Segment Reporting in the European Union: Analyzing the Effects of Country, Size, Industry, and Exchange Listing

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The purpose of this study is to provide an analysis of segment reporting practices of firms in the European Union and to identify factors which potentially influence the quality of disclosure. The quality of segment reporting is defined as the number of financial statement items (e.g., sales, profits, assets) disclosed per segment. Segment reporting by line of business and by geographic area are analyzed separately. The four variables hypothesized to influence the quality of segment reporting are country, firm size, industry, and exchange listing. The descriptive analysis individually examines the effect of each of these four variables on the quality of segment reporting. The multiple regression analysis measures the marginal effect of each variable while holding the effects of all other variables constant. The results indicate that the quality of segment reporting is significantly affected by country, firm size, and exchange listing. No evidence is found for an industry effect.

INTRODUCTION

Financial disclosures can be separated into two components; the quality (i.e., decision usefulness) and the extent (i.e., quantity) of disclosure (Rennie and Emmanuel 1992). The purpose of this study is to provide an analysis of segment reporting practices of firms in the European Union (EU) and to identify factors which potentially influence the quality of disclosure. The quality of segment reporting is defined as the number of financial statement items disclosed per segment. Common financial statement items disclosed by segment include sales,

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profits, and assets. Other financial statement items include number of employees, capital expenditures, and production costs. With respect to segment information, firms in the EU are required to disclose only sales by line of business (LOB) and by geographic (GEOG) region (EU Fourth Directive, Article 43). Such a basic foundation facilitates tests to determine which factors contribute to firms' additional (i.e., higher quality) disclosures. The quality of segment reporting is not defined as the number of segments disclosed since the meaning of the number of segments disclosed by firms is difficult to interpret. Firms may disclose more LOB segments simply because they are more conglomerate-type firms or disclose more GEOG segments because they are more internationally diverse. In these cases, a greater number of segments would not necessarily indicate greater willingness to disclose information.

Segment reporting is important since firms' operations can vary significantly across LOB and GEOG segments. Segments may vary according to rates of profitability, levels of risk, and opportunities for growth. These differences are difficult, if not impossible, to identify without the supplemental information provided by segment disclosures. For example, in 1990, Caterpillar announced that operations in Brazil had taken a sharp downturn. Without segment disclosures related to Brazilian operations, the initial stock price reaction was limited since the effects of this downturn on the entire company could not be determined. However, when Caterpillar disclosed the size of its operations in Brazil, a significant stock price reaction resulted because the magnitude of the overall impact could now be identified (Berg 1990). The importance of segment information to financial analysts is summarized in a position paper on corporate financial reporting published by the Association for Investment Management and Research. Segment information is not only necessary; it is vital, essential, fundamentally indespensable, and integral to the investment analysis process (AIMR 1992, 39). Similarly, creditors require segment information in order to assess the quality of earnings and to make intelligent comparisons across industries and geographic areas (Pacter 1993, 102). Additional users potentially benefiting from segment information include labor unions, foreign governments, and environmental agencies.

As a result of having higher quality segment information, investors should make better decisions. Beyond disclosure of sales by segment, disclosure of additional items such as profits, assets, capital expenditures, number of employees, production, and order backlogs expands users' understanding of the resources committed by the firm to each segment and the risks and returns of those segments. For example, disclosing only segment sales without segment profits does not afford investors useful information concerning the profitability of each segment. The overall performance of the firm is closely related to the individual areas of profitability. In addition, disclosing only sales and profits by segment without assets, capital expenditures, and number of employees by segment provides little information as to the resources committed by the firm to each particular segment.

The EU's Fourth Directive requires minimal segment disclosures. Firms within the EU are only required to disclose sales by LOB and by GEOG segment. International standard setting bodies have made additional recommendations, which demonstrates a desire for a higher quality of segment disclosure than is required under the EU's Fourth Directive. For example, the Organization for Economic Co-operation and Development (OECD) recommends that firms disclose sales and new capital investments by LOB segment and sales, profits, capital investment, and number of employees by GEOG segment (OECD 1976). The International Accounting Standards Committee (IASC) recommends that firms disclose sales, profits, and identifiable assets by LOB and GEOG segment (IASC, 1981). The United Nations (UN) recommends that sales, profits, assets employed, intersegment pricing, and number of employees be disclosed by LOB and GEOG segment (UN 1988).

In 1987, the OECD published a survey on how well member nations were applying segment reporting guidelines. All twelve EU nations are members of the OECD. Overall, the conclusions of the survey suggests that disclosure of segment information by large multinational firms (MNFs) is unsatisfactory. Failure by many MNFs to disclose sales, operating results, employee data, and new capital investment by segment is one of the main reasons why the results cannot be considered satisfactory (OECD 1987, 8).

Standard-setting bodies in the United States and Canada and the IASC are currently reexamining the issue of segment disclosures due, at least in part, to the increasing importance and growing dissatisfaction of segment information to users of financial data (Pacter 1993). The current study can provide information to these standard setting bodies in their investigation of the adequacy of current requirements for segment disclosures and the factors which are likely to influence the overall quality of disclosure.

Gray (1978) is the only previous study to empirically examine segment disclosure practices of firms in the EU. Gray (1978) surveyed the segment disclosures reported in the 1972-1973 annual reports of the 100 largest MNFs in the EU. Forty-five of the firms were based in the United Kingdom and 55 were based in continental Europe. Our study improves upon Gray (1978) in the following ways. First, this study examines 1992-1993 annual reports, 20 years subsequent to those utilized in Gray (1978). Harmonization of accounting standards in the EU had not even began in 1972, whereas both the Fourth and Seventh Directives had been passed into law by all member countries by 1992. Therefore, the current study provides evidence on the extent to which the EU Directives harmonize segment disclosure practices. Second, Gray (1978) compares the United Kingdom to continental Europe. No attempt is made to break down continental Europe into individual countries, as done in this study. Finally, in addition to a summary of segment disclosures by country, this study examines the differential effects of firm size,

industry, and stock exchange listings on the quality of segment reporting in the EU.

The remainder of the article is organized as follows. The next section develops the theory and formally states the hypotheses to be tested. The data section explains the procedures used in arriving at our final sample. The descriptive analysis discusses the quality of segment reporting in the EU by country, by firm size, by industry, and by stock exchange listing. The multiple regression analysis extends the descriptive statistics by examining the combined effects of country, firm size, industry, and exchange listing. The final section concludes with a summary of the findings.

THEORY DEVELOPMENT AND HYPOTHESIS FORMULATION

Prior empirical and theoretical research has established a number of variables that may influence firms' disclosure policies. This section discusses the effects of country, firm size, industry, and exchange listing on the quality of segment reporting of firms in the EU.

Country Hypothesis

The quality of segment disclosures is expected to vary across countries for a number of reasons. First, the characteristics of the general business environment are likely to affect managers' perceptions of the cost/benefit tradeoff of disclosures. Gray, Radebaugh, and Roberts (1990) find significant differences in the way U.S. and U.K. financial executives perceive the net costs and benefits in the disclosure of 33 specific items. These perceptions are based on costs such as competitive disadvantage, processing, auditing, and potential litigation as well as financial benefits such as reduced regulation and lower cost of capital. Gray, Meek, and Roberts (1994) provide empirical support that significant national differences in financial reporting practices do exist between U.S. and U.K. firms. As differences in the general business environments among countries increase, so should the perceptions of the net costs and benefits of disclosure.

A second reason for country differences in disclosure may be attributable to differences in national segment reporting requirements. The requirements of France, the United Kingdom, and Ireland extend beyond those of the EU's Fourth Directive. In France, all firms listed on the French stock exchange are required to disclose operating profit by LOB and GEOG market in addition to sales (IOSCO 1991). The United Kingdom and Ireland require the disclosure of sales, operating profit, and net assets disaggregated by LOB and GEOG markets (Companies Act of 1986; SSAP 25). The existence of differences in mandatory segment disclosure indicates potential differences in overall segment disclosures.

A third, but related, reason for national differences in disclosure may be attributable to country-specific mandatory disclosures. Dye (1985, 1986) analytically demonstrates that voluntary disclosures are affected by mandatory disclosures, depending upon whether voluntary and mandatory disclosures are substitutes or complements. Specifically, Dye (1985, 1986) shows that voluntary and mandatory disclosures are substitutes when mandatory disclosures consist of reports of proprietary information. Voluntary and mandatory disclosures are complements when mandatory disclosures consist of reports of nonproprietary information. Article 43 of the EU's Fourth Directive mandates that each firm disclose sales by LOB and GEOG. If the perception of the proprietary nature of segment disclosures varies across countries, then the quality of segment disclosures will also vary across countries. Therefore, considering the differences in business environments, mandatory segment requirements, and perceptions of the proprietary nature of segment disclosures among EU countries, the first hypothesis predicts a significant country effect.

H1: The quality of segment reporting is higher for firms in countries with greater national segment reporting requirements and lower perceptions of the proprietary nature of segment disclosures.

Firm Size Hypothesis

Numerous studies indicate a positive relationship between firm size and overall disclosure (e.g., Buzby 1975; Firth 1979; Chow and Wong-Boren 1987; Cooke 1989, 1991; Bradbury 1992). Ball and Foster (1982) note that size may proxy for a number of firm attributes including information production costs, competitive costs, and vulnerability to political costs. Such factors may influence the quality of segment reporting. Regarding information production costs and competitive costs, Firth (1979) acknowledges that larger firms can better afford information production costs and are less susceptible to competitive disadvantages. This suggests that larger firms are likely to disclose more information than smaller firms.

Watts and Zimmerman (1986, 235) argue that larger firms are more politically sensitive and have relatively larger wealth transfers imposed on them than smaller firms. Watts and Zimmerman (1978) show that a firm's political visibility greatly influences management's choice of accounting policy. Political costs are imposed on the firm by private-sector interest groups (e.g., trade unions) and by governmental regulatory bodies and taxing agencies. One way to potentially reduce this political cost is through additional disclosure which enhances the corporate image (Craswell and Taylor 1992). Therefore, several factors indicate that the relationship between the quality of segment reporting and firm size should be positive. Firm size is measured as the log of total sales in U.S. dollars.

H2: The quality of segment reporting is positively related to firm size.

Industry Hypothesis

Separating firms by primary industry provides a useful scheme for classifying firms according to their economic and financial characteristics. In general, firms in the same industry face similar levels of competition, risk, and growth opportunities. As a result, disclosure practices should be similar within industries.

Competition varies across industries because of differences in the barriers to entry and/or the number of firms already competing within the industry (Verrecchia 1983; Biddle and Seow 1991). Firms in industries with low barriers to entry contend with potential as well as present competitors, while firms in industries with high barriers to entry contend almost exclusively with present competitors. Disclosing proprietary segment information can greatly diminish the short-term profits of firms in highly competitive industries, as present and potential competitors will likely respond to segment disclosures that reveal highly profitable operations.

Industries also differ as to their risk and return prospects. Biddle and Seow (1991) examine the differences between industries' growth rates, financial leverage, and operating leverage. They find that the earnings of firms in industries with lower growth rates and higher financial and operating leverages (i.e., higher risk) are valued less by the market. As a result, high risk industries have additional incentives to disclose segment information. Such disclosure can ease, to some extent, investors' uncertainties as to the timing and amount of future cash flows and can, therefore, lower the firm's cost of capital. Disclosure by firms in high risk, politically sensitive industries (e.g., chemicals, natural resources) can also reduce the risk of increased political costs for reasons similar to those presented above for the size hypothesis (Whittred and Zimmer 1990). In summary, industries represented by high barriers to entry and high risk are expected to provide a higher quality of segment reporting.

H3: The quality of segment reporting is higher for firms in industries with lower competition and higher financial and political risks.

Exchange Listing Hypothesis

Previous research supports the claim that firms listing on multiple stock exchanges disclose more information than firms listing only on their domestic exchange (e.g., Gray, Meek, and Roberts 1994; Cooke 1989,1991). Agency theory suggests that a divorce between the ownership of a firm and the control of the firm creates the potential for agency costs. Agency costs arise because the princi-

pal (shareholder) cannot directly observe the agent (manager) and, therefore, must incur costs to monitor the activity of the agent. Jensen and Meckling (1976) demonstrate that agency costs are ultimately passed on to the firm in the form of lower share prices (i.e., higher cost of capital), which reduces the agent's utility. Firms listing on multiple exchanges are likely to have more shareholders and incur greater monitoring cost than firms listing only on their domestic exchange. Since the disclosure of additional information in the annual report is one way for the agent to reduce agency costs, we expect the quality of segment reporting for firms listing on multiple exchanges to be greater than that for firms listing only on their domestic exchange.

Two additional circumstances support the notion that firms listing on multiple exchanges disclose more segment information. First, firms listing on multiple country exchanges are more likely to have debt financed by foreign capital (Choi and Mueller 1984). Segment disclosure might be increased to meet the requirements and local customs of foreign banks. Second, listing on foreign exchanges requires the solicitation of foreign investors. Choi and Levich (1991) report that additional disclosures are one way of overcoming international differences in accounting principles. Based on the above arguments, it is expected that the quality of segment reporting will be higher for firms listing on multiple stock exchanges.

H4: The quality of segment reporting is higher for firms listing on multiple exchanges than for firms listing only on their domestic exchange.

DATA

The data used in this study are from the most recent annual reports available at the time of collection (1992-1993 year-ends). Based on the information in *Europe's 15,000 Largest Companies* (1992), letters requesting the most recent annual report were sent to the 65 firms, excluding financial institutions and insurance firms, having the largest total sales in each of ten EU member nations for a total of 650 requests. Greece and Luxembourg were excluded from the mailing as neither country had 65 firms large enough to be listed in our data source. The largest firms in each country were selected since the importance and usefulness of segment reporting generally increase with firm size. Furthermore, sampling from the largest firms in each country increases the likelihood of firms having separate industry and geographic segments. Selection of the largest firms in each country still resulted in a significant variance in firm size. Sales varied from a low of U.S. $50 million to a high of over U.S. $60 billion.

The response rates varied significantly by country. The highest responses were from France, Germany, the Netherlands, and the United Kingdom, where

over 30 corporate annual reports were received from each country. Annual reports were randomly selected from those received in each of these four countries to arrive at the final sample of 30 annual reports per country. The response rates from Denmark and Ireland were slightly lower, most likely due to the relatively smaller size of firms located in these two countries. There were significantly lower response rates for Belgium, Portugal, Italy, and Spain, due possibly to three factors. First, numerous firms in these four countries do not provide English language versions of their annual reports. Second, financial reporting in these countries is less oriented towards investors, which decreases the likelihood of a favorable response when requesting an annual report. Third, requests were written in English. The final sample includes 30 corporate annual reports from France, 30 from Germany, 30 from the Netherlands, 30 from the United Kingdom, 27 from Denmark, 26 from Ireland, 20 from Belgium, 12 from Portugal, 11 from Italy, and 7 from Spain, for a total sample of 223 annual reports from 10 countries.

While both LOB and GEOG segment disclosures apply to the majority of firms, there are cases where either LOB or GEOG segment disclosures do not apply for a particular firm. Table 1 provides a summary of the research sample. Due to small sample sizes, the results for Portugal, Italy, and Spain are combined. Individual data pertaining to these three countries can be obtained from the authors.

DESCRIPTIVE ANALYSIS

The quality of segment reporting in the EU is analyzed by country (Table 2), by firm size (Table 3), by industry (Table 4), and by exchange listing (Table 5). Panel A and panel B of each table detail LOB and GEOG segment information, respectively. The data is presented using percentages and averages to allow com-

TABLE 1
Sample Size

	Belgium	*Denmark*	*France*	*Germany*	*Ireland*	*Netherlands*	*United Kingdom*	*Other*[a]	*Total*
LOB and GEOG	17	21	30	28	21	28	28	22	195
LOB only	1	3	0	1	1	0	1	3	10
GEOG only	2	3	0	1	4	2	1	5	18
Total	20	27	30	30	26	30	30	30	223
Total LOB[b]	18	24	30	29	22	28	29	25	205
Total GEOG[c]	19	24	30	29	25	30	29	27	213

Notes: [a]*Other* includes firms from Italy, Portugal, and Spain.
[b]Total LOB is the number of firms that disclose both LOB and GEOG segments plus the number of firms that disclose only LOB segments.
[c]Total GEOG is the number of firms that disclose both LOB and GEOG segments plus the number of firms that disclose only GEOG segments.

parison of information across categories. Statistical tests of the data are performed in the following section on multiple regression analysis. The descriptive analysis attempts to link the results presented in this section with the factors likely to affect the quality of segment reporting described in the theory development section.

By Country

Table 2 provides a comparison across the EU countries of the items disclosed by LOB segment and by GEOG segment. The majority of all firms disclose sales by LOB and GEOG segments as required under the EU's Fourth Directive. The percentage of sales disclosures are less than 100% since some firms took advan-

TABLE 2
Items Disclosed by Country

Panel A: LOB Segments

	Belgium	*Denmark*	*France*	*Germany*	*Ireland*	*Netherlands*	*United Kingdom*	*Other*	*Overall*
(n =	*18*	*24*	*30*	*29*	*22*	*28*	*29*	*25*	*205)*
	%	%	%	%	%	%	%	%	%
Sales	100.0	83.3	93.3	100.0	86.4	96.4	96.6	96.0	94.1
Profits	38.9	33.3	53.3	20.7	36.4	35.7	93.1	24.0	42.9
Assets	11.1	41.7	30.0	0.0	31.8	17.9	100.0	24.0	33.2
Employees	27.8	50.0	36.7	58.6	31.8	35.7	41.4	32.0	40.0
Capital Expenditure	16.7	8.3	33.3	37.9	0.0	21.4	13.8	24.0	20.5
Other[a]	27.8	33.3	80.0	69.0	0.0	25.0	6.9	68.0	40.5
Average items per firm	2.2	2.5	3.3	2.9	1.9	2.3	3.5	2.7	2.7

Panel B: GEOG Segments

	Belgium	*Denmark*	*France*	*Germany*	*Ireland*	*Netherlands*	*United Kingdom*	*Other*	*Overall*
(n =	*19*	*24*	*30*	*29*	*25*	*30*	*29*	*27*	*213)*
	%	%	%	%	%	%	%	%	%
Sales	79.0	95.8	100.0	100.0	80.0	100.0	100.0	88.9	93.9
Profits	5.3	8.3	46.7	10.3	36.0	16.7	89.7	11.1	29.6
Assets	5.3	8.3	46.7	0.0	28.0	16.7	96.6	11.1	28.2
Employees	31.6	33.3	46.7	27.6	16.0	43.3	24.1	11.1	29.6
Capital Expenditure	5.3	0.0	23.3	10.3	0.0	13.3	10.3	7.4	9.4
Other	10.5	16.7	60.0	20.7	28.0	13.3	65.5	29.6	31.9
Average items per firm	1.4	1.6	3.2	1.7	1.9	2.0	3.9	1.6	2.2

Note: [a]The other category contains a variety of items including gross profit, sales orders, research & development, cash flows, investments, inventory, fixed assets, depreciation, and production costs.

tage of the Article 45 exclusion, which allows firms to omit disclosure of sales if disclosure would be prejudicial to the firm. Examining the remaining item categories, approximately 30% to 40% of all firms disclose profits, assets, or employees. The other category contains a variety of items including gross profit, sales orders, research and development, cash flows, investments, inventory, fixed assets, depreciation, and production costs.

Based on the average items disclosed by country, the quality of segment reporting appears to be higher for France and the United Kingdom. This may be attributable to factors such as business environments and regulatory requirements as discussed in the theory development section. First, France and the United Kingdom have experienced a significant increase in takeover activity in comparison to the rest of Europe (Berney 1990). This difference in the French and U.K. business environments may increase the importance placed on segment reporting by financial statement users. This, in turn, may increase the perceived benefits of segment reporting to management resulting in more extensive disclosure of segment information.

Second, as discussed earlier, the mandatory disclosure requirements for segment reporting are greater for French and U.K. firms. In France, all firms listed on the French stock exchange are required to disclose operating profit, in addition to sales, by LOB segment and by GEOG segment. The United Kingdom and Ireland require the disclosure of sales, operating profit, and net assets disaggregated by LOB and GEOG markets. The stricter national requirements in these countries should increase the quality of segment reporting as is the case for France and the United Kingdom. Note, however, that this did not hold for firms located in Ireland. The quality of segment reporting in Ireland did not improve with greater regulation, since a significantly higher percentage of firms in Ireland took advantage of the Article 45 exclusion. Perhaps based on Dye's (1985, 1986) arguments discussed in the theory development section above, Ireland perceives segment information to be of a more proprietary nature than France and the United Kingdom.

By Firm Size

Firms are categorized into five equal groups based on size (total sales). Group 1 contains the largest 20% of the sample firms and group 5 contains the smallest 20% of the sample firms. Total sales, rather than total assets or total equity, is used to measure firm size to alleviate measurement problems caused by differences in accounting principles across countries. For comparative purposes, all sales amounts are translated to U.S. dollars at the average exchange rates for 1992. Total sales varied from an average of $21 billion for the largest 20% to an average of $300 million for the smallest 20%.

Table 3 demonstrates that firm size is positively related to the quality of segment disclosures provided by EU firms. Larger firms provide more item disclosures per LOB or GEOG segment than smaller firms. The disclosure percentage in the

TABLE 3
Items Disclosed by Firm Size

Panel A: LOB Segments

Largest	*1*[a]	*2*	*3*	*4*	*5*	*Smallest*	*Overall*
	(%)	*(%)*	*(%)*	*(%)*	*(%)*		*(%)*
Sales	97.6	95.1	97.6	92.7	87.8		94.1
Profits	63.4	58.5	43.9	19.5	29.3		42.9
Assets	36.6	56.1	26.8	24.4	22.0		33.2
Employees	48.8	39.0	43.9	36.6	31.7		40.0
Capital expenditures	53.7	17.1	17.1	9.8	4.9		20.5
Other	95.1	29.3	26.8	24.4	29.3		40.5
Average items per firm	3.9	3.0	2.6	2.1	2.0		2.7

Panel B: GEOG Segments

Largest	*1*	*2*	*3*	*4*	*5*	*Smallest*	*Overall*
	(%)	*(%)*	*(%)*	*(%)*	*(%)*		*(%)*
Sales	100.0	95.4	95.4	92.9	85.7		93.9
Profits	41.9	51.2	27.9	9.5	16.7		29.6
Assets	37.2	58.1	23.3	9.5	11.9		28.2
Employees	27.9	37.2	32.6	31.0	19.1		29.6
Capital expenditures	27.9	14.0	2.3	0.0	2.4		9.4
Other	46.5	51.2	32.6	4.8	23.8		31.9
Average items per firm	2.8	3.1	2.1	1.5	1.6		2.2

Note: [a]Firms are categorized into five equal groups based on size (total sales). Group 1 contains the largest 20% of the sample firms and group 5 contains the smallest 20% of the sample firms.

largest size category exceeds the disclosure percentage in the smallest size category for all six disclosure items: sales, profits, assets, employees, capital expenditures, and other disclosures. The average number of LOB item disclosures per firm increases consistently with increases in firm size. The average number of GEOG items disclosed per firm also exhibits a firm size effect, although not as clear as for LOB item disclosures. For GEOG item disclosures, the second largest size category exceeds the largest size category in the disclosure of profits, assets, employees, and other items. Overall, the results indicate that larger firms provide more extensive segment disclosures. This is consistent with lower production costs, greater competitive costs, and higher political costs associated with larger firms.

By Industry

Firms are classified into industries based on the primary International Standard Industrial Classification (ISIC) code disclosed in *Europe's 15,000 Largest*

Companies (1992). Firms with operations spanning over more than one industrial classification are included in the industrial classification representing the largest proportion of their operations. These specific industry classifications are combined to form eight general industry categories for presentation purposes.

Table 4 presents the LOB and GEOG item disclosures, respectively, broken down by industry. Overall, the variability in the number of item disclosures among the eight industry classifications is less than the variability in the number of item disclosures among the eight country classifications presented in Table 2. Regarding the industry classifications, the chemical industry provides the highest quality of segment disclosure. The chemical industry reports the highest "average items per firm" for GEOG segments and the second highest "average items per firm" for LOB segments. Bavishi and Wyman (1980) found similar results for U.S. MNFs; chemical firms supply the most segment information. The metals industry reports the highest average items per firm for LOB segments, while reporting the lowest average items per firm for GEOG segments. The best expla-

TABLE 4
Items Disclosed by Industry

Panel A: LOB Segments

	Machinery Equipment	*Construction*	*Food/ Beverages*	*Chemicals*	*Retail*	*Natural Resources*	*Metal*	*Other*
(n =	*34*	*32*	*29*	*24*	*24*	*19*	*14*	*29)*
	(%)	*(%)*	*(%)*	*(%)*	*(%)*	*(%)*	*(%)*	*(%)*
Sales	94.1	90.6	89.7	100.0	87.5	94.7	100.0	100.0
Profits	38.2	37.5	51.7	54.2	33.3	57.9	42.9	34.5
Assets	29.4	31.3	55.2	25.0	29.2	52.6	21.4	20.7
Employees	47.1	31.3	37.9	37.5	33.3	26.3	71.4	44.8
Capital expenditures	26.5	9.4	13.8	37.5	8.3	26.3	42.9	13.8
Other	76.5	18.8	24.1	75.0	25.0	21.1	57.1	27.6
Average items per firm	3.1	2.2	2.7	3.3	2.2	2.8	3.4	2.4

Panel B: GEOG Segments

	Machinery Equipment	*Construction*	*Food/ Beverages*	*Chemicals*	*Retail*	*Natural Resources*	*Metal*	*Other*
(n =	*37*	*34*	*31*	*24*	*21*	*19*	*17*	*30)*
	(%)	*(%)*	*(%)*	*(%)*	*(%)*	*(%)*	*(%)*	*(%)*
Sales	97.3	97.1	87.1	100.0	90.5	89.5	94.1	93.3
Profits	18.9	32.4	38.7	37.5	38.1	36.8	17.7	20.0
Assets	27.0	23.5	38.7	25.0	38.1	36.8	29.4	13.3
Employees	32.4	38.2	12.9	45.8	28.6	21.1	11.8	36.7
Capital expenditures	8.1	2.9	3.2	25.0	14.3	15.8	11.8	3.3
Other	32.4	47.1	32.3	33.3	19.1	52.6	17.7	16.7
Average items per firm	2.2	2.4	2.1	2.7	2.3	2.5	1.8	1.8

nation is that while the metals industry produces a variety of products, the production tends to be more domestic.

The results in Table 4 are generally in support of the factors developed in the theory section; industries represented by high barriers to entry and high risk are expected to provide a higher quality of segment reporting. The chemical, natural resource, and metal industries are characterized by high barriers to entry and high risk. Note that these industries also tend to provide the highest quality segment disclosures. The food and beverage and the retail industries are characterized by relatively lower barriers to entry and lower risk. Similarly, these industries tend to provide the lowest quality segment disclosures.

By Exchange Listing

Firms are divided into those which list only on domestic exchanges and those which list on exchanges in multiple countries. Exchange listing information is found in Moody's International (1993) and Euromoney (1992). Moody's International lists all of the exchanges on which the firm is traded. Euromoney lists the

TABLE 5
Items Disclosed by Exchange Listing

Panel A: LOB Segments

	Domestic Only	*Multiple Countries*
(n =	*131*	*74)*
	(%)	*(%)*
Sales	93.1	95.9
Profits	32.8	60.8
Assets	28.2	41.9
Employees	38.9	31.3
Capital expenditures	13.0	41.9
Other	32.1	55.4
Average items per firm	2.4	3.3

Panel B: GEOG Segments

	Domestic Only	*Multiple Countries*
(n =	*139*	*74)*
	(%)	*(%)*
Sales	92.1	97.3
Profits	16.5	54.1
Assets	18.0	47.3
Employees	25.2	37.8
Capital expenditures	2.9	21.6
Other	21.6	51.4
Average items per firm	1.8	3.1

300 largest European firms listed on foreign exchanges. In the remote cases where the firm's listing status is not recorded in either source, classification is based on information in the annual report.

Table 5 presents the LOB and GEOG item disclosures, respectively, classified by exchange listing. Considering only the effects of exchange listing, firms with multiple country exchange listings disclose a greater number of items by LOB and GEOG segments. The differences between firms with multiple country exchange listings and firms with only domestic listings appear to be stronger for GEOG item disclosures than for LOB item disclosures. Firms with multiple country exchange listings provide more LOB item disclosures in five of the six item categories and more GEOG item disclosures in all six item categories. Overall, the results suggest that firms seeking capital on foreign exchanges increase segment item disclosures to reduce agency costs and to meet the informational needs of international investors and creditors.

MULTIPLE REGRESSION ANALYSIS

Interpreting the results of simple descriptive statistics should be performed with caution since simple statistics do not control for the effects of other variables. For example, larger firms are more likely to be listed in multiple countries. With simple descriptive statistics, it is difficult to determine whether the higher quality of segment reporting is due to the size effect or the exchange listing effect. To overcome these problems, multiple regression analysis is performed. By using multiple regression analysis, it is possible to determine the marginal effects of each variable while holding the effects of all other variables constant.

Model Specification

The four variables hypothesized to affect segment reporting are tested based on the following model:

$$y = \alpha_0 + \sum_{i=1}^{7} \alpha_{1i}\, Country_i + \alpha_2 Size + \sum_{i=1}^{7} \alpha_{1i}\, Industry_i + \alpha_4 Listing + \varepsilon$$

where:

y = The number of LOB item disclosures or the number of GEOG item disclosures;

$Country_i$ = 1 for the ith country, 0 otherwise;

$Size$ = Log of sales in U.S. dollars;

$Industry_i$ = 1 for the ith industry, 0 otherwise;

$Listing$ = 1 for multiple country listing, 0 otherwise.

This model regresses the firm's quality (i.e., number of items) of segment reporting on the factors hypothesized to affect the quality of disclosure. The country, industry, and exchange listing factors are represented with dummy variables. The number of dummy variables used to test each factor is one less than the actual number of categories for each factor. This is necessary to avoid perfect collinearity (Judge et al. 1988, 420-425). The size variable is continuous and is represented as the log of sales in U.S. dollars. Amihud and Mendelson (1986) and Lamoureux and Sanger (1989) suggest using the log of size instead of absolute size because the effect of firm size is nonlinear. The results of the diagnostic checks conducted to determine the appropriateness of using ordinary least squares are discussed in the Appendix.

Hypotheses

The country, size, industry, and exchange listing hypotheses are tested using the standard F-test described by Kmenta (1986, 479):

$$F_{(j,\, n-k)} = \frac{(SSE_R - SSE_U)/j}{(SSE_U)/(n-k)}$$

where j is the number of restrictions, n is the number of observations, and k is the number of unrestricted coefficients. SSE_U is the unrestricted sum of squares error and SSE_R is the restricted sum of squares error. The unrestricted sum of squares error is computed based on the complete model. The restricted sum of squares error is computed by placing the restrictions of the null hypothesis on the model.

Results

The F statistics computed for the LOB and GEOG multiple regression equations appear in Table 6. The results indicate that the quality of segment disclosures varies significantly across countries. The country effect is significant for the number of LOB and GEOG item disclosures, at the .05 and the .01 levels, respectively. Controlling for the effects of firm size, industry, and exchange listing, firms from France and the United Kingdom disclose the greatest amount of segment information overall. This is likely due to the higher disclosure requirements for segment reporting in these countries. It may also be attributable to the increasing takeover activity found in France and the United Kingdom.

Firm size is significant at the .01 level for the number of LOB and GEOG item disclosures. The results indicate that even after controlling for the effects of the other variables, larger firms provide a higher quality of segment reporting than smaller firms. Besides the costs incurred in preparing segment information, firms

TABLE 6
Multiple Regression Analysis
***F*-Statistics**

	Number of LOB Item Disclosures	*Number of GEOG Item Disclosures*
Country Effect[a]	2.477*	7.650**
Size Effect[b]	20.408**	6.061**
Industry Effect[a]	1.124	1.375
Exchange Listing Effect[b]	.333	5.511**

Notes: [a]Distributed F with 7 and 188 degrees of freedom for LOB and with 7 and 196 degrees of freedom for GEOG.
[b]Distributed F with 1 and 188 degrees of freedom for LOB and with 1 and 196 degrees of freedom for GEOG and adjusted for a one-tailed *t*-test.
*Significant at the .05 level.
**Significant at the .01 level.

also face the potentially greater costs of competitive disadvantage. Firms disclosing segment information run the risk that this information may be used against them by competitors, labor unions, foreign governments, and so forth. While the costs incurred in preparing segment information is similar for both larger and smaller firms, the potential for competitive disadvantage costs appears to be much higher for smaller firms. Furthermore, larger firms are subject to greater political costs. Increased segment disclosure by larger firms may improve their corporate image, reducing the potential political costs.

Industry membership is not significant in explaining the quality of LOB and GEOG item disclosures. Comparing Table 2 and Table 4, the variability in the number of item disclosures by industry is less than the variability in the number of item disclosures by country. While finding a significant effect by country, no industry effect is detected after controlling for the effects of country, firm size, and exchange listing. The lack of a strong industry effect on firms' disclosures has also been shown in prior research. Cooke (1989) and Cooke (1991) found only a mild industry effect in Sweden and Japan, respectively. McNally, Eng, and Hasseldine (1982) found no industry effect in New Zealand.

The effects of exchange listing are significant at the .01 level for the number of GEOG item disclosures but are not significant for the number of LOB item disclosures. In other words, after controlling for the effects of the other three variables, firms listed on multiple exchanges are more likely to increase their GEOG, but not LOB, segment disclosures. This appears reasonable for at least two reasons. First, the descriptive analysis by exchange listing summarized in Table 5 indicates that the exchange listing effect is stronger for GEOG item disclosures than for LOB item disclosures. Second, firms listed on multiple exchanges tend to be more internationally oriented. These firms may be increasing their geographic segment disclosures to better meet the informational needs of international investors and creditors.

SUMMARY AND CONCLUSIONS

Based on the annual reports of 223 firms from ten EU countries, this study examines variables influencing the quality of segment reporting in the EU. The four variables hypothesized to influence the quality of segment reporting are country, firm size, industry, and exchange listing. The descriptive analysis individually examines the effect of each of these four variables for LOB item disclosures and GEOG item disclosures. The multiple regression analysis measures the marginal effect of each variable while holding the effects of other variables constant.

The results indicate that the quality of segment reporting in the EU varies significantly by country with the most extensive disclosures found in France and the United Kingdom. Firm size is also significant. Larger firms provide more item disclosures per LOB or GEOG segment than smaller firms. The industry variable is not significant in explaining either the number of LOB or the number of GEOG segment items. Exchange listing is significant for GEOG segment disclosures only. The results by exchange listing suggest that firms seeking capital on foreign exchanges increase GEOG segment item disclosures to meet the informational needs of international investors.

The results are subject to limitations. First, the largest firms from each country were examined. Hence, the results may not be generalizable to the accounting practices of small and medium sized firms from the respective ten countries. Second, all of the annual reports examined were in the English language. The English version of the annual reports may provide an investor-oriented bias of segment disclosures.

The findings in this study may assist national (e.g., U.S. and Canadian) and international (e.g., IASC) standard-setting bodies in their current reexamination of segment disclosures. Higher quality segment disclosures are located in countries with more extensive mandatory segment disclosure rules. This indicates that additional regulation has been effective in increasing the number of financial statement items disclosed per segment. Firm size is positively related to the quality of segment disclosures provided. Therefore, greater attention by standard-setting authorities may need to be focused on the smaller firms in improving overall segment reporting. The need for specific industry standards related to segment reporting appears unwarranted since industry is not a significant variable in explaining the overall quality of segment reporting. Finally, firms seeking capital on foreign exchanges appear willing to increase segment item disclosures. This indicates that national standard-setting bodies may be able to impose similar segment reporting requirements on both domestic and foreign registrants.

APPENDIX

Diagnostic checks are conducted to determine the appropriateness of using ordinary least squares as a basis for hypothesis testing. The potential effects of

heteroscedasticity, multicollinearity, outliers, and nonnormal error terms are investigated.

The presence of heteroscedasticity causes ordinary least squares to be inefficient and produces biased estimates of the covariance matrix. This means that hypothesis tests are no longer strictly valid using ordinary least squares in a heteroscedastic model. Based on the Breusch-Pagan (1979) test, slight heteroscedasticity is detected. Therefore, White's (1980) consistent covariance estimator is used to adjust for the effects of heteroscedasticity.

Multicollinearity is tested for by noting condition indices. Condition indices above 30 indicate severe multicollinearity. For our model, condition indices do not exceed 10, indicating that multicollinearity is not a problem.

The presence of a single outlier can distort all parameter estimates. The Cook outlier test is used to identify any influential observations. The results indicate that no influential outliers are present in the sample. Additionally, plotting the residuals revealed no influential outliers.

A final diagnostic check tests the normality of the error terms. For hypothesis testing, ordinary least squares assumes that the error terms have a normal distribution. The normality assumption is tested using the Jarque-Bera (1980) Lagrange Multiplier test. The error terms in our model are not distributed normally. However, Kirk (1968, 75-76) shows that the F-test is robust with respect to departures from normality. Furthermore, estimates are asymptotically efficient if the variance is finite via the Central Limit Theorem.

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