confounding events.

(Insert Table 4 about here)

To conclude, two findings emerge from this section. First, the market responds positively to the regulatory changes announced by Deutsche Börse. In the days surrounding the announcement of the changes, 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. Second, in line with previous work we find significant positive market reactions around actual stock unifications. Third, similar to Dittmann and Ulbricht (2007), we only find significant abnormal returns for the non-voting shares, but not for the voting shares.

VI. Motives for the Unification of Dual-Class Shares and Methodology

This section first develops a set of hypotheses on the motives for the unification of dual-class shares. It then proceeds by raising a series of econometric issues and proposes a methodology to test the hypotheses.

A. Hypotheses to be tested

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 and to weigh them against the costs from dropping by one index or the foregone benefits from moving up one index. This discussion leads to our first and main hypothesis.

Hypothesis 1 (Danger): Firms that are in danger of dropping out of their index are more likely to abolish their dual-class share structure.

As afore-mentioned, the empirical evidence on Germany suggests that the unification of dual-class stock increases firm value as evidenced by the positive announcement effect. This evidence suggests that shareholders of German firms prefer single-class stock structures over dual-class structures. 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. Zwiebel (1995) argues that the private benefits of control of the large shareholder increase with the size of his stake. In addition, both the theoretical and empirical literature (see e.g. Grossman and Hart (1988) and 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. This discussion leads us to the following two hypotheses.

Hypothesis 2 (Voting Rights): The larger the percentage of voting rights owned by the large shareholder the greater are the private benefits of control and hence the lower is the likelihood of a dual-class unification.

Hypothesis 3 (Severity of the Deviation from the One-share One-vote Principle): If the large shareholder has more voting rights than cash flow rights, the firm is less likely to abolish its dual-class structure.

Dyck and Zingales (2004) as well as the afore-mentioned studies on dual-class stock unifications suggest that firms with dual-class shares trade at a discount. As greater growth opportunities increase the need for external funding, the valuation of the equity and the cost of capital become a key issue. Hence, the large shareholder may agree to the unification of the dual-class shares if the increase in the value of his stake obtained from investing in the growth opportunities exceeds the private benefits of control he will have to forego. Therefore, we hypothesize as follows.

Hypothesis 4 (Growth Opportunities): Firms with good growth opportunities are more likely to convert their non-voting stock into voting stock.

Finally, whereas Hypothesis 1 focuses on how the danger of dropping out of the index may positively influence the probability of a dual-class stock unification the chance of moving up one index may similarly increase the likelihood of a unification.

Hypothesis 5 (Chance): Firms that have the chance to move up one index are more likely to abolish their dual-class share structure.

B. Econometric Issues

Our analysis consists of modelling two sequential and related events. The first event is the firm getting into the danger zone of dropping out of its index due to among other things the change in the selection rules for the indices of Deutsche Börse. The second event is the firm adopting a single-class share structure. The probability of a dual-class unification in turn is likely to be influenced by the danger of dropping out of the index (see also Hypothesis 1).Hence, the methodology which we adopt consists of a recursive bivariate probit (RBP) model which can be considered as a special case of the simple bivariate probit. Similar to the simple bivariate probit, it jointly handles two distinct binary responses allowing for the error terms of both equations to be correlated due to unobservable factors. These unobservable factors might have an impact on both the probability of dropping out of the index, "danger", and the probability of a stock unification, "conversion", thereby creating a link between the two probabilities. In addition to the simple bivariate probit, the RBP model allows for one of the two dependent variables to be among the explanatory variables for the other equation (see Maddala (1983), and Greene (1998), (2008)). This recursive structure accommodates for the sequential order of the two events and

assumes that being in "danger" has an influence on the probability of "conversion" during the coming year.

Alternative methodologies, such as duration models and binomial logits or probits, spring to mind. However, neither can accommodate for the type of decision we study. Indeed, we study how changes to the selection criteria of the German selection indices may put firms with dual-class shares in danger of dropping out of their index and how these firms react to this danger. Neither a duration model nor a binomial logit or probit can adjust for the interrelatedness of these two events.

Our model consists of two latent variable equations. The first equation models the probability of being in "danger", i.e. the probability of dropping out of the index:

$$danger^* = x_1'\beta_1 + \varepsilon_1 \qquad (1);$$

where danger = 1 if danger* > 0, and 0 otherwise. "Danger" is measured by the 5%, 10% and 15% quantile, respectively. In other words, we proxy the danger for the firm of dropping out of the index by how low it currently ranks in its index. Vector x_1 contains the company's relative performance, i.e. its return relative to the index it belongs to, as well as its systematic risk. The firm's performance relative to its index measures how the firm's stock return moves relative to the other member firms of the index. If there is a lot of movement in the firm's stock price, but less movement in the level of the index this is likely to have consequences for the firm's position within the index. Systematic risk adjusts for the volatility of the firm's stock return and reflects how the firm's stock return moves relative to the market.

The second equation explains the firm's decision of conversion in a given year, i.e. "conversion", via a set of firm characteristics (x_2) as well as the "danger" dummy variable from the first equation, all measured in the previous year:

$$\text{conversion}^* = x_2'\beta_2 + \gamma\ \text{danger} + \varepsilon_2 \qquad (2);$$

where conversion = 1 if conversion* > 0, 0 otherwise. x_2 is the vector which includes the percentage of voting rights of the largest shareholder, the market-to-book ratio (the proxy for growth opportunities), the logarithm of total assets (a measure of firm size) and the dummy variable indicating whether there is a deviation of the cash flow rights from the voting rights of the largest shareholder.

VII. Empirical Analysis

We estimate two distinct variants of the recursive bivariate probit. The first one is based on the full sample of firms, irrespective of whether or not they are in a selection index. This allows us to work with a larger sample and is likely to enhance the precision of our estimates. However, by definition, only the subsample of firms included in a selection index can be in danger of dropping out of the index as these are the firms that are affected by the change in rules. Thus, we add a dummy variable to the danger equation to distinguish between those firms that are not part of a selection index and those that are, thereby filtering out the noise induced by including these companies. The second variant is based on the subsample of firms that are included in a selection index. Table 5 presents the results based on the full sample whereas Table 6 presents the results for the subsample of firms that are part of a selection index. As the results are virtually the same across the two variants, we discuss the two sets of results jointly.[15]

Specifications (1), (2) and (3) in both tables differ as to the way we measure the danger of dropping out of the index: the 5%, 10% and 15% quantile, respectively. Rho, i.e. the measure of the correlation between the disturbances from the two equations, is statistically significant in all

[15] Due to the limited number of observations, we do not include year dummies in the specifications in Tables 5and 6.

specifications in Table 5 and in Specifications (1) and (2) in Table 6. While under the null hypothesis the disturbances are not correlated and the two equations can be estimated separately, the Wald test calls for the rejection of the null. This suggests that our methodology is appropriate and that it is crucial to adjust for the fact that the probabilities of the two events are related. Further, the results from the first equation suggest that firms are more likely to drop out of their index if their shares have been performing badly relative to their index. The variable "relative performance" is negative and highly significant in all models as the change in (relative) performance is likely to be a key factor in the index reshufflings. Finally, the firm's systematic risk is positively associated with the likelihood of being in danger of dropping out of its index.

The second equation of our RBP model shows that the risk of dropping out of the index is indeed a determinant of the firm's decision to convert its shares. The coefficient on the "danger" dummy is positive and highly significant in all, but one specification. The fact that the coefficient is insignificant in Specification (3) of Table 6 may be due to the fact that the risk of dropping out of the index is perceived to be marginal and not substantial enough to call for a stock unification if the firm is in the 15% quantile compared to the 10% and 5% quantile. All in all, the evidence is highly supportive of our main hypothesis, Hypothesis 1.[16]

[16]It would be desirable to control for firm fixed effects in our framework. Unfortunately, this is not feasible due to several reasons. Just as in the case of the single equation model, to the best of our knowledge there exists as yet no fixed effects bivariate probit model. Simply including firm fixed effects in the estimation equation would cause the incidental parameter problem and therefore lead to biased estimation results. As Dittmann and Ulbricht (2007) point out, the nature of the data does not allow to consistently estimate firm fixed effects. An extension of the period of study is not a way forward as this would not sufficiently increase the number of time periods available for estimation as firms drop out of the sample after unification. Therefore, we cannot estimate a bivariate probit model in which individual heterogeneity and the explanatory variables have an unspecified correlation structure. An intuitive way forward would be to employ the Mundlak (1978) and Chamberlain (1980) device. This would involve modeling

Further, the voting rights held by the ultimate controlling shareholder have a significantly negative impact on the likelihood to convert. The coefficient is significant at the 1% level in all specifications, except for Specification (3) of Table 6 where it is significant at the 5% level only. This provides strong support for Hypothesis 2. Moreover, the coefficient on the dummy variable *Wedge* is negative and significant at the 1% level in all specifications. This suggests that the large shareholder is more likely to agree to convert his firm's non-voting shares if he has fewer private benefits to lose. This result provides support for Hypothesis 3.

There is also strong support for Hypothesis 4 as the coefficient on the proxy for growth opportunities is significant at the 1% level, suggesting that growth opportunities increase the likelihood of the firm converting its non-voting stock. While this study focuses on conversions following a major change in the rules underlying the selection indices, our results suggest that, similar to conversions predating the change (see Maury and Pajuste (2011) and Dittmann and Ulbricht (2007)), the power of the large shareholder and the firm's growth opportunities are important explanatory variables of the decision to convert.

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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 would lead to an increased number of parameters which would have to be estimated. The fact that there is relatively little variation in some of the independent variables might lead to additional problems with this approach. Alternatively, one might use a single equation conditional fixed effects logit estimator. However, the single equation estimation results are not directly comparable to those of our recursive bivariate probit estimation. In a conditional fixed effects logit, firms without variation in the dependent variable are excluded, i.e. we would base our estimation solely on those firms which decide to unify their shares. Thus a conditional fixed effects logit might not serve as an adequate robustness check.

(Insert Tables 5 and 6 about here)

The estimation procedure in Tables 5 and 6 explicitly ignores the possibility that firms do not just convert their non-voting shares in order to avoid dropping out of their current index, but that they may also do so to move up one index. Hence in addition to the above bivariate RBP model, we also estimate a trivariate RBP model that includes a third equation to account for this possibility, captured by the dummy variable "chance" which is set to one if the firm is in the 95%, 90% and 85% quantile, respectively.

The results from this estimation for the full sample and the subsample of firms that are part of one of the selection indices are reported in Table 7 and Table 8, respectively. Similar to the danger-equation of Table 5, the chance-equation of Table 7 contains a dummy, which is set to one for those companies that cannot move up further as they are already included in the EuroStoxx50. Although this study focuses on the German market, we want to allow for the possibility that companies included in the DAX, i.e. the German selection index including the largest firms, convert their shares in order to join the EuroStoxx50, a selection index covering 18 European countries with weights based on the firms' market value of their free float. Conversely, firms already included in both the DAX and EuroStoxx50 have no chance to move up further. There is strong evidence, at the 5% level or better, that the danger of dropping out of the index increases the likelihood of conversion, confirming the results from Tables 5 and 6. However, the possibility of moving up one index does not have any significant impact on the likelihood of conversion. This result is 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 to companies whereas there is no anecdotal evidence suggesting that moving up one index is deemed to be of importance. Hence, this calls for the rejection of Hypothesis 5.

(Insert Tables 7 and 8 about here)

As a robustness check, we re-estimate the probability of conversion (equation (2)) using a regular probit rather than a RBP model. The results, which are not tabulated here but are available upon request, confirm our previous results.

So far, our analysis has shown that the danger of dropping out of the index has a positive impact on the likelihood of a conversion whereas the percentage of voting rights held by the large shareholder has a negative impact on the likelihood. We now turn our attention to the the trade-off the large shareholder faces between the main benefit from converting the non-voting shares, i.e. maintaining index membership, and keeping control. In order to study this trade-off in more detail, we determine for each firm-year observation the predicted probability of conversion conditional on whether the firm is a drop-out candidate in that year (Prob(conversion=1|x_1, x_2, danger=1)) or not (Prob(conversion=1|x_1, x_2, danger=0)). As the de facto probability of being in danger is 0 for all firms that are not part of a selection index, we restrict ourselves to the subsample of firms that are part of a selection index in what follows. Figures 1, 2 and 3 plot these predicted conditional probabilities of conversion for different levels of control held by the large shareholder and distinguish between whether the company is in danger of dropping out of its index and whether it is not.

(Insert Figures 1, 2 and 3 about here)

The vertical distance between the two curves in each figure is the impact on the probability of conversion of switching from the situation where the firm is in danger to that where it is not in danger. For example, Figure 1 suggests that companies in danger of dropping out of the index

(based on the 5% quantile) with a large shareholder holding 40% of the voting rights have a probability of 35.1% of converting their dual-class shares compared to a probability of only 11.3% for those companies with a large shareholder with the same percentage of voting rights but that are not in danger. In other words, the difference in the probabilities of conversion between the former and the latter amounts to almost 24%. The distance between the two curves diminishes, i.e. the impact of the danger on the probability of conversion becomes smaller, as the percentage of the voting rights held by the large shareholder becomes greater.

This suggests that the larger the voting stake of the controlling shareholder the greater are his private benefits of control and the less he is concerned by the prospect of dropping out of the index. In contrast, controlling shareholders holding relatively small voting stakes have fewer private benefits to lose and thus presumably are more willing to convert in the wake of losing index membership. Another way of interpreting the difference between the two curves is that it represents the sensitivity towards loss of index membership: the figures then indicate that this sensitivity decreases with increasing control by the large shareholder. Bearing in mind the difference in slopes between the two curves, when a firm is in danger the probability of conversion decreases faster with increases in the percentage of voting rights held by the large shareholder than when it is not in danger. This pattern is in line with what one expects to observe in the presence of a trade-off faced by the large shareholder between diluting control and loss of membership. Also, the distance between the two curves reduces as the danger of dropping out of the index increases, i.e. the firm moves from the 15% quantile to the 10% quantile to the 5% quantile.

In summary, we document that index membership significantly affects the controlling shareholder's motivation to unify the non-voting and voting stock. As the calculation of the

predicted conditional probability of conversion has shown, this motivation also depends on the level of the controlling shareholder's voting rights.

The question now arises as to whether the market is able to predict the probability of conversion for individual firms at the time of the announcement of the regulatory change. If this is the case, then the market reaction at the announcement should be positively related to the perceived probability of conversion. We calculate the perceived probability of conversion based on the coefficient estimates of the recursive bivariate probit with the firm characteristics measured at the end of 1999. We obtain three different types of perceived probability of conversion depending on whether the danger of dropping out of the index is measured by the firm being in the 5% quantile, the 10% quantile or the 15% quantile. We then regress the CARs for the [-20, 20] window for the non-voting shares at the announcement of the regulatory change on these probabilities. We repeat the exercise for the CARs for the voting shares.

The results for the CARs for the non-voting shares are reported in Table 9. The results suggest a positive and significant link (at the 10% level) between the CARs at the announcement of the regulatory change and the perceived probability of conversion when danger is measured at the 5% quantile and the 10% quantile. However, if danger is measured at the 15% quantile there is no such link. This is in line with the regression results from Table 6 which also suggest that investors do not perceive firms to be in danger of dropping out of their index if they are in the 15% quantile.[17] We find the same positive link with voting shares, yet it is only significant when danger is measured at the 5% quantile.

[17] In addition to the regressions reported in Table 9, instead of the CARs we used the percentile ranks for the CARs. The significance levels increase from 10% to 5% for danger based on the 5% and 10% quantiles and the coefficient on the perceived probability becomes significant (at the 10% level) if danger is based on the 15% quantile. A possible reason for the improved results is that the percentiles are better at dealing with outliers and nonlinearities in

To conclude, we find two important results. First, the large shareholder faces at trade-off between the foregone private benefits of control on one side and the benefits from conversion and the avoidance of loss of index membership on the other side. Second, at the announcement of the regulatory change in August 2000 the market reaction for individual firms depends on the perceived probability of conversion.

(Insert Table 9 about here)

VIII. Conclusion

In summer 2000, Deutsche Börse changed the rules on how firms are selected into its selection indices. 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 of the change in rules firms with dual-class stock faced the danger of dropping out of their index. Within this context, this study examines the probability of dual-class stock unifications. We find that the danger of a loss of index membership has a significant and substantial impact on the probability of a dual-class stock unification. For example for a given firm with a controlling shareholder holding 40% of the votes the probability is 35.1% when the firm is in danger of loss of index membership compared to only 11.3% when the firm is not in such a danger. In other words, for this particular level of control the probability of a unification increases by 24%.

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the relation between predicted probabilities and CARs. We also rerun the regressions as Tobit regressions given that the dependent variable is now bounded between 0 and 100%. The results, which are not reported in tabular form, are qualitatively similar to those obtained from the OLS regressions.

We also find that both the announcements of actual unifications as well as the announcement of the new rules generate significant abnormal returns for the non-voting shares. Similar to studies on dual-class stock unifications before the change in rules, we observe that firms are more likely to abolish their dual-class share structures if they have greater growth opportunities. We also show that the existence of private benefits of control makes it less likely for firms to unify their shares.

More generally, our findings suggest that the large shareholder faces a trade-off between the private benefits of control and the costs associated with a potential index membership loss when deciding on a conversion. The greater the private benefits, the less likely there will be a conversion as a result of the danger of dropping out of the index. In other words, loss of membership may be the lesser of two evils if the alternative is losing control. Finally, we find evidence that at the announcement of the regulatory change the market reaction for individual firms depends on the perceived probability of conversion.

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Table 1

Selection Indices

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.

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 31st, 2004, as a result of the dissolution of the Neuer Markt.

Table 2

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
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% (10%, 15%) 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% (90%, 85%) quantile, and zero otherwise. This dummy measures the potential for the firm to move up one index.
CDAX	Dummy variable that is set to one if the firm is not part of a selection index in the year before the unification takes place, and zero otherwise
STOXX50	Dummy variable that is set to one if the firm is included in the Eurostoxx 50 in the year before the unification takes place, and zero otherwise
Voting rights	Voting rights of the largest shareholder if they exceed 5%, and zero otherwise
Wedge	Dummy variable that is set to one if the voting and cash flow rights of the largest ultimate shareholder differ from each other
Ln(total assets)	Natural logarithm of total assets
Market-to-book	Market value of equity over book value of equity
Systematic risk	Beta estimate from the market model consisting of regressing the firm's daily returns over the last year on the CDAX daily returns
Relative performance	The firm' stock return relative to the return on the index it belongs to

Table 3

Descriptive statistics

The variables are defined as in Table 2.

Panel A. Percentage and number of firm-year observations for all dual-class firms (figures in parentheses are based on those dual-class firms that are part of a selection index) where the stake of the largest shareholder is equal to or greater than the following percentages of votes

Minimum stake held by largest shareholder	%	#
25%	91.8 (87.9)	470 (203)
50%	79.5 (71.4)	407 (165)

Panel B. Descriptive statistics for the firm-year observations for all dual-class firms (figures in parentheses are based on those dual-class firms that are part of a selection index) and selected quantiles of largest voting stakes (2000-2008).

Summary statistics:

Variable	N	Mean	Median	S.D.
Voting rights of largest shareholder	512 (231)	71.6 (64.1)	75.1 (65.6)	27.5 (29.1)
Cash flow rights of largest shareholder	512 (231)	49.9 (41.3)	50.0 (41.8)	25.1 (21.4)
Difference between voting and cash-flow rights of largest shareholder	512 (231)	21.1 (22.8)	19.1 (24.9)	17.4 (16.9)
Total assets (m euros)	485 (228)	18.9 (34.4)	0.7 (1.6)	77.5 (105.9)
Market-to-book	486 (228)	1.7 (2.1)	1.4 (1.5)	10.5 (5.0)

Table 4

Event study results

Table 4 presents cumulative abnormal returns (CARs) around the announcement day for actual stock unifications as well as around the announcement day of the change in rules. CARs are reported for four distinct event windows: [-20, 20], [-20, 0], [-1, 1] and [0, 0]. Panel A presents CARs 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 CARs 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.

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

CARs for the actually listed share category

Event window	CAR	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

CARs for non-voting shares

Event window	CAR	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

CARs for voting shares

Event window	CAR	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 abnormal returns at the announcement of a stock unification between 2000 and 2008

CARs for non-voting shares

Event window	CAR	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**

CARs for voting shares

Event window	CAR	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

Table 5

Recursive bivariate probit estimates

Table 5 reports the results on the determinants of the probability to drop out of an index and to adopt a single-class share structure based on a bivariate probit. The bivariate probit, which consists of two separate equations, allows for both the error terms of the equations to be correlated and for Equation 2 to include the dependent variable from Equation 1. Equation 1 estimates the probability of the firm being in danger of dropping out of its index based on the median of the firm's quantile rank in the year before the unification takes place. The quantiles are the 5%, 10% and 15% lowest ranks in the index, respectively. Equation 2 estimates the probability of the firm converting its non-voting stock into voting stock. The variables are defined in Table 1. The bivariate probit is estimated for all sample firms. It comprises 499 firm-year observations with 85 dual-class firms of which 25 firms decide to unify over the period 2000-2008. Firms are excluded from the sample after unification. The regressors are lagged by one period. The t-statistics are cluster-robust standard errors. ***, ** and * denotes statistical significance at the 1%, 5% and 10% level, respectively.

Equation 1: Danger

	(1) 5% quantile		(2) 10% quantile		(3) 15% quantile	
	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.
Systematic risk	0.409	1.49	0. 510	1.63	0.386	1.44
Relative performance	-0. 786	-2.85***	-0. 819	-3.24***	-0.582	-2.11**
CDAX	-5.667	-20.57***	-6.071	-10.31***	-5.937	-18.62***
Intercept	-1.626	-7.51***	-1.408	-6.80***	-1.048	-5.37***
Equation 2: Conversion						
Voting rights	-0.016	-4.57***	-0. 016	-4.42***	-0.016	-4.17***
Danger	3.054	7.50***	2.590	4.42***	1.865	2.95***
Market-to-book	0. 074	3.27***	0. 064	2.66***	0.065	2.85***
Ln(total assets)	-0. 122	-2.27**	-0. 128	-2.41**	-0.129	-2.25**
Wedge	-0.808	-3.02***	-0.860	-3.19***	-0.885	-3.09***
Intercept	1.572	2.03***	1.697	2.21**	2.380	1.670**
Rho	-0.939		-0.882		-0.646	
Wald test	5.775**		2.941*		2.907*	
N	499		499		499	

Table 6

Recursive bivariate probit estimates

Table 6 reports the results on the determinants of the probability to drop out of an index and to adopt a single-class share structure based on a bivariate probit. The bivariate probit, which consists of two separate equations, allows for both the error terms of the equations to be correlated and for Equation 2 to include the dependent variable from Equation 1. Equation 1 estimates the probability of the firm being in danger of dropping out of its selection index based on the median of the firm's quantile rank in the year before the unification takes place. The quantiles are the 5%, 10% and 15% lowest ranks in the selection index, respectively. Equation 2 estimates the probability of the firm converting its non-voting stock into voting stock. The variables are defined in Table 1. The bivariate probit is estimated for the subsample of firms that are in a selection index. It comprises 229 firm-year observations with 54 dual-class firms of which 19 firms decide to unify over the period 2000-2008. Firms are excluded from the sample after unification. The regressors are lagged by one period. The t-statistics are cluster-robust standard errors. ***, ** and * denotes statistical significance at the 1%, 5% and 10% level, respectively.

Equation 1: Danger

	(1) 5% quantile		(2) 10% quantile		(3) 15% quantile	
	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.
Systematic risk	0.459	1.58	0. 566	1.91*	0.417	1.45
Relative performance	-0. 788	-2.92***	-0. 829	-3.17***	-0.585	-1.96*
Intercept	-1.662	-7.38***	-1.449	-7.07***	-1.074	-5.47***
Equation 2: Conversion						
Voting rights	-0.014	-3.08***	-0. 014	-2.94***	-0.014	-2.41**
Danger	2.940	5.82***	2.393	4.16***	1.331	0.53
Market-to-book	0. 080	4.11***	0. 069	3.28***	0.074	3.44***
Ln(total assets)	-0. 131	-2.07**	-0. 134	-2.07**	-0.116	-1.54
Wedge	-1.586	-3.23***	-1.596	-3.38***	-1.775	-2.70***
Intercept	2.487	2.63***	2.533	2.67***	2.380	2.07**
Rho	-0.934		-0.852		-0.426	
Wald test	4.027**		3.544*		0.086	
N	229		229		229	

Table 7

Recursive trivariate probit estimates

Table 7 reports the results on the determinants of the probability to drop out of an index, to move into a higher index and to adopt a single-class share structure based on a trivariate probit. The trivariate probit, which consists of three separate equations, allows for both the error terms of the equations to be correlated and for Equation 3 to include the dependent variables from the other two equations. Equation 1 estimates the probability of the firm being in danger of dropping out of its selection index based on the median of the firm's quantile rank in the year before the unification takes place. The quantiles are the 5%, 10% and 15% lowest ranks in the selection index, respectively. Equation 2 estimates the probability of the firm moving up one index and Equation 3 estimates the probability of the firm converting its non-voting stock into voting stock. The variables are defined in Table 1. The trivariate probit is estimated for all sample firms. It comprises 499 firm-year observations with 85 dual-class firms of which 25 firms decide to unify over the period 2000-2008. Firms are excluded from the sample after unification. The regressors are lagged by one period. The t-statistics are cluster-robust standard errors. ***, ** and * denotes statistical significance at the 1%, 5% and 10% level, respectively.

Equation 1: Danger	(1) 5% (95%) quantile		(2) 10% (90%) quantile		(3) 15% (85%) quantile	
	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.
Systematic risk	0.526	1.97**	0.546	1.87*	0.317	1.22
Relative performance	-0.815	-2.57***	-0.812	-2.61***	-0.523	-1.96**
CDAX	-4.531	-21.99***	-4.519	-13.81***	-4.742	-25.31***
Intercept	-1.589	-7.07***	-1.473	-7.43***	-1.084	-5.74***
Equation 2: Chance						
Systematic risk	0.959	3.05***	0.814	2.55**	0.572	1.94*
Relative performance	-0.192	-1.23	0.123	0.90	0.208	1.78*
STOXX50	-5.034	-8.86***	-4.877	-12.42***	-4.993	-18.78***
Intercept	-2.234	-9.09***	-1.321	-9.86***	-1.023	-7.22***
Equation 3: Conversion						
Voting rights	-0.016	-4.47***	-0.016	-4.29***	-0.016	-4.28***
Danger	2.076	5.19***	2.031	4.31***	1.611	4.27***
Chance	0.258	0.34	-0.282	-0.53	-0.174	-0.40
Market-to-book	0.067	2.93***	0.071	3.03***	0.068	2.85***
Ln(total assets)	-0.114	-2.07**	-0.117	-2.05**	-0.125	-2.18**
Wedge	-0.841	-2.91***	-0.877	-3.01***	-0.882	-3.02***
Intercept	1.589	1.88*	2.399	1.90*	1.665	2.02**
Rho_{31}	-0.585	-4.59***	-0.680	-3.76***	-0.533	-3.18***
Rho_{32}	0.539	1.10	0.005	0.02	0.100	0.47
Rho_{21}	-0.235	-0.77	-0.197	-0.66	-0.494	-2.59***
N	499		499		499	

Table 8

Recursive trivariate probit estimates

Table 8 reports the results on the determinants of the probability to drop out of an index, to move into a higher index and to adopt a single-class share structure based on a trivariate probit. The trivariate probit, which consists of three separate equations, allows for both the error terms of the equations to be correlated and for Equation 3 to include the dependent variables from the other two equations. Equation 1 estimates the probability of the firm being in danger of dropping out of its selection index based on the median of the firm's quantile rank in the year before the unification takes place. The quantiles are the 5%, 10% and 15% lowest ranks in the selection index, respectively. Equation 2 estimates the probability of the firm moving up one index and Equation 3 estimates the probability of the firm converting its non-voting stock into voting stock. The variables are defined in Table 1. The trivariate probit is estimated for the subsample of firms that are in a selection index. It comprises 229 firm-year observations with 54 dual-class firms of which 19 firms decide to unify over the period 2000-2008. Firms are excluded from the sample after unification. The regressors are lagged by one period. The t-statistics are cluster-robust standard errors. ***, ** and * denotes statistical significance at the 1%, 5% and 10% level, respectively.

Equation 1: Danger	(1) 5% (95%) quantile		(2) 10% (90%) quantile		(3) 15% (85%) quantile	
	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.
Systematic risk	0.507	1.87*	0.547	2.01**	0.389	1.47
Relative performance	-0.852	-2.66***	-0.826	-2.96***	-0.546	-2.02**
Intercept	-1.690	-7.99***	-1.444	-7.45***	-1.065	-5.50***
Equation 2: Chance						
Systematic risk	0.550	1.26	0.241	0.69	-0.067	-0.18
Relative performance	0.237	0.75	0.591	2.67***	0.471	1.90*
Intercept	-2.234	-9.09***	-1.525	-8.26***	-1.082	-4.62***
Equation 3: Conversion						
Voting rights	-0.014	-2.98***	-0.013	-2.85***	-0.014	-2.62***
Danger	2.585	5.40***	2.147	6.25***	1.350	2.21**
Chance	0.403	0.59	-0.782	-1.27	-0.572	-1.08
Market-to-book	0.078	4.04***	0.063	3.15***	0.069	3.39***
Ln(total assets)	-0.128	-1.88*	-0.119	-1.88*	-0.113	-1.65*
Wedge	-1.640	-3.37***	-1.538	-3.53***	-1.678	-3.14***
Intercept	2.481	2.42**	2.399	2.54**	2.370	2.26**
Rho_{31}	-0.814	-5.55***	-0.832	-9.80***	-0.526	-1.76*
Rho_{32}	0.085	0.62	0.587	1.96**	0.432	1.85*
Rho_{21}	-0.222	-1.87*	-0.647	-2.06**	-0.695	-7.72***
N	229		229		229	

Table 9

The market's ability to predict unifications at the time of the announcement of the regulatory change

Table 9 reports the results of OLS regressions relating the abnormal returns of dual-class firms at the announcement of the regulatory change to the predicted probabilities of conversion. The probabilities of conversion are obtained by plugging the values of the information set in 2000, i.e. the firm characteristics measured at the end of 1999, into the bivariate probits from Table 5. We obtain three different types of perceived probability of conversion depending on whether danger of dropping out of the index is measured by the firm being in the 5% quantile, the 10% quantile and the 15% quantile, respectively. We then regress the CARs for the [-20, 20] window for the non-voting and voting shares at the announcement of the regulatory change on these probabilities. The t-statistics are cluster-robust standard errors. ***, ** and * denotes statistical significance at the 1%, 5% and 10% level, respectively.

Non-voting shares

	(1) 5% quantile		(2) 10% quantile		(3) 15% quantile	
	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.
Predicted probability	0.115	1.80*	0.087	1.96*	0.105	1.42
Intercept	0.045	2.26**	0.047	2.29**	0.045	2.03**
Adj. R^2	0.03		0.02		0.02	
N	41		41		41	
Voting shares						
Predicted probability	0.135	2.04**	0.060	0.94	0.075	0.96
Intercept	0.020	0.90	0.029	1.20	0.026	1.03
Adj. R^2	0.05		0.01		0.01	
N	32		32		32	

Figure 1 – Conditional predicted probabilities of conversion based on the 5% quantile

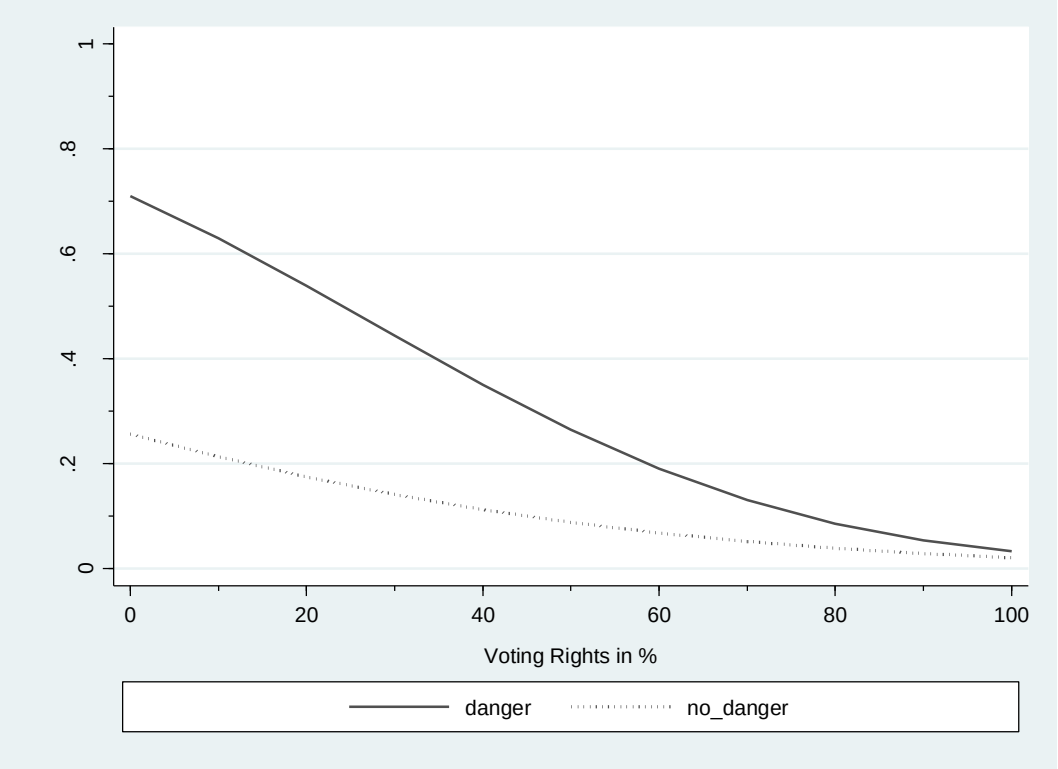

Figure 2 – Conditional predicted probabilities of conversion based on the 10% quantile

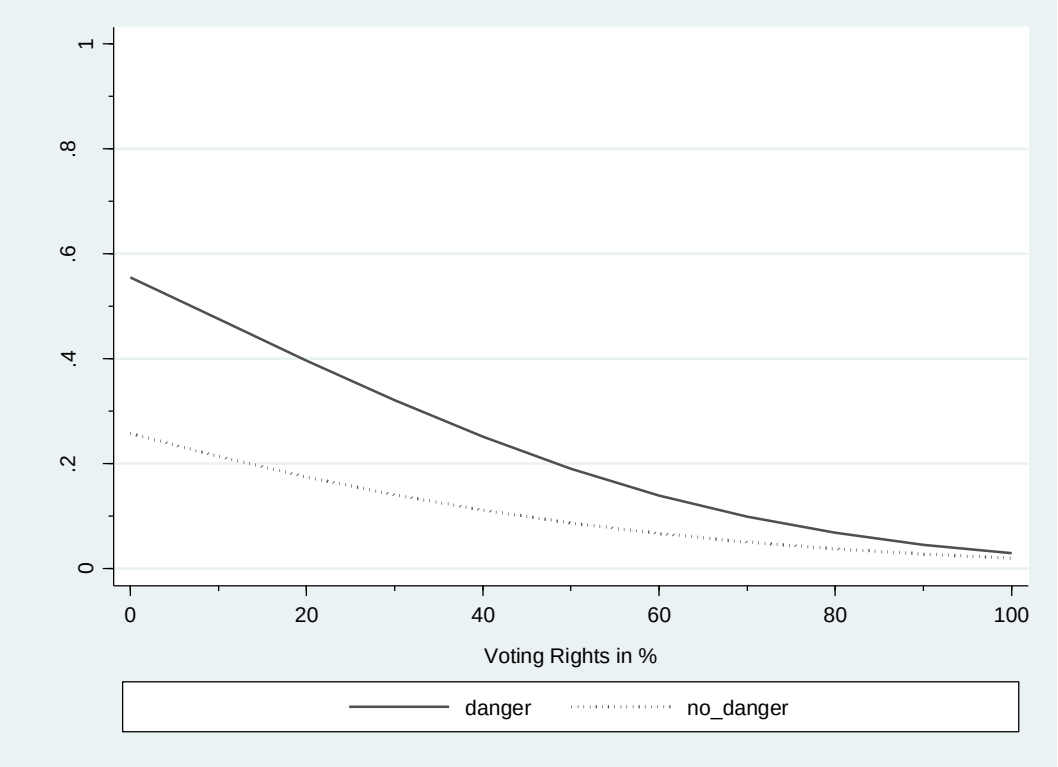

Figure 3 – Conditional predicted probabilities of conversion based on the 15% quantile