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Multilevel Approach to Sustainability Report Assurance Decisions

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Using generalised linear mixed models as a statistical tool, this paper analyses the factors that explain the decision of a company to assure their sustainability report and of the choice of a Big 4 auditor as assesor. Specifically, we investigate the variables that affect the two dependent variables, existence of assurance and the profile of the assesor, at two different levels: the characteristics of the reporting company, and the country in which the company is located. Previous literature has explained this relationship as the result of linear regression models, considering only the fixed effects of the factors. Taking into account random effects, we are able to arrive at more precise conclusions on the effect of country (legal tradition and European membership) and company variables (size, public or non-public, industry and integrated reporting), on the existence of assurance and the profile of the assesor.

Sustainability reporting is a natural output of corporate social responsibility (CSR). Companies with a CSR strategy should be willing to disclose their social, economic and environmental performance (Hubbard 2009) given that it showcases their activities in the area. Sustainability reports (SRs) are the best tool for this communication. Because SRs include mostly voluntary disclosure, and there are only limited standards, the inclusion of an assurance statement (AS) adds an additional layer of credibility to the report and reduces the information risk. As stated in previous research, the existence of independent assurance is a mechanism of quality, reliability and transparency (Bachoo et al. 2013; Dubbink et al. 2008; Williams 2005). Although the external verification of SRs is not always as deep as it should be (Gillet 2012), it improves the users' perceptions of the SR's credibility (Hodge et al. 2009). Ball et al. (2000) posit that SR assurance exhibits a 'managerial turn' rather than a commitment to transparency. Deegan et al. (2006a, 2006b) find ambiguity in assurance reports in Europe and Australia. They conclude that it has limited value. Furthermore, O'Dwyer and Owen (2005) raise questions on the independence of the assurers and the high degree of management control in the assurance process.

Different factors may explain why companies assure their SRs. Some of these are linked to the characteristics of the country in which the company is located (Kolk and Perego 2010; Simnett et al. 2009; Perego 2009) and others are linked to companies' specific incentives, such as building their reputation or enhancing their SR credibility (Francis et al. 2011; Simnett et al. 2009). Research linking ASs and companies' characteristics is not conclusive.

Regarding the provider of assurance for SRs, major accountancy firms assure 67% of the N100 companies (KPMG 2013). It has been stated that financial accounting auditing inspires the SR assurance process and that the existing gap in financial auditing between the Big 4 and others is also applicable to SR assurance (Deegan et al. 2006; Boiral and Gendron 2011). Also, assurance by Big 4 auditing firms is linked to higher quality AS in format and procedures (Perego 2009), and Big 4 auditing firms produce more moderate assurance reports than other assurers (Mock et al. 2007; Martinov-Bennie and Hoffman 2012).

From an economic perspective, the demand for SR assurance is justified as long as the benefits obtained in terms of credibility are higher than the cost of the assurance service. In addition, the accounting profession has an active role in the development of regulatory mechanisms linked to social responsibility practices (Hopwood 2009). The 2013 KPMG survey (KPMG 2013) indicates that less than 60% of the largest 100 companies around the world present assured information, which might

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indicate that the cost of the assurance service is high or that there is a perception that it does not add value to the report.

Prior literature has studied the variables that affect the existence of ASs at two different levels: the characteristics of the reporting company (Mock et al., 2013; Kolk and Perego 2010; Zorio et al. 2013; Perego 2009; Sierra-García et al. 2013a) and the country in which the company is located (Kolk and Perego 2010; Simnett et al. 2009; Perego 2009). To the best of our knowledge, previous research has considered the effects of country and company characteristics on the dependent variable without considering the existence of a structure of nested data. This structure indicates the links among companies that belong to the same country. If these links are ignored, and classical regression is used, statistical and conceptual inconsistencies may arise (Hox 2002; Pardo and Ruiz 2012) because data will be analysed either aggregated (grouping by country) or disaggregated (using company as unit of analysis). In the first case, the information related to companies is aggregated by countries and the statistical analysis loses power due to the underlying reduction of the sample. In the second case, the characteristics of the country and the company are the explanatory variables, and the variability of the estimations associated with country could be underestimated, finding associations that do not exist. There may also be conceptual problems if data are analysed at one level and conclusions are drawn at another level. Therefore, when data are nested or when there are repeated measurements for one unit of observation, it is recommended that multilevel modelling techniques are used. These techniques improve the understanding of the relationship between the explained and explanatory variables, because the interrelations among the latter are identified and statistically analysed. The use of mixed models makes it possible to simultaneously assess different layers of a nested dataset.

Our paper contributes to the literature by using a multilevel statistic model. We investigate the factors that explain the decision of a company to assure their SRs (Model 1) and the choice of a Big 4 auditor as assurance provider (Model 2). In order to define the two models to be tested, the candidate explanatory variables are selected from prior literature. We then explore the bivariate associations among those identified variables to select the explanatory variables to be included in our regression. We apply generalised linear mixed models in two steps, first to test the adequacy of this technique and, second, to test our hypotheses. We use a large sample of 3706 reports from 22 countries over a three-year period (2011–2013) from 2220 companies. By having a more extensive sample than those found in previous research, our results allow generalisation and expanded analysis.

Literature Review and Hypotheses Development

Theoretical approach

Prior literature has identified several theories to support CSR reporting. Among them, institutional, stakeholder and legitimacy theories are the most widely argued in CSR reporting (Hahn and Kühnen 2013).

Institutional theory emphasises the social context within which firms operate. Bansal (2005) posits that institutional theory is relevant to CSR for three reasons: (1) individual values and beliefs judge a firm's commitment to sustainable development, affecting perceptions of the firm's acceptability and legitimacy; (2) discussions among people with different opinions result in common beliefs and norms; (3) sustainability issues become institutionalised and regulated. The legal system has been used as an institutional factor to explain the decision to assure the SR (Kolk and Perego 2010; Simnett et al. 2009) and the choice of a Big 4 auditor as assessor (Perego 2009; Simnett et al. 2009). Even if the corporation has no marginal return from their sustainability practices, it might still decide to engage in sustainability as a result of regulation or social pressure, creating differences among countries produced by the demand for sustainability. Hence, there is an effect at the country level that needs to be considered when studying sustainability.

Another explanation for why companies may engage in sustainability practices and assure their SRs is linked to stakeholder and legitimacy theories. Freeman (1984) posits that different factors such as stakeholders, values and societal issues have to be analysed to establish the foundation of enterprise-level strategy. He indicates that the distinguishing feature of CSR is that it applies 'the stakeholder concept to non-traditional stakeholder groups usually thought as having an adversarial relationship with the firm', and that 'less emphasis is put on satisfying owners and comparatively more emphasis is put on the public or the community or the employees' (Freeman 1984: 38). Based on this idea, stakeholder pressure is expected to determine the assurance of SRs and the selection of assessor. Previous literature has stated that this pressure is associated with industry membership and company size (Kolk and Perego 2010; Mock et al. 2007; Sierra-García et al. 2013a). For example, companies with activities that have a major environmental impact or companies that are well known to the general public will try to reduce risks, giving more confidence to their stakeholders through CSR-assured information.

Legitimacy theory is based on the idea that there is a 'social contract' between a company and the society in which it operates. This theory assumes that

companies will behave in such a way that society will recognise them as socially responsible (O'Donovan 2002). The disclosure of CSR information through SRs legitimises the role of the firm within society (Deegan 2002), given that when society perceives that a company's behaviour is not acceptable, a legitimacy gap may develop (Branco and Rodrigues 2006). In those situations, the existence of assurance reinforces social behaviour by adding credibility to the report.

These two latest theories explain that differences in reporting and assurance may exist depending on company characteristics and independently of the country in which the company operates, making it important to take into account this effect when researching sustainability.

In sum, both effects, at the country and company levels, need to be identified; otherwise we may reach erroneous conclusions.

Country-level determinants

Previous international research on country determinants of SR assurances offer mixed results. Origin of laws, enforcement and institutional pressure are the determinants of legal system traditions most frequently cited (Kolk and Perego 2010).

Regarding the origin of laws, Simnett et al. (2009) classify countries differentiating between common law (associated with shareholder-oriented countries) and code law (related to stakeholder-oriented countries) (Ball et al. 2000). Simnett et al.'s (2009) results support that the choice of an accounting firm as assessor is higher in companies in stakeholder-oriented countries. Kolk and Perego (2010) use a logistic regression with fixed effects to analyse the likelihood that a SR has been assured. Their sample includes 341 companies in 20 countries for the years 1999, 2002 and 2005, resulting in 636 observations. They find a positive association between the response variable (existence of AS) and the stakeholder orientation of the country. They conclude that country-level factors are significant drivers of sustainability assurance, and highlight the need for future research to analyse country-level and firm-level factors concurrently. These researchers also analyse if the origin of the law, besides the other aforementioned determinants, is significant in the choice of assurance provider. For that purpose, they use the SRs in their sample that were externally assured (98 SRs). They find no significant effect of country-level determinants on choice of assessor.

The second determinant used in previous literature is the enforcement mechanism (Simnett et al. 2009; Kolk and Perego 2010). It is measured by the rule of law, which was developed by the World Bank. The rule of law is a measure of the '... perceptions of the extent to which agents have confidence in and abide by the rules of

society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence' (Kaufman et al. 2010: 4). Simnett et al. (2009) use an international sample of 2113 companies that published SRs in the period 2002–2004. They find that companies in countries with a strong legal system are more likely to have their SRs assured. However, Kolk and Perego (2010) conclude that companies in countries with weak enforcement mechanisms are more likely to assure their SRs.

Pressure for sustainability is the third determinant of a country's legal system tradition. Kolk and Perego (2010) find a positive relationship between the existence of AS and the pressure towards sustainability. However, they cannot reach any conclusions on the effect of pressure on choice of assurance provider. Finally, Perego (2009) studies the choice of the assurance provider using a data set collected between 1999 and 2005 from companies in Australia, New Zealand, Hong Kong, Ireland, Malaysia, North America, Pakistan, Singapore, South Africa, Sri Lanka, the United Kingdom (UK) and other European countries. At the country level, he uses different indexes as proxies for the quality of governance and legal country regime. He finds that the choice of a large accounting firm as assessor of the SR is positively associated with countries with weaker enforcement, and negatively associated with the level of litigation risk in the country, measured by a Liability Standard Index developed by LaPorta et al. (2006).

We complete country determinants with a novel element not considered in previous research. In 2001, the European Commission developed a strategic policy to promote CSR. One of the main effects of this policy is the rise of companies that prepare and present their SRs according to the Global Reporting Initiative (GRI) framework, from 270 in 2006 to over 850 in 2011 (European Commission 2011). The preeminence of Europe in the sustainability assurance market was highlighted by Mock et al. (2007), and was evidenced by observations of a sample of 130 companies that published assured SRs in the 2002–2004 period. In a comparative study with data from 2006–2007, Mock et al. (2013) confirmed the leadership of European companies in sustainability assurance. As a consequence of institutional pressure from the European Union (EU), on 15 April 2014, the European Parliament approved the Directive on disclosure of non-financial and diversity information by certain large companies and groups.¹ European public policies promote the quality of sustainability disclosures but do not set rules on the selection of assurance providers. Hence, we hypothesise that countries in the EU are more likely to have SRs externally assured, but we expect no effect on the choice of assessor.

Based on our theoretical approach, our country-level hypotheses are stated as follows:

H1: Determinants at the country level (origin of the law, enforcement and institutional pressure) affect the decision to have SRs externally assured.

H2: Determinants at the country level (origin of the law, enforcement and institutional pressure) affect the decision to hire a Big 4 company as assurance provider.

H3: Being domiciled in an EU country affects the decision of a company to have SRs externally assured.

H4: Being domiciled in an EU country does not affect the decision of a company to hire a Big 4 company as assurance provider.

Company-level determinants

As observed in previous literature, the decision to assure SRs and the choice of assurance provider can be affected by industry membership, company size and shareholder pressure. As for country determinants, previous research presents no conclusive results. Perego (2009) tests company-level variables such as size, industry and profitability, and finds no conclusive results for any of them. On the contrary, Kolk and Perego (2010) show a significant association between existence of assurance and concrete industries: companies in oil, chemical and manufacturing industries, and no significant association between existence of assurance, and the explanatory variables size and capitalisation rate. Sierra-García et al. (2013a) study the factors that influence the decision to have SRs externally assured, as well as the choice of assurance provider, considering only firm-level variables. The sample includes 133 Ibex-35 Spanish companies with SRs, and the variables under consideration are industry, size, profitability and leverage. They conclude that the decision to externally assure a SR is positively associated with size and ROE (return on equity), and negatively associated with ROA (return on assets) and leverage. The authors use a second sample of 163 companies issuing SRs (with and without AS), and find a relationship between the financial audit market and the SR assurance market. Finally, using a third sample of 135 companies with SRs and AS, they conclude that companies in the oil and energy, basic materials and financial industries are more likely to have their SRs assured by a Big 4 auditing firm. Zorio et al. (2013) find similar results using a sample of 130 companies listed on the *Bolsa de Madrid* in the period 2005–2010. The authors highlight that big companies, those that belong to the oil and energy industries, as well as companies listed on IBEX-35, are more likely to have their SRs assured. They also find that the decision to hire an auditor, as opposed to a consultant, depends on industry, size and inclusion on the IBEX-35.

Mock et al. (2007) use a sample of 130 assured SRs from 21 countries during the years 2002–2004 and find that companies in utilities, mining and oil are more likely to assure their SRs than companies in other industries.

This result is updated in Mock et al. (2013) who find that companies in the tobacco, food and drinks industries are starting to assure their SRs. They conclude that companies in economically sensitive industries have more AS than their counterparts in other industries.

To date, the International Integrated Reporting Committee (IIRC), which was created by the Prince's Accounting for Sustainability Project, the GRI and the International Federation of Accountants (IFAC), is working on a framework to provide the wide range of information that investors demand. According to the IIRC, an integrated report should identify the financial and non-financial connections among the following elements (IIRC 2011): organisational overview and business model; operating context (risks and opportunities included); strategic goals and strategies to achieve these goals; governance and remuneration; performance; and future outlook. Based on these initiatives we add two additional determinants at the company level, which are linked to company strategy in reporting. We expect that the commitment to CSR, represented by higher levels of CSR disclosure or by the assumption that integrated reports provide enhanced communication with stakeholders, will affect the existence of assurance and the quality of the assurance provider.

There is little research on the determinants of integrated reports mainly focused on country-level determinants (Frías-Aceituno et al. 2013a; García-Sánchez et al. 2013; Jensen and Berg 2012; Sierra-García et al. 2013b), but also including characteristics at the company level (Frías-Aceituno et al. 2013b; Sierra-García et al. 2013b). Sierra-García et al. (2013b) find that the likelihood of presenting an integrated report is significantly and positively associated with the assurance of SRs.

Thus, based on the discussed theoretical approach, our company-level hypotheses are stated as follows:

H5: Determinants at the company level (industry, size, GRI application level and existence of integrated report) affect the decision to have SRs externally assured.

H6: Determinants at the company level (industry, size, GRI application level and existence of integrated report) affect the decision to hire a Big 4 as assurance provider.

Research Method

Methodology

We test our hypotheses with two models. Model 1 is used to test the hypotheses referring to the existence of external assurance and Model 2 is used to test the set of hypotheses referring to the choice of a Big 4 assessor.

We begin our analysis with a bivariate test of the explanatory variables selected from the literature review in order to choose those with a statistical association with

the response variables. When the variables are categorical, we use a cross-tabulation analysis; when the variables are continuous, we calculate the correlations. We continue with the application of a generalised linear mixed model in two steps: (1) the justification of the use of this methodology with an unconditional or null model, excluding the explanatory variables; (2) the test of the hypotheses applying the following model:

$$Y_{ij} = \beta_{0j} + \beta_{1j}X_{1ij} + \dots + \beta_{nj}X_{nij} + \varepsilon_{ij}$$

Y_{ij} is assurance in Model 1 and Big 4 in Model 2. It is the response variable referred to as the i th company in the j th country.

X_{1ij}, \dots, X_{nij} represent the n explanatory variables at the company level.

ε_{ij} represents the error or random variation around the average.

Because in our sample this variable is dichotomous, we express the model as a logistic regression, as follows:

$$Y_{ij} = \log \frac{\Pr(Y_{ij} = 1)}{\Pr(Y_{ij} = 0)}$$

The parameters $\beta_{0j}, \beta_{1j}, \dots, \beta_{nj}$ are not constants as in a classical regression, but are variables with values that may change from one country to another. For example, β_{0j} includes three components:

- (1) A fixed component (γ_{00}) that represents the global average of the dependent variable.
- (2) A second component representing the explanatory variables at the country level (Z_1, \dots, Z_m).
- (3) A random component (U_{0j}, \dots, U_{nj}) that represents the variability of the means of the dependent variables in the different countries with respect to the global variability.

$$\beta_{0j} = \gamma_{00} + \gamma_{01}Z_{1j} + \dots + \gamma_{0m}Z_{mj} + U_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}Z_{1j} + \dots + \gamma_{1m}Z_{mj} + U_{1j}$$

$$\beta_{nj} = \gamma_{n0} + \gamma_{n1}Z_{1j} + \dots + \gamma_{nm}Z_{mj} + U_{nj}$$

The model establishes a hierarchy in the data. In our sample, company-year (level 1) is nested in countries (level 2); hence, data at the company-year level are not independent within each country given their common country characteristics.

Sample

Data were collected from the GRI website. The GRI does not require reported information to have any kind of assurance. Registrants may choose to add an AS to en-

hance the credibility of the report, achieving a plus rating. We used this dataset because the GRI is recognised as the most trusted framework for CSR reporting (KPMG 2011; Brown et al. 2009; Kaye 2011). In the period 2011–2013 this dataset included 8332 companies with SR registered in more than 80 countries. Sample 1 is used to test the hypotheses referring to the existence of external assurance represented in Model 1. It consists of 3706 company-year observations, from 2220 companies that voluntarily decided to register their SRs according to the GRI. In order to achieve a worldwide representation of countries with and without mandatory CSR reporting, and in developed and developing economies, our sample includes 22 countries in different regions. For companies in each of these countries, we removed all the SRs that did not follow the GRI guidelines or the SR classified as GRI content index, to eliminate the effect of information that is not homogeneous. Duplications were excluded and data completed with hand-collected information from the corporate websites, as needed. Sample 2 derives from Sample 1, and it is used to test the set of hypotheses referring to the choice of a Big 4 company as assessor, represented in Model 2. Thus, this second sample includes only the assured SRs, resulting in a total of 1491 observations from 874 companies.

Variable definition

In Model 1, the response variable is *Assurance*. This variable adopts a value of 1 if the company has its SR externally assured, and 0 otherwise. *Big4* is the response variable in Model 2. *Big4* adopts a value of 1 if the SR is assured by a Big 4 firm, and 0 otherwise.

The explanatory variables are as follows:

- (a) At the country level

Country is a nominal variable, representing the 22 countries in the sample. We use this variable as a grouping factor (random effect).

NCRI (National Corporate Responsibility Index) is used as a proxy for institutional pressure towards sustainability (Kolk and Perego 2010) and calculated by Zadek et al. (2005). NCRI refers to three dimensions: internal (corporate governance, ethical practices and human capital development); external (civil society context); and environmental management.

RuleofLaw is a measure of regulatory enforcement developed by The World Bank Group (2013). We used the last available information, that from 2012.

LawOrigin is defined according to Djankov et al. (2008). It has a value of 1 for common law and 0 for civil or code law.

EU identifies companies in European Union countries. It has a value of 1 if countries are in the EU, and 0 otherwise.

b) At the company level:

Industry, refers to the sector of the company issuing the SR. The GRI database classifies 38 industries. We group them into 10 values according to their nature using previous classifications (Amran and Haniffa 2010; Deegan and Gordon 1996; Wilmshurst and Frost 2000). Energy and chemicals (chemicals, energy, energy utilities); construction (construction, construction materials); consumer goods (consumer durables, food and beverages, healthcare products, household and personal products, retailers); transportation (aviation, logistic, railroad); finance (financial services); primary sector (agriculture, forest and paper, mining); manufacturing (automotive, equipment, metal products, textiles apparel, tobacco, toys); services (commercial services, healthcare services, media, non-profit services, public agency, real estate, tourism/leisure, universities, waste management, water utilities); technology (computers, technology hardware, telecommunications); and other (conglomerate, other).

Size has a value of 1 if the SR is published by a large or multinational company, and 0 if the company is small or medium, following the GRI criteria.

Listed has a value of 1 if the SR is issued by a company publicly traded, and 0 otherwise.

App-level indicates the level of application of the GRI guidelines. Two guidelines (G3 and G4) were issued by the GRI in the period of analysis. From the sample of 3706 companies, 99.7% followed the G3 guidelines. G3 distinguishes three levels (A, B and C) from higher to lower, which indicate the level of information disclosure in the report. The remaining 0.3% is prepared according to the G4 guidelines that establish two levels of disclosure (In Accordance-comprehensive and In Accordance-core). The GRI defines no association between G3 and G4 guidelines. This variable adopts a value of 1 if the SR has level A or In accordance-comprehensive, and 0 otherwise.

Integrated indicates how sustainability information is disclosed by the company. This variable has a value of 1 if the company issues an integrated report and 0 if it issues a stand-alone report. According to Sierra-García et al. (2013b), there is a positive association between the decision to assure the SR and the likelihood of issuing an integrated report.

Year is the variable that identifies the year of the observation.

Results

Descriptive analysis

The distribution of the sample by country is shown in Table 1. Sample 1 consists of 3706 reports from 22 countries, for the period 2011–2013. The United

Table 1 Sample distribution by country

Country	Sample 1		Sample 2		Proportion of SRs with AS
	Freq.	%	Freq.	%	
Argentina	96	2.6	20	1.3	20.83
Australia	159	4.3	85	5.7	53.46
Belgium	60	1.6	14	0.9	23.33
Brazil	274	7.4	105	7	38.32
Canada	207	5.6	67	4.5	32.37
China	242	6.5	58	3.9	23.97
Denmark	47	1.3	25	1.7	53.19
Finland	151	4.1	58	3.9	38.41
France	72	1.9	35	2.3	48.61
Germany	231	6.2	103	6.9	44.59
Greece	76	2.1	37	2.5	48.68
Hungary	51	1.4	13	0.9	25.49
Italy	135	3.6	92	6.2	68.15
Japan	55	1.5	19	1.3	34.55
Netherlands	196	5.3	94	6.3	47.96
Norway	34	0.9	17	1.1	50.00
Portugal	66	1.8	41	2.7	62.12
South Africa	159	4.3	66	4.4	41.51
Spain	342	9.2	189	12.7	55.26
Sweden	299	8.1	175	11.7	58.53
UK	166	4.5	73	4.9	43.98
US	588	15.9	105	7	17.86
Total	3706	100	1491	100	40.23

Table 2 Sample distribution by industry

Industry	Sample 1		Sample 2		Proportion of SRs with AS
	Freq.	%	Freq.	%	
Construction	184	4.96	73	4.90	39.67
Consumer goods	468	12.63	133	8.92	28.42
Transportation	182	4.10	86	5.77	47.25
Energy and chemicals	557	15.03	276	18.51	49.55
Primary sector	277	7.47	107	7.18	38.63
Manufacturing	262	7.07	92	6.17	35.11
Services	659	17.78	218	14.62	33.08
Technology	230	6.21	98	6.57	42.61
Other	418	11.28	160	10.73	38.28
Finance	469	12.66	248	16.63	52.88
Total	3706	100.00	1491	100.00	40.23

States (US) has the largest number of SRs representing 15.9% of the total. Norway, with 34 observations, is the country with the least SRs (0.9%). Sample 2 consists of 1491 assured reports, with Spain and Sweden being the countries with the highest number. The last column in Table 1 reports the proportion of assured SRs per country. Italy (68.15%), Portugal (62.12%), Sweden (58.53%) and Spain (55.26%) have the highest proportion of assured reports.

Table 2 presents the distribution by industry for the two samples. The weights of 'Services', 'Finance', and 'Energy and chemicals' stand out in both samples. The last column represents the proportion of assured SRs per industry. Of the SRs in 'Finance', 52.88% are assured, in contrast to 28.42% of SRs in 'Consumer goods'.

Table 3 Correlation/Cross tabulation analysis

Factor	Model 1 (Assurance) (N = 3706)		Model 2 (Big4) (N = 1491)	
	Pearson correlation	Asym. Sig (2-tales)	Pearson correlation	Asym. Sig (2-tales)
RuleofLaw	.048	.003	.143	.000
NCRI	.054	.001	.152	.000
	Pearson Chi-Square	Asym. Sig (2-tales)	Pearson Chi-Square	Asym. Sig (2-tales)
LawOrigin	69.801	.000	51.862	.000
EU	164.229	.000	81.008	.000
Country	341.436	.000	284.679	.000
Size	21.941	.000	3.565	.059
Listed	17.893	.000	10.571	.001
Industry	100.597	.000	52.626	.000
App-level	558.643	.000	.605	.437
Integrated	15.659	.000	6.373	.012

In Sample 1, 87.2% of the reports are from large or multinational companies, 57.3% are issued by listed companies and 40.2% have an AS. In Sample 2, 90.3% of the reports are issued by large or multinational companies, 61.4% are from listed companies and 64% are assured by a Big 4 auditing firm.

Bivariate analysis

Results of the correlation analysis for continuous variables (Rule of law and NCRI) and cross-tabulation for categorical variables (Law origin, EU, Country, Size, Listed, Industry, Application level and Integrated reports) are presented in Table 3 (significant at the 010% level). All factors have statistical association with the response variable 'Existence of assurance' (Model 1). Regarding the variable response 'Choice of a Big4' (Model 2), all factors, except for 'Application level' are significant.

Test of multilevel structure

We apply the unconditional or null model to Sample 1 to measure the effect of the factor 'Country' on dependent variable 'Assurance', excluding the explanatory variables. The model fits 64.2%. Z statistics showing the effect of country are significant for all years (p-value is less than 0.005). Hence, the average likelihood of presenting assurance of SRs by companies is not the same in all the countries for each of the three years. As shown in Table 4, variance among the countries is 0.345; intraclass coefficients in different years are around 0.25, which means that a quarter of the total variability of the dependent variable is due to the fact that companies are grouped into countries, justifying the use of the multilevel approach.

The same procedure is repeated with Sample 2. The accuracy of the model is 71%. Results show that the average likelihood of choosing a Big 4 firm as assessor is

not the same in all countries (p-value of Z statistics is less than 0.005 in all cases). Table 5 presents the covariance parameters for Sample 2. Variance among countries is 0.986; and intraclass coefficients are around 0.50, which shows that a half of the total variability of the dependent is due to the fact that companies are grouped into countries, justifying the use of the multilevel approach.

Test of hypotheses

Model 1 (Existence of external assurance)

We run a generalised linear mixed model with a binomial probability distribution and a logit link function over two levels: country and company-year. Country is used as random effect and the variables with significant correlations in the bivariate analysis determine the fixed effects. The test of Model 1 has a good fit (72.6%).

Table 6 shows the estimated values of the parameters associated with the random effects and the intraclass coefficients. A comparison of the intraclass coefficients of Model 1 with the corresponding unconditional model shows a slight reduction, which means that the explanatory variables introduced in Model 1 explain part of the variability among countries. The estimated value of the covariance parameters in Model 1 is 0.219, less than the corresponding value in the unconditional model (0.345). This means that 36.5% $((0.345 - 0.219) / 0.345)$ of the variability among countries is explained by the variables at the country level introduced in Model 1. The Z test is significant at the 0.05 level. This result shows that there are other determinants in the decision to present an AS at the country level that are not included in our model and which have to be investigated.

Fixed effects are shown in Table 7. Our results do not support Hypothesis 1 because legal system (LawOrigin), enforcement (RuleofLaw) and pressure towards Sustainability (NCRI) do not have a significant effect on the

Table 4 Covariance parameters with null or unconditional model on Sample 1

Var.	Estimate	Z	Sig.		
Subject: country	.345	2.922	.003	Year	Intraclass coefficients
Residual (2011)	.925	28.286	.000	2011	.345/(.345 + .925) = .2717
Residual (2012)	1.021	23.900	.000	2012	.345/(.345 + 1.021) = .2526
Residual (2013)	1.099	21.173	.000	2013	.345/(.345 + 1.099) = .2389

Covariance structure: Variance components.

Table 5 Covariance parameters with null or unconditional model on Sample 2

Var.	Estimate	Z	Sig.		
Subject: country	.986	16.780	.004	Year	Intraclass coefficients
Residual (2011)	.981	15.518	.000	2011	.986/(.986 + .981) = .5013
Residual (2012)	.986	14.492	.000	2012	.986/(.986 + .988) = .5000
Residual (2013)	.957	2.873	.000	2013	.986/(.986 + .957) = .5075

Covariance structure: Variance components.

Table 6 Model 1 Covariance parameters

Var.	Estimate	Z	Sig.		
Subject: country	.219	2.542	.011	Year	Intraclass coefficients
Residual (2011)	.908	28.222	.000	2011	.219/(.219 + .908) = .1943
Residual (2012)	1.065	23.844	.000	2012	.219/(.219 + 1.065) = .1706
Residual (2013)	1.150	21.143	.000	2013	.219/(.219 + 1.150) = .1600

Covariance structure: Variance components.

Table 7 Model 1: Fixed effects

Source	F	Sig.	Source	F	Sig.
Correctedmodel	29.738	.000	Size	15.475	.000
RuleLaw	.821	.365	Listed	10.183	.001
NCRI	1.063	.303	Industry	5.870	.000
LawOrigin	.000	.990	App-level	365.446	.000
EU	5.407	.020	Integrated	.006	.938

response variable (Assurance). The EU variable is significant, which can be explained by the specific public policies on CSR promoted by the European Commission. Thus, Hypothesis 3 is supported. At the company-year level we observe that 'Industry', 'Size', 'Listed' and 'App-level' determine the existence of assurance of the SRs. On the contrary, the existence of integrated reports is not a significant factor. Hypothesis 5 is thus partially supported.

Table 8 shows the exponential coefficients of the significant fixed effects. The results are as follows:

- The odds for companies in non-European countries having their SRs externally assured are .509 times the odds for European companies, all other things being equal.
- In SME companies, the odds are .602 times the corresponding odds for large and multinational enterprises, all other things being equal.

Table 8 Model 1: Fixed coefficients

Source	Coefficient	Sig.	Exp (Coeff)
Intercept	-.893	.698	.409
EU countries = No	-.676	.020	.509
EU countries = Yes	.000 ^a		
Size = SME	-.508	.000	.602
Size = Large and multinational	.000 ^a		
Listed = No	-.281	.001	.755
Listed = Yes	.000 ^a		
Industry = Construction	-.865	.000	.421
Industry = Consumer goods	-.789	.000	.454
Industry = Transportation	-.263	.198	.769
Industry = Energy and chemical	-.147	.315	.864
Industry = Primary sector	-.619	.001	.538
Industry = Manufacturing	-.761	.000	.467
Industry = Services	-.649	.000	.523
Industry = Technology	-.394	.036	.675
Industry = Other	-.477	.002	.620
Industry = Finance	.000 ^a		
AppLevel = Other	-1.825	.000	.161
AppLevel = Highest	.000 ^a		

^aThis coefficient is set to zero because it is redundant.

- In non-listed companies, the odds are .755 times the corresponding odds for listed companies, all other things being equal.
- For Industry, we reference companies in the financial industry because it is the industry with the highest rate of assured SRs. We find that, all other things being equal:

Table 9 Model 2: Covariance parameters

Var.	Estimate	Z	Sig.		
Subject: country	.891	2.512	.012	Year	Intraclass coefficients
Residual (2011)	.998	16.696	.000	2011	.891/(.891 + .998) = .4717
Residual (2012)	1.017	15.418	.000	2012	.891/(.891 + 1.017) = .4670
Residual (2013)	1.047	14.381	.000	2013	.891/(.891 + 1.047) = .4598

the odds of having SRs externally assured in companies belonging to the construction industry are .421 times the corresponding odds for companies in the Financial sector; in Consumer goods they are .454 times; in the Primary sector they are .538 times; in Manufacturing they are .467 times; in Services they are .523 times; in Technology they are .675 times; and in Others they are .620 times.

the odds of having SRs externally assured in companies that issue SR with the lowest levels of disclosure are 0.161 times the corresponding odds for companies that issue the SR with the highest levels, all other things being equal.

In sum, according to the GRI, the likelihood of having SRs assured is higher in companies that are from Europe, large or multinational, listed, or that present the SR with the highest level of sustainability disclosure. We also find that companies in Finance are more likely to have their SRs externally assured than companies in Construction, Consumer goods, Primary sector, Manufacturing, Services, Technology and Other. We find no evidence for Transportation, and Energy and chemicals, indicating that these sectors have no significant differences from Finance.

Model 2 (Choice of a Big 4 as assessor)

The second model analyses the choice of a Big 4 firm as provider of the SR assurance. Like Model 1, Model 2 is a generalised linear mixed model with a binomial probability distribution and logit link function. Data are nested within two levels, Country and Company-year. Country is used as a random effect as in the previous model. Model 2 has an appropriate goodness of fit test (74.4%). The estimations of the parameters associated with the random effects and the intraclass coefficients are included in Table 9. The comparison of the estimated value of covariance parameters of Model 2 (.891) with the corresponding unconditional model (.986) shows a slight reduction of 9%. After accounting for the explanatory variables, the differences among countries explain 47.17% of the variability of the response variable, Big4. 'Intraclass coefficients' has similar percentages in 2012 and 2013, 46.70% and 45.98% respectively. The likelihood of having SRs assured by a Big 4 firm is not the same in all countries (p-value of Z test is .012).

Table 10 Model 2: Fixed effects

Source	F	Sig.	Source	F	Sig.
Corrected model	6.027	.000	Size	5.740	.017
RuleLaw	.033	.856	Listed	28.297	.000
NCRI	.067	.796	Industry	4.751	.000
LawOrigin	1.706	.192	Integrated	4.688	.031
EU	1.323	.250			

Table 11 Model 2: Fixed coefficients

Source	Coefficient	Sig.	Exp (Coeff)
Intercept	-.354	.931	1.425
Size = SME	-.559	.017	.572
Size = large and multinationals	.000 ^a		
Listed = No	-.774	.000	.461
Listed = Yes	.000 ^a		
Industry = Construction	-.685	.033	.504
Industry = Consumer goods	-1.128	.000	.324
Industry = Transportation	.057	.869	1.058
Industry = Energy and chemical	-.359	.108	.698
Industry = Primary sector	-.697	.015	.498
Industry = Manufacturing	-1.103	.000	.332
Industry = Services	-1.139	.000	.320
Industry = Technology	-.571	.060	.565
Industry = Others	-.706	.006	.494
Industry = Finance	.000 ^a		
Integrated = No	-.360	.031	.698
Integrated = Yes	.000 ^a		

^aThis coefficient is set to zero because it is redundant.

Table 10 presents the explanatory variables of this model: Size, Listed, Industry and Existence of an integrated report, all at the company level and included in Hypothesis 6. Like Model 1, legal system (LawOrigin), enforcement (RuleofLaw) or pressure to be sustainable (NCRI) do not have a significant effect on the decision to have the SR assured by a Big 4 firm. Finally, EU membership does not affect the dependent variable. Hence, Hypothesis 2 is not supported, while Hypothesis 3 is supported. These results suggest the possible existence of other effects at country level that explain the selection of a Big 4 firm as assessor. At the company level, 'Size', 'Industry', 'Listed and presenting an integrated report' are significant determinants for the choice of a Big 4 auditor. On the contrary, the GRI application level is not significant. Hypothesis 6 then is partially supported.

Table 11 presents the exponential coefficients of the significant fixed effects. The results are as follows:

Table 12 Summary of the results

Hypothesis	Determinant	Result	Conclusion	
Country level	H1	Origin of the law	Not confirmed	Rejected
		Rule of law	Not confirmed	
		NCRI	Not confirmed	
	H2	Origin of the law	Not confirmed	Rejected
		Rule of law	Not confirmed	
		NCRI	Not confirmed	
Company level	H3	Belonging to the EU	Confirmed	Accepted
	H4	Belonging to the EU	Confirmed	Accepted
	H4	Industry	Confirmed	Partially accepted
		Size	Confirmed	
		Listed	Confirmed	
		GRI application level	Confirmed	
	H5	Integrated reporting	Not confirmed	Partially accepted
		Industry	Confirmed	
		Size	Confirmed	
		Listed	Confirmed	
GRI application level		Not confirmed		
Integrated reporting		Confirmed		

- The odds of having the SR externally assured by a Big 4 firm by small and medium size companies are .572 times the corresponding odds for large and multinational firms, all other thing being equal.
- The odds of having the SR externally assured by a Big 4 firm in unlisted companies are .461 times the corresponding odds for listed ones, all other things being equal.
- For the variable 'Industry', we reference companies in the financial industry. We find that, all other things being equal:
 - in Construction the odds are .504 times the corresponding odds for companies in Finance;
 - in Consumer goods the odds are .324 times;
 - in Primary sector they are .498 times;
 - in Manufacturing they are .332 times;
 - in Services they are .320 times;
 - in Others they are .494 times.
- In companies that present sustainability information in a stand-alone report, the odds are .698 times the corresponding odds for companies that present it in an integrated report.

Our results show that the likelihood of hiring a Big 4 auditing firm as SR assesor is higher in companies that are large or multinational, listed and present sustainability information in an integrated report. Regarding industry, the likelihood of choosing a Big 4 firm as assurance provider is higher in Finance than in Construction, Consumer goods, Primary sector, Manufacturing, Services and Others.

Discussion and Conclusions

The aim of our paper was to investigate the factors that explain a company's decision to assure their SRs and their choice of assesor. We contribute to the existing literature by using generalised mixed models, which consider the effect of randomness produced by hierarchical grouping. We used a large sample, which facilitates the generalisation of the results. In our paper, data were analysed at two levels: country and company-year. We tested the hypotheses using two samples. Sample 1 included 3706 company-year observations from 2220 companies in 22 countries. Sample 2 included only the assured SRs of Sample 1, resulting in a total of 1491 observations from 874 companies, also in 22 countries. We found that the decision to assure the SRs and the choice of a Big 4 firm as assesor are explained both by differences among countries and differences within each country.

Regarding country level, in contrast to Kolk and Perego (2010), Perego (2009) and Simnett et al. (2009), we did not find that the legal system of the country, measured by the origin of the law, legal enforcement and pressure towards sustainability, significantly affects the decision to externally assure SRs or the choice of a Big 4 firm as assesor. Thus, Hypotheses 1 and 2 could not be supported (Table 12). Also, at the country level, we found that companies in the EU are more likely to have their SRs assured than companies in non-EU countries, although they do not hire more Big 4 auditors than companies in other countries. Our results therefore support Hypotheses 3 and 4. These results can be explained by the existence of specific policies for sustainability in the EU that promote the assurance of the SR as a tool to improve its quality, but do not put

restrictions on the selection of assessor. This shows that EU policy, via recommendations, exerts a pressure that is influencing the behaviour of companies towards SR assurance. These results are also explained by institutional theory. Regulation in general, and specifically regulation on CSR reporting, determines the institutional structures, playing an important role in the development of CSR. As there is still an important proportion of variability of both the two dependent variables analysed (decision to assure and the choice of a Big 4 auditor as assurance provider) to be explained, new explanatory variables at the country level have to be explored. Further research is needed to study determinants of SR assurances at the country level, which might be related to regulation.

At the company level, similar to Simnett et al. (2009) and Sierra-García et al. (2013a) we found that large and multinational companies are more likely to have their SR externally assured. We also found that the likelihood of hiring a Big 4 firm as assurance provider is higher in large companies than in small and medium ones, which confirms the results from Simnett (2009), despite using different measures. Comparable to Mock et al. (2007, 2013) and Kolk and Perego (2010), we found that companies in Energy and Chemicals are more likely to have their SR assured. We also found that the odds of having SRs assured are higher in Finance and Transportation. Furthermore, as in Sierra-García et al. (2013a) and Kolk and Perego (2010), our results show that the likelihood of choosing a Big 4 firm as assurance provider is higher in Finance than it is in the Construction and Primary sectors, and for Consumer goods, Manufacturing, Services and Others. In conclusion, company characteristics such as size, public or non-public, and industry affect both the decision to assure the SR and the choice of a Big 4 firm as assessor. This would be related to the idea that large firms and those belonging to sectors with greater visibility (stakeholder theory), such as financial services, have a greater need to demonstrate that they are socially responsible and legitimise their role in society (legitimacy theory). The level of application of the GRI guidelines is found to be a measure of commitment to transparency, because it affects the decision to have the SR assured, but not the choice of assurance provider. Unlike Sierra-García et al. (2013a), we did not find evidence that the likelihood of presenting an integrated report is significantly and positively associated with having the SR assured. However, companies that present their SRs in an integrated way are more likely to hire a Big 4 company as assessor than companies that issue a non-integrated report. This result might indicate that the issuance of an integrated report drives managers to extend the criteria used to choose the financial auditor to the choice of the social reporting assessor. It is interesting that the current trend for preparing integrated reports seems to promote the hiring of a Big 4 firm as assurance provider.

In conclusion, regulatory actions, such as those proposed by the EU Commission, have a greater effect on the likelihood of having SRs assured than the legal system tradition of a country. Considering this effect, at the company level, variables such as industry, size or public/non-public ownership structure have been tested in prior literature and our results reaffirm their influence on the probability of externally assuring SRs. Other findings, such as the positive effect of the level of commitment to CSR by the reporting company on the presence of external assurance, contribute to the existing literature by providing evidence relating to this matter. Regarding the choice of a Big 4 auditor as assessor, we find no country-level influence. This is an interesting result if we consider that large accounting firms are involved in the production of disclosure standards and information assurance mechanisms (Malsch 2013). At the company level, our results are consistent with previous works in the literature: size, industry and public/non-public ownership structure influence the choice of a Big 4 firm as assessor. We contribute to the existing literature by providing further evidence of the relationship between that choice and the existence of an integrated report. Our results highlight the country effect on both the decision to assure the SR and the choice of a Big 4 company as assessor.

One limitation of the present study is that our findings can only be generalised to the population from which the sample was obtained, that is, companies that register their SRs according to the GRI; therefore, they cannot be extrapolated to the whole sustainability assurance market. Future research is needed to evaluate the determinants of assuring SR, including more countries and different reporting frameworks. Another limitation is the use of the GRI's classification to determine the size of the companies, which discriminates only among small and medium, large and multinational without specifying how it is calculated. A third limitation is the use of data from 2011 to 2013, which may be biased due to different crisis effects in the countries analysed. However, despite these limitations, our results may be useful to regulators and companies that offer the assurance of the SR's service.

Note

1 http://europa.eu/rapid/press-release_MEMO-14-301_en.htm

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