



The assurance market of sustainability reports: What do accounting firms do?



Belen Fernandez-Feijoo^a, Silvia Romero^{b,*}, Silvia Ruiz^a

^a University of Vigo, Spain

^b Montclair State University, USA

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ABSTRACT

The assurance of sustainability reports is a relatively new service offered by different providers such as accounting firms and consultants. The percentage of sustainability reports assured and the weight of the four largest accounting firms (Deloitte, EY, KPMG and PWC) in this new market are evolving in time. The purpose of this paper is to contribute to a better understanding of the role each one of the four major accounting firms (Big4) play in this assurance market. Using a generalized linear mixed model in an international sample, our results confirm that each Big4 accounting firm leverages its network of financial audit clients to enter the sustainability assurance market. Despite the global context in which Big4 operate, the choice of a specific Big4 as assurance provider depends on country level factors. We also find significant differences in the industry distribution for each major accounting firm. These results suggest a potential competitive advantage for the Big4 to enter the sustainability assurance market when they are also auditors of the financial statements. Our findings suggest that each Big4 does not act uniquely at a global level when they assure sustainability reports as there are characteristics in the geographical environment which affect this market. Additionally, the differences in market share of each Big4 by industry, may enforce the idea of the connection between financial auditor (a market highly specialized by industry) and the sustainability assessor.

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1. Introduction

Big4 audit firms (Deloitte, EY, KPMG and PWC) are the largest international professional companies offering audit, assurance, tax, consulting, advisory, actuarial, corporate finance, and legal services. Among them, sustainability assurance refers to the assurance of sustainability reports (SR). Professional accountants are qualified for this service due to their professional standards and because they are required to follow ethical principles (Peters and Romi, 2014).

At the end of the last century the financial auditing market had to overcome important challenges (Elliott, 1997), which produced the development of new markets. The American Institute of Certified Public Accountants (AICPA) predicted that there were possibilities for auditors to expand their services, and that they would have to face many competitors (Marnet et al., 2014). In this new setting, Big4 accounting firms had to evaluate the opportunities and threats of conducting other types of assurance. In recent

years, both the offer of new services (e.g. the assurance of SRs) and the presence of new agents (certifying firms and consultants) in the assurance market are a fact.

There is no information about the fees paid for this service, because they are disclosed with other non-financial services in the Transparency reports issued by audit firms (e.g. Deloitte, 2014; EY, 2014; KPMG, 2014; PWC, 2014). Given the lack of evidence about the economic impact of this market, we approach it considering the number of companies that assure of their SRs (Aravind and Christmann, 2011). The percentage of SRs assured and the weight of the Big4 in this new market are evolving in time. Mock et al. (2013) reported that the percentage of SRs assured by Big4 increased from 35.4% in 2002–2004 to 51.35% in 2006–2007. In addition, KPMG highlights that the market share of the Big4 increased from 60% of the assured SRs in 2005 (KPMG, 2008) to 67% of the assured SRs in 2013 (KPMG, 2013).

Most of the previous research in sustainability assurance services refers to Big4 as a whole, and considers differences between them and other assurance providers (Simnett et al., 2009; Hasan et al., 2005; Perego, 2009). Little is known about the role played

* Corresponding author.

E-mail address: romeros@mail.montclair.edu (S. Romero).

by each specific Big4 in this market. Fernandez-Feijoo et al. (2014) reported the supremacy of Big4 in assurance of SRs with the following distribution: KPMG 18%, PWC 19%, Deloitte 10%, and EY, 14%. The lowest percentage of assurance statements issued during the 2011–2012 period by Deloitte and EY might be explained by the fact that both of them have their headquarters in New York, and it has not been until recent years that sustainability became a subject of matter in the US. On the other hand, KPMG and PWC have their headquarters in Europe. Europe has been a leader in sustainability reporting since the European Union released what is known as the “Europe 2020 Strategy” (European Commission, 2010), a new model of business based on sustainable growth (Martinuzzi et al., 2011). In addition, KPMG has been a leader in reporting on sustainability practices since 2008. In fact, sustainability is one of the main strategies of this audit firm, which is denoted by the triennial KPMG surveys of CSR reporting issued since 1993. Cohen and Simnett (2014) identified a research gap regarding the market of sustainability assurance, which we are addressing in this paper.

The purpose of this paper is twofold. First, we investigate if Big4 audit firms leverage their network of financial audit customers to enter the sustainability assurance market. Second, we study if there is industry specialization or country differentiation in sustainability assurance for each specific Big4 audit firm. A better understanding of the role of Big4 in this assurance market will strengthen previous results providing an insight on this novel market. This approach can open new venues for future research by comparing both audit and assurance markets, and understanding the underlying reason for audit companies to engage on assurance services. It may also be useful for regulatory bodies to design the policy of this oligopolistic market mainly dominated by four large firms (Deloitte, EY, KPMG and PWC). Our motivation is founded on previous literature, which assesses the existence of industry specialization (Dunn and Mayhew, 2004; Carson, 2009; Jaggi et al., 2012) and country differentiation (Verleyen and De Beelde, 2011) among Big4, in the financial auditing market.

The paper proceeds as follows: the background that supports the development of our hypotheses; the description of the sample and research methods; the descriptive analysis and the results of testing our hypotheses, followed by our conclusions and implications for the future.

2. Background and hypotheses development

There are no norms or regulation to guide the contract between a firm and an assurance provider. In order to contract the provision of any assurance service by an audit firm, both the client has to make a decision to hire a specific auditor, and the auditing firm has to accept the client. The choice of an assurance provider is a complex process that includes arguments based on economic rationality and arguments based on collective rationality (DiMaggio and Powell, 1983) that can be explained under institutional theory. In a context of economic rationality, companies will choose a specific assurance provider under a cost-benefit analysis. Hence, the selection of an assessor might be influenced by the fact that it is also the financial auditor. The possibility of having common processes in both services might allow economies of scope, including the reduction of time needed to learn about the reporting organization (Park and Brorson, 2005) or the reduction of fees (Byus et al., 2013). However, institutional theory implies that companies do not follow this rational behavior, but instead they emphasize the social context within which firms operates (Bansal, 2005). In other words, a firm committed to sustainability reporting and assurance might select the same auditor as assessor because of informal mechanisms that can reinforce the company's social reputation. Therefore, regulation and social pressure (Daub, 2007; Alrazi et al., 2015)

besides marginal returns, might be the underlying reasons for companies to engage in CSR assurance.

Research in auditing found association between audit and non-audit fees, which is consistent with knowledge spillovers between both services (Simunic, 1984; Davis et al., 1993; Craswell and Francis, 1999). For example, the understanding of the internal control system is necessary for both, the financial audit and the assurance of the SR process under ISAE3000 (IAASB, 2013, 2014; AICPA, 2015). In general, providing financial audit and assurance of SR is allowed by regulation; although there is a risk of compromising the independence of the auditor due to the provision of additional services (Boyd, 2004; Reiter and Williams, 2004). European firms have limits to provide the joint service depending on total turnover (European Parliament and the Council, 2014). Nevertheless, this measure, implemented to safeguard auditor's independence, has a marginal effect because it is only applied to specific situations. Based on these grounds, the provision of financial auditing and SR assurance services simultaneously may have advantages for suppliers, because of the knowledge acquired during the financial audit process. At the same time, from the demand standpoint, it might be desirable to hire a service supplier that already knows the company and its procedures. In the Spanish context, Sierra-García et al. (2013) identified several marketing strategies of the Big4's, concluding that Deloitte and EY offer sustainability assurance as additional service to their audit clients while KPMG get new clients for this new service. We formulate our first hypothesis as follows:

H1. Each Big4 accounting firm leverages its network of financial audit clients to enter the sustainability assurance market.

The decision to assure the SR can be comprehended under the institutional theory (Kolk and Perego, 2010; O'Dwyer et al., 2011; Simnett et al., 2009). This decision, in the context of CSR communication, is not necessarily taken under economic criteria, as Larrinaga-González (2007) asserted, because of the existence of structures or mechanisms that make the assurance of SR a process widely accepted by companies. DiMaggio and Powell (1983) referred to coercive, normative and mimetic mechanisms. Coercive mechanisms include pressure exerted by other organizations upon which the company is dependent and also by cultural expectations; normative mechanisms arise mainly from shared values and norms; and mimetic mechanisms stem from uncertainty as a force that encourages imitation. These mechanisms or processes may be leading companies in a particular context (country, industry, etc.) to behave in a similar way regarding the choice of the assurance provider. If an assurance provider is a specialist with a high reputation in a particular country it is likely that this reputation will lead other companies to hire her. In this situation, it is expected that every Big4 has its own market in each country (Francis et al., 2013). However these are global firms that have incentives to maintain uniform quality around the world (Simunic and Stein, 1987). United States (US) is a paradigmatic example due to a low demand of sustainability assurance. From the supply point of view, Casey and Grenier (2014) evaluated companies in highly regulated industries in the US (finance and utilities) where the oversight by regulators becomes a substitute of CSR assurance. According to Francis and Wang (2008) the Big4 accounting firms are hesitant to offer these services due to an excessive litigation environment. From the demand point of view, Cho et al. (2014) found that investors in the US do not value the assurance of CSR reports. Conversely, Braam et al. (2016) found that in the Netherlands the process of assurance positively affects the level of corporate environmental accountability. These authors considered that The Netherlands has a CSR leadership role, due to the fact that GRI and Greenpeace are based there. In a detailed analysis of the

sustainability assurance market, Fernandez-Feijoo et al. (2014) identified significant differences by country. Using a sample of 2526 sustainability reports with external assurance in 16 countries, they found that KPMG has the largest market share in Italy and the Netherlands; PWC in Finland, Germany and South Africa; Deloitte in Portugal, and EY in Canada and France. They also found that there is no clear predominance of any of them in Australia, China, Spain and the US. Kolk and Margineantu (2009) explored if each Big4 adopts a global integration (standardization) or a responsiveness (adaptation) strategy with respect to their sustainability services. They found that Big4 firms follow an adaptation strategy (persistent differences between countries) consistent with country specialization more than a standardization strategy (no consistency at the country or region levels). They highlighted that in terms of visibility, KPMG has preeminence in Europe, Deloitte in North America, PWC in both North and South America, and EY in Africa. According to this reasoning, the demand for sustainability assurance should follow differentiated patterns of behavior by country. Hence, we formulate our second hypothesis as follows:

H2. *Ceteris paribus*, country determinants affect the sustainability assurance market share of each Big4 accounting firm.

Previous research indicates that industry specialization generally leads to expertise and economies of scale. For example, Fung et al. (2012) found significant specialization premiums and scale discounts due to industry specialization. Industry specialization in the financial audit context is an issue widely analyzed since Zeff and Fossum's (1967) seminal work (Carson, 2009; Ettredge et al., 2009; Verleyen and De Beelde, 2011). Hogan and Jeter (1999) highlighted that audit concentration levels are higher in regulated and concentrated industries, and in those industries experiencing a rapid growth. Specialization by industry offers a competitive advantage from the supply point of view and provides an argument for the design of strategies in the sustainability assurance market (Carson et al., 2004; Casterella et al., 2004). Under the prism of economic rationality, companies select an industry specialist with the expectation of obtaining a higher quality of service (Almutairi et al., 2009; Francis, 2004; Lim and Tan, 2010; Nagy, 2012). Additionally, it is necessary to consider that not all decisions are taken with an economic rationale and could have an isomorphic behavior among companies in the same sector due to institutionalization mechanisms through imitation (DiMaggio and Powell, 1983). It is expected that if a particular assurance provider is a specialist in an industry, companies in that sector will have a higher propensity to hire it, considering it is a guarantee of quality. Hence, we formulate our third hypothesis as follows:

H3. *Ceteris paribus*, industry determinants affect the sustainability assurance market share of each Big4 accounting firm.

3. Sample and research methods

3.1. Data selection and sample design

Data were collected from the GRI database for the years 2011–2013 (data retrieved in September 2014). We selected 18 countries (Table 1) that have the largest number of reports submitted to the GRI, and span the whole world except for Asian countries, due to language limitations in hand collection of data. The sample includes countries with an economic relevance (e.g., US); with a leadership in communication and verification of sustainability reports (e.g., Spain); with cultural values towards sustainability (e.g., Sweden and Finland); developing countries (e.g., Argentina, Brazil and Colombia); and developed ones (e.g., Germany, Canada and Australia). We hand collected the name of the

assurer for the year 2011. For 2012, 2013, this information is available in the GRI database. We also hand collected the name of the financial auditor for each company and year, as well as the industry when it was identified by “others” and “conglomerates” in the GRI database, removing those for which we did not find a specific industry. Data were gathered from different sources: the companies' websites, public databases and contacting with the firms. Although the sample of countries has not been selected randomly, which can compromise generalization of results, we use generalized linear mixed model because, according to Snijders and Bosker (2012), if the number of countries is larger than 10, the mixed model is more parsimonious than the fixed model. Our sample includes 1378 SRs, from 739 companies, assured by a Big4 or a non-Big4, being the financial auditor a Big4 or a non-Big4.

3.2. Analytical models

According to Hox (2002) generalized linear mixed models are highly recommended in analyzing jointly explanatory variables referred to different levels when data are nested. We adopt this methodology because our sample has repeated measures for each company during the period 2011–2013, and the possible existence of nested data by country. For that purpose, we create a first unconditional model to test the effect of country as random effect in the response variables. Other explanatory variables are omitted. The general mathematical expression is (equation (1)):

$$\log \frac{\Pr(Y_{ij} = 1)}{1 - \Pr(Y_{ij} = 1)} = \beta_{0j} + \varepsilon_{ij} \quad (1)$$

where: $\Pr(Y_{ij} = 1)$ is the probability of the dependent variable referred to the i th company in the j th country adopts a value of 1. β_{0j} is the average value of the dependent variable in every country, and ε_{ij} is the error or random variation around the average.

To analyze the covariance parameters to verify country as random effect, we calculate the intraclass correlation coefficient (ICC) as the variance of the random effect divided by the total variance. Wald Z statistic indicates the significance. If country is a random effect, generalized linear mixed models are justified.

In a second step, we introduce different explanatory variables. We use Big4*-FA to test H1, referred to the effect of each Big4 accounting firm on the offer of assurance services. Country-level variables (Common law and EU) are used to test H2, to identify causes of the differentiation by countries. Finally, we use Industry to test H3, in order to analyze the specialization by industry. As control variable, we include Listed, representing if the firm is quoted in a stock exchange. We include this variable because listed companies are usually leaders on reporting practices, due to their public exposition (Gürtürk and Hahn, 2015). We run the model four times, one per each Big4. The model is expressed as equation (2):

$$\text{BIGX}^* - \text{AP} = f(\text{BIGX}^* - \text{FA}, \text{Country}, \text{Commonlaw}, \text{EU}, \text{Industry}, \text{Listed}) \quad (2)$$

BIGX* is each of the Big4 audit firm, resulting therefore in four tests for each model.

Because all the dependent variables are dichotomous, we express the models as binary logistic regressions (equation (3)):

$$Y_{ij} = \log \frac{\Pr(Y_{ij} = 1)}{\Pr(Y_{ij} = 0)} = \beta_{0j} + \beta_{1j}X_{1ij} + \dots + \beta_{nj}X_{nij} + \varepsilon_{ij} \quad (3)$$

where: Y_{ij} is the response variable in each model. The double index refers to the i th company in the j th country. X_{1ij} , ..., X_{nij} represent

Table 1

Sample distribution by country and assurance provider.

Country	KPMG	PWC	Deloitte	EY	Others	Total	% Big4 over total by country	% First Big4 over Total by country
Argentina	1	10	2	3	6	22	72.73	45.45
Australia	7	6	8	18	60	99	39.39	18.18
Brazil	27	15	5	9	29	85	65.88	31.76
Canada	2	7	11	9	8	37	78.38	29.73
Colombia	4	2	12	0	8	26	69.23	46.15
Finland	6	16	2	1	10	35	71.43	45.71
France	6	4	5	17	3	35	91.43	48.57
Germany	22	45	2	4	27	100	73.00	45.00
Greece	8	0	8	3	19	38	50.00	21.05
Italy	30	13	16	21	13	93	86.02	32.26
Mexico	3	13	12	3	19	50	62.00	26.00
Netherlands	33	23	7	23	8	94	91.49	35.11
Portugal	13	13	14	0	5	45	88.89	31.11
South Africa	14	17	9	13	37	90	58.89	18.89
Spain	49	34	14	10	77	184	58.15	26.63
Sweden	26	37	34	35	21	153	86.27	24.18
UK	8	15	5	13	36	77	53.25	19.48
US	3	4	9	8	91	115	20.87	7.83
Total	262	274	175	190	477	1378	65.38	19.88
% over Total	19.01	19.88	12.70	13.79	34.62	100		

the n explanatory variables at the company level. ε_{ij} represents the error or random variation around the average.

The parameters β_{0j} , β_{1j} , ..., β_{nj} (equation (4)) are variables with values that may vary from one country to another

$$\begin{aligned}\beta_{0j} &= \gamma_{00} + \gamma_{01}Z_{1j} + \dots + \gamma_{0m}Z_{mj} + U_{0j} \\ \beta_{1j} &= \gamma_{11} + \gamma_{12}Z_{2j} + \dots + \gamma_{1m}Z_{mj} + U_{1j} \\ &\dots \\ \beta_{nj} &= \gamma_{n0} + \gamma_{n1}Z_{1j} + \dots + \gamma_{nm}Z_{mj} + U_{nj}\end{aligned}\quad (4)$$

where: $\gamma_{00}, \dots, \gamma_{nm}$ are fixed coefficients. Z_{1j}, \dots, Z_{mj} represent the m explanatory variables at the country level. U_{0j}, \dots, U_{nj} represents the variability of the means of the dependent variables in the different countries with respect to the global variability.

3.3. Variable description

3.3.1. Dependent variables

KPMG-AP adopts a value of 1 if the company hires KPMG as assurance provider of its SR, 0 otherwise.

PWC-AP adopts a value of 1 if the company hires PWC as assurance provider of its SR, 0 otherwise.

DEL-AP adopts a value of 1 if the company hires Deloitte as assurance provider of its SR, 0 otherwise.

EY-AP adopts a value of 1 if the company hires EY as assurance provider of its SR, 0 otherwise.

3.3.2. Explanatory variables

KPMG-FA adopts a value of 1 if the company hires KPMG as auditor of its financial statements, 0 otherwise.

PWC-FA adopts a value of 1 if the company hires PWC as auditor of its financial statements, 0 otherwise.

DEL-FA adopts a value of 1 if the company hires Deloitte as auditor of its financial statements, 0 otherwise.

EY-FA adopts a value of 1 if the company hires EY as auditor of its financial statements, 0 otherwise.

Country. Reporting practices vary across countries due to different cultural and social norms or governmental regulations (Sotorrio and Sánchez, 2010; Golob and Bartlett, 2007; Hahn and Kühnen, 2013). This variable is used as random effect in all the models. It adopts 18 values, according to the 18 countries in our sample.

To further analyze the country effect on the response variable,

we introduce the following variables at the country level:

Commonlaw

According to LaPorta et al. (1997), historical background and legal system can be used to classify countries into common law and civil law legal tradition, being the first linked to stronger investor protection than the second. Sustainability assurance demand differs by country depending on their legal system (Kolk and Perego, 2010; Simnett et al., 2009). This variable adopts a value of 1 for Canada, Australia, South Africa, UK and US, and a value of 0 for the remaining countries (Argentina, Brazil, Colombia, Finland France, Germany Greece, Italy, Mexico, Netherlands, Portugal, Spain and Sweden).

EU

According to Kolk and Margineantu (2009), there is a strong local adaptation more than standardization in sustainability services offered by Big4. Europe is a reference region due to its policies towards sustainability (Fernandez-Feijoo et al., 2014). This variable adopts a value of 1 if the company is in Europe and 0 otherwise.

At the company-year level we introduce the following variables:

Industry

It is defined following Fernandez-Feijoo et al. (2015). It adopts a value of 1 if the company belongs to Energy (Chemical, Energy and Energy utilities); 2 if Construction (Construction and Construction materials); 3 if Services (Commercial services, Healthcare services, Media, Non-profit services, Public agency, Real estate, Tourism, Universities, Waste management and Water utilities); 4 if Transportation (Aviation, Logistic, Railroad); 5 if Primary sector (Agriculture, Forest and paper products and Mining); 6 if Manufacturing (Automotive, Equipment, Metal products, Textiles and Apparel, and Tobacco); 7 if Technology (Computers, Technology hardware, Telecommunications); 8 if Consumer goods (Consumer durables, Food and Beverages, Health care products, Household and personal products and Retailers); 9 if Financial services. To facilitate the interpretation of the results, we first identify the less significant industry in each Big4 as value of reference. Thus, Manufacturing is the reference in testing KPMG and EY and Consumer goods is the

reference for PWC and Deloitte.

Listed is a variable included to control for the effect of the pressure of investors. It adopts a value of 1 if the company is listed and 0 otherwise.

We use a variable Year, not as an explanatory variable, but as part of the structure of the model due to the repeated measures for each company.

4. Results

4.1. Descriptive statistics

The distribution of the sample according to the assurance provider and the country is broken down in Table 1. We aggregated more than 50 different assurers into “Others”. Some of these providers work on specific countries, identified by importance in parentheses, i.e. Aenor (Spain), Bureau Veritas (US, Brazil, Spain, UK, Canada, Colombia and France), DNV (Brazil, US, Italy, Sweden, Germany, Greece, UK), ERM (US, South Africa, UK, Australia, Germany, Spain), Net Balance¹ (Australia, Germany), SGS (Spain, UK). Due to its heterogeneous nature, we do not use Others-AP as dependent variable. Big4 have a market share of 65.38% in the sustainability assurance services, and KPMG and PWC stand out, with a percentage of 19.01% and 19.88%, respectively. The cross tabulation analysis between country and assurance providers shows a significant correlation (Pearson Chi-Square value = 515.700 and Asymp Sig. = 0.000). Table 1 indicates that Big-4 have the highest market share in the majority of the countries analyzed, meanwhile non-Big4 providers (Others) have the highest market share only in Australia and the US, with large differences respect to the second provider. Interestingly, in every country the Big 4 with the highest market share has close to 50% of the total market, being the average 19.88%, and the lowest market share of the Big4 in US.

4.2. Test of hypotheses

As a first step we test the country effect. We run 4 generalized linear mixed models, one for each Big4, with country as random effect but no fixed factors. This analysis allows us to determine the odds of choosing a specific Big4 as assurance provider, using country as random effect. Table 2 shows significant high values for the intraclass correlation coefficient (ICC), which indicates the percentage of variability of the dependent variable due to country level determinants. 35.82% of the variability in choosing KPMG as assurance provider is explained by country level factors, 43.45% for PWC, 40.14% for Deloitte and 47.63% for EY. Notwithstanding the global context in which Big4 operates, we find that the country in which the company operates affects the sustainability assurance market share of every Big4.

As a second step we introduce in the model a variable indicating the corresponding financial auditor, Commonlaw, EU, Industry and Listed. Table 3 displays the statistical coefficients and significances of the different values of each variable.

The results suggest that the likelihood of choosing a given Big4 as assurance provider is positive and significantly associated to the fact that the same Big4 is also the financial auditor (p-

value = 0.000). The exponential coefficient indicates that the odds of choosing KPMG as assurance provider of the SR is 0.079 times lower in companies where KPMG is not the financial auditor than in companies where KPMG is the financial auditor. For PWC, the odds ratio is 0.096; for Deloitte is 0.054 and for EY is 0.058.

According to this result, each Big4 accounting firm leverages its network of financial audit clients to enter the sustainability assurance market, supporting our first hypothesis. The first analysis, using the unconditional model (Table 2), confirms a significant effect of country in the sustainability assurance market share of every Big4, supporting our second hypothesis. In order to explain the source of this diversity, we test the effect of country-level determinants in each Big4. We find a significant association (at the 95% level) in the KPMG model. The odds of choosing KPMG as assurance provider of the SR, is 3.081 times higher in companies located in civil law than in companies located in common law countries (p-value = 0.008). We also test differences between EU countries and others and find that the odds of choosing KPMG as assurance provider of the SR is 0.402 times lower in companies located in non EU countries than in companies located in EU countries (p-value = 0.017).

To further analyze these results, we create the variable Commonlaw by LegalSystem. This variable considers 4 values: 1 if it belongs to German civil law (Germany), 2 if French civil law (Argentina, Brazil, Colombia, France, Greece, Italy, Mexico, The Netherlands, Portugal and Spain); 3 if Scandinavian civil law (Finland and Sweden) and 4 if English common law (Australia, Canada, SouthAfrica, UK and US), according to LaPorta et al. (1997). Non-tabulated results indicate that the likelihood of choosing KPMG as assurance provider is 3.300 times higher in companies located in French civil law than in companies in English legal system (p-value = 0.005). The effects of the remaining variables are nearly identical to the reported model. We do not find any significant association for PWC, Deloitte and EY.

Regarding the specialization by industries, Table 3 shows a significant association between each Big4 and industry. This association has to be described considering the industry used as reference, which was selected because it was the less representative. It is important to highlight that we control for the effect of each Big4 being the financial auditor in the company. The odds of choosing KPMG as assurance provider of the SR is higher in companies belonging to the Energy and chemicals (2.385 times), Construction (2.522 times), Transportation (3.548 times), Primary sector (2.806 times), Consumer goods (2.353 times) and Financial services (2.671 times) industries than in companies in Manufacturing (p-

Table 2
Country effect (Unconditional model).

	Unconditional-Model (KPMG-AP)			Unconditional-Model (PWC-AP)		
BIC ^a	6659.344			6639.927		
Accuracy	81.0%			80.1%		
Covariance parameters	Estimate	Z	Sig.	Estimate	Z	Sig.
Random effect (country)	0.528	2.281	0.023	0.726	2.277	0.023
Residual effect	0.946	26.072	0.000	0.945	26.048	0.000
ICC (%)	35.82			43.45		
	Unconditional-Model (DEL-AP)			Unconditional-Model (EY-AP)		
BIC ^a	7119.348			7064.741		
Accurate	87.3%			86.2%		
Covariance parameters	Estimate	Z	Sig.	Estimate	Z	Sig.
Random effect (country)	0.631	2.322	0.020	0.843	2.221	0.026
Residual effect	0.941	26.074	0.000	0.927	26.055	0.000
ICC (%)	40.14			47.63		

^a BIC is Bayesian Information Criterion, based on $-2 \log$ pseudo likelihood.

¹ Subsequently to our data analysis, in 2014, Net Balance was acquired by EY Australia. Worth mentioning that in Australia there is a dominance of a local consultancy firm and one of the Big4 is the first Big4 in terms of market share with a significant difference respect to the second firm. It opens a possible new stage in the evolution of this market with the acquisitions of local consultancy firms by any Big4 which dominates the market. That could be the case of KPMG in South Africa, Spain or UK, where a non-Big4 firm has an important market share.

Table 3
Fixed coefficients in our model.

Model (KPMG-AP)				Model (PWC-AP)			
BIC ^a	7278.214			7342.971			
Accuracy	85.9%			85.0%			
Model term	t	Sig.	Exp(Coeff)	t	Sig.	Exp(Coeff)	
Intercept	−2.090	0.037	0.326	−1.778	0.076	0.301	
KPMG-FA (value = 0)	−14.539	0.000	0.079	—	—	—	
PWC-FA (value = 0)	—	—	—	−13.588	0.000	0.096	
Common Law (Civil law)	2.655	0.008	3.081	1.596	0.111	2.557	
EU (non EU)	−2.386	0.017	0.402	−0.427	0.670	0.797	
Industry (Ener. and Chem.)	2.329	0.020	2.385	1.140	0.254	1.506	
Industry (Construction)	2.160	0.031	2.522	2.383	0.017	2.755	
Industry (Services)	0.516	0.606	1.231	0.423	0.672	1.173	
Industry (Transportation)	2.757	0.006	3.548	1.054	0.292	1.589	
Industry (Primary sector)	2.350	0.019	2.806	2.563	0.010	2.794	
Industry (Manufacturing)	0.000 ^a			2.116	0.035	2.367	
Industry (Technology)	1.672	0.095	2.117	1.258	0.209	1.714	
Industry (Consumer goods)	2.030	0.043	2.353	0.000 ^a			
Industry (Financial services)	2.662	0.008	2.671	1.689	0.091	1.834	
Listed (no listed)	−2.458	0.014	0.630	0.209	0.835	1.041	

Model (DEL-AP)				Model (EY-AP)			
BIC ^a	7917.024			7969.869			
Accuracy	88.8%			89.7%			
Model term	t	Sig.	Exp(Coeff)	t	Sig.	Exp(Coeff)	
Intercept	−2.765	0.006	0.135	−0.648	0.517	0.569	
DEL-FA (value = 0)	−14.976	0.000	0.054	—	—	—	
EY-FA (value = 0)	—	—	—	−14.336	0.000	0.058	
Common Law (Civil law)	0.937	0.349	1.749	−1.397	0.163	0.395	
EU (non EU)	1.128	0.260	1.845	−1.124	0.261	0.498	
Industry (Ener. and Chem.)	2.910	0.004	3.437	2.480	0.013	4.019	
Industry (Construction)	1.731	0.084	2.268	1.515	0.130	2.662	
Industry (Services)	1.852	0.064	2.247	2.547	0.011	4.443	
Industry (Transportation)	2.427	0.015	3.303	2.314	0.021	4.480	
Industry (Primary sector)	0.474	0.636	1.273	1.716	0.086	2.998	
Industry (Manufacturing)	1.243	0.214	1.968	0.000 ^a			
Industry (Technology)	0.699	0.485	1.419	3.754	0.000	9.493	
Industry (Consumer goods)	0.000 ^a			1.139	0.255	2.013	
Industry (Financial services)	3.051	0.002	3.642	2.691	0.007	4.710	
Listed (no listed)	1.324	0.186	1.305	−1.099	0.272	0.771	

Bold values are statistically significant.

^a This coefficient is set to zero because it is redundant.

values = 0.020, 0.031, 0.006, 0.019, 0.043 and 0.008, respectively). This association is remarkable in the Transportation industry (Fig. 1).

The odds of choosing PWC as assurance provider is statistically higher in companies belonging to Construction (2.755 times), the Primary sector (2.794 times) and Manufacturing (2.367 times), than in companies in the Consumer goods industry (p-values = 0.017, 0.010, and 0.035, respectively) (Fig. 2).

Regarding the industry distribution for Deloitte (Fig. 3), the odds of choosing Deloitte as assurance provider is significantly higher in companies belonging to Energy and chemicals (3.437 times), Transportation (3.303 times) and Financial Services (3.642 times) than in companies in the Consumer goods sector (p-values = 0.004, 0.015, and 0.002, respectively).

The odds of choosing EY as assurance provider is significantly higher in companies belonging to the Energy and chemicals (4.019 times), Services (4.443 times), Transportation (4.480 times), Technology (9.493 times) and Financial services industry (4.710 times) than in the Manufacturing sector (p-values = 0.013, 0.011, 0.21, 0.000 and 0.007, respectively). As depicted in Fig. 4, there is a spike in the Technology industry.

These results confirm the variability of the market share of each Big4 accounting firm depending on the industry membership of the company assured, which supports the third hypothesis.

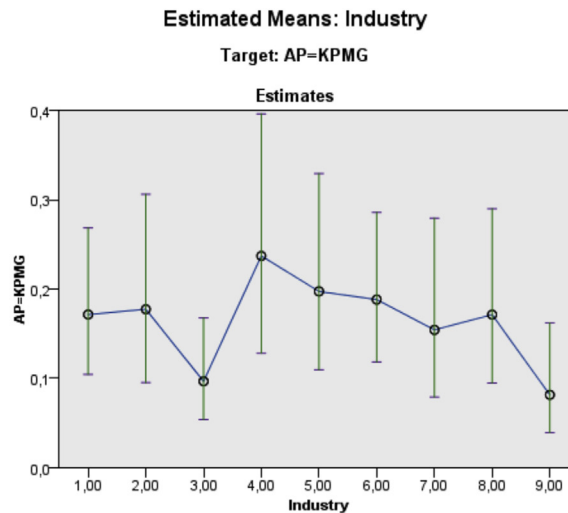
Finally, regarding the Listed control variable, we find it significant only for KPMG. The likelihood of choosing KPMG as assurance

provider of the SR is higher in listed companies (p-value = 0.035). The odds of choosing KPMG is 0.677 times lower in non-listed companies than in listed companies.

5. Discussion

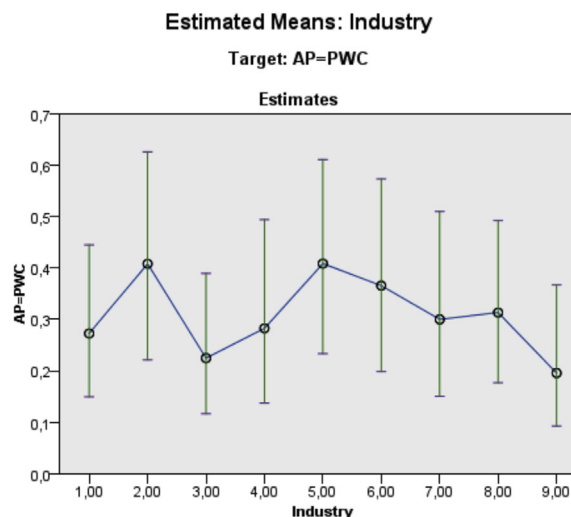
Our results indicate that Big4 firms find an opportunity in providing assurance services to their financial auditing clients. From the companies' point of view, the rationale might be an economic criterion: the existence of common processes in both services that allows a reduction of fees. On the side of the provider, the explanation could be based on the marketing strategy of the audit firm: offering sustainability assurance to their audit clients might foster their loyalty and add entrance barriers to other suppliers. This result might also be a starting point for future research regarding the consequences of the high concentration in this market and how the accounting profession should deal with the possible conflicts of interest.

Regarding the country or industry differentiations in sustainability assurance among Big4 firms, our results confirm the significant weight of country level factors to explain the choice of a specific Big4 as assurance provider. Audit firms are not equally distributed along the different countries, and the country in which the company is located affects the sustainability assurance market share of every Big4. Our results confirm the preeminence of KPMG in Europe as in Kolk and Margineantu (2009) and Fernandez-Feijoo



Legend (industry): 1: Energy and chemicals; 2: Construction; 3: Services; 4: Transportation; 5: Primary sector; 6: Financial services; 7: Technology; 8: Consumer goods and 9: Manufacturing (value of Reference).

Fig. 1. Distribution by industry in KPMG.



Legend (industry): 1: Energy and chemicals; 2: Construction; 3: Services; 4: Transportation; 5: Primary sector; 6: Manufacturing; 7: Technology; 8: Financial services and 9: Consumer goods (value of Reference).

Fig. 2. Distribution by industry in PWC.

et al. (2014). We find that Big4 has a low market share in US as Casey and Grenier (2014). PWC leads the sustainability assurance market in Argentina, Finland and Germany; Deloitte in Colombia; and EY in France. Hence, our results support the existence of a country differentiation regarding the assurance service. We further investigate if legal system tradition or being part of the EU affects the market share of the each Big4. Both variables are only significant for KPMG. This fact that can be explained by the high visibility of this firm in Europe (Kolk and Margineantu, 2009) and its public commitment towards sustainability. Thus, there are other country variables, yet to be investigated, that could explain the choice of Deloitte, EY or PWC as assurer providers.

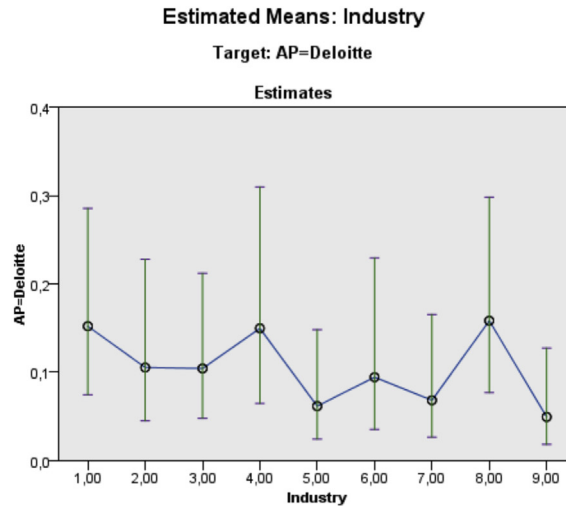
Regarding industry, our results show significant differences in

the industry distribution for each Big 4 after controlling for other factors. There is a predominance of KPMG in Transportation, PWC in Construction and Primary sector, Deloitte in Financial services and Transportation, and finally EY in Technology. Most of the sectors are highly regulated industries, with a high level of concentration and a rapid growth, which are the characteristics that Hogan and Jeter (1999) link to high levels of audit concentration.

Finally, regarding the effect of the variable Listed, representing the pressure of investors, it has only significance for KPMG.

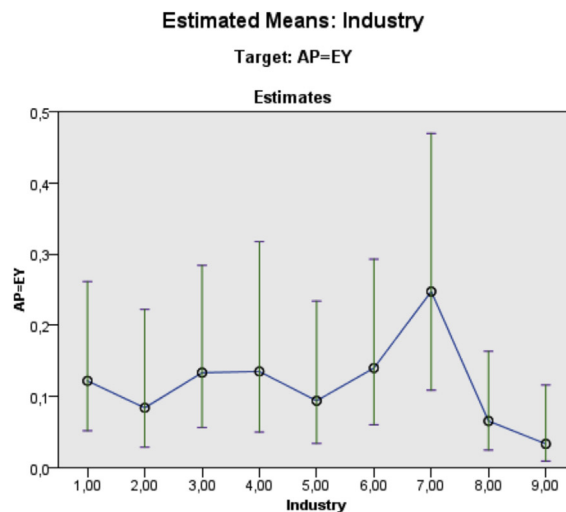
6. Conclusions

This study explored the relationship between the main global



Legend (industry): 1: Energy and chemicals; 2: Construction; 3: Services; 4: Transportation; 5: Primary sector; 6: Manufacturing; 7: Technology; 8: Financial services and 9: Consumer goods (value of Reference).

Fig. 3. Distribution by industry in Deloitte.



Legend (industry): 1: Energy and chemicals; 2: Construction; 3: Services; 4: Transportation; 5: Primary sector; 6: Financial services; 7: Technology; 8: Consumer goods and 9: Manufacturing (value of Reference).

Fig. 4. EY by industry.

accounting firms acting as financial auditors and their role as assurers of SR. The novelty of our approach is that we analyze each one of the known as Big4 individually. Given that these firms operate all over the world, certain global homogeneity in the functioning of each accounting firm might be expected. As an initial step, we investigate if Big4 audit firms leverage their network of financial audit customers to enter the sustainability assurance market. We find that they do. We believe that there is a potential competitive advantage. The Big4 firms can define a generic strategy to approach their clients with other services (e.g. assurance of the SR) linked to the auditing service.

Our findings suggest that each Big4 does not behave uniformly

at a global level when they assure SRs as could be predicted. There are characteristics at a country level affecting this market. Additionally, the strengths of cultural factors overcoming the expected homogeneity of the Big4 should be assessed. It seems that the major accounting firms should consider this local differences when designing their strategies, when consolidating their country position and also when penetrating new markets. In sum, more attention should be paid to those factors that conform the specific characteristics of a country. The observed differences in market share by industry may enforce the idea of the connection between financial auditor (a market highly specialized by industry) and the sustainability assessor. Our results are signing towards a

specialization of assurance providers by industry. This specialization, significant by itself, and influenced by financial auditing specialization, is prompted by a possible client capture.

This paper has implications for practitioners and regulators since it provides evidence of the existence of a relationship between providers of financial and sustainability assurance. It also indicates specifically the market of each Big4 in the assurance of sustainability reports market. Future research should look into the financial audit market to verify if the specialization observed in the assurance market overlaps with the financial auditing market. New explanatory variables help understand the effect of country in the market share of each Big4, providing more knowledge on the behavior of these audit firms.

Our results are subject to limitations because the sample was collected from GRI database, and might be biased due to the companies' decision to report to GRI. Additionally, the selection of countries might influence the results. More research is needed to overcome these limitations.

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