Institutional Distance among Country Influences and Environmental Performance Standardization in Multinational Enterprises

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Abstract

This research compares and contrasts the findings in Aguilera-Caracuel et al. (2013) with the outcomes of applying fuzzy-set qualitative comparative analysis (fsQCA)— a methodological strategy that gathers quantitative and qualitative information to explain complexity at the case level and generality across cases. Using the same sample of 128 multinational enterprises (MNEs) with headquarters and subsidiaries based in the USA, Canada, France, and Spain, we identify a set of relevant configurations of causes and conditions to explain environmental performance standardization. By avoiding separate treatments for each variable, which is typical in multiple regression analysis (MRA), we overcome prior limitations and propose a new way of understanding this phenomenon. In summary, our results significantly reinforce and complement the previous results.

Keywords: fsQCA method, multiple regression analysis, formal and informal institutional distance between countries

1. Introduction to the research question

Multinational enterprises (MNEs) characteristics include having different units (headquarters and subsidiaries) based in countries with their own institutional profiles (Kostova & Roth, 2002). As a result, MNEs may face challenges in strategically deciding whether their approaches in each country should be similar given the diversity of the countries and regions in which they operate (Christmann, 2004; Kostova et al., 2008). Other researchers propose that environmental differences between countries may generate incentives for maintaining differentiated approaches to reduce costs where possible, adopting a reactive posture based on complying with regulations to avoid sanctions and legal penalties (e.g., Chang & Rosenzweig, 2001; King & Shaver, 2001; Stewart, 1993; Surroca et al., 2013; Vernon, 1992). In contrast, other studies indicate that firms may prefer a standardized approach to reinforce credibility, legitimacy and transparency within their internal network (e.g., Christmann, 2004; Delmas & Montes-Sancho, 2011; Orlitzky et al., 2011; Rivera & deLeon, 2008).

These contradictory results may be because research pays special attention to the influence of national and international regulations (formal dimension) on MNEs' environmental strategies (e.g., Bansal, 2005; Christmann, 2004; Darnall, 2006; Delmas & Montes-Sancho, 2011; Henriques, & Sadorsky, 2008; King & Shaver, 2001; Rugman & Verbeke, 1998a, 1998b). In this vein, informal aspects may complement national institutional profiles (North, 1990; Aguilera-Caracuel et al., 2013). The informal dimension of national institutions includes values, beliefs, customs, traditions, and codes of conduct in each home country (Arslan & Larimo, 2010; North, 1990; Salomon & Wu, 2012). Salomon and Wu (2012) refer to informal institutions as cultural institutions. Other scholars explicitly account for the differences between normative and cognitive institutions (e.g., Kostova & Roth, 2002;

Xu & Shenkar, 2002; Yiu & Makino, 2002). Thus, this dimension clearly captures the attributes of national culture (Hanges & Dickson, 2006).

In summary, few studies account for informal institutional elements at the country level as they relate to environmental issues (e.g., Aguilera-Caracuel et al., 2012; Darnall, 2006; Delmas & Montes-Sancho, 2011; Hoffman, 1999). In this sense, Aguilera-Caracuel et al. (2013) analyze the differentiated effects of the formal and informal institutional distance between home and host countries on the environmental performance of MNEs. By using multiple regression analysis (MRA), they report that a high informal environmental distance between home and host countries encourages the MNEs to standardize their environmental performance, whereas a high formal environmental distance drives the MNEs to adapt their environmental performance according to each country's institutional requirements.

Through the use of the same sample and the same set of variables described in Aguilera-Caracuel et al. (2013), the aim of this research is to contrast the results of a fuzzy-set qualitative comparative analysis (fsQCA) with the results of previous studies. This innovative technique allows the researcher to generalize beyond the individual case while still identifying individual cases in specific models that are relevant to his/her investigation (Woodside, 2013; Woodside & Zhang, 2013). This technique provides the opportunity to detect the relevant configurations that guarantee a high performance in the outcome condition. We can then reinforce our results for some specific cases by demonstrating how the selected variables may explain environmental performance standardization within a MNE.

The article is organized as follows. The next section reviews the sample and variables. Section three states the main drawbacks that are derived from using MRA and focuses on explaining and applying the fsQCA to our data set. Section four summarizes the fsQCA results. Finally, the last two sections highlight the main conclusions and discuss the new results, comparing them with those previously obtained using MRA.

2. Dataset

The sample and variables used in Aguilera-Caracuel et al. (2013) were also used in this study to better compare MRA results with the new results obtained from fsQCA. Although fsQCA is based on cases instead of variables, the information incorporated into the model may come from quantitative (or even qualitative) variables that have to be translated in terms of “belonging” or “membership”, a crucial concept in set theory. Note that some of the considered variables are dichotomous—which is not desirable when applying either technique—but this fact cannot be avoided in this study because of the definition of the measured characteristics and the availability of useful data.

2.1. Sample

MNEs that have headquarters based in the USA, Canada or France and subsidiaries in the USA, Canada, France, and Spain are the focus of this study. Public data from national environmental registries and private information from Standard & Poor’s Capital IQ were used in this study (2009). In relation to the national environmental registries, the USA has free access to the Toxic Release Inventory (TRI), Canada has the National Pollution Release Inventory (NPRI), and Spain and France have the European Pollutant Emission Register (EPER).

The study examines three industries: chemical (SIC Code 28), industrial machinery (SIC Code 37), and energy and petroleum (SIC Code 29). The MNEs were selected using three criteria. First, the MNEs had to have at least one subsidiary based in one of the four countries analyzed. Second, those subsidiaries had to belong to the same industry and conduct the same activities as the headquarters. Third, the study excluded the facilities of the headquarters and subsidiaries (identified by using each national environmental registry) that do not focus on the core industrial activity (i.e., local sales, distribution centers, or centers with diverse activities).

The population of MNEs that comply with all of the requisites mentioned above consists of 191 MNEs, 285 cases and 2165 facilities. Because of missing data, the final sample was reduced to 170 cases that included 128 different MNEs and 1790 facilities. Among the headquarters, 73 are based in the USA, 35 are based in in France, and 20 are based in Canada. Additionally, the sample includes 18 subsidiaries that are based in the USA, 69 that are based in Canada, 66 that are based in France, and 17 that are based in Spain. With respect to the industrial activities of the MNEs, 82 cases corresponded to the chemical industry, 58 corresponded to industrial machinery, and 30 corresponded to the energy and petroleum industry.

2.2 Variables description

By utilizing the variables that were used in Aguilera-Caracuel et al. (2013), we could incorporate reliable information into an fsQCA model. To use these variables, a calibration process was necessary (this step is described in section 3.2.2).

2.2.1 Environmental performance standardization within the MNE (outcome)

To compute the variable that was the dependent variable in the prior MRA, the degree of similarity between headquarters' and subsidiaries' environmental performance was considered (the proxy refers to air releases). Similar to other studies that assessed the environmental performance of facilities and firms (e.g., King & Lenox, 2000, 2002; King & Shaver, 2001), the coefficient between the headquarters' and subsidiaries' air releases and their total revenues in 2005 (Capital IQ, 2009) was used to obtain a value that showed the environmental impact of each of the MNEs' organizational units (headquarters and subsidiaries), considering both sales during that year and the environmental impact associated with those sales. Environmental performance standardization within MNEs was calculated by subtracting the headquarter ratios from the subsidiary ratios, and the absolute values was considered for the analysis. Values that are close to zero imply that the MNEs standardize their environmental performance to the different areas where they operate.

2.2.2 Formal environmental distance between home and host countries

The "rule of law" variable (World Economic Forum, 2004) shows information that addresses aspects of environmental regulation: air pollution regulations, chemical waste regulations, clarity and stability of regulations, flexibility of regulations, environmental regulatory innovation, leadership in environmental policy, consistency of regulation enforcement, environmental regulatory stringency, toxic waste disposal regulations, and water pollution regulations. Using principal components of all survey questions included in the analysis, this dimension aggregated all of the aspects of environmental regulation that are mentioned above. The formal environmental distance between the countries in which the headquarters and the subsidiaries are located was calculated based on the absolute value of the differences between the scores of the two countries. In addition, the values of this variable were normalized.

2.2.3 Informal environmental distance between home and host countries

A multi-item indicator including secondary data was used to create a selection of four different environmental domestic variables: "waste recycling" (Organization for Economic Cooperation and Development, 2004; United Nations Human Settlements Programme, 2004), "practices related to the reduction of ecological footprint per capita" (Ecological Footprint of Nations, 2004), "private sector environmental innovation", and "energy subsidy use" (World Economic Forum, 2004). The informal environmental distance between the countries was calculated based on the absolute values of the differences between the final score of this dimension in each country. The values of this variable were also normalized.

2.2.4 Headquarters and subsidiary size

According to King and Shaver (2001), the size of MNEs is measured using the Neperian logarithm of the number of employees in 2005. Because MNEs have a set of different organizational units (headquarters and subsidiaries), we considered two different variables for each MNE of our sample: headquarters size and subsidiary size.

2.2.5 Industry

To consider the possible effects of the three different industries in the sample, two dummy variables were created: chemical industry and energy and petroleum industries (Christmann & Taylor, 2001). Because MRAs can only consider two (discrete) values, these variables were not ideal for an MRA; a similar phenomenon occurred with fsQCA.

2.2.6 Headquarters' financial performance

The return on equity (ROE) in 2005 was used as a proxy to capture headquarters' financial performance (Bansal, 2005).

2.2.7 NAFTA

The study includes another dichotomous variable to control for whether the headquarters country is part of NAFTA.

3. Comments on the statistical method

3.1 Drawbacks to applying MRA

Today, MRA is used by scientists from all disciplines. This technique is considered to be so powerful and versatile that it has become the most common way to reach significant results from a quantitative data set. However, before applying MRA, the researcher should first consider whether this method is appropriate for the problem being solved. Moreover, as with any statistical tool, some hypotheses must be verified mathematically; these mathematical tests are the only way to support the deduction of valid conclusions. Finally, one has to be aware of the relative meaning of the results; because the "proofs" are based on probabilities, some of them do not deserve the same credibility as others.

Regarding business research, Woodside (2013) holds that most of the performed MRAs are inappropriate and misleading. He supports this idea through logical statements and some insightful examples. Here, each of the three previously listed objections is discussed more modestly.

First, we examine the problem of functional causality. MRA presumes that several variables can act as regressors for the response function. On the one hand, there is no guarantee for the existence of this function involving the corresponding net effect for each variable (Woodside, 2013). Some values of variables or characteristics can be necessary and/or sufficient conditions for any phenomenon, but this is not proof of the existence of a mathematical or logical equivalence (a more-in-depth explanation of symmetrical *versus* asymmetrical relationships is available in Woodside, 2013).

On the other hand, if such a function exists, then some variables would have a non-linear relationship with the dependent variable (Gladwell, 1996; McClelland, 1998), and their degree and sign of influence would depend on combinatorial conditions (according to the range of variation for some of the rest of the variables). In these cases, some authors recommend combining groups of variables into composite indices to apply classic, linear techniques (Mauro, 1995: 685-686). The function obtained from an MRA or any other regression is usually a good fit to the data set, but it is usually a poor estimation (Gigerenzer & Brighton, 2009, p. 118). Considering all of these factors, one has to consider whether his/her goal is a good fit or whether he/she should analyze different inter-related cases (or configurations) in which the studied phenomenon may not have a homogeneous behavior along the multivariate "function domain".

Second, independence is one of the hypotheses underlying MRA. Of course, MRA is commonly accepted to have correlated variables, to some extent, but the logic behind MRA assumes that all of the explicative variables are independent or uncorrelated. In spite of this, real life demonstrates that the value of an "independent" variable may affect the way in which other variables interact to produce an outcome. Hence, coherent action by a researcher should consist of performing many different MRAs depending on the values of those key variables that may affect the behavior of the rest. In practice, this strategy is useless because it involves too much effort and too many valid cases in the data set (which are usually unavailable). There are other hypotheses that should always be taken into account before applying a statistical method to situations embraced by the Social Sciences. This fact is also essential to determine whether a tool can be used in a specific case. In this respect, note that regressions are only valid in the range where there is any valid data—a fact that is usually forgotten when using time series. Another difficulty arises from the sample size, which should be determined according to the mathematical formulae.

Third, the results of a statistical method can be different from the expected results. In other words, when a social scientist pursues a proof, rigor has to be assured. Small correlation indices imply that the model is not sufficient. According to Woodside (2013), only correlations above 0.80 indicate symmetric relationships (those properly connected with MRA). In social sciences, which depend on human behavior, high correlations are very rare. Typically, significant correlations between unique variables or groups of variables fall below 0.50, which means that the variability explained by the model is even less than the part that is unexplained. In such situations, MRA is clearly contraindicated. Adding many variables, which typically co-vary with other variables introduced in the model, to artificially increase the correlations can make the situation worse (Armstrong, 2013).

These reasons have lead us to use a novel technique--focused on grouping cases and conditions rather than treating each independent variable as analytically distinct and separate--to explain the dependent variable through net effects.

3.2 Basis and calibration of fsQCA

3.2.1 Introduction to fsQCA

In summary, fsQCA is a technique that uses Boolean algebra and Fuzzy Set Theory to identify meaningful cases with a determined level in an aspect worthy of being studied. Such cases correspond to configurations of characteristics (analogous to the “independent variables” in MRA), and logic helps to select the most relevant configurations. Additionally, fuzzy sets provide a flexible translation between qualitative and quantitative characteristics because discrete variables are transformed into a continuous degree of “belonging” or “membership”, while continuous variables are reinterpreted as the presence/absence of a specific feature. Social researchers (in the broadest sense) are showing an increasing interest in fsQCA because this method eases case comparison through quantitative reasoning. According to Woodside and Zhang (2013), fsQCA bridges quantitative and qualitative examination to enable contributions to explaining complexity at the case level and generality across cases. See Ragin (2008) if a more detailed description of the technique is needed.

Regarding logical basis, the value of a given variable in a specific case is replaced by the degree to which that case presents the characteristic measured by the variable; strictly speaking, the variable is replaced by the degree to which the case belongs to the set of the cases verifying the property in a required level. This idea makes sense because Fuzzy Set Theory considers observations that are "fully in" the set, those that are "almost fully in" the set, those that are neither "more in" nor "more out" of the set, those that are "barely more out than in" the set, and so on (Woodside and Zhang, 2013). From this point of view, fsQCA considers cases as configurations (i.e., a degree of membership to each set). Moreover, fsQCA pays special attention to those specific combinations of causally relevant ingredients (the so-called causal recipes) linked to an outcome. After performing the corresponding computations (with software that can be found at http://fsqca.com), the researcher extracts the configurations that best explain the phenomenon. Depending on the analysis, several different configurations of diverse complexity may be useful in understanding the situation, all of which help to provide a global picture that usually does not respond to a unique regression model.

3.2.2 Calibration

Before applying an fsQCA, the procedure for assigning fuzzy membership scores to cases must be specified by the researcher; this procedure should be explicit enough to allow replication by specifying their three key breakpoints (Woodside, 2013). Next, we explain the calibration process for each variable included in this analysis.

Let us begin with headquarters size (“mgran”, described in subsection 2.2.4). According to the European Commission (2003), firms with more than 250 employees are considered to be “big” firms. However, the MNEs considered in this study have an international scope; therefore, the headquarters with more than 3000 employees were considered to be “very big”. Headquarters with fewer than 660 employees do not have a “very big” size. The threshold at which we cannot properly assess whether the headquarters have a “very big” size is 1500 employees. Hence, using Neperian logarithms, the threshold for full membership (FM) is given by FM=8; the crossover point (CP, maximum membership ambiguity) corresponds to CP=7.3; and the threshold for full non-membership (FN) is FN=6.5.

The subsidiary size (“gran”, described in subsection 2.2.4) is considered to be “big” if the number of employees is greater than 400 and “non-big at all” if the number of employees is less than 50 (European Commission, 2003); it is difficult to classify a subsidiary with 250 employees. Therefore, using Neperian logarithms, FM=6, CP=5.5, and FN=4.

Chemical industry, energy and petroleum industry, and NAFTA (“quim”, “enpet”, and “nafta”, described in subsections 2.2.5 and 2.2.7, respectively) are dichotomous variables. In these cases, to address crisp variables, it is advisable to define FM=0.95 (the characteristic is fulfilled), CP=0.5, and FN=0.05 (the characteristic is not satisfied by that specific case).

Regarding headquarters’ financial performance (“roe”, described in subsection 2.2.6), comparisons of returns on equity (ROE) are generally the most meaningful among firms within the same industry, and the definition of a "high" or "low" ratio should be made within this context. However, in general, financial analysts consider return on equity ratios in the 15-20% range as representing attractive levels of investment quality (see Buyandhold: A division of freedom investments). In this case, we distinguish the following thresholds: FM=0.20 (very profitable headquarters), CP=0.176 (uncertainty), and FN=0.10 (not very profitable).

The variable formal environmental distance between home and host countries (“dform”, described in subsection 2.2.2) is calibrated through: FM=0.44 (there is a high formal environmental distance between home and host countries), CP=0.10, and FN=0.05 (there is not a high formal environmental distance between home and host countries).

Similarly, for informal environmental distance between home and host countries (“dinf”, described in subsection 2.2.3), FM=0.61 (there is a high informal environmental distance between home and host countries), CP=0.30, and FN=0.10 (there is not a high informal environmental distance between home and host countries).

Finally, when measuring environmental performance standardization within the MNE (subsection 2.2.1, analogous to the dependent variable in an MRA), a slight difference appears. As values close to zero correspond to environmental performance standardization, we decided to reverse the variable to ease interpretation. Hence, the signs of these values were changed from positive to negative. Therefore, FM= –0.12 (MNEs have a similar environmental performance in the different locations where they operate), CP= –0.18, and

FN= –0.20 (MNEs do not standardize their environmental performance within their internal network).

4. fsQCA analyses

Once the variables were calibrated (with 170 cases), the truth table was determined. The truth table has 256 rows (2^8 because 8 different causal conditions are present). We decided to disregard the configurations that were inadequately represented: those with fewer than 2 cases whose membership was at least 0.5 (keeping 92% of cases). Note that this decision was not frivolous; for instance, the findings do not support a strong symmetric or asymmetric relationship between the environmental performance standardization variable and any other individual variable, except from headquarters size (“mgran”). The corresponding XY graph (Figure 1) shows that low standardization “implies” high headquarters size, or equivalently, low headquarters size means high standardization. However, the number of cases with low membership to “mgran” were not representative at all; indeed, those cases were removed for the subsequent analysis.

Figure 1 here

Before performing the fsQCA, we used the previous calibration to validate the relationship between the two main variables considered in Aguilera et al. (2013): formal distance vs. informal distance. Figure 2A shows that “dform” is a subset of “dinf” (consistency = 0.98); i.e., from a high formal environmental distance between home and host countries we infer a high informal environmental distance between them. Analogously, Figure 2B shows that “dinf” is a subset of the complement set of “dform” (consistency = 0.75); i.e., a high membership to “dinf” leads to a low environmental institutional distance between home and host countries.

Figures 2A and 2B here

In fsQCA, a consistency threshold (or cutoff) is required to perform the computations. The list of degrees to which membership in a corner of the vector space (with 1s and 0s in each membership) was a consistent subset of memberships in the outcome was considered. The special distribution of these degrees in our data set steered us to the use of three different consistency cutoffs: 0.75 (standard), 0.71 (according to the greater leap), and 0.82 (more reliable). Moreover, informative results are usually extracted when consistency is above 0.74 and coverage is between 0.25 and 0.65 (Ragin, 2008), but small variations are also permitted.

Table 1 shows the results of this study. In this table, the symbol ~ represents the negation of the corresponding condition, and "*" indicates the logical "and" condition.

Table 1 here

In general, the consistency and coverage of the general solutions are very reasonable. In addition, ten solution terms were highlighted using complex, parsimonious, and intermediate solutions. Nine of these terms have raw coverage between 0.25 and 0.65, and their consistencies are greater than 0.74:

*~quim*mgran*gran*~roe*nafta*~dform*
*~enpet*mgran*~roe*nafta*~dform*
*~enpet*mgran*gran*nafta*~dform*
*~quim*mgran*gran*~roe*nafta*~dform*
*~quim*mgran*gran*~roe*nafta*~dform*
~quim~enpet*mgran*gran*nafta*~dform*
*~quim*gran*~roe*nafta*~dform*
*~dform*nafta*gran*mgran*~enpet*~quim*
*~dform*nafta*~roe*gran*mgran*~quim*

The last interesting solution term, with raw coverage and consistency are 0.2450 and 0.8430, respectively, is

*~enpet*mgran*nafta*~dform*dinf.*

Hence, six different solution terms with high relevance to the study of environmental performance standardization within the MNE were included: [fix spacing; discuss each]

(1)**~quim*mgran*gran*~roe*nafta*~dform**: MNEs are more willing to standardize their environmental performance within their internal network if they do not belong to the chemical industry; have "very big" headquarters and "big" subsidiaries; have headquarters that are not very profitable; have headquarters in a country that is part of NAFTA; and have a low level of formal environmental institutional distance between home and host countries. All of these prerequisites are required to enhance the environmental performance standardization within an MNE.

(2)**~enpet*mgran*~roe*nafta*~dform**: MNEs are more willing to standardize their environmental performance in their different operational locations if they do not belong to the energy and petroleum industry; have headquarters that are "big" but are not very profitable; have headquarters in a country that is part of NAFTA; and have a low level of formal environmental institutional distance between home and host countries.

(3)**~enpet*mgran*gran*nafta*~dform**: MNEs are more willing to standardize their environmental performance if they do not belong to the energy and petroleum industry; have "very big" headquarters and "big" subsidiaries; have headquarters in a country that is part of NAFTA; and have a low level of formal environmental institutional distance between home and host countries.

(4)**~enpet*mgran*nafta*~dform*dinf**: MNEs standardize their levels of environmental performance if they do not belong to the energy and petroleum industry; have "very big" headquarters; have headquarters in a country that is part of NAFTA; have a low level of formal environmental institutional distance between countries; and have a high level of informal environmental institutional distance between home and host countries.

(5)**~quim*~enpet*mgran*gran*nafta*~dform:** MNEs standardize their environmental performance within their internal network if they do not belong to the chemical industry or the energy and petroleum industry; have “very big” headquarters and “big” subsidiaries; have headquarters in a country that is part of NAFTA; and have a low level of formal environmental institutional distance between home and host countries.

(6)**~quim*gran*~roe*nafta*~dform:** MNEs standardize their environmental performance within their internal network if they do not belong to the chemical industry; have “big” subsidiaries and headquarters that are not very profitable; have headquarters in a country that is part of NAFTA; and have a low level of formal environmental institutional distance between home and host countries.

5. Conclusion

Aguilera-Caracuel et al. (2013) report that a high formal environmental institutional distance between home and host countries leads the sampled MNEs to adapt their environmental performance according to each country’s legal requirements. Consequently, these firms are concerned with complying with formal institutions to gain license to operate (King & Shaver, 2001; Surroca et al., 2013). In addition, their study provides evidence regarding the influence of informal environmental institutional distance between countries on environmental performance decisions within the MNEs. The results strongly support the conclusion that a high informal environmental institutional distance between home and host countries encourages MNEs to standardize their environmental performance within their internal network (including headquarters and subsidiaries). Indeed, as long as MNEs are obligated to comply with environmental legal requirements, they prefer to implement environmental business models that provide transparency, provide legitimacy (Bansal, 2005) and reduce their operational costs due to improved internal coherence (Kostova et al., 2008).

Compared with the results regarding the influence of formal environmental institutional distance between home and host countries on environmental performance standardization within the MNE, the results related to informal environmental institutional distance between home and host countries are less statistically significant ($p < 0.055$). These findings are especially relevant in environmental management literature because they consider both formal and informal institutional dimensions at the country level. Important implications for academicians, managers, and policy makers can also be obtained (see Aguilera-Caracuel et al., 2013).

Here is a summary of the main findings of the six different solution terms. The MNEs in our sample are willing to standardize their environmental performance if they have “very big” headquarters and “big” subsidiaries; have headquarters in a country that is part of NAFTA; have headquarters that are not very profitable; and have a low level of formal environmental institutional distance between countries. In relation to the type of industry, some configurations show that MNEs do not belong to the chemical industry, others reveal that MNEs not to belong to the energy and petroleum industry, and others show that MNEs do not belong to either of these industries.

We also conclude that a high informal environmental distance between home and host countries also favors environmental performance standardization, but only if the MNE also possesses a low level of formal environmental institutional distance between countries, has “very big” headquarters in NAFTA, and is not in the energy and petroleum industries. This finding is consistent with the results obtained in Aguilera-Caracuel et al. (2013).

6. Discussion

From a methodological viewpoint, prior work mostly relies on the MRA technique. MRA involves a number of assumptions that must be validated, including that the errors from the model are normally distributed; that the errors have constant variance; that the mean of the errors is zero; and that the errors are independent (Braumoeller & Goertz, 2003; Dul et al., 2010).

However, these assumptions frequently entail important limitations when applied to social sciences in general and to the business sphere in particular (Woodside, 2013). Fortunately, the fsQCA model avoids such drawbacks, as comparative approaches (Vis, 2012) highlight. Therefore, the results obtained by using MRA with low correlations should be examined. In this research, which considers the results obtained using fsQCA, we validate the previous findings for specific groups of MNEs. Indeed, as seen in section 4, we can establish different configurations for MNEs that are willing to standardize their environmental performance within their internal network.

In summary, the formal and informal environmental institutional distances between home and host countries are two key variables for studying environmental performance within the MNE. Nevertheless, these variables alone cannot explain environmental performance standardization within the MNE. For this reason, the use of a configuration of cases and variables is required. The fsQCA results more reliably capture in greater detail the antecedents that encourage MNEs to standardize their environmental performance and, therefore, reinforce our previous findings. Consequently, we are able to overcome previous limitations regarding the treatment of each independent variable as analytically distinct and separate to explain the dependent variable through net effects. Using fsQCA, we are able to replace the value of a given variable in a specific case by the degree to which that case presents the characteristic measured by the variable (environmental performance standardization within the MNE in our case). As a result, the dependent variable is now replaced by the degree to which the case belongs to the set of “the cases verifying the property in a required level” (Woodside & Zhang, 2013). Therefore, fsQCA pays special attention to those specific combinations of causally relevant ingredients that are linked to the outcome.

This study has some limitations. First, the use of dichotomous variables (corresponding to the so-called crisp sets) is inappropriate for demonstrating continuous relationships among variables in the case of MRA. Additionally, the fsQCA is not designed to include these types of variables. As mentioned in section 2, the use of dichotomous variables could not be avoided because of the definition of the characteristics to be measured and the availability of useful data. Future studies should incorporate only non-dichotomous variables in the analyses.

Second, the presence of measurement errors in social research is very common and may occur in our variables. Specifically, the environmental performance of the MNEs was measured using data for air releases. Water and land release data as well as data on waste recovery and recycling processing might also be of interest to complement the study if these data become internationally available in the future. Third, because the US MNEs in our sample have a great scope and international relevance, their headquarters are “very big” (“mgran” variable). Therefore, the fsQCA results show that the sample does not capture the reality of small headquarters and could not extend the results to these cases. Finally, performing different fsQCAs would be useful with diverse antecedent conditions to measure environmental performance standardization and the formal and informal institutional distance between countries variables.

REFERENCES

Aguilera-Caracuel, J., Aragón-Correa, J.A., Hurtado-Torres, N.E., & Rugman, A.M. (2012). The effects of institutional distance and headquarters' financial performance on the generation of environmental standards in multinational companies. *Journal of Business Ethics*, 105(4), 461–474,

Aguilera-Caracuel, J., Hurtado-Torres, N.E., Aragón-Correa, J.A., & Rugman, A.M. (2013). Differentiated effects of formal and informal institutional distance between countries on the environmental performance of multinational enterprises. *Journal of Business Research*, *66*(12), 2657–2665.

Armstrong, J.S. (2013). Illusions in regression analysis. *International Journal of Forecasting, 28,* 689–694.

Arslan, A., & Larimo, J. (2010). Ownership strategy of multinational enterprises and the impacts of regulative and normative institutional distance: Evidence from Finnish foreign direct investments in Central and Eastern Europe. *Journal of East-West Business, 16*(3), 179–200.

Bansal, P. (2005). Evolving sustainably: A longitudinal study of corporate sustainable development. *Strategic Management Journal, 26*(3), 197–218.

Braumoeller, Bear F., & Gary Goertz. (2003). *The Statistical Methodology of Necessary Conditions*. Pp. 197-223 in Necessary Conditions: Theory, Methodology, and Applications, edited by G. Goertz and H. Starr. Lanham, MD: Rowman & Littlefield.

Buyandhold: A division of freedom investments. http://www.buyandhold.com/bh/en/

Chang, S. J., & Rosenzweig, P. (2001). The choice of entry mode in sequential foreign direct investment. *Strategic Management Journal*, *22*(8), 747–776.

Christmann, P. (2004). Multinational companies and the natural environment: Determinants of global environmental policy standardization. *Academy of Management Journal, 47*(5), 747–760.

Christmann, P., & Taylor, G. (2001). Globalization and the environment: Determinants of firm self-regulation in China. *Journal of International Business Studies, 32*(3), 439–458.

Darnall, N. (2006). Why firms mandate ISO 14001 Certification. *Business & Society, 45*(3), 354–381.

Delmas, M., & Montes-Sancho, M.J. (2011). An institutional perspective on the diffusion of international management system standards: The case of the environmental management standard ISO 14001. *Business Ethics Quarterly, 21*(1), 103–132.

Dul, J., Hak, T., Goertz, G., & Voss, C. (2010). Necessary condition hypotheses in operations management. *International Journal of Operations & Production Management, 30*(11), 1170-1190.

Ecological Footprint of Nations (2004). http://www.footprintnetwork.org/pt/index.php/GFN/page/footprint_for_nations/

European Commission (2003). Recommendation 2003/361/EC, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:124:0036:0041:en:PDF

Gigerenzer, G. & Brighton, H. (2009) Homo heuristicus: Why biased minds make better inferences. *Topics in Cognitive Science*, 1, 107–143.

Gladwell, M. (1996). The tipping point. *The New York Yorker, 72*, 32–39.

Hanges, P. J., & Dickson,M.W. (2006). Agitation over aggregation: Clarifying the development of and the nature of the globe scales. *The Leadership Quarterly, 17*, 522–536.

Henriques, I. y Sadorsky, P. (2008). Oil prices and the stock prices of alternative energy companies. *Energy Economics, 30*, 998–1010.

Hoffman, A.J. (1999). Institutional evolution and change: environmentalism and the US chemical industry. *Academy of Management Journal, 42*(4), 351–371.

King, A.A., & Lenox, M.J. (2000). Industry self-regulation without sanctions: The chemical industry’s responsible care program. *Academy of Management Journal,* 43(4), 698–716.

King, A.A., & Shaver, J.M. (2001). Are aliens green? Assessing foreign establishments’ environmental conduct in the United States. *Strategic Management Journal, 22*(11), 1069–1086.

Kostova, T., & Roth, K. (2002). Adoption of an organizational practice by subsidiaries of multinational corporations: Institutional and relational effects. *Academy of Management Journal, 45*(1), 215–233.

Kostova, T., Roth, K., & Dacin, T. (2008). Institutional theory in the study of multinational corporations: A critique and new directions. *Academy of Management Review, 33*(4), 994–1006.

Mauro, P. (1995). Corruption and growth. *Quarterly Journal of Economics, 110*(3), 681-712.

McClelland, D.C. (1998). Identifying competencies with behavioural-event interviews. *Psychological Science, 9*(5), 331-339.

North, D. C. (1990). Institutions, institutional change and economic performance. New York, NY: Cambridge University Press.

Organization for Economic Cooperation and Development (2004). http://www.oecd.org/

Orlitzky, M., Siegel, D.S., & Waldman, D.A. (2011). Strategic corporate social responsibility and environmental sustainability. *Business & Society, 50*(1), 6–27.

Ragin, C. (2008). *Redesigning social inquiry: Fuzzy sets and beyond*. Chicago: Chicago University Press.

Rivera, J.E., & deLeon, P. (2008). Voluntary environmental programs: Are carrots without sticks enough? *The Policy Studies Journal, 36*(1), 61–63.

Rugman, A.M., & Verbeke, A. (1998a). Corporate strategy and international environmental policy. *Journal of International Business Studies, 29*(4), 819–833.

Rugman, A.M., & Verbeke, A. (1998b). Corporate strategies and environmental regulations: An organizing framework. *Strategic Management Journal, 19*(4), 363–375.

Salomon R., & Wu, Z. (2012). Institutional distance and local isomorphism strategy. *Journal of International Business Studies, 43*, 343–367.

Stewart, R. (1993). Environmental regulation and international competitiveness. *Yale Law Journal 102*, 2039–2106.

Surroca, J., Tribó, J.A., & Zahra, S.A. 2013. Stakeholder Pressure on MNEs and the Transfer of Socially Irresponsible Practices to Subsidiaries. *Academy of Management Journal*, *56*(2), 549–572.

United Nations Human Settlements Programme (2004). http://ww2.unhabitat.org/

Vernon, R. (1992). Transnational corporations: Where are they coming from, where are they headed? *Transnational Corporations*, *1*(2), 7–35.

Vis, B. (2012). The comparative advantages of fsQCA and regression analysis for moderately large-N analyses. *Sociological Methods & Research*, *41*(1), 168-198.

Woodside, A.G. (2013). Moving beyond multiple regression analysis to algorithms: Calling for adoption of a paradigm shift from symmetric to asymmetric thinking in data analysis and crafting theory. *Journal of Business Research*, *66*(4), 463-472.

Woodside, A.G., & Zhang, M. (2013). Cultural diversity and marketing transactions: Are market integration, large community size, and world religions necessary for fairness in ephemeral exchanges? *Psychology and Marketing*, *30*(3), 263–276.

World Economic Forum (2004). World Economic Forum (WEF) Survey, The Global Competitiveness Report 2003-2004', Porter, Michael E. et al. Oxford University Press, 2003-2004, http://www.weforum.org/site/knowledgenavigator.nsf/Content/KB+Country+Profiles.

Xu, D., & Shenkar, O. (2002). Institutional distance and the multinational enterprise. *Academy of Management Review*, *27*(4), 608–618.

Yiu, D., & Makino, S. (2002). The choice between joint venture and wholly owned subsidiary: An institutional perspective. *Organization Science*, 13(6), 667–683.

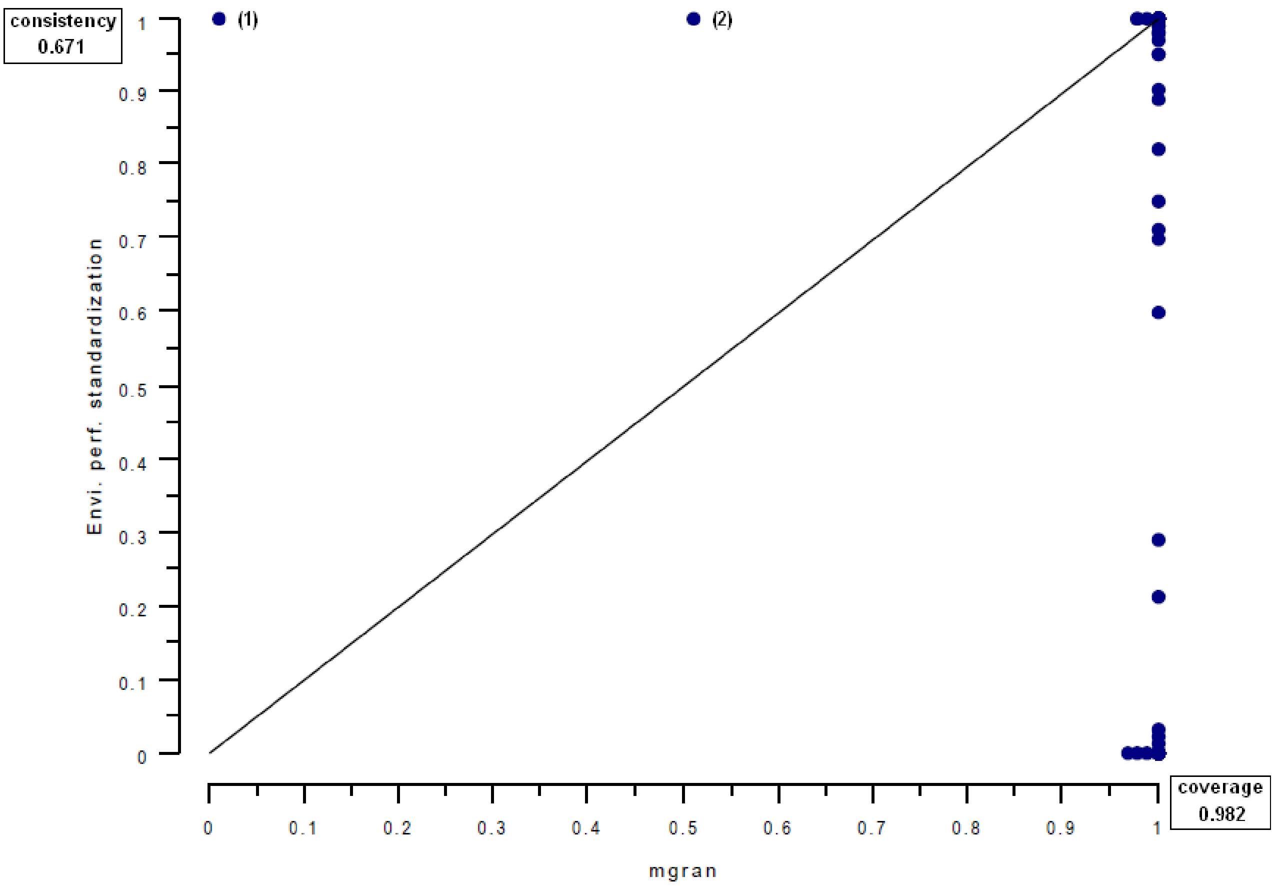

Figure 1

Impact of headquarters size ("mgran") on the environmental performance standardization within the MNE. Numbers in parenthesis indicate the number of cases in each dot (from a total of n=170).

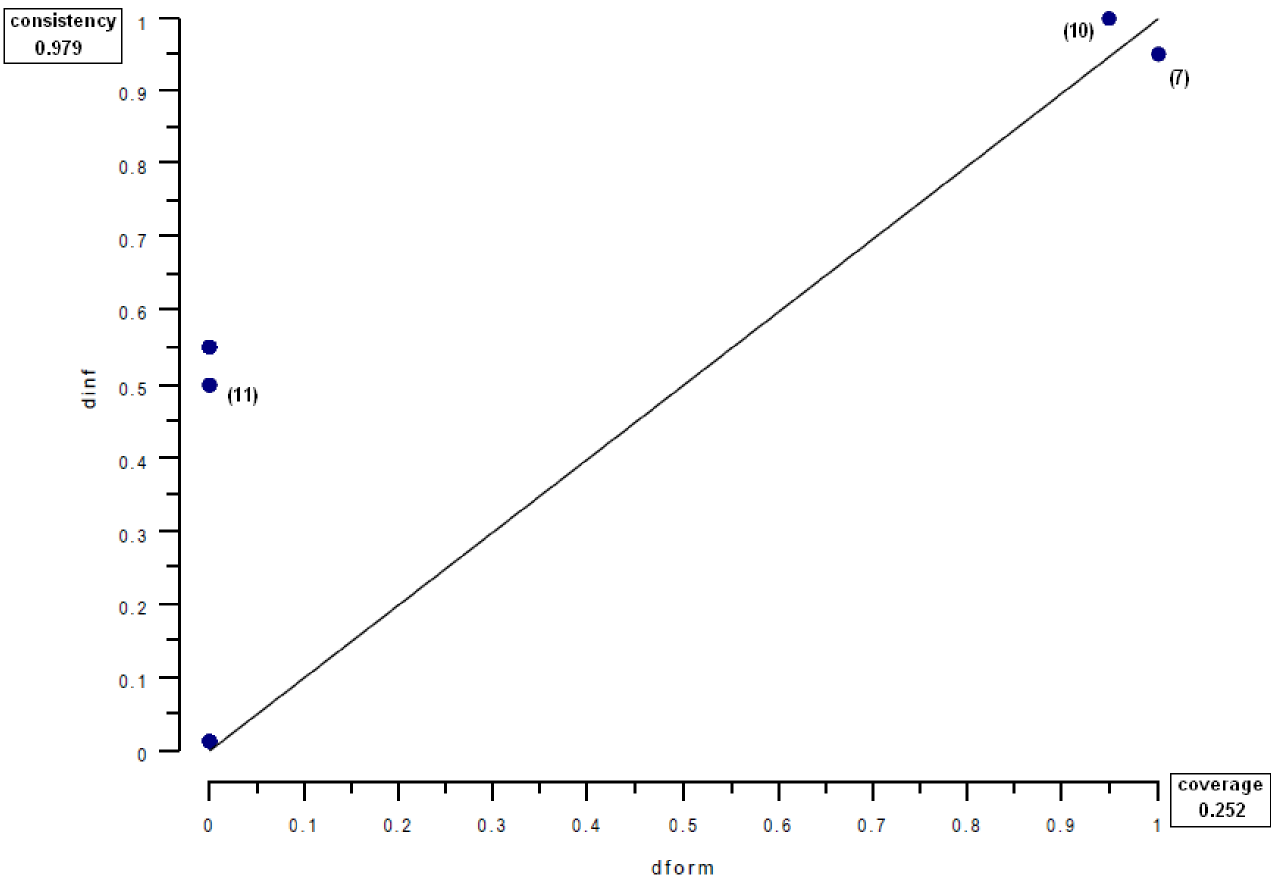

Figure 2A

Impact of formal distance (dform) on informal distance (dinf). Numbers in parenthesis indicate the number of cases represented in each dot (from a total of n=170).

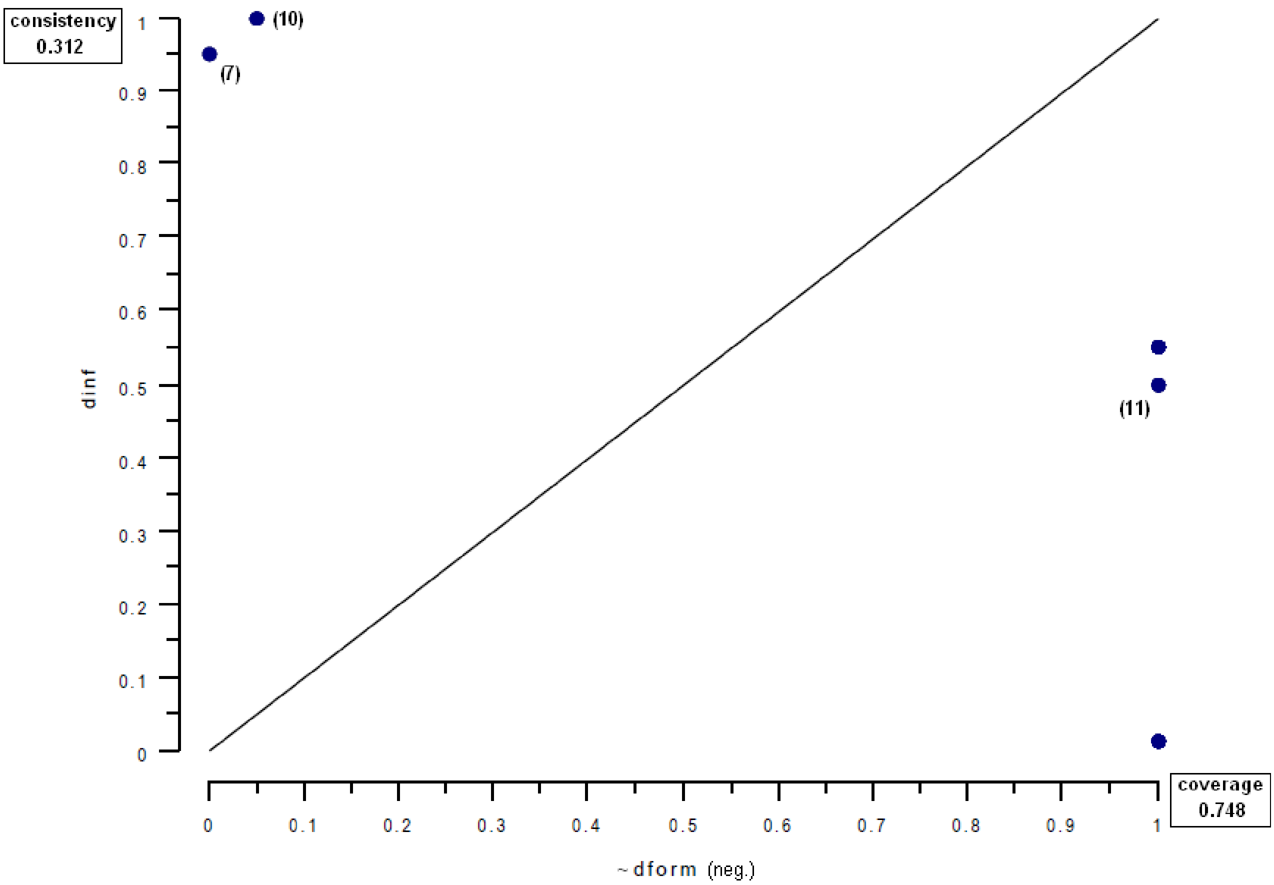

Figure 2B

Impact of negation of formal distance (~dform) on informal distance (dinf). Numbers in parenthesis indicate the number of cases represented in each dot (from a total of n=170).

Table 1

Findings from fsQCA for environmental performance standardization within the MNE

---COMPLEX SOLUTION---

frequency cutoff: 2 consistency cutoff: 0.7550	raw coverage	unique coverage	consistency
~quim*~enpet*mgran*~roe*nafta*~dform	0.2339	0.0628	0.8470
~quim*mgran*gran*~roe*nafta*~dform	**0.2585**	**0.1022**	**0.9104**
~quim*~enpet*mgran*nafta*~dform*dinf	0.1225	0.0036	0.8721
~enpet*mgran*gran*roe*nafta*~dform	0.2211	0.1151	0.8359
~enpet*mgran*gran*nafta*~dform*dinf	0.1955	0.0639	0.8779
quim*~enpet*mgran*~gran*~roe*nafta*dform*dinf	0.0159	0.0150	0.9100
solution coverage: 0.5993			
solution consistency: 0.8596			

---COMPLEX SOLUTION---

frequency cutoff: 2 *consistency cutoff: 0.7101*	Raw coverage	unique coverage	consistency
~enpet*mgran*~roe*nafta*~dform	**0.4921**	**0.1451**	**0.7986**
~enpet*mgran*gran*nafta*~dform	**0.5119**	**0.1367**	**0.8429**
~enpet*mgran*nafta*~dform*dinf	**0.2450**	**0.0136**	**0.8430**
~quim*mgran*gran*~roe*nafta*~dform	**0.2585**	**0.1022**	**0.9104**
quim*~enpet*mgran*~gran*~roe*nafta*dinf	0.0696	0.0150	0.7502
solution coverage: 0.8238			
solution consistency: 0.8300			

---COMPLEX SOLUTION---

frequency cutoff: 2 *consistency cutoff: 0.8269*	Raw coverage	unique coverage	consistency
~quim*mgran*gran*~roe*nafta*~dform	**0.2585**	**0.1022**	**0.9104**
~quim*~enpet*mgran*gran*nafta*~dform	**0.2622**	**0.0679**	**0.8955**
~enpet*mgran*gran*~roe*nafta*~dform*dinf	0.1313	0.0649	0.8766
~quim*~enpet*mgran*roe*nafta*~dform*dinf	0.0615	0.0037	0.9277
quim*~enpet*mgran*~gran*~roe*nafta*dform*dinf	0.0159	0.0150	0.9100
solution coverage: 0.4482			
solution consistency: 0.9015			

---PARSIMONIOUS SOLUTION---

frequency cutoff: 2 *consistency cutoff: 0.8269*	Raw coverage	unique coverage	consistency
~quim*~enpet*roe	0.1475	0.1047	0.8758
~gran*nafta*dform	0.0180	0.0150	0.8381
~quim*gran*~roe*nafta*~dform	**0.2587**	**0.1561**	**0.9104**
gran*~roe*nafta*~dform*dinf	0.1470	0.0650	0.8879
solution coverage: 0.4457			
solution consistency: 0.8909			

---INTERMEDIATE SOLUTION---

frequency cutoff: 2			
consistency cutoff: 0.8269	**raw coverage**	**unique coverage**	**consistency**
~dform*nafta*gran*mgran*~enpet*~quim	**0.2622**	**0.0679**	**0.8955**
~dform*nafta*~roe*gran*mgran*~quim	**0.2585**	**0.1022**	**0.9104**
dinf*~dform*nafta*roe*mgran*~enpet*~quim	0.0615	0.0037	0.9277
dinf*~dform*nafta*~roe*gran*mgran*~enpet	0.1313	0.0649	0.8766
dinf*dform*nafta*~roe*~gran*mgran*~enpet*quim	0.0159	0.0150	0.9100
solution coverage: 0.4482			
solution consistency: 0.9015			