

THE GEOGRAPHICAL FACTOR IN THE DETERMINATION OF AUDIT QUALITY

EL FACTOR GEOGRÁFICO EN LA DETERMINACIÓN DE LA CALIDAD DE LA AUDITORÍA

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ABSTRACT

The aim of this research paper is to analyze the role of the spatial factor in the determination of audit quality. Concretely, we hypothesize that audit quality is influenced by location and by the existence of spill-over effects generated by two factors: (1) the specialization and reputation of auditing firms and (2) the economic and institutional development of the audit firm's location. We developed an empirical research to test the existence of such spatial effects (location and spill-over) on a representative sample of the Spanish audit market. The study includes spatial econometric techniques taking into account the auditee specific characteristics, as well as other external factors. The findings highlight the relevance of including the spatial dimension when the audit quality is being studied. The results confirm the existence of a location effect according to the highest quality values are found in the most developed Spanish areas. Furthermore, we find a spatial spill-over effect among regions, affecting audit quality values. This effect confirms that audit quality within a location spreads to its surroundings. The results support the promotion of governmental policies leading to improve audit quality considering the spill-over effect.

KEYWORDS: audit quality, spatial effects, audit market, regional analysis

JEL Classification: C21; O18; M42

RESUMEN

El objetivo de este artículo es analizar la influencia del factor geográfico en la determinación de la calidad de la auditoría. En concreto, la hipótesis que se plantea sostiene que la calidad de la auditoría se ve afectada por la ubicación y por la existencia de efectos indirectos generados por dos factores: (1) la especialización y la reputación de las firmas de auditoría y (2) el desarrollo económico e institucional de la provincia donde se localiza la firma de auditoría. Con este objetivo hemos desarrollado un estudio empírico para probar la existencia de tales efectos espaciales (ubicación y desbordamiento) en una muestra representativa del

mercado de auditoría español. El estudio incluye técnicas econométricas espaciales, teniendo en cuenta las características específicas de las empresas auditadas, así como otros factores externos. Los resultados destacan la importancia de incluir la dimensión espacial cuando se estudia la calidad de la auditoría. Así, se confirma la existencia de un efecto localización que identifica que los valores más altos de calidad se encuentran en las zonas de España más desarrolladas. Además, nos encontramos con un efecto espacial indirecto entre las distintas provincias que también influye en la calidad de la auditoría, de forma que la calidad que alcanza una firma de auditoría en cierta localización se extiende a las zonas colindantes. Los resultados permiten concluir que en la promoción de políticas gubernamentales que conduzcan a mejorar la calidad de la auditoría se debe considerar efecto desbordamiento que confirma el estudio.

PALABRAS CLAVE: calidad de la auditoría, mercado de auditoría, efectos espaciales, análisis regional

Clasificación JEL: C21; O18; M42

1 | INTRODUCTION

Audit reports offer extended information to economic agents (Carcello and Nagy, 2004). An audit's opinion about the quality of accounting information should somehow be reflected on the decision-making process of economic agents. Because of the importance of these agents' decisions, there is an extensive literature focused on the analysis of audit firms (Chaney *et al.* 2004). In this context, one of the most analyzed factors regarding the quality of financial information is the type of auditor. In order to study this characteristic, a wide amount of studies (Sainty *et al.* 2002; Whisenant *et al.* 2003; Kane and Velury, 2004; Chaney *et al.* 2004 or Louis, 2005) consider the size of the audit as a surrogate of the quality. According to previous research, the size of an audit firm affects its reliability and the perceived quality of the audit report. Following this reasoning, larger audit firms are associated with higher quality values.

From a supranational perspective, the location of audit firms may influence their quality because of the differences among legal environments, as can be found in countries ruled by a code-law as opposed to countries ruled by a civil-law (Broye and Weill, 2008). Countries with a higher legal protection for creditors and stronger disclosure requirements will demand high-quality audits as a monitoring mechanism. Additionally, Hope *et al.* (2008) supported the view that the institutional development of each region affects the quality of audit. In this sense, regions with less developed institutions will hire smaller audits, associated to lower quality values, instead of large ones. Moreover, Huang and Li (2009) consider the "geographical hypothesis" to control for the behaviour of auditors regarding industry and geographic patterns, identifying a reputation effect that spill over by the location of auditor firms

In spite of the apparent importance of the geographical factor on audit quality research previous literature in very scarce. In order to fill this gap, we developed an empirical research to test the existence of spatial effects (location and spill-over) on a representative sample of the Spanish audit market. According to Nieves *et al.* (2005) the structure of the Spanish audit market during the period of 1990 to 2000 is characterized by an oligopolistic configuration, in which BIG Audit firms dominate the market. Furthermore, they reached that since 1995 there was a consistent increase in concentration. They argued that as the market grows up, reaching maturity, the number of auditors reduces and mergers take place among auditors of different size, following the same trend as other European countries, which means so the hard competition also influences concentration. Additionally, it should be taken into account that there are multinationals established in Spain before the former Spanish auditing law (Ley 19/1988, de 12 de julio), so they remain with a long tradition within the national market. At the moment, almost the whole market of listed firms (Spanish Stock Market) is audited by BIG 4. In addition to the own audit market characteristics, Spain is characterized by regional

heterogeneity, in terms of institutions and economic activities (Mate *et al.* 2009). In contrast to previous literature, and encouraged by the singularities of the Spanish economy, we contribute with new evidence on the relevance of the spatial factor (heterogeneity/location and regional spill-over effects) to control for the quality of auditing in Spain. In order to get this objective, we undertake an analysis based on spatial econometric techniques considering the province¹ (NUT-3) as spatial unit of reference.

Our results provide evidence about the relevance of the spatial factors when analysing audit quality. In this sense, we obtain that the most institutionally decentralized and developed regions present the highest values of audit quality. Besides, these regions tend to be surrounded by regions with similar audit quality levels. This study contributes to auditing literature because of the results highlights the importance of spill-over effects in the determination of audit quality. The results support the introduction of governmental policies leading to improve audit quality considering the spatial factor.

The article is organized as follows: we start with an introduction followed by a second section where there is a review of the previous literature. The third section includes the methodological framework, the sample and the statistical methods that have been developed. Then, there is a discussion about the obtained results, and finally we present the conclusions.

2 LITERATURE REVIEW

2.1. Previous studies on audit quality

There is a large amount of previous literature researching on audit quality. In some cases the measure of audit quality remains the main purpose of the study, and in other cases the control for the quality of audit is a collateral question.

According to previous studies, the ‘perceived image’ of the audit firm can be considered as subrogate of the audit quality. In this sense, the results of previous research confirm that multinational audit firms benefit from a greater reputation than individual and small and medium auditor firms (Francis and Wilson, 1988; Rollins and Bremser, 1997; Sundgren, 1998; Sucher *et al.* 1999 and Ferguson and Stokes, 2002). Therefore, the size of the auditing company affects the reliability and perceived quality of the audit report (De Angelo 1981, Nair and Rittenberg, 1987; Palmrose, 1988; Cravens *et al.* 1994; Moizer, 1997; Colbert and

¹ Province is equivalent to the NUT-3 level of aggregation according to EUROSTAT classification (2008).

Murray, 1998; Fargher, *et al.* 2001; Piot, 2001; Reynolds and Francis, 2001; Sainty *et al.* 2002; Whisenant, *et al.* 2003; Kane and Velury, 2004 and Carcello and Nagy, 2004).

The research developed in North America by Shockley and Holt (1983) tried to address if there are differences in the quality of the service between multinationals and other auditors, carrying out a survey with risk analysts from large banks. The results of their multidimensional analysis led them to conclude that banks differentiate the quality of the audit service. Consequently, they only admit a higher quality from multinationals given their high market share in the financial sector. Next, Nair and Rittenberg (1987) made an experimental study with financial institutions risk analysts, either from small or large banks. They were asked to analyze the different reliability level they obtain from auditors. They introduce as independent variable the type of auditor who issues the report, considering multinational firms and others, with the aim of testing whether the reliability of accounting information depends on the reputation of the auditor. The results confer more credibility to large auditor firms than to the small ones. Feroz *et al.* (1991) showed that the size of the auditor is a good substitute to measure the audit quality. They analyzed the disciplinary measures that received the American auditors received on the part of the SEC, verifying that small auditors obtained a greater amount of penalties by deficiencies in the implementation of the audit than the large multinationals.

In the Czech Republic, Sucher *et al.* (1999) found that auditees perceive a different image from multinational auditors associated with a better quality of their audit work. They are seen as 'international' auditors with a branded name, and with a better formalized structure. The sample of the study is limited exclusively to public quoted businesses. Khurana and Raman (2004) found that the Big 4 auditees *ceteris paribus* have a lower ex-ante cost of equity capital than non-Big 4 auditees. Their findings supported that Big 4 auditors are perceived as higher quality auditors in US, though they did not obtain the same results the UK, Australian and Canadian environments. Chaney *et al.* (2004) researched audit pricing among private firms of the UK for the period 1994-1998. They found client firms choosing Big 5 auditors faced higher audit fees than in the opposite case. In addition, auditees viewed Big 5 auditors as being superior in terms of perceived quality on the services provided to a degree high enough to pass a fee premium. Louis (2005) developed an empirical study in USA, obtaining that while Big 4 auditing firms are usually assumed to offer better services than the smaller ones. Smaller audit firms have a comparative advantage in serving their customers. Niskanen *et al.* (2010), found that higher quality audits (BIG 4) are used by small private family firms to overcome agency costs.

2.2. The spatial hypothesis in audit quality

Previous traditional models to test audit quality do not consider specifically the "spatial factor" in this context. But, according to the geographical hypothesis (Huang and Li, 2009) "audit practices of auditors in the same audit organization are highly comparable". Those authors indicate that the geographical hypothesis is related to the research field on "local bias of investors", showing

that the behaviour of asset prices depends on the geographic location. In addition to the location factor, Huang and Li (2009) consider the existence of spill-overs due to the reputation effect among audited companies, as well as because of the specialization of auditors. In that sense, previous studies confirm that audit firms tend to be specialized in certain sectors of activity, in order to reach specific market niches (Kang *et al.* 2009). At the same time, there is a tendency to concentrate similar productive activities in specific areas with the intention of earning profit from the availability of resources and infrastructures. According to Krugman (1991), the concentration will generate a spread-out effect over the surrounding locations. In other words, the existence of an intense activity in a particular location will cause the surrounding locations to develop the same kind of activity (Ellison and Glaeser, 1999). Following this structure, audit firms, specialised in a certain productive activity, will tend to spread out their activities and skills towards their surrounding areas.

A similar reasoning can be followed if we consider the regional development. Concerning the relationship between quality and regional development, previous literature establishes that countries (regions) with developed economies will have a higher proportion of audit assignments conducted by large and international audit companies and, therefore, higher quality values. In that sense, Guedhami *et al.* (2009) supported the proposal that more developed regions benefit from more developed institutions and their capital markets require more accounting disclosure than in the opposite case. Taking into account this argument and the spill-over effect related to the regional development (Ciccone, 2002; Brauningner and Niehuhr, 2005, Mur *et al.* 2009), a concentration effect is expected regarding the quality of the audit firms.

Following previous arguments, we propose the next hypothesis related to the geographical location of auditors:

H₁: The audit quality is influenced by the geographical location and the existence of spill-over effects.

3 | EMPIRICAL APPLICATION

3.1. Data

Regarding the information collected for the research, we got the data from the “Sistema de Análisis de Balances Ibéricos (SABI)” database, provided by Bureau Van Dijk. This database comprises of 1,320,000 Spanish firms. We selected a subsample composed by audited firms which suppose a 26% of the total population (Table 1). These companies are distributed throughout the fifty Spanish provinces over the period of 2004-2006.

TABLE 1. AUDITED COMPANIES PER PROVINCE (%)

Province	(%)	Province	(%)
Álava	30.560	León	20.203
Albacete	17.995	Lérida	22.119
Alicante	25.863	Logroño	27.018
Almería	17.729	Lugo	22.186
Asturias	26.127	Madrid	29.595
Ávila	12.887	Málaga	16.282
Badajoz	17.780	Murcia	29.393
Baleares	15.413	Navarra	33.152
Barcelona	29.626	Orense	23.077
Burgos	25.734	Palencia	23.208
Cáceres	14.021	Pontevedra	27.742
Cádiz	20.470	Salamanca	18.630
Cantabria	21.022	Segovia	20.629
Castellón	37.078	Sevilla	25.718
Ciudad Real	17.045	Soria	20.488
Córdoba	21.693	Tenerife	23.137
Cuenca	15.152	Tarragona	23.526
Gerona	22.719	Teruel	15.385
Granada	16.413	Toledo	24.619
Guadalajara	28.909	Valencia	26.813
Guipúzcoa	25.446	Valladolid	22.324
Huelva	23.551	Vizcaya	26.424
Huesca	21.121	Zamora	17.961
Jaén	21.339	Zaragoza	31.237
La Coruña	29.336	TOTAL	26.755
Las Palmas	24.540		

3.2. Variables

3.2.1. Audit Quality

Previous literature has been focused on the identification of the variables that affect the quality of audit companies. These variables can be classified in two groups: (1) variables related to the specific characteristics of audited firms and (2) variables associated with audit firms and with external factors. Concerning the first group, the literature introduces size, economic activity, legal form and age of audited firms (Rob and Fishman, 2005; Guedhami and Pittman, 2006, Broye and Weil, 2008; Hope *et al.* 2008; Benh *et al.* 2008). Regarding variables associated with audit firms, two of the most analyzed variables were tenure (Lennox, 2000; Francis, 2004) and the opinion issued in the audit report (Bartov *et al.* 2001; Wang *et al.* 2008). In relation to the

external factors, recent studies (Broye and Weill, 2008; Hope *et al.* 2008 and Huang and Li, 2009) have highlighted the importance of a spatial component (location and contagion among firms) which could exert an important role in the determination of the quality of audit firms.

We used the following typology to classify auditors: “Big 4” multinational firms, small and medium firms and individual auditors. This typology turns into a proxy of the audit quality variable. This is consistent with previous studies carried out by Piot (2001), Francis (2004), Mansi *et al.* (2004) and Hope *et al.* (2008). According to Francis (2004) there are “differences” in audit quality that can be reached comparing the different typologies of auditors. The ‘perceived image’ of an audit firm can be considered as a surrogate of audit quality, because e.g. Big 4 are viewed as being superior in terms of perceived quality of the audit service they provide. This will be the reasoning supporting higher fees from multinational audit firms (Chaney *et al.* 2004).

In this sense, the results of previous research literature confirm that multinational auditors benefit from a better reputation than small and medium firms (Ferguson and Stokes, 2002). Therefore, the size of audit companies affects the reliability and perceived quality of audit reports (Kane and Velury, 2004; Carcello and Nagy, 2004; Khurana and Raman, 2004; Chaney *et al.* 2004; Louis, 2005).

3.2.2. *Independent variables: specific characteristics of auditee*

Size

In relation to size (SIZE) of the audited firm, we will expect larger firms to demand the highest quality auditors, because they have a better reputation and resources to accomplish audit work. According to Broye and Weill (2008) and Hope *et al.* (2008) variables related to firm size are associated on audit complexity, specifically the amount of resources auditors must use to develop their work. Guedhami *et al.* (2009) hypothesized that larger, growing, more profitable companies with more complex operations and less leverage are more likely to hire a multinational audit company. An example of the relationship between auditee size and type of auditor comes from the case of listed companies. Individual or small auditors are not able to carry out the audit work of a firm quoting at the stock market because they would not have enough resources (primarily, employees) to accomplish the assignment. This reasoning is in accordance with previous studies showing that in countries where more disclosure of financial information is required, a high-reputation auditor is expected to be chosen (Fargher *et al.* 2001). Usually, country regulations demand more or less disclosure of information depending on the size of the business, because this is the way to ascertain the importance of the firm and its impact on the economy.

Status

The proxy for agency costs is the legal form of the business (STATUS). Public limited companies are expected to have higher agency costs than private firms, because they have greater monitoring needs and, therefore, would choose high quality auditors (Francis and Krishnan, 1999). Public limited companies would maintain less ownership concentration and –having higher agency costs– would not be able to mitigate managerial misconduct, as it happens in private limited companies (Guedhami and Pittman, 2006). Audit quality is also a corporate governance mechanism to achieve high quality of accounting information and to reduce asymmetries of information and agency costs between managers, debt holders and stockholders (Hope *et al.* 2008).

Sector

Through this variable, we consider the economic activity of audited firms (BUILDING, INDUSTRY and SERVICES). Prior literature identifies the relationship between the type of auditor and the industry affiliation of the firm (Hope *et al.* 2008; Huang and Li, 2009). Those studies indicate that multinational auditors adopt strategies to specialize in certain sectors and obtain a market niche.

Age

Previous studies confirmed the relationship between the reputation of a company and its life cycle. Corporate reputation is a collection of economic and non-economic attributes associated to a firm, formed through past actions of the company. According to Rob and Fishman (2005) the reputation of firms increases with age (AGE). The longer the market life of firms, the greater the number of potential customers who are aware of the quality tradition of the company. Therefore, there is a reputation effect related to the life cycle of the business. Some other previous studies use the age of a firm as a proxy of its reputation and branding (Datta *et al.* 1999). In that sense, firms offer a brand name and reputation to their customers by hiring higher quality auditors.

3.2.3. External variables

Opinion

Large auditors are associated with more qualified opinions than small auditors (OPINION) (Lennox, 2000). We assumed that there is a higher probability of the audited firm being a multinational when the auditee has received a qualified opinion in the audit report. Previous

research supports this argument: according to Bartov et al. (2001) higher quality auditors (Big 4) are less willing to accept problematic accounting practices and more likely to report errors and irregularities. Wang *et al.* (2008) –under the “demand argument”– found that small auditors have less ability to find errors or are reluctant to report errors when they are found.

TABLE 2. DESCRIPTION OF VARIABLES

Dependent variable	Label	Definition
Audit quality	AUDQUALITY	Using the following typology to classify audits “big 4” multinational firms: (value 3), small and medium firms (value 2) and individual audits (value 1) as proxy of the audit quality variable.
Firm specific characteristics	Label	Definition
Size of the company	SIZE*	Dummy variable representing the total assets of each firm: value 1 for firms with assets below 10 million Euros (micro and small firms); value 2 for the remaining cases. To elaborate this variable we consider SMEs classification (OCDE, 2001). It is log-transformed.
Legal form of the company	STATUS*	Dummy variable which represents the legal form of the firm: value 1 for public limited companies; value 0 for private limited companies.
Economic activity	SECTOR*	Dummy variable for INDUSTRY, BUILDING and SERVICES. The reference sector is agriculture.
Age of the firm	AGE*	Year of the data minus year when the firm was established.
External variables	Label	Definition
Audit’s opinion	OPINION*	For audit reports in each year we define: 1 for firms with an audit without exceptions and 0 otherwise.
Rotation of audit	TENURE	1 for firms which have changed audit firm at least once during the last three years.
Historical provinces	FORHIS	Dummy variable which is equal to one if the province is a historical region and zero otherwise.

Sources: (*) SABI Database. All these variables are aggregated at a provincial level.

Tenure

Big 4 auditors are associated to lower tenure or higher clientele rotation (TENURE). Lower tenure increases auditors’ independence, letting higher quality of accounting disclosure (Francis, 2004). Large auditors are associated with more qualified opinions than small

auditors, causing the change of auditor on the part of the audited firm that tries to reduce the probability of receiving a qualified report (Lennox, 2000). According to Vanstraelen's results (2000), *ceteris paribus*, the longer the audit-client relationship, the less probability the auditor issues a qualified audit report. Moreover, auditors are more willing to provide an unclean report in the last years of their assignment.

Historical regions

In Spain, there are historical regions (FORHIS) with their own legal regulations. Particularly, the north area of Spain is characterized by the establishment of "Comunidades Forales" (Spanish term for Autonomous Regions: País Vasco and Navarra;), as well as "Comunidades Históricas" (Spanish term for Historical Regions: País Vasco, Galicia and Cataluña). The north regions of Spain have a higher independence both for governmental decisions and for regulatory practices. So, there are geographical characteristics to specifically study if the autonomy of regions and specific legal environments may also affect auditor choice and the quality of the audit work. A similar reasoning has already been tested in similar circumstances, although in different countries or regions. At a regional level, Wang *et al.* (2008) supported that regions with less developed institutions will hire small auditors instead of large ones.

3.3. Methodology

The determination of the quality of Spanish auditors starts from a basic linear regression model (1):

$$y_i = X_i\beta + v_i \quad v_i \approx N(0, \sigma^2 I) \quad [1]$$

Where, i (with $i = 1, \dots, N$) represents the different spatial units (fifty provinces in this case), X_i is an $N \times K$ dimensional matrix of the explanatory variables, y_i is an N -dimensional vector of endogenous observations, β is a K -dimensional coefficient vector, and v_i is a residual with variance σ^2 . Additionally, spatial spill-over in a one-period model is implemented specifying an $N \times N$ contiguity matrix W . This is a square matrix which defines spatial linkages of proximity among firms. Its elements w_{ij} (with $i \neq j$) are different from zero if regions i and j are neighbors and equal to zero otherwise. There are different criteria to define the neighborhood relationship between i and j , the common border criterion is one of the most used. According to previous reasoning, two regions i and j are neighbors if they have a common border. Following this criterion, we define weight matrix W , a first-order binary contiguity matrix with w_{ij} elements (with $i \neq j$), equal to one if regions i and j have a common border and zero otherwise. The W

matrix is then standardized dividing each element by the sum of the elements in the row it belongs to. Thus, the resulting Wy_i variable is defined as the weighted average of variable y in the units surrounding each region i .

Spill-over effects can be included in model (1) by means of two alternative structures (Anselin, 2001). Firstly, the Spatial Autoregressive Regression (SLM) model which presents the following structure for each region i ,

$$y_i = \rho Wy_i + X_i \beta + v_i \quad \text{with } v_i \approx N(0, \sigma^2 I) \quad [2]$$

Where, all variables are defined as in (1) and W is the weight matrix. In expression (2), the interaction effect is subsumed in the right-hand side of the equation (ρWy_i). The associated coefficient (ρ) is known as the spatial-lag autoregressive coefficient. It measures spatial interaction among neighbor regions. A significant positive ρ confirms the existence of positive spatial interaction. In other words, regions with high (low) values in variable y tend to be surrounded by regions with high (low) values in y . A significant negative ρ indicates negative spatial interaction. In this case, regions with high (low) values in y tend to be surrounded by regions with low (high) y values.

Secondly, the Spatial Error Model (SEM) which is defined in (3)

$$y_i = X_i \beta + v_i \quad \text{with } v_i = \lambda W v_i + \varepsilon_i \quad \text{and } \varepsilon_i \approx N(0, \sigma^2 I) \quad [3]$$

Where, λ is the spatial autoregressive term measuring interaction in the adjustment process. In this case, the spatial effect is subsumed in the residual term. Two paths can be taken in order to select the most adequate spatial structure (SLM or SEM model): (i) a priori: the interpretation of each model – while a spatial lag is designed to reveal the “existence and strength of spatial interaction”, a spatial error seeks to correct the “potentially biasing influences of spatial autocorrelation” (Anselin, 2001). (ii) Statistical: a more rigorous method is the selection criterion based on the Lagrange Multiplier (LM) in spatial models (Florax and Folmer, 1995).

4 | EMPIRICAL RESULTS

In this section, we include the main results obtained in our empirical application. Firstly, we show some descriptive statistics of the variables to corroborate the adequacy of our subsequent estimation results. Secondly, we compute the graphical distribution of the audit quality variable and, finally, we undertake the estimation of a model to test spatial effects (location and spill-over).

Because of the regional character of our analysis, the empirical model is undertaken at a provincial level, in order to achieve a local representative value. For each variable, we compute a regional average value, considering all the companies belonging to the same province. In this way, the dummy variables of our analysis are transformed into continuous variables.

4.1. Descriptive statistics

Table 3 and Table 4 show descriptive statistics and partial correlations of the variables respectively. Table 3 includes the maximum and minimum values, the mean and the standard deviation for each variable. These values are included within the normal ranges² and there are not atypical values in the variables.

TABLE 3. DESCRIPTIVE STATISTICS FOR THE PROVINCIAL AGGREGATION OF THE VARIABLES

Variable label	Minimum	Maximum	Mean	Standard Deviation
AUDQUALITY	1.029	1.3200	1.222	0.111
SIZE	15.987	17.025	16.533	0.188
STATUS	0.395	0.875	0.641	0.123
INDUSTRY	0.000	0.700	0.398	0.166
BUILDING	0.000	0.500	0.122	0.084
SERVICES	0.000	0.826	0.461	0.155
AGE	16.250	30.250	23.853	3.182
OPINION	0.363	0.923	0.719	0.108
TENURE	0.100	0.533	0.310	0.099
FORHIS	0	1	0.240	0.193

Table 4 shows statistic correlations between the explicative variables. Correlation values present the expected signs. Also, there is not any high value of correlation. This result ensures we reach unbiased and efficient estimations because of the absence of multicollinearity in our analysis (Greene, 2008).

² Normal ranges in relation to previous studies which have used these variables (Rob and Fishman, 2005; Guedhami and Pittman, 2006; Broye and Weil, 2008; Hope *et al.* 2008; Benh *et al.* 2008).

TABLE 4. PARTIAL CORRELATION COEFFICIENTS

	SIZE	STATUS	INDUSTRY	BUILDING	SERVICES	AGE	OPINION	TENURE	FORHIS
SIZE	1.0000	0.0311	0.0454	0.0305	-0.0610	0.0972	0.0576	0.1420	0.3163
STATUS	-	1.0000	0.2832	-0.1858	-0.2104	0.4336	0.0049	0.1907	0.2191
INDUSTRY	-	-	1.0000	-0.3375	-0.8571	0.3176	-0.0324	-0.0988	0.0950
BUILDING	-	-	-	1.0000	-0.1677	-0.4536	0.1659	-0.2102	-0.1853
SERVICES	-	-	-	-	1.0000	-0.1015	-0.0032	0.1672	0.0014
AGE	-	-	-	-	-	1.0000	-0.2868	0.1472	0.3982
OPINION	-	-	-	-	-	-	1.0000	-0.1071	0.0652
TENURE	-	-	-	-	-	-	-	1.0000	-0.1588
FORHIS	-	-	-	-	-	-	-	-	1.0000

4.2. Geographical distribution of audit quality in Spain

Figure 1 represents the Quartile Maps for the geographical distribution of Audit Quality in year 2006³.

FIGURE 1. QUARTILE MAP FOR AUDIT QUALITY 2006

As we can observe, the geographical distribution of audit quality does not follow a random pattern: provinces with the highest audit quality values (the ones with a higher number of multinational audit firms) are located in Northern Spain, while the provinces with the lowest values for this variable are located in the South. These results are in accordance with

³ The quartile maps of Audit Quality for years 2004 and 2005 have a similar distribution of the variable.

previous literature which highlights the importance of the location effect on audit quality (Hope *et al.* 2008; Huang and Li, 2009). In this sense, provinces with the highest values are associated to the more economically developed and institutionalized provinces (see Figure 2 and 3).

FIGURE 2. QUARTILE MAP FOR GDP PER CAPITA IN 2006

FIGURE 3. MORE INSTITUTIONALLY DEVELOPED PROVINCES

 “Comunidades históricas” y “Comunidades Forales”

The above results (Figure 1) indicate the existence of a geographical pattern regarding the audit quality variable. Furthermore, reviewing Figure 1, we observe a certain relationship among provinces in relation to their audit quality values. In this sense, provinces with high audit quality values tend to be surrounding by provinces with high values and otherwise. This effect is known as spatial correlation. Nevertheless, the quartile map analysis is a graphical

tool but sensitive to the number of intervals, so, in spite of this preliminary evidence about the geographical effects it is necessary to go a step further. With the aim of testing the spatial dependence among regions, we compute the “I Moran test” which evaluates this characteristic. For each of the years of the study (2004-2006), the “I Moran test” was positive and significant. Therefore, we conclude about the existence of spatial dependence in the audit quality variable. Table 5 shows the results of the test.

TABLE 5. MORAN'S I TEST FOR SPATIAL DEPENDENCE ON THE AUDIT QUALITY VARIABLE

	Variable		
	AUDQUALITY06	AUDQUALITY05	AUDQUALITY04
I Moran Test	0.1542*** (0.000)	0.1525*** (0.000)	0.1495*** (0.000)

Notes: *** Null hypothesis is rejected at 1%.

4.3. Multivariate analysis to explain audit quality

The next step in our analysis is to test if spatial factors have some influence on the quality of audit in Spain. Table 6 shows the results of this estimation through linear regression⁴.

Variables traditionally included in this kind of research have a similar behaviour to previous studies. In this sense, the SIZE variable has a significant and positive sign. This result is in accordance with Chaney *et al.* (2004); Louis (2005) and Guedhami *et al.* (2009), who concluded that larger audited firms demand higher quality auditors, since they have a better reputation and more resources to complete the audit work. In the case of the legal form adopted by audited firms (STATUS), we also find a positive and significant relation. This result implies that audit quality is higher for public limited companies than for private limited companies, because of public limited companies have less ownership concentration and higher agency costs than private limited companies and benefit less from mitigating managerial misconduct (Guedhami and Pittman, 2006). In public limited companies, audit quality is a corporate governance mechanism to promote a higher quality of accounting information, reducing agency costs and asymmetries of information for stockholders (Hope *et al.* 2008). Considering the activity sector, the variable BUILDING does not obtain significant values. Nevertheless, in the case of the services sector (SERVICES) there is a positive and significant coefficient, in accordance

⁴ According to the results of Table 4, INDUSTRY variable was dropped from the regression analysis in order to avoid multicollinearity bias.

with previous studies results for the Spanish audit market (Ruiz *et al.* 2002). The AGE of the audited firm shows a negative relationship with audit quality variable, although its coefficient value is very low and it is not significant.

TABLE 6. LINEAR REGRESSION FOR AUDIT QUALITY VARIABLE

To estimate an explicative model of audit quality we use OLS regression for which we assume one cross-section of NT observations. This reads as:

$$\text{AUD} = \alpha + \beta_1 \text{SIZE} + \beta_2 \text{STATUS} + \beta_3 \text{BUILDING} + \beta_4 \text{SERVICES} + \beta_5 \text{AGE} + \beta_6 \text{OPINION} + \beta_7 \text{TENURE} + \beta_8 \text{FORHIS} + \nu$$

$$\nu \sim N(0, \sigma^2 I)$$

Variable	Coefficient (β)
CONSTANT	-2.448* (0.014)
SIZE	0.224*** (0.000)
STATUS	0.326*** (0.003)
BUILDING	0.153 (0.345)
SERVICES	0.142** (0.007)
AGE	-0.001 (0.771)
OPINION	-0.353*** (0.003)
Variable	Coefficient (β)
TENURE	-0.164** (0.006)
FORHIS	0.058* (0.062)

Post-Estimation tests:

LIKELIHOOD FUNCTION: 31.001; BREUSCH-PAGAN EST 6.973 (0.539); JARQUE-BERA TEST 0.211 (0.899); ROBUST LM TEST [LMLAG 4.610* (0.031)] [LMERROR 0.467 (0.493)].

Notes: *** Null hypothesis is rejected at 1%. ** Null hypothesis is rejected at 5%. * Null hypothesis is rejected at 10%. Probability values are between brackets. This model is estimated used Maximum Likelihood. JARQUE – BERA is the non-normality test for the residuals of the model. BREUSCH - PAGAN is the heteroscedasticity test for the residuals. LMLAG and LMERR tests contrast the existence of interaction in the residuals of the model.

The variable concerning the professional judgment issued by auditors (OPINION) shows a negative and significant coefficient. This result involves that the largest auditors (multinationals) are associated with a higher number of unclean audit reports than small and medium auditors or individual auditors. In other words, when the auditor is a multinational there is a higher probability of issuing a report with exceptions. Previous research supports this argument; Lennox (2000) found that large auditors are associated with issuing more qualified opinions than small auditors. Bartov *et al.* (2001) observed that higher quality auditors (Big 4) are less willing to accept problematic accounting practices and more likely to report errors and irregularities. Wang *et al.* (2008) confirmed this hypothesis because, under the “demand argument”, small auditors have less ability to find errors or are reluctant to report errors when they are found. The variable regarding the rotation of auditors (TENURE) is negative and significant, because multinational auditors are associated with higher clientele rotation (Francis, 2004).

Finally, the variable controlling for more institutionally developed regions (FORHIS), point out a positive and significant relationship with audit quality, confirming the hypothesis that supports the importance of considering the location factor in the analysis of audit quality. In this sense, we conclude that provinces with higher institutional development have higher audit quality values.

Post-estimation tests show that there are no problems in terms of heterogeneity (Breusch-Pagan test) or normality of the data (Jarque-Bera test). Nevertheless, the spatial dependence LM tests indicate the existence of a spill-over effect which should be considered in the estimation process. Following Folmer and Florax's (1995) methodology, we obtain that the spill-over effects are generated by the audit quality variable itself. In this sense, we find that the LM-LAG test is significant while the LM-ERR test is not. Therefore, the most adequate model to consider the spread-out effect is Spatial Autoregressive Regression (expression 2). Table 7 shows these estimation results in which weight matrix W is defined as a first-order binary contiguity matrix.

Explicative variables confirm similar relations and significance as in the previous estimation showed in Table 6. We also take into account an additionally variable (W^*AUD), which shows that the spill-over effect is positive and significant. Therefore, results identify the influence of this kind of spatial effect in the determination of audit quality. In that respect, provinces with a high number of multinational auditors tend to be surrounded by provinces that also have a high percentage of large audit firms. This result confirms our hypothesis about the existence of a contagion effect among auditors, which would be generated by the specialization and reputation of audit firms in certain sectors and/ or by the different regional development values in different provinces.

TABLE 7. SPATIAL ESTIMATION FOR THE AUDIT QUALITY (MLE)

To estimate an explicative model of audit quality we use spatial regression for which we assume one cross-section of NT observations. This reads as:

$$AUD = \alpha + \rho WAUD + \beta_1 SIZE + \beta_2 STATUS + \beta_3 BUILDING + \beta_4 SERVICES + \beta_5 AGE + \beta_6 OPINION + \beta_7 TENURE + \beta_8 FORHIS + \nu$$

$$\nu \approx N(0, \sigma^2 I)$$

Variable	Coefficient
CONSTANT	-2.413(**) (0.005)
W*AUD	0.040(**) (0.005)
SIZE	0.217(***) (0.000)
STATUS	0.315(***) (0.000)
BUILDING	0.160 (0.267)
Variable	Coefficient
SERVICES	0.181(***) (0.002)
AGE	-0.000 (0.880)
OPINION	-0.351(***) (0.000)
TENURE	-0.173(**) (0.025)
FORHIS	0.052(*) (0.064)

LIKELIHOOD FUNCTION: 62.831; JARQUE-BERA TEST: 0.931 (0.627); BREUSCH-PAGAN TEST: 6.126 (0.633). LR-TEST: 5.650(*) (0.001)

Notes: *** Null hypothesis is rejected at 1%. ** Null hypothesis is rejected at 5%. * Null hypothesis is rejected at 10%. Probability values are between brackets. This model is estimated used Maximum Likelihood. JARQUE – BERA is the non-normality test for the residuals of the model. BREUSCH- PAGAN is the heteroscedasticity test for the residuals. The LR test allows us to select the best specification between two nested models.

Regarding the post-estimation analysis, heterogeneity and normality tests confirm the correctness of fit for the estimation model. The LR test indicates that the model with the spill-over effect fits better than the model without the effect.

5 CONCLUSIONS

This paper considers the existence of spatial effects (location and spill-over) in the analysis of audit quality. We draw on spatial econometric tools in order to deal with the line of research on audit quality through the methodology of the regional analysis. Following previous literature, we agree that different stages of economic and institutional development in some geographical areas make the “location factor” an essential issue in the analysis of audit quality. Likewise to previous research studies, we obtain that the quality associated with some type of auditors in a concrete location not only depends on the characteristics of that region itself, but also on the audit quality values of the surrounding areas. This spread-out effect (that we call “spill-over”) would be generated by the reputation and specialization of audit firms attempting to capture market niches (Kang *et al.* 2009) and/or by the different development values of each region and its influence on neighboring areas (Krugman, 1991).

We implement an empirical study considering the Spanish audit market, taking into account the regional heterogeneity detected in Spain when economic variables are analyzed. Our results confirm the importance of spatial effects when audit quality is studied. In this sense, the “location effect” implies that provinces with higher economic and institutional development show higher audit quality values. This result is in accordance with previous literature (Hope *et al.* 2008; Wang *et al.* 2008; Huang and Li, 2009) researching on the importance of geographical factor when analyzing the type of auditors. Our results find a positive and significant spill-over effect that let conclude the audit quality values in Spain for a given province not only depend on the characteristics of that province, but are also influenced by the audit quality levels of the surroundings.

The study contributes to auditing literature because the results highlight the importance of spill-over effects in the determination of audit quality. The results support the introduction of governmental policies leading to improve audit quality considering the spill-over effect. Governmental institutions should be aware of developing policies to promote the audit quality in certain “strategic” geographical areas in order to spread out the quality values, skills and reputation of some auditors towards the surroundings auditors, due to the contagion effect the research reveals.

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