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**Voluntary Disclosure of Cash Flow Statements
and Segment Data in Germany**

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Abstract

Discretionary disclosure theory suggests that firms' incentives to provide proprietary versus non-proprietary information differ markedly. To test this conjecture, the paper investigates the incentives of German firms to voluntarily disclose business segment reports and cash flow statements in their annual financial reports. While the former is likely to reveal proprietary information to competitors, the latter is less proprietary in nature. Using these proxies for proprietary and non-proprietary disclosures, respectively, I find that the determinants or at least their relative magnitudes differ in a way consistent with the proprietary cost hypothesis. That is, cash flow statement disclosures appear to be governed primarily by capital-market considerations, whereas segment disclosures are more strongly associated with proxies for product-market and proprietary-cost considerations.

1. Introduction

Studying voluntary disclosures provides valuable insights to standard setters and regulators as they need to be aware of situations where full disclosure is not likely to prevail absent mandatory requirements. Proprietary costs have been suggested as a rationale for why the full disclosure equilibrium fails (e.g., Verrecchia, 1983 and 1990; Wagenhofer, 1990a). In the absence of such reasons, firms have incentives to provide information voluntarily to reduce information asymmetry and preempt costly private information acquisition which in turn makes capital markets more liquid and lowers firms' cost of capital (e.g., Diamond 1985).

This paper provides evidence on the determinants of proprietary and fairly non-proprietary disclosures that is consistent with the proprietary cost hypothesis. As proxies for each type of disclosure, I use *voluntary* business segment reports and cash flow statements by German firms, respectively. While either disclosure is likely to provide relevant information and reduce the costs of private information acquisition to outside equity investors, cash flow statements are arguably less proprietary in nature than segment reports. That is, the latter is more likely to provide information that can be exploited by the firm's competitors. Based on this premise and extant theories, I expect the determinants and their relative importance to differ across both disclosures in a systematic way. I hypothesize that product-market and proprietary-cost considerations are more important for segment data disclosures relative to cash flow statement disclosures. That is, I predict the latter to be governed primarily by capital-market considerations and the former to exhibit a tradeoff of both considerations.

My results are generally consistent with this conjecture. In binary and ordered probit regressions, I find that German firms voluntarily provide business segment data when the proprietary costs of its disclosure seem low, i.e., when entry barriers are relatively high, the firm is large and segment information tends to be highly aggregated and the firm's profitability is low. To the

contrary, cash flow statement disclosures are strongly associated with high trading volume, but exhibit only moderate positive associations with firm size and entry barriers, and no significant association with profitability.

The finding that profitability is significant only for the segment reports, while trading volume as a proxy for information asymmetry and cost savings in private information acquisition is highly significant only for the cash flow statements corroborates the main hypothesis of the paper. However, the results also indicate that proprietary cost considerations are not completely irrelevant for (informative) cash flow statement disclosures as the proxy for entry barriers is significant whenever cash flow statements tend to provide additional information.

Irrespective of the type of disclosure, I find that a low percentage of closely held shares is positively associated with voluntary disclosures. This suggests that the ownership structure and hence agency cost considerations are important determinants of voluntary disclosures by German firms as well. Moreover, I find that German firms voluntarily provide both disclosures whenever they are listed at a foreign exchange where domestic firms are required to disclose them (e.g., London Stock Exchange). Thus, peer or competitive pressures in international capital markets appear to be sufficient to induce both disclosures. All the findings are robust to several sensitivity checks.

This paper contributes to the extant literature on financial disclosure[1] by explicitly investigating the determinants of proprietary and fairly non-proprietary disclosures. In a recent survey, Saudagaran and Meek (1997) note that "proprietary costs have been modeled analytically, but empirical research on their effects on disclosure in an international context is notably absent." This is not only apparent in an international context (albeit to a lesser extent) and can in part be attributed to the fact that

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[1] For surveys see Lang and Lundholm (1993) and Francis et al. (1994). Note that much of the US literature has focused on management forecasts. The decision to voluntarily provide a forecast, however, is quite different from

proprietary costs are notoriously difficult to measure. While measurement remains to be an issue, the idea of this paper is to exploit the specifics of the German institutional environment to construct a more complete test of the proprietary cost hypothesis than previous studies. Scott (1994) is one of the few papers that explicitly test this hypothesis. His findings for voluntary disclosures of pension plan information by Canadian firms are consistent with the proprietary cost hypothesis. However, as his study examines only one disclosure item, it is not known whether non-proprietary disclosures would have produced different results and hence whether they are in fact driven by the proprietary nature of the information. To control for this, I explicitly compare two disclosures to assess the relative magnitudes of various determinants and in particular the role of proprietary costs.

Prior to my paper, others have suggested that determinants may vary across different types of disclosures (see e.g., Diamond, 1985, p. 1088; Dye, 1986). In previous research international listing, size and financing effects have been identified as major factors (see Lang and Lundholm, 1993; Saudagaran and Meek, 1997), but the results vary across studies. The different conclusions suggests that disclosure determinants differ across distinct types of information. However, as studies differ in many respects, such as design and sample, it is difficult to see what drives the differences in their results. Similarly, there are voluntary disclosure studies that analyze either cash flow statements or segment reports with different findings.[2] But again, it is hard to compare their results across different designs, samples and institutional environments.

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the disclosure *policy* choices considered in this paper. These *one-time* decisions can be viewed as a commitment to provide certain information in the future (irrespective of the particular realization of the information).

[2] Schneider (1985) as well as Bauer and Schader (1994) study voluntary cash flow statements of German and Austrian firms, respectively. Voluntary segment data disclosures are analyzed by Bradbury (1992) for New Zealand, McKinnon and Dalimunthe (1993) and Mitchell et al. (1995) for Australia, and Bernards (1994) for Germany. Note that the studies on German (and Austrian) firms do not provide multiple regressions. In addition, there are merely descriptive studies on cash flow statement disclosures by German firms (Haller and Jakoby, 1994; Stahn, 1996 and 1997).

There are papers on the determinants of voluntary disclosures that capture many different types of information items by using broad disclosure indices or analyst ratings (e.g., Chow and Wong-Boren, 1987; Cook, 1989; Lang and Lundholm, 1993; Botosan, 1997). However, their design prevents a comparison of the determinants across individual information items. The paper by Meek et al. (1995) is an exception in this regard. They construct different disclosure scores for strategic, financial and non-financial information and find that the factors influencing voluntary disclosure by multinational corporations differ across the different types of information. However, each of three disclosure scores includes information that may be characterized as proprietary and hence it is not possible to disentangle the effects as desired in this study.

The remainder of the paper is organized as follows. Section 2 describes the German institutional setting in which the disclosures of cash flow statements and segment reports take place and derives the specific hypotheses for the determinants. Section 3 describes the sample selection and the data. Section 4 presents the results and section 5 discusses the robustness and sensitivity of the findings. Section 6 concludes the paper.

2. Determinants of Cash Flow Statements and Segment Data Disclosures

2.1 Institutional Setting

The paper analyzes disclosure practice of German firms for the fiscal year ending between 4/1/1996 and 3/31/97. During that time, neither cash flow statements nor detailed segment reports were mandatory under German GAAP. In April 1998, new legislation became effective. As a consequence, all listed corporations have to provide cash flow statements and segment reports in their consolidated financial statements for fiscal years beginning after 12/31/1998. However, I am confident that this requirement does not unduly affect my results because (a) I study disclosure practice sufficiently prior to its enactment and (b) it applies to both cash flow statements and

segment reports. Moreover, detailed rules for either statement are not yet available and the rules described below are currently still in effect.

According to the commercial code (HGB), corporations that are either large[3] or have publicly traded securities are required to disclose a division of *sales* by activities as well as by geographical markets in the notes of their individual and consolidated accounts if "the activities and the geographical markets differ significantly from each other taking into account how the firm's sale of products and provision of services are organized" [§§ 285 No. 4 and 314 (3) HGB]. The commercial code does not furnish an elaborate definition of a segment, and there are no court decisions making it more precise. Legal commentaries view the terms "activities" and "geographical markets" as referring to product lines or industries and the firm's sales markets, respectively. They recommend to choose business and geographical segments such that the benefits and risks are homogeneous within a segment and heterogeneous across segments.[4] Thus, unlike firms reporting under US GAAP or IAS which face specific criteria, German firms have considerable discretion in defining their segments. Furthermore, intersegment sales do not have to be disclosed and the division of sales can be suppressed if the disclosure is likely to significantly harm the firm or one of its subsidiaries [§§ 286 (2) and 314 (2) HGB], in which case the firm only has to indicate that this protective clause has been applied.[5]

The only other requirement to provide sub-entity data in the annual report is stated in §§ 286 No. 11 and 313 (2) HGB. It stipulates that a corporation that owns more than 5 percent of another firm's capital has to disclose its stake, as well as the equity and net earnings of the other firm. However, equity and net earnings do not have to be provided if the stake is smaller than 50 percent

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[3] A corporation is large according to the commercial code (§ 267 HGB) if it exceeds two of the following three size criteria: total assets > 15.5 million DM, sales > 32 million DM, employees (average over the year) > 250.

[4] See, for instance, Schülen (1992), Rz. 20 and Adler, Düring and Schmaltz (1997), Rz. 90.

or if the subsidiary itself is not required to disclose its financial statements. Furthermore, all three items can be suppressed if their disclosure is immaterial or likely to harm the firm or one of its subsidiaries [§§ 286 (3) and 313 (3)].[6]

With respect to the cash flow statement, the commercial code stipulates only that the annual report of a corporation also has to provide a true and fair view of the firm's *financial* position [§§ 264 (2) and 297 (2) HGB].[7] However, it does not state how this should be achieved. According to the legal commentaries, it is generally accepted that this requirement does not imply a "third" statement in addition to the balance sheet and the statement of earnings, but that compliance may entail additional disclosures pertaining the financial position in the notes.[8] If a firm, however, discloses a cash flow statement (of any form) in the annual report, legal commentaries view this as sufficient to provide a true and fair view of the financial position.

In addition, as auditors commonly prepare a cash flow statement to analyze the firm's financial position and include it in the audit report (Mansch et al., 1995), there is a *professional* recommendation (HFA 1995). It is jointly issued by the Institute of Chartered Accountants (IdW) and the Schmalenbach Gesellschaft (SG), an influential group of practitioners and academics, and provides a guideline for preparing and auditing cash flow statements that is closely aligned with international practice (IdW/SG, 1995). While this recommendation and audit practice are likely to

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[5] None of the sample firms invokes the protective clause.
[6] One sample firm (Moksel AG) invokes the protective clause. Most of my firms provide only an abbreviated list of their main subsidiaries and investments in the annual report. Moreover, any financial information in this list is generally not matched with business segment sales provided elsewhere in the notes. If a firm, however, uses this list as a means to disclose segment data as defined in this study, I code the dependent variables accordingly.
[7] Besides the commercial code, § 21 BörsZulV states that firms registering securities for public trading have to provide a cash flow statement in the prospectus. However, neither a publication in the annual report nor a specific format for the statement are required. As the case of Fielmann AG illustrates, firms do not necessarily disclose cash flow statements *in their annual report* subsequent to the initial public offering.
[8] See Budde and Karig (1990), Rz. 37 and Adler, Düring and Schmaltz (1997), Rz. 70-71.

encourage German firms to include cash flow statements in the annual reports, their disclosure remains voluntary.

2.2   Proprietary versus Non-Proprietary Disclosures: The Main Hypothesis

Investors and analysts generally perceive cash flow and segment information as useful and the corresponding statements as among the most important parts of the annual report (SRI, 1987; AMIR, 1993). Cash flow *information* facilitates an assessment of the firm's cash generating ability and the persistence of earnings, as well as the detection of accrual manipulations. Segment *information* is considered useful to investors because corporate diversification generally reduces the informativeness of consolidated financial statements (e.g., Ijiri, 1995). There are several empirical studies that support the usefulness of both types of information to investors.[9] Moreover, as the lack of compulsory cash flow statements and segment reports is viewed as one of the major differences to international reporting practice, firms voluntarily disclosing them are typically perceived as particularly "investor-friendly" and "capital-market oriented" (e.g., Goebel and Fuchs, 1995).

Thus, cash flow statements and segment reports are important elements of the firm's disclosure policy and may in principle have substantial benefits. The disclosure decision can be viewed as a commitment to provide useful information and to reduce information asymmetries, which is likely to lower the firm's cost of capital. At the same time, cash flow and segment information may be exploited by the firm's competitors. Cash flow information may be useful to a competitor, for instance, in deciding whether to start a price war. Segment data is competitively sensitive as its disclosure may reveal the divisions' operating margin, return on assets as well as in which markets the firm expands or contracts (see also Feltham et al., 1992; Hayes and Lundholm, 1996).

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[9]   For cash flow information see, e.g., Livnat and Zarowin (1990) and for segment information see Wysocki (1998), Piotroski (1999) as well as the survey by Pacter (1993).

The main proposition of the paper is that segment disclosures are generally more proprietary in nature than cash flow statement disclosures. Clearly, the distinction is more a matter of degree than kind, but the conjecture is supported by several studies as well as observations. Gray and Roberts (1988) conduct a survey on disclosure attitudes of British managers and find that segment disclosures are viewed as among the most highly sensitive items. However, managers also concede that segment disclosures may have a positive net benefit if sufficiently aggregated.[10] Similarly, in a study on entry deterrence, Smiley (1988) finds that "masking the division's profitability" is the most frequently chosen strategy: About 80% of the respondents (US product managers) admit that they use this strategy at least occasionally and more than 50% express that entry deterrence at least as important as other strategic decisions.

The conjecture about the relative magnitude of proprietary costs is further supported by anecdotal evidence from standard setting: In the US, firms expressed much concern about the proprietary costs of mandatory segment disclosures. Similar concerns were not raised with respect to mandatory cash flow statements. On the contrary, Australian firms even supported the change from compulsory funds flow statements to more informative cash flow statements (Jones et al., 1995).

Thus, in principle, segment reports and cash flow statements seem to be a reasonable proxies for proprietary and relatively non-proprietary disclosures, respectively. However, I also have to consider the tradeoffs in the specific institutional and informational environment as they also depend on information available elsewhere. For instance, the usefulness of cash flow information does not imply that cash flow *statements* are incrementally useful, as proxies of the firm's cash flows can be derived from the balance sheet and the income statement. If the cash flow statement provides additional information not provided elsewhere in the annual report, then the arguments made above apply. But

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[10]   Conversely, cash flow statements provide information at the firm level.

if the statement contains no additional information, its benefits may be small. The disclosure of such a

cash flow statement may still generate some benefits. It creates cost savings to investors and financial

analysts (e.g., Gebhardt, 1984; AMIR, 1993, p. 66).[11] Moreover, the firm's market maker in setting

the bid-ask spread does not have to worry that only more sophisticated traders understand how to

derive a proxy. On the other hand, such a statement has no (additional) proprietary costs, so the firm

may as well provide it. If the cash flow statement reveals information not contained elsewhere in the

annual report, there may be some proprietary costs to be traded off against the benefits in the capital

market.[12] This suggest that it may be important to control for the information provided in the cash

flow statement.

Similarly, the usefulness of voluntary segment *reports* to investors and competitors hinges on the

availability of sub-entity data elsewhere. In this case, there are no close substitutes in the annual

report itself. However, each German corporation has to publish a financial report based on so called

individual accounts. These (non-consolidated) statements, which have to be filed with the local

commercial registrar, provide potentially valuable sub-entity information if the subsidiaries are

separate legal entities (i.e., corporations) *and* if the group's legal and organizational structures are

matched. But even then the usefulness of these statements is confined by the well-known limitations

of non-consolidated statements. In summary, a close proxy for a segment report seems not readily

available, although other information sources may reduce its (incremental) proprietary costs.[13]

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[11] Similarly, investors and analysts value summaries of historical financial information and fact books (SRI, 1987), although they do not provide information not available elsewhere. Moreover, firms providing them generally receive higher AMIR ratings which have been used as disclosure measures by previous studies.

[12] Stahn (1997, p. 1194) reports that cash flow statements of German firms *may* provide pieces of information not contained elsewhere in the annual report. But many firms also suppress information by netting cash flows and using the less informative indirect method to derive the operating cash flow (see e.g., Haller and Jakoby, 1994; Stahn, 1996).

[13] Another source of information may be consolidated statements for *sub*-groups (*Teilkonzernabschlüsse*). However, these statements are generally voluntary and rarely provided by German subsidiaries. See Görges and Schulte (1994). In addition, sub-groups do not have to match with the business or geographic segments.

However, recall that German corporations have to report both business and geographic segment sales (see section 2.1). Thus, a voluntary segment *report* provides only additional segment information. Several previous studies find that, once the firm discloses segment *sales*, the usefulness of *additional* segment information, in particular segment earnings, may be small to investors (e.g., Collins, 1976; Balakrishnan et al., 1990). But even if additional information is of little (incremental) value to investors, it still can be useful to the firm's competitors. In particular, segment earnings and assets are sensitive pieces of information potentially revealing divisions' operating margins and returns on assets as well as changes in the firm's investment strategy.

In summary, the conjecture about the relative importance of proprietary costs of voluntary cash flow statement and segment disclosures seems reasonable with the German institutional environment. However, capital-market as well as proprietary-cost considerations may matter to some (but varying) degree for both disclosures.[14] Therefore, proxies for these considerations are not necessarily expected to have opposite signs for the two disclosures. Rather, I anticipate that in many cases their relative importance differs in the sense that a variable turns out significant for one disclosure but not for the other or that its marginal effects differ across disclosures.[15] In particular, I hypothesize that proprietary-cost considerations are more important for segment reports than for cash flow statements. That is, I predict that the latter to be governed primarily by capital-market considerations.

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[14] There may be other benefits and hence rationales for disclosing cash flow statements or segment reports. The former makes it easier to detect earnings manipulations, and the latter facilitates the monitoring of managers' decisions to adapt, expand or abandon divisions (Wysocki, 1998). But as both disclosures help to mitigate agency conflicts between the manager and outside shareholders, this does not lead to qualitatively different predictions.

[15] Cash flow statements and segment reports may also differ with respect to the direct costs of generating, verifying and disseminating the information. However, I expect the marginal costs of either disclosure to be fairly small in comparison to the proprietary costs given that all firms have to publish an annual report and that many use cash flow statements and segment data for internal purposes.

2.3   Individual Hypotheses

Following Lang and Lundholm (1993), the hypotheses are derived based on a survey of the existing analytical and empirical literature as opposed to a specific model. I focus in particular on papers pertaining to segment reports and cash flow statements. First, I discuss those variables that are proxies for the magnitude of capital-market benefits and proprietary costs. Based on the main hypothesis, they are expected to differ in their relative importance across segment and cash flow statement disclosures. Thereafter, several control variables are discussed.

- *Trading volume*

Trading volume is a measure of liquidity and hence a proxy for information asymmetry. Furthermore, if at least some investors trade based on privately acquired information, trading volume is also a proxy for private information cost savings generated by voluntary disclosures (Scott, 1994). Thus, I expect trading volume to be positively associated with voluntary disclosures.[16] In particular, if cash flow information is value-relevant and/or costly to generate privately from the annual report, I hypothesize a positive association between trading volume and voluntary cash flow statements. Based on the main hypothesis, I expect capital-market considerations, and hence trading volume to be less relevant for segment reports. Similarly, Diamond (1985, p. 1088) maintains that "private information acquisition should be most profitable for proprietary information."

- *Firm size*

There is a multitude of reasons why size is expected to be positively associated with voluntary disclosures. First, the costs of producing and disseminating information are likely to be decreasing per unit of firm size due to some fixed component. Second, the larger the firm, the more investors and analysts are likely to be interested in the firm. Thus, firm size is also a proxy for potential cost

savings in private information acquisition generated by voluntary. Third, Hayes and Lundholm (1996) suggest that firms may have an incentive to "combine" activities in a way that obfuscates their results (see also Smiley, 1988; AMIR, 1993). Thus, there is another (and more compelling) reason why size and segment disclosures are positively associated: Large firms are in a better position to "hide" proprietary information, i.e., profitable segments. Likewise, they provide more highly aggregated information for a given number of segments. Gray and Roberts (1988) document that the aggregation level of segment information plays a key role in managers' perception of its benefits and proprietary costs.

In summary, I hypothesize that the probability of voluntary disclosures increases in firm size for cash flow statement and segment disclosures. However, as the "hiding effect" applies only to segment disclosures and as the "cost savings effect" is more directly captured by other variables, in particular trading volume, I expect firm size to be more important for segment reports than for cash flow statements. In general, a positive size effect is well-documented in the literature (e.g., Schneider, 1985; Bradbury, 1992; Bernards, 1994; Mitchell et al. 1995; Bauer and Schader, 1996).

- *Profitability*

More profitable firms are expected to have incentives to voluntarily disclose information to the capital market in order to distinguish themselves from less profitable firms. But as this information may be used by competitors and result in substantial proprietary costs outweighing the capital-market benefits, in particular for "moderately" profitable firms (Verrecchia, 1983; Wagenhofer, 1990a).[17] This suggests on average a positive association, although extant models show that the

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[16] Note, however, that the causal relationship is not obvious. Voluntary disclosures may reduce informational asymmetries and hence increase trading volume (Healy et al., 1996).

[17] There can also be proprietary costs in the labor markets. Given a profitability above the industry average, labor unions are more likely to ask for wage increases and the management is more susceptible to wage concessions (Scott, 1994). In Germany, however, wage bargaining generally does not take place at the firm level. Furthermore, labor representatives sit on the board of directors of most large firms (in 106 out of 109 sample firms) and hence

relationship between voluntary disclosures and profitability is complex and depends on the type of competition (e.g., Verrecchia, 1990; Ewert and Wagenhofer, 1992; Feltham et al., 1992).

Recall, however, that the choices considered here are long-run disclosure *policy* decisions. That is, the firms commits to provide cash flow or segment information irrespective of its particular future realization (see also Harris, 1998, p. 124). Thus, if the proprietary costs of these disclosures are material, a negative association with profitability is more likely. Based on the hypothesis that cash flow statement disclosures are less proprietary in nature than segment reports, I predict a negative relation that is less pronounced (or even insignificant) for the former than for the latter. Harris (1998) finds that business segment disclosures are positively associated with post-entry competition. Her evidence is consistent with firms hiding their most profitable activities, which are likely to be in less competitive industries, and supports the hypothesis of a negative association. Other studies present mixed results with respect to profitability. While they generally find a negative association, it is not always significant (e.g., Schneider, 1985; Bernards, 1994, p. 241-242; Wagenhofer, 1990b, p. 252; Scott, 1994).

- *Capital Intensity*

The firm's capital intensity is a proxy for entry barriers. As the threat of entry decreases, firms are more likely to make voluntary disclosures to the capital market (Darrough and Stoughton, 1990; Wagenhofer, 1990b). Thus, I hypothesize that both voluntary disclosures are positively associated with capital intensity. Again, based on the paper's main hypothesis, I expect this variable being less important (or even insignificant) for cash flow statement than for segment disclosures (depending on how much additional information the former provides).

- *Control Variables*

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may have access to segment data and cash flow information. Thus, incremental proprietary costs in the labor

As agency problems associated with debt are likely to increase with *leverage*, voluntary disclosures are often hypothesized to be positively associated with leverage. The idea is that voluntary disclosures enhance monitoring (e.g., Leftwich et al., 1981). However, in Germany, public debt agreements are rare. In bank debt agreements, which are widespread, there are other means than the annual to provide information to debtholders for monitoring purposes (Schneider, 1985, p. 26). Furthermore, leverage may also be inversely related to cost savings in private information acquisition since a higher leverage implies *ceteris paribus* less (outside) equity. The latter implies a negative association.

Thus, it is a priori not clear how leverage is associated with voluntary of segment or cash flow statement disclosures by German firms. Previous empirical results with regard to leverage are inconclusive. While some studies find a significantly positive association (e.g., Bradbury, 1992; Mitchell et al., 1995), many other studies report that the effect of leverage is insignificant (e.g., Schneider, 1985; Chow and Wong-Boren, 1987; Wagenhofer, 1990b, p. 252; McKinnon and Dalimunthe, 1993; Bernards, 1994, p. 235-236).

Jensen and Meckling (1976) argue that agency costs are likely to increase as the level of outside equity rises. Hence, voluntary disclosures are expected to be negatively associated with *concentration of ownership* (see also Leftwich et al., 1981). In addition, large shareholders are less reliant on the annual report as an information source because they presumably have access to other information channels, such as the board of directors. Thus, they may obtain cash flow information or segment data privately while small (arm's length) shareholders may not. Furthermore, cost savings in private information acquisition generated by voluntary disclosures increase in the number of shareholders and hence are likely to decrease with concentration of ownership. For these reasons, I

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market from *disclosures* of this information to the capital market are likely to be small.

predict that firms with concentrated ownership are less likely to disclose cash flow statements and segment reports. The existing evidence generally supports this hypothesis (e.g., Schneider, 1985; McKinnon and Dalimunthe, 1993; Scott, 1994).

Firms with unrelated lines of business are presumably under more capital market pressure to provide segment information than firms with closely related lines of business because for the former consolidated financial statements are less informative (e.g., Ijiri, 1995) and managers are more difficult to monitor (Wysocki, 1998). That is, segment reports are relatively more informative and hence more important to investors for firms with unrelated activities. However, for the same reason, segment reports are likely to have relatively higher proprietary costs for these firms (see also Hayes and Lundholm, 1996).

Thus, the association between voluntary segment disclosures and the degree of *corporate diversification* is indeterminate. The two forces pull in opposite directions and possibly result in an insignificant coefficient. This may explain why McKinnon and Dalimunthe (1993) as well as Mitchell et al. (1995) find that voluntary segment disclosures by Australian firms are not significantly associated with unrelated diversification. As the cash flow statement provides information at the same level of aggregation as the other financial statements, there is no clear prediction either.

A *listing at a foreign stock exchange* is likely to result in additional demand for voluntary disclosures (Meek and Gray, 1989). I expect German firms to face particularly strong pressures in the foreign capital market if the other (domestic) firms in the market generally provide this information, while these disclosures are neither required in Germany nor by the foreign exchange. Such a situation arises at the London Stock Exchange (LSE) and in the US OTC market, where cash flow statements and segment reports are mandatory for domestic firms, but not required from German firms. Consequently, I predict that a listing at the LSE and the fact that ADRs for the firm are trading in US OTC market are positively associated with voluntary segment and cash flow

statement disclosures by German firms. A weaker effect is expected for any foreign listing. Several disclosure index studies report an international listing effect (e.g., Cooke, 1989; Meek et al., 1995), while Mitchell et al. (1995) find only weak support segment data disclosures by Australian firms.

A multinational firm is likely to face a different demand for disclosures than a firm that generates most of its business domestically (e.g., Gray and Radebaugh, 1984; Meek et al., 1995). That is, a German firm that operates worldwide presumably has a substantial number of foreign *stake*holders resulting in greater pressures to conform with internationally accepted accounting and disclosure practices. Since cash flow statements and segment reports are widespread internationally, I hypothesize that *foreign business* and both voluntary disclosures are positively related. However, Bernards (1994, p. 226-228) finds the extent of foreign business to be insignificant in his study on segment disclosures by German firms. In contrast, Schneider (1985) reports a positive and significant association between foreign business and cash flow statement disclosures by German firms.

In principle, any auditor has some influence on the firm's disclosure policy. However, a *"big six" auditor* is expected to encourage internationally accepted accounting and disclosure standards since they presumably have a competitive advantage in auditing such statement compared to national auditors (Bauer and Schader, 1996). Thus, I control for the fact that the firm has a "big six" auditor and hypothesize a positive association for both types of disclosures. However, Bauer and Schader (1996) find that the "big six" variable is not significantly related with voluntary cash flow statement disclosures by Austrian firms.

Table 1 summarizes the individual hypotheses, i.e. the predicted signs, for the determinants. For those variables that are predicted to differ in their relative importance for cash flow statements and segment reports based on the main hypothesis, the last column indicates for which of the two disclosures a stronger marginal effect is predicted.

3.   Sample Selection and Data Description

Sample firms were chosen based on the DAX 100 stock index and "Die Großen 500" list published by "Die Welt". The latter contains the largest 553 German non-financial firms ranked by total revenues.[18] From this list, I eliminate all firms that were not listed at a German stock exchange prior to October, 30th 1996 because disclosure incentives of German firms with and without publicly traded stock are likely to be different (for evidence see Haller and Jakoby, 1994; Bernards, 1994).

Furthermore, I eliminate from both sources all firms that are either a subsidiary of a foreign firm or of a German parent included in the sample. In both cases, the subsidiary's decision to disclose or not to disclose cash flow statements and segment reports may not be "independent" of the parent, and hence bias my results.[19] For instance, a subsidiary's disclosure policy may be decided by the parent, in which case including both firms in the sample would result in double-counting. Similarly, the disclosure policy of a subsidiary with a foreign parent may be determined by foreign disclosure standards used by the parent. Alternatively, the disclosure may be coordinated in the sense that the subsidiary does not disclose precisely because the parents provides this information in its (consolidated) statements.[20] In addition, I eliminate three firms that were listed at the NYSE in 1996 and as a result *had* to provide cash flow statements and segment reports. I also exclude two outliers.[21] The final sample contains 109 non-financial firms and comprises more than 75% of the

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[18]   In 1996, the smallest firm in this list had a total revenue of about one billion DM. The Welt 500 list was double-checked against German entries in the Worldscope database. This check revealed five firms with total revenues of approximately one billion or more that were missing from the Welt 500 list. They were added to the sample.

[19]   The criterion was a stake in the firm's outstanding capital greater or equal to 50%. A similar argument can be made for associated firms, when another sample or a foreign firm holds a stake between 20 and 50%. This case, however, is not present in the final sample. Note that sample firms may be subsidiaries or associates of *non-sample* firms, in particular, financials. But as German financials generally do not consolidate industrial subsidiaries and as accounting practices for financials are quite different, a direct link between the parent's and the subsidiary's policies is more difficult to establish.

[20]   For evidence on these cases, see Görges and Schulte (1994), Goebel and Fuchs (1995, p. 1522), Stahn (1997, p. 1193), respectively.

[21]   They were identified as influential observations distorting some of the cash flow statement regressions. Eliminating both firms is also justified on theoretical grounds as one is an organization solely set up to promote the business of

total market capitalization of German industrials. Table 2 describes the independent proxies and the databases from which they were obtained and table 3 presents descriptive statistics.

The magnitude of the proprietary costs associated with disclosure also depends on quality, i.e., the precision of the information provided. Thus, I construct several dependent variables accounting for qualitative differences in the cash flow statement and segment disclosures. Furthermore, due to the lack of German accounting standards for both disclosures, it is not obvious what precisely constitutes a cash flow statement or a segment report. Thus, I create several variables to check the robustness of my results with respect to the classification. All dependent variables are coded based on hard copies of the annual reports with fiscal year ending between 4/1/1996 and 3/30/1997.

The first variable (CFS1) is based on a very broad definition and indicates whether the annual report provides a "cash flow statement" of any and even simplest kind. Since previous studies view the "separating out" of a funds change at the bottom of the statement as a distinguishing feature (e.g., Haller and Jakoby, 1994; Bauer and Schader, 1996), the second variable (CFS2) refers to cash flow statements with a funds change as separate line item. This definition is purely based on the format. Presumably, however, the format is less important to investors than whether the cash flow statement provides additional information. Based on idea of "substance over form", the third variable (CFS3) classifies according to the fact that a funds change is disclosed (not necessarily at the bottom-line) *and* that there is at least one line item, which (a) is typically not provided elsewhere in the annual report and (b) helps to more precisely determine the firm's cash flows.[22] However, this

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its owners (1800 independent shoe retailers) while the other was in severe financial distress prior and at the time of the study. I was not able to identify any further observations whose elimination would materially alter my results.

[22] Examples are gains from selling fixed assets or from accounting associates at equity, cash flows from selling fixed assets (and not merely the change in book value), gross cash flows from new loans and repayments, changes in cash and cash equivalents due to currency translation or valuation changes. Note that some of these are non-cash items. However, knowing these line item would help to compute the firm's cash flow if it had to be determined from the income statement and the balance sheet in a retrograde fashion.

binary classification has the drawback that CFS3=0 comprises firms that publish cash flow statements, which fail to meet the information criterion, as well as firms that do not disclose one.

Therefore, I define an *ordinal* variable (CFS4) with three levels: full disclosure (=2) indicates a cash flow statement that satisfies the criteria used for CFS3, partial disclosure (=1) any other cash flow statement and no disclosure (=0) the lack thereof. Panel A of table 4 presents the frequencies for the different cash flow variables. The reported frequencies are in line with those of previous studies on German firms (e.g., Haller and Jakoby, 1994; Stahn, 1997). As expected the frequencies decrease in the restrictiveness of the definition used: Out of the 97 firms with a cash flow statement of any kind, eight do not disclose a statement with a funds change as separate line item and twenty do not provide a statement with at least one line item that typically provides additional information. As such additional disclosures within the cash flow statement may have some proprietary costs, this pattern in the frequencies is consistent with the main hypothesis of this paper.

The dependent variables for voluntary business segment disclosures are constructed using US GAAP and IAS standards on segment reporting (prevailing in 1996) as a guide. For all variables, "no *voluntary* disclosure" (=0) indicates that the firm reports segment sales only; the latter is mandatory for German firms with publicly traded shares. For BDISC1, "voluntary disclosure" (=1) requires that the firm provides at least one of the following four items for each segment in addition to sales: operating income, identifiable assets, capital expenditures, depreciation. Under SFAS 14, these five items had to be disclosed. However, I do not require all five items in the classification because under IAS 14 (before its revision) only sales, operating income and identifiable assets had to be reported. The second variable (BDISC2) uses a more restrictive definition. It requires that the firm as a minimum discloses operating income in addition to sales for each segment. This classification is

based on the notion that operating income for a segment is a particularly sensitive piece of information allowing competitors to determine the operating margin.[23]

To distinguish between full and partial segment reports, I create an *ordinal* variable (BDISC3) with three levels: "full segment report" (=2) refers to disclosing all five items while "partial segment report" (=1) refers to reporting at least one but less than four items in addition to sales. For comparison, I construct analogous variables for geographic segment disclosures. Panel B in table 4 presents descriptive statistics for the different segment data variables. The low level of voluntary segment disclosures is in line with the findings in Bernards (1994). German firms rarely provide a full segment report, i.e. data on sales, operating income, assets, capital expenditures, depreciation for each segment. The most common item reported is operating income for both business and geographic segments while the least common item is identifiable assets for the business segments and depreciation for the geographic segments.

Geographic segment disclosures by German firms are particularly rare. Previous studies make similar observations in other countries and suggest that there may be substantial political costs associated with geographic segment disclosures in addition to the proprietary costs (see Herrmann and Thomas, 1997). For instance, tax authorities may use these disclosures in transfer pricing disputes. Thus, geographic segment disclosures are likely to be governed by considerations beyond those discussed in section 2.2. As this makes them less suited than business segment disclosures for this study, I do not further consider geographic segment disclosures.

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[23] Some firms provide the operating cash flow instead of operating income (e.g., Dyckerhoff AG) because this figure is more appropriate for their business. As this disclosure also allows competitors to calculate the operating margin such a disclosure is coded in the same way as the disclosure of operating income.

4.   Empirical Results

4.1   Description of Disclosure Behavior

Comparing panels A and B in table 4 reveals that voluntary cash flow statement are strikingly more frequent than voluntary segment reports. While the vast majority of the German firms presents a cash flow statement (of any kind), less than 50% of the firms provide business segment data (beyond sales). This comparison alone suggests that the two disclosures are quite different in nature. Moreover, there is no (only one) firm that provides segment profits (capital expenditures) in addition to segment sales, but not a cash flow statement of any kind. This observation as well as the different frequencies are consistent with the hypothesis that segment reports are associated with higher proprietary costs. Note that this difference becomes smaller if the most restrictive cash flow statement definition (CFS3) is used. This pattern is consistent with the earlier conjecture that cash flow statement disclosures can result in some proprietary costs.

As a further check of the hypotheses derived in section 2, I compare the disclosure choices of firms for which proprietary costs (capital-market benefits) are expected to be high (low) with those of firms for which the reverse is expected. The first group comprises firms with below median trading volume, firm size, capital intensity and above median profitability whereas the reverse holds for the second group. I expect that firms in the high proprietary costs/low capital-market benefits group disclose less frequently compared to those in the low proprietary costs/high capital-market benefits group. Moreover, I expect that, within each group, the firms disclose more cash flow statements than segment reports. The results presented in table 5 are consistent with these hypotheses. Similar results are obtained, if the two groups are selected using free float and trading volume as capital-market benefit proxies and any combination of two proprietary cost proxies (firm size, return on assets and capital intensity).

4.2   Multiple Regression Analysis

To examine the incremental explanatory power of the variables, I estimate multiple regressions using the following model:

$$Disclosure = Intercept + b_1 Log(Volume) + b_2 Log(Size) + b_3 ROA + b_4 Capital\ intensity$$
$$+ b_5 Leverage + b_6 Free\ float + b_7 Diversification + b_8 Foreign\ listing$$
$$+ b_9 Foreign\ business + b_{10} Big\ six + e$$

As size and profitability proxies, I choose firm value and return on assets (ROA), respectively. However, the other proxies (see table 2) produce very similar results. As foreign listing proxy, I select the dummy indicating whether the firm is listed at the London Stock Exchange or has sponsored depository receipts trading in the US OTC market. The capital market pressures are expected to be more pronounced for this variable than for the dummy indicating whether the firm has any foreign listing. Moreover, the former is less strongly correlated with size. Table 6 presents pairwise correlations of the independent variables. There is only one pairwise correlation above 0.5. Moreover, regression diagnostics suggested in Belsley et al. (1980) indicate that collinearity among the independent variables is not a problem, but confirm the *weak* collinearities between foreign listing and size as well as profitability and leverage revealed by the pairwise correlations.[24]

Table 7 presents three probit regressions for the cash flow statements.[25] All models have significant explanatory power. The results for CFS1 are not reported, but very similar to those in table 7. In the CFS2 regression, trading volume, firm size, free float and foreign listing status are

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[24] The model fails the suggested criteria indicating collinearity (Belsley et al., 1980). That is, I do not find condition indices above 10 or two or more variables with variance proportions above 0.5 for the same eigenvalue. The condition number, i.e. the highest condition index, is 2.68 in the intercept-adjusted diagnostics. Furthermore, variance inflation is below 2.5 for all independent variables.

[25] The results are virtually unchanged using logit regressions. OLS regressions yield results similar to those reported and adjusted R^2s of 0.16, 0.29 and 0.29, respectively.

highly significant and have the expected sign.[26] Profitability and capital intensity have the predicted signs, but fail to attain conventional significance levels. These findings are consistent with the hypothesis that cash flow statement disclosures are governed primarily by capital-market considerations. Likewise, the findings for diversification, leverage are in line with the my predictions for cash flow statement disclosures. The foreign business variable and the big six dummy are unexpectedly not significant.

Using CFS3 as dependent variable, trading volume, firm size, free float and foreign listing status are again highly significant with the predicted signs. In addition, capital intensity and leverage are now significant. That is, firms are more likely to disclose cash flow statements with at least one line item that generally is not contained elsewhere in the annual report (CFS3=1), if they are highly leveraged and if entry barriers are high. Both findings are consistent with theory because additional information about the firm's cash-generating ability is particularly important for highly leveraged firms, and as the disclosure of this information may have some proprietary costs, it is more likely to be provided if entry barriers are high. Again, profitability, diversification and big six auditor are insignificant. The coefficient on foreign business has now a significant negative coefficient. The ordered CFS4 regression essentially confirms the results using CFS3 except that leverage is no longer attains conventional significance levels (p=0.126).

In summary, the major findings are the significance of trading volume, free float and foreign listing status as well as the insignificance of profitability across all regressions. These results are consistent with the hypothesis that voluntary cash flow statement disclosures are governed primarily

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[26] Note that all sample firms with a listing at the LSE or ADRs trading in the US OTC market disclose cash flow statements. This makes the foreign listing dummy a perfect predictor in 7 cases and hence highly significant. Excluding the dummy and re-estimating all cash flow regressions as well as estimating these regressions without the 7 firms do not materially change the coefficients of the other variables. Thus, the estimates are reliable and not affected by this quasi-complete separation in the data.

by capital-market considerations. The significance of capital intensity in the latter two regressions suggests that proprietary cost considerations are not completely irrelevant, but matter only if the cash flow statement is likely to reveal additional information. There is also a moderate size effect. The negative and in two regressions significant coefficient of business abroad is puzzling and inconsistent with my expectations.[27]

Table 8 presents three probit regressions for the business segment disclosures.[28] All models have significant explanatory power. In the first two models, firm size, capital intensity and free float are highly significant and have the predicted signs. Profitability has a negative sign, as expected, but is highly significant only in one of the two binary regressions.[29] Trading volume exhibits a weak positive association in the first but no association in the second regression. These findings are generally consistent with my hypotheses. With respect to the control variables, I find only weak support for a positive association of unrelated diversification (p=0.109 and p=0.129) and foreign business (p=0.121 and p=0.086). The low significance level of diversification is not a surprise considering that capital market pressures and proprietary cost considerations are hypothesized to pull in opposite directions (see section 2.3). However, an alternative explanation is that the proxy poorly captures whether the firm diversifies into related or unrelated industries. Foreign listing status has unexpectedly no significant influence. However, the insignificance prevails because of one sample firm, which is listed at the London Stock Exchange, but does not provide business segment data.[30]

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[27] The sign does not change if the foreign listing dummy is dropped from the model. However, the coefficient is no longer significant if industry dummies are included (see section 5).

[28] The results are virtually unchanged using logit regressions. OLS regressions produce results similar to those reported with adjusted R^2s of 0.30, 0.30 and 0.43, respectively.

[29] Note that the insignificance of profitability is not the result of the reported correlation with leverage. Dropping leverage does materially alter the coefficients and significance levels reported in table 8.

[30] Interestingly, the firm discloses geographic segment data. There are only six firms in the sample that provide more geographic than business segment disclosures (i.e., GDISC3>BDISC3). To check whether neglecting geographic segment disclosures affects my results, I re-estimate all regressions excluding these firms. The coefficients and significance levels of all variables (except the foreign listing dummy) are essentially unchanged. Note also that

Dropping this firm reveals a positive and highly significant association between the foreign listing dummy and voluntary business segment disclosures as hypothesized.

The ordered regression (BDISC3), which accounts for qualitative differences in the disclosures, essentially confirms the findings of the binary probit models. Notably, profitability is highly significant while trading volume fails to attain conventional significance levels. Moreover, leverage, which has a negative sign across all regressions, is now significant.

In summary, the significance of firm size, profitability (in two regressions) and capital intensity as well as the insignificance of trading volume (in two regressions) are consistent with the main hypothesis of the paper. These results suggest that proprietary cost considerations play a major role for voluntary business segment disclosures. However, the significance of trading volume in one regression as well as the results for free float and foreign listing (if one observation is eliminated) indicate that firms trade off proprietary costs and capital-market pressures and benefits.

4.3   Relative Magnitudes of the Determinants across Disclosures

A comparison of tables 7 and 8 suggests that the relative importance of the main proxies is reversed for the two types of disclosures. In particular, the signs and significance levels of trading volume, firm size, profitability and capital intensity across the two regressions are in line with the paper's main hypothesis. That is, proprietary-cost considerations appear more important for segment disclosures while cash flow statement disclosures seem to be governed primarily by capital-market considerations.

But as direct comparisons of the coefficients across probit regressions - even for the same sample - can be misleading, I calculate for each observation the marginal effect of each of the *four* independent variables using the parameter estimates obtained in the binary cash flow statement and

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dropping the observations with a foreign listing or re-estimating the regressions without the foreign listing dummy

business segment regressions. Table 9 presents the means of these individual marginal effects for each of the four variables and each binary regression. Comparing across the cash flow statement and business segment data regressions, I find that the average marginal effect of trading volume is *always* larger for the former, while the average (absolute) marginal effects of firm size, profitability and capital intensity are *always* larger for the latter. Moreover, for each variable, the differences in the means across the cash flow and business segment regressions are significant at the 1% level, except in one case (CFS2 and BDISC1) where the difference is significant at the 5% level using a t-test and at the 10% level using a non-parametric Wilcoxon test. These findings are consistent with the paper's main hypothesis as well as the individual predictions in table 1 (see last column).

5.   **Robustness Checks**

First, it should be pointed out that the reported findings are fairly similar for the different definitions of cash flow statements and robust across binary and ordered probit regressions. In addition, the following robustness checks were performed:

Industry effects

Since competitive pressures vary across industries, it is likely that voluntary disclosures depend on the industry within the firm operates. Furthermore, firms may imitate the disclosure practice of other firms in the industry (Dye and Sridhar, 1995). Consistent with these expectations, disclosure studies typically find significant industry effects (e.g., Schneider, 1985; Wagenhofer, 1990b; Bernards, 1994; Mitchell et al., 1995).

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does *not* materially change the coefficients and significance levels of the other variables.

To check whether industry effects are present in this study as well and whether they affect the results reported above, I include five industry dummies and re-estimate all regressions.[31] Panel C of table 4 provides details on the industry classification used as well as the frequencies of voluntary cash flow statements and segment reports for each industry. Table 10 reports selected probit regressions. In summary, the results reported in tables 7 and 8, as well as the comparison across regressions, are robust and do not appear to be influenced by industry effects. That is, the coefficients of the variables and their test statistics are not materially affected by the inclusion of industry dummies with two minor exceptions: Firm size has a slightly lower significance level in the cash flow regressions, and foreign business has a generally insignificant (and sometimes even positive) coefficient. Both changes are consistent with my hypotheses and do not alter the conclusions drawn in section 4.

For cash flow statement disclosures, I find a negative industry effect for construction that is weakly significant at the 10% level using CFS3 and CFS4. For the business segment disclosures, I find significant industry effects only for the binary, but not for the ordered probit regression. There are positive industry effects for automotives, chemicals & pharmaceuticals, and engineering using BDISC1 as well as chemicals & pharmaceuticals using BDISC2.

Equity offerings

Several papers have documented that voluntary disclosures are positively associated with future security offerings (see e.g., Lang and Lundholm, 1993). However, such behavior is less likely for the one-time disclosure policy choices considered in this paper, unless the firm anticipates to be continuously in the market. As debt contracts are typically private in Germany, I check whether future equity offerings explain previous disclosure choices in my study. That is, I create a dummy variable equal to one if a firm raises equity in the capital market between its fiscal year end and Dec.

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[31] Note that the capital intensity variable is likely to be industry-related and hence already controls for industry effects

30th 1997. There are nine firms in my sample for which the dummy variable indicates a subsequent equity offering. I expect a positive association between the dummy variable and voluntary cash flow statement and segment disclosures. While the coefficient generally has a positive sign, the test statistics are quite low and far from conventional significance levels. Moreover, none of the coefficients or test statistics of the other independent variables is materially affected by the introduction of the equity offering dummy.[32]

Firms with one segment only

A concern given the sample selection procedure is that the sample may contain firms that operate in only one industry and hence do not have several segments to report. The Worldscope database provides up to five SIC codes for each firm based on the description of the company in the annual report. However, the sample does not contain firms for which Worldscope provides only *one* four-digit SIC code.

Another way to identify single-segment firms is the mandatory disaggregation of sales by activities in the notes of the annual report. However, German firms have considerable discretion in this disaggregation and may combine segments. Thus, it is not clear whether firms *reporting* only one segment are in fact single-segment firms and should be excluded from the study. Nevertheless, I re-estimate all segment data regressions using only those firms disclosing sales for at least two business segments in the notes. The results of these regressions, dropping eight firms, are very similar to those reported above.

Accounting for qualitative differences in business segment disclosures

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to some extent.

[32] The correlation between the equity offerings dummy and capital intensity is slightly negative (ρ=-0.083), but not significant. This is consistent with my interpretation that, in the German environment, capital intensity proxies for entry barriers (and not for financing effects).

As mentioned before, the magnitude of proprietary costs depends on the quality of the particular disclosure. For this reason, the dependent variables are constructed to account at least to some extent for qualitative differences. But even in the ordered probit regressions, firms are classified in the same way whether they provide (for each segment) two or three items in addition to sales. Moreover, it has been suggested that, due to the proprietary nature of segment information, firms have an incentive to "combine" activities in order to obfuscate their results and "hide" profitable segments. Hence, the number of segments to be reported may play an important role in the firm's disclosure choice, but is not accounted for by the dependent segment data variables.[33] I neglected this aspect because the study's main purpose is a comparison of cash flow statement and segment data regressions, which requires that the construction of the dependent variables is closely matched.

To check whether my results are affected by this construction and to better account for qualitative differences in voluntary segment disclosures, I create the following variable (BDISC4): Number of items voluntarily provided for each segment (i.e., operating income, identifiable assets, capital expenditures, depreciation, cash flow) times the number of segments reported. As this variable is censored at zero for those firms not voluntarily disclosing segment data, I estimate a tobit regression. The results are very similar to those presented for BDISC3 in table 8.

6.   Discussion and Conclusions

This paper exploits specific features of the German institutional environment to provide a more complete test of the proprietary cost hypothesis than previous studies. Using voluntary cash flow statements and segment reports by German firms as proxies for non-proprietary and proprietary

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[33] Recall that the diversification proxy accounts both for the number of segments as well as how related segments are. Note further that it would not be appropriate to include the number of segments disclosed as independent variable, although doing it does not materially alter my results and in particular does not remove the significance of size.

disclosures, respectively, I present evidence consistent with the hypothesis that proprietary-cost considerations are more important for latter than for the former. Cash flow statement disclosures appear to be governed primarily by capital-market considerations, whereas segment disclosures are more strongly associated with proxies for product-market and proprietary-cost considerations. In particular, trading volume as proxy for capital-market benefits of voluntary disclosures has always a positive sign, but generally is significant only for the cash flow statements. Conversely, I find that the firm's profitability as a proxy for proprietary costs is negatively associated with voluntary disclosures in all regressions (except one), but it is significant only for business segment reports.[34]

The proprietary cost hypothesis is further supported by comparing the significance levels of capital intensity and firm size across the cash flow statement and segment data regressions. While both variables are positively associated and generally significant, the test statistics are considerably higher in the segment disclosure regressions. Moreover, capital intensity as a proxy for entry barriers and (the inverse of) proprietary costs is only significant for those cash flow statements with potential proprietary cost implications. These findings are consistent with the notion that proprietary costs considerations are more important for the business segment reports, but not completely irrelevant for (informative) cash flow statements.

The higher significance level of firm size in the segment data regressions is expected as size proxies *ceteris paribus* for the aggregation level of segment disclosures as well as the firm's ability to combine activities to obfuscate segment results and hide profitable activities. Thus, proprietary costs of business segment disclosures are likely to be decreasing in firm size. In the cash flow statement regressions, firm size does not have this interpretation and hence its moderate significance level is likely to be the usual size effect found in many disclosure studies.

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[34] The latter result is consistent with Harris (1998). She finds a positive relationship between segment disclosures and

In addition, I explicitly assess the relative importance of the determinants for non-proprietary and proprietary disclosures. That is, I compare the average marginal effect of each of the four variables on voluntary cash flow statement and segment disclosures in the binary probit regressions. The differences in the magnitudes of the average marginal effects are as hypothesized and highly significant, which corroborates the above conclusions. The results also suggest that standard setters are well advised to focus on proprietary disclosures - if deemed desirable - since capital market forces may not be sufficiently strong to result in a complete "unraveling" for such disclosures.

With respect to the control variables, I find no support for the hypothesis that big six auditors have an influence on the firm's disclosure policy. Another unanimous result for both types of disclosures is the significance of the firm's foreign listing status. This finding supplements previous studies (see Saudagaran and Meek, 1997) and is consistent with the idea that competitive pressures in foreign capital markets, such as the London Stock Exchange or the US OTC market where peers regularly provide cash flow statements and segment reports, are sufficiently strong to induce even proprietary disclosures. I also find that the firm's free float is positively associated with cash flow statement and segment disclosures by German firms. This result is consistent with the hypothesis that the agency conflict between the management and outside equity, i.e., the ownership structure, is an important determinant of proprietary *and* non-proprietary disclosures in Germany. It is also in line with the agency perspective on segment disclosures put forth in Wysocki (1998). Alternatively, the finding may indicate the importance of cost savings in private information acquisition as suggested by Diamond (1985). Based on this study, it is not possible to disentangle the two explanations.

For financial leverage, I did not expect a particular sign due to special features of the German institutional environment. I obtain positive coefficients for the cash flow statements and negative

competition, which she interprets as evidence that firms hide profitable segments in less competitive industries.

signs for the segment reports that are significant in the ordered regressions. The negative sign might indicate that leverage proxies in Germany for cost savings in private information acquisition not fully captured by the other variables in the model, while the positive sign might be due to the demand for cash flow information in particular for highly levered firms. Although the findings for leverage remain inconclusive, they suggest that the firm's capital structure influences voluntary cash flow statement and segment disclosures in opposite ways.

Such findings, as well as the differences in the significance levels of several variables across the cash flow statement and segment data regressions, raise doubts whether it is appropriate to aggregate different types of information into a single disclosure index. If disclosure incentives are distinct across different types of information, as suggested by this study, then the different effects may cancel each other and be lost in the index.

Finally, the evidence should be interpreted with the following caveats in mind: Proprietary costs as well as disclosure benefits in the capital market are notoriously difficult to measure. Thus, my conclusions hinge on how well the proxies capture these underlying constructs. Moreover, the sample size precludes a further analysis of subsamples in which one could control more directly for these costs and benefits (e.g., firms in regulated industries where proprietary costs are less of a concern). To construct such tests is left for future research.

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Table 1

Hypothesized Determinants of Cash Flow Statement and Segment Disclosures

Determinant	Cash Flow Statement Sign	Segment Report Sign	Stronger Marginal Effect[1] (Main Hypothesis)
Main Variables			
Trading volume	+	+	CFS
Firm size	+	+	SR
Profitability[2]	0/-	-	SR
Capital intensity[2]	0/+	+	SR
Control Variables			
Financial leverage	?	?	
Concentrated ownership	-	-	
Corporate diversification	?	?	
Foreign listing status	+	+	
Foreign business	+	+	
"Big Six auditor"	+	+	

[1] The last column indicates whether the variable is expected to be more important, that is, have a stronger marginal effect on cash flow statement (CFS) or segment (SR) disclosures given the conjectured differences in associated proprietary costs.

[2] The predictions for profitability (0/-) and capital intensity (0/+) depend on how much additional information the cash flow statement provides. If the cash flow statement contains (almost) no additional information, the proprietary costs are (almost) zero and hence an insignificant relationship is expected for the two variables.

Table 2

Description of Independent Variables and Proxies

Independent variable	Proxy	Data base
Trading volume[1] Log (Volume)	• Yearly trading volume (in number of shares) in all market segments at the main exchange divided by total number of all voting and non-voting shares registered for trading	Deutsche Börse (Trading volume); Bloomberg (Shares outstanding)
Firm size[2] Log (Size)	• Net sales (in mill. DM) • Book value of total assets (in mill. DM) • Firm value = Market value of equity + book value of total liabilities (in mill. DM)	Bloomberg (Sales; Assets) Deutsche Börse (Market value equity)
Profitability[3]	• Operating income divided by net sales • Operating income divided by total assets (ROA) • ROA relative to industry	Bloomberg
Capital intensity	• Net plant, property and equipment divided by total assets	Worldscope (NPPE) Bloomberg (Assets)
Financial leverage	• Total liabilities including contingencies divided by total assets	Bloomberg
Concentrated ownership[4]	• Free float: Percentage of voting shares widely held and known to be available for free trading	Hoppenstedt (1996)
Corporate diversification[5]	• Sum of number of different one-digit, two-digit and three-digit SIC codes	Worldscope
Foreign listing status[6]	• Dummy: Foreign listing = 1 • Dummy: Listing at LSE or ADRs trading in US OTC market = 1	Hoppenstedt (1997)
Foreign business[7]	• Percentage of total revenues generated outside of Germany	Bloomberg; Worldscope
"Big Six" auditor	• Dummy: "Big Six" auditor = 1	Worldscope

Note: For several independent variables several proxies are available. In this case, the regressions are estimated for each proxy to check the robustness of the results. Following other studies, I use the natural log of trading volume and firm size as both variables are expected to have a decreasing influence and are highly skewed to the left.

[1] Trading volume is divided by the number of voting and non-voting shares registered for trading as the absolute trading volume is expected to be correlated with firm size (see also Scott, 1994).

[2] The market value of equity is calculated using the market capitalization as of 12/30/1996. For firms where one class of shares is not traded and hence there are no market prices for this particular stock, I use the share price of the traded class of stock as an approximation.

[3] Operating income is defined as earnings before taxes, interest and extraordinary items. ROA relative to industry is the firm's ROA minus the average ROA of all sample firms with the same industry classification (see table 4, panel C for details).

[4] The free float variable is a proxy for the *inverse* of ownership concentration. That is, a low percentage of voting shares available for free trading implies that one or several shareholders hold large blocks of shares.

[5] Worldscope provides a maximum of 5 SIC codes per firm. Using this classification, I first determine in how many industries a firm operates based on the first digit, the first two digits, the first three digits of the SIC codes. I then add the three measures of diversification for each firm to obtain a proxy for *unrelated* diversification. Note that two SIC codes that are different for the first two digits are also different for the first three digits (while the reverse is not true). Thus, adding the three measures exploits the lexicographic order of SIC codes and gives more weight to diversification into industries with SIC codes that are different at an earlier digit and presumably less related.

[6] The second dummy indicates (=1) if firm has a listing at the London Stock Exchange (LSE) or American Depository Receipts (ADRs) trading in the US over-the-counter (OTC) market. Note that in these markets domestic firms have to provide both disclosures. Private placements and unsponsored ADRs in the OTC market are excluded.

[7] For 7 firms, only sales generated outside Europe are available because they do not report sales in Germany. Note also that firms may not report sales generated abroad in a consistent fashion. Where several classifications for foreign sales are offered, I consistently choose sales by customer location.

Table 3

Descriptive Statistics for the Independent Variables

Panel A: Dummy Variables			
Variable	Foreign Listing	Listing at LSE or ADRs trading in US OTC market	"Big Six" auditor
Number of firms with	27	7	69
Percentage	24.8%	6.4%	63.3%

Note: Percentages are calculated based on sample of 109 non-financial firms that are listed at a German stock exchange before Oct. 30th 1996 and are not a subsidiary of a foreign or another sample firm. For further details on variable definitions see table 2.

Panel B: Continuous Variables											
Variable	Trading volume (per share)	Firm Size I (Total assets)	Firm size II (Net sales)	Firm size III (Firm value)	Profitability I (Operating margin)	Profitability II (ROA)	Profitability III (ROA vs. industry)	Capital intensity	Financial leverage	Concentrated ownership (Free float)	Corporate diversi-fication	Foreign business
Mean	1645297	9046	10504	11698	0.0424	0.0530	-0.0010	0.3339	0.7057	0.3914	8.4312	0.3829
Median	1471885	2145	2968	2732	0.0335	0.0492	-0.0048	0.3176	0.7232	0.3730	8.0000	0.4330
Maximum	5035251	94568	100123	103851	0.2439	0.2697	0.2244	0.7786	0.9567	1.0000	14.0000	0.8617
Minimum	4113	289	488	330	-0.1743	-0.1545	-0.2101	0.0222	0.3433	0.0000	4.0000	0.0000
Std. Dev.	1246142	17978	18602	22319	0.0525	0.0639	0.0623	0.1560	0.1291	0.2821	2.3069	0.2769

Note: Sample includes 109 non-financial firms that are listed at a German stock exchange before Oct. 30th 1996 and are not a subsidiary of a foreign or another sample firm. Trading volume is measured as the number of shares traded in 1996 in all market segments at the main exchange divided by total number of all voting and non-voting shares registered for trading. Firm size I is the book value of total assets in mill. DM. Firm size II is total sales in mill. DM. Firm size III is the sum of market value of equity as of 12/30/1996 and book value of total liabilities in mill. DM. PROF I is operating income before interest, taxes and extraordinary items divided by total sales. PROF II is operating income before interest, taxes and extraordinary items divided by book value of total assets (ROA). PROF III is the firm's ROA minus the average ROA of all sample firms with the same industry classification. Capital intensity is measured as net plant, property and equipment divided by total assets. Leverage is total liabilities including contingencies divided by total liabilities. Free float is the percentage of voting shares widely held and known to be available for free trading. Corporate diversification is a proxy for *unrelated* diversification measured as sum of *different* one-digit, two-digit, three-digit SIC codes. Foreign business is the percentage of total revenues generated outside Germany. See table 2 for further details on the variables.

Table 4

Descriptive Statistics for the Dependent Variables

Panel A: Frequencies of Voluntary Cash Flow Statement Disclosures by German firms

	CFS1		CFS2		CFS3		CFS4		
Value	=0	=1	=0	=1	=0	=1	=0	=1	=2
Number	12	97	20	89	40	69	12	28	69
Percentage	11	89	18.3	81.7	36.7	63.3	11	25.7	63.3

Note: Percentages are calculated based on sample of 109 non-financial firms that are listed at a German stock exchange before Oct. 30th 1996 and are not a subsidiary of a foreign or another sample firm. CFS1 as binary variable indicates whether the annual report provides a "cash flow statement" of any kind. CFS2 is binary and refers to cash flow statements with a funds change as separate line item and is based on the format. CFS3 is binary and classifies according to the fact that a funds change is disclosed (not necessarily at the bottom-line) *and* that there is at least one line item, which typically is not provided elsewhere in the annual report *and* helps to determine the firm's cash flows. The latter may be non-cash line items that are nevertheless useful to "back out" the firm's cash flows (see also footnote 22). CFS4 is an ordinal variable with three levels: full disclosure (=2) indicates a cash flow statement that satisfies the criteria used for CFS3, partial disclosure (=1) any other cash flow statement and no disclosure (=0) the lack thereof.

Panel B: Frequencies of Voluntary Business and Geographic Segment Data Disclosures by German firms

	BDISC1		BDISC2		BDISC3			GDISC1		GDISC3		
Value	=0	=1	=0	=1	=0	=1	=2	=0	=1	=0	=1	=2
Number	59	50	66	43	59	37	13	89	20	89	15	5
Percentage	54.1	45.9	60.6	39.4	54.1	33.9	11.9	81.7	18.3	81.7	13.8	4.5

Note: Percentages are calculated based on sample of 109 non-financial firms that are listed at a German stock exchange before Oct. 30th 1996 and are not a subsidiary of a foreign or another sample firm. The variables for voluntary segment disclosures are constructed using US GAAP and IAS standards on segment reporting (prevailing in 1996) as a guide. For all variables, "no *voluntary* disclosure" (=0) implies that the firm reports segment sales only; the latter is mandatory for German firms with publicly traded shares. BDISC1 as binary variable indicates whether the firm provides at least one of the following four items for each segment in addition to sales: operating income, identifiable assets, capital expenditures, depreciation. BDISC2 requires that the firm as a minimum discloses operating income in addition to sales for each segment. BDISC3 as ordinal variable with three levels distinguishes between full and partial segment reports: "full segment report" (=2) refers to disclosing all five items while "partial segment report" (=1) refers to reporting sales plus at least one but less than four items.

Table 4 continued

Panel C: Distribution of Sample Firms and their Voluntary Disclosures across Industries						
	Number of firms	Number of firms disclosing a cash flow statement			Number of firms disclosing business segment data	
		CFS1	CFS2	CFS3	BDISC1	BDISC2
Automotives	7	6 85.7%	6 85.7%	5 71.4%	5 71.4%	4 57.1%
Construction	13	10 76.9%	10 76.9%	7 53.9%	6 46.2%	4 30.8%
Chemicals & Pharmaceuticals	16	14 87.5%	13 81.3%	10 62.5%	10 62.5%	9 56.3%
Retail & Consumer Goods (incl. Breweries and Textiles)	34	30 88.2%	27 79.4%	19 55.9%	7 20.6%	6 17.7%
Mechanical and Electrical Engineering & Machinery; Steel & Metals	28	26 92.9%	24 85.7%	19 67.9%	17 60.7%	15 53.6%
Utilities & Telecoms; Transport (Regulated industries)	11	11 100%	9 81.8%	9 81.8%	5 45.5%	5 45.5%

Note: Percentages are calculated based on the number of firms in the industry (second column). For details on dependent variable definitions see panels A and B of this table. Firms listed at the Frankfurt Stock Exchange are classified based on the Composite DAX industry classification. It distinguishes the following non-financial industries: Automotives, Construction, Chemicals & Pharmaceuticals, Holding Companies, Electricals, Breweries, Transport, Mechanical Engineering & Machinery, Paper, Utilities & Telecoms, Steel & Metals, Textils, Retail & Consumer Goods. These industries are further aggregated into 6 major sectors as shown above. Sample firms classified as holding companies (AGIV, IVG) are reclassified based on the company description in Hoppenstedt (1997) and the primary SIC code in the Worldscope database. The only sample firm belonging to the paper industry (Herlitz) is reclassified as Retail & Consumer Goods. Sample firms not listed at the Frankfurt Stock Exchange are classified based on the classification provided in the Hoppenstedt Börsenforum which is essentially based on the Composite DAX classification.

Table 5

Comparison of Disclosure Choices of Firms with High (Low) Proprietary Costs and Low (High) Capital-Market Benefits

	High Proprietary Costs/Low Capital Market Benefits (n=8)	Low Proprietary Costs/High Capital Market Benefits (n=7)	Sample Average (n=109)
CFS1	85.7%	100%	89%
CFS2	71.4%	100%	81.7%
CFS3	28.6%	87.5%	63.3%
BDISC1	0%	87.5%	45.9%
BDISC2	0%	75%	39.4%

Note: Percentages are calculated based on the number of firms mentioned in the column header. Firms in the first (second) column have below (above) median trading volume, firm size and capital intensity and above (below) median profitability. CFS1 as binary variable indicates whether the annual report provides a "cash flow statement" of any kind. CFS2 is binary and refers to cash flow statements with a funds change as separate line item and is based on the format. CFS3 is binary and classifies according to the fact that a funds change is disclosed (not necessarily at the bottom-line) *and* that there is at least one line item, which typically is not provided elsewhere in the annual report *and* helps to determine the firm's cash flows. BDISC1 as binary variable indicates whether the firm provides at least one of the following four items for each segment in addition to sales: operating income, identifiable assets, capital expenditures, depreciation. BDISC2 requires that the firm as a minimum discloses operating income in addition to sales for each segment.

Table 6

Pairwise Pearson Correlations for the Independent Variables

	LNTVOL	LNSIZE	ROA	CAPINT	LEVER	FFLOAT	DIV	EXLIST	FORBUS
LNSIZE	0.1957 *								
ROA	0.1772	-0.0331							
CAPINT	-0.2640 **	0.0578	-0.0979						
LEVER	-0.2165 *	0.1090	-0.6096 **	0.0698					
FFLOAT	0.4186 **	0.3793 **	0.0196	-0.1089	-0.0043				
DIV	0.0831	0.2290 *	-0.0607	-0.0604	-0.0208	0.0873			
EXLIST	0.1066	0.4870 **	-0.0228	-0.0320	0.0077	0.3623 **	0.0975		
FORBUS	0.4066 **	0.2600 **	0.0539	-0.2471 **	-0.1077	0.2198 *	0.1145	0.1502	
BSIX	0.1700	0.3450 **	-0.0672	0.0361	-0.0120	0.1542	0.2673 **	0.1218	0.2140 *

Note: Sample comprises 109 non-financial firms that are listed at a German stock exchange before Oct. 30th 1996 and are not a subsidiary of a foreign or another sample firm. LNTVOL is the natural log of (relative) trading volume measured as the number of shares traded in 1996 in all market segments at the main exchange divided by total number of all voting and non-voting shares registered for trading. LNSIZE is the natural log of firm value measured as the sum of market value of equity as of 12/30/1996 and book value of total liabilities in mill. DM. ROA is the operating income before interest, taxes and extraordinary items divided by book value of total assets. Capital intensity (CAPINT) is measured as net plant, property and equipment divided by total assets. LEVER is total liabilities including contingencies divided by total liabilities. Free float (FFLOAT) is the percentage of voting shares widely held and known to be available for free trading. DIV is a proxy for unrelated diversification measured as sum of different one-digit, two-digit, three-digit SIC codes. EXLIST is a dummy variable equal to one if the firm is listed at the London Stock Exchange or has American depository receipts trading in the US OTC market. FORBUS is the percentage of total revenues generated outside Germany. BSIX is a dummy variable equal to one if the firm has a big six auditor. Two (three) asterisks indicate pairwise correlations with p-values (two-tailed) smaller than 0.05 (0.01).

Table 7

Probit Regressions for Voluntary Cash Flow Statements by German Firms

	CFS2	CFS3	CFS4
Intercept	-7.475[***]	-9.368[***]	-
	(-3.193)	(-4.172)	
Trading volume (+)	0.333[***]	0.335[***]	0.269[***]
	(2.998)	(3.048)	(7.237)
Firm size (+)	0.366[**]	0.320[**]	0.312[**]
[Log(Firm value)]	(2.242)	(2.006)	(5.702)
Profitability (-)	-3.430	0.392	-1.244
[ROA]	(-1.144)	(0.137)	(0.238)
Capital intensity (+)	1.299	2.206[**]	2.009[**]
	(1.289)	(2.484)	(4.738)
Leverage (?)	0.925	2.859[*]	2.045
	(0.612)	(1.789)	(2.344)
Free float (+)	2.280[**]	1.527[**]	1.692[***]
	(2.560)	(2.148)	(7.373)
Diversification (?)	-0.010	-0.045	0.003
	(-0.123)	(-0.733)	(0.002)
Foreign listing (+)	5.562[***]	6.573[***]	6.968[***]
[LSE listing and OTC trading]	(6.467)	(10.250)	(11.394)
Foreign business (+)	-0.495	-1.199[**]	-1.095[**]
	(-0.712)	(-2.050)	(4.145)
Big six auditor (+)	-0.302	0.156	0.202
	(-0.818)	(0.496)	(0.495)
LR statistic (prob.)	32.07	47.67	50.72
	(0.000)	(0.000)	(0.000)
McFadden R^2	0.3086	0.3329	-
Within-sample (vs. naive) classification rate	83.49% (81.65%)	79.82% (63.30%)	-

Note: Sample includes 109 non-financial firms that are listed at a German stock exchange before Oct. 30th 1996 and are not a subsidiary of a foreign or another sample firm. Predicted signs for the independent variables are in the first column in parentheses. The first two regressions (with CFS2 and CFS3 as dependent variables respectively) are binary probit models estimated with quasi-maximum likelihood procedures. Z-statistics are in parentheses and standard errors are robust to misspecifications of the underlying distribution (see White, 1982). The third regression (CFS4) is an ordered probit model with two intercept terms which are significant at 1% level but not presented. Wald chi-square statistics are in parentheses. For all regressions, two-tailed significance levels are indicated by asterisks: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. The likelihood ratio (LR) statistic, which tests for the explanatory power of the full model, is distributed chi-square with 10 degrees of freedom. Significance levels are in parentheses. The last row of the table presents the within-sample classification rates for the binary probit models. The naive classification is based on the largest cell.

CFS2 is a binary variable equal to one if the firm discloses a cash flow statement with a funds change as separate line item. CFS3 is a binary variable equal to one if the firm discloses a cash flow statement with a funds change (not necessarily at the bottom-line) *and* at least one line item, which typically is not provided elsewhere in the annual report *and* which would be useful when determining the firm's cash flow in a retrograde fashion. CFS4 is an ordinal variable with three levels: full disclosure (=2) indicates a cash flow statement that satisfies the criteria used for CFS3, partial disclosure (=1) any other cash flow statement and no disclosure (=0) the lack thereof. Details on the definitions of the independent variables are in table 2.

Table 8

Probit Regressions for Voluntary Segment Data Disclosures by German Firms

	BDISC1	BDISC2	BDISC3
Intercept	-6.919[***]	-7.272[***]	-
	(-3.298)	(-3.058)	
Trading volume (+)	0.185[*]	0.101	0.161
	(1.730)	(0.889)	(1.939)
Firm size (+)	0.433[***]	0.420[***]	0.553[***]
[Log(Firm value)]	(3.230)	(3.084)	(19.759)
Profitability (-)	-8.572[***]	-3.612	-7.825[***]
[ROA]	(-2.858)	(-1.212)	(7.641)
Capital intensity (+)	2.602[**]	2.607[***]	2.376[**]
	(2.550)	(2.654)	(6.038)
Leverage (?)	-1.901	-0.670	-2.522[*]
	(-1.355)	(-0.464)	(3.585)
Free float (+)	1.474[**]	1.525[***]	1.473[***]
	(2.327)	(2.620)	(7.205)
Diversification (?)	0.110	0.111	0.020
	(1.604)	(1.518)	(0.115)
Foreign listing (+)	-0.655[†]	-0.344[†]	-0.747[†]
[LSE listing and OTC trading]	(-0.887)	(-0.502)	(1.727)
Foreign business (+)	0.890	0.982[*]	1.139[**]
	(1.552)	(1.717)	(4.015)
Big six auditor (+)	-0.310	-0.037	-0.187
	(-0.981)	(-0.117)	(0.391)
LR statistic (prob.)	49.53	47.67	68.45
	(0.000)	(0.000)	(0.000)
McFadden R^2	0.3294	0.3289	-
Within-sample (vs. naive) classification rate	77.06% (54.13%)	78.90% (60.55%)	-

Note: Sample includes 109 non-financial firms that are listed at a German stock exchange before Oct. 30th 1996 and are not a subsidiary of a foreign or another sample firm. Predicted signs for the independent variables are in the first column in parentheses. The first two regressions (with BDISC1 and BDISC2 as dependent variables respectively) are binary probit models estimated with quasi-maximum likelihood procedures. Z-statistics are in parentheses and standard errors are robust to misspecifications of the underlying distribution (see White, 1982). The third regression (BDISC3) is an ordered probit model with two intercept terms which are significant at 1% level but not presented. Wald chi-square statistics are in parentheses. For all regressions, significance levels are indicated by asterisks: [*] $p < 0.10$; [**] $p < 0.05$; [***] $p < 0.01$. The likelihood ratio (LR) statistic, which tests for the explanatory power of the full model, is distributed chi-square with 10 degrees of freedom. Significance levels are in parentheses. The last row of the table presents the within-sample classification rates for the binary probit models. The naive classification is based on the largest cell. [†] Note that the coefficient is insignificant due to one firm which is listed at the LSE, but does not provide business segment data. If this firm (which provides geographic segment data) is dropped, the coefficient is positive and significant at the 1% level in all three regressions (see footnote 30).

BDISC1 is a binary variable equal to one if the firm voluntarily provides at least one of the following four items for each segment in addition to mandatory segment sales: operating income, identifiable assets, capital expenditures, depreciation. BDISC2 is a binary variable equal to one if the firm as a minimum discloses operating income in addition to sales for each segment. BDISC3 is an ordinal variable with three levels: "full segment report" (=2) refers to disclosing all five items while "partial segment report" (=1) refers to reporting sales plus at least one but less than four items.

Table 9

Means of the Individual Marginal Effects of the Independent Variables in the Cash Flow

Statement and the Business Segment Regressions in Tables 7 and 8

	CFS2	CFS3	Prediction	BDISC1	BDISC2	Sign.
Trading volume	0.061	0.083	>	0.048	0.025	1% [†]
Firm size	0.067	0.079	<	0.112	0.105	1%
Profitability	-0.629	0.097	<	-2.206	-0.903	1%
Capital intensity	0.238	0.544	<	0.670	0.652	1%

Note: The marginal effect of the independent variables on the probability of a voluntary disclosure (y=1) in a binary probit regression for a particular observation can be expressed as follows:

$$\frac{\partial E[y|x]}{\partial x} = \phi(\beta'x)\beta$$

where E[y|x] is the expected probability for a voluntary disclosure (y=1) given the *vector* of covariates x of a particular observation, $\phi(\cdot)$ is the standard normal density and β is the vector of parameter estimates from the regression. This expression is evaluated at every observation to obtain the individual marginal effects for each independent variable using the *binary* probit regressions. The table presents the means of these individual effects for each variable and each binary regression. The fourth column indicates the predicted (absolute) magnitude of the average marginal effects across cash flow statement and segment regressions (see also table 1).

[†] For any combination of variables, the differences in the means across cash flow statement and business segment regressions are statistically different at the 1% level using a t-test for paired samples as well as a non-parametric Wilcoxon matched-pairs/signed-ranks test, except the difference in the means of trading volume in the CFS2 and BDISC1 regressions, which has p-values of 0.014 and 0.079 for the parametric and the non-parametric test, respectively. For details on dependent and independent variables see tables 2 and 3, respectively.

Table 10

Probit Regressions for Voluntary Cash Flow Statement and Segment Disclosures by German Firms

	CFS3	CFS4	BDISC1	BDISC2
Trading volume	0.475***	0.387***	0.145	0.060
	(3.537)	(9.293)	(1.194)	(0.497)
Firm size	0.246	0.253*	0.484***	0.465***
[Log(Firm value)]	(1.495)	(3.105)	(2.883)	(2.822)
Profitability [ROA]	0.090	-1.296	-9.540***	-4.026
	(0.032)	(0.247)	(-3.032)	(-1.327)
Capital intensity	2.104**	1.932*	3.317***	3.259***
	(2.121)	(3.718)	(2.755)	(2.854)
Leverage	2.930*	2.218	-2.053	-0.593
	(1.855)	(2.668)	(-1.348)	(-0.402)
Free float	1.586**	1.740***	1.416**	1.530***
	(2.114)	(7.415)	(2.037)	(2.654)
Diversification	-0.041	0.006	0.123*	0.115
	(-0.652)	(0.010)	(1.771)	(1.568)
Foreign listing	7.792***	7.285***	-0.691	-0.381
[LSE listing and OTC trading]	(10.284)	(12.967)	(-0.719)	(-0.479)
Foreign business	-1.499	-1.075	-0.657	0.188
	(-1.639)	(1.634)	(-0.764)	(0.232)
Big six auditor	0.149	0.186	-0.307	0.015
	(0.469)	(0.390)	(-0.973)	(0.046)
ID 1 (Automotives)	-1.228	-1.404	1.733*	1.071
	(-1.292)	(1.761)	(1.897)	(1.373)
ID 2 (Construction)	-1.434*	-1.553*	1.059	0.590
	(-1.659)	(2.985)	(1.367)	(0.807)
ID 3 (Chemicals & Pharmaceuticals)	-0.709	-0.833	1.800**	1.326*
	(-0.769)	(0.771)	(2.171)	(1.713)
ID 4 (Retail & Consumer Goods)	-1.034	-0.845	0.461	0.666
	(-1.320)	(1.084)	(0.657)	(0.979)
ID 5 (Engineering; Steel & Metals)	-0.875	-0.889	1.624*	1.193
	(-0.959)	(0.818)	(1.926)	(1.489)
LR statistic (prob.)	50.54	55.47	56.16	51.42
	(0.000)	(0.000)	(0.000)	(0.000)
McFadden R^2	0.353	-	0.374	0.352
Within-sample (vs. naive) classification rate	78.9% (63.3%)	-	79.8% (54.1%)	75.2% (60.6%)

Note: Sample includes 109 non-financial firms that are listed at a German stock exchange before Oct. 30th 1996 and are not a subsidiary of a foreign or another sample firm. The first regression (with CFS3 as dependent variables) is a binary probit model estimated with quasi-maximum likelihood procedures. Z-statistics are in parentheses and standard errors are robust to misspecifications of the underlying distribution (see White, 1982). The second regression (CFS4) is an ordered probit model with two intercept terms. Wald chi-square statistics are in parentheses. The third and fourth regression (with BDISC1 and BDISC2 as dependent variables, respectively) are binary probit models estimated with quasi-maximum likelihood procedures. Z-statistics are in parentheses and standard errors are robust to misspecifications of the underlying distribution. For all regressions, the base category is ID6 (regulated industries). Intercept terms are significant at the 1% level, but not reported. Significance levels are indicated by asterisks: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. The likelihood ratio (LR) statistic, which tests for the explanatory power of the full model, is distributed chi-square with 15 degrees of freedom. Significance levels are in parentheses. The last row of the table presents the within-sample classification rates for the binary probit models. The naive classification is based on the largest cell. Industry dummies are based on table 4, panel C.