Using demographic heterogeneity and national culture indices for international TMT research

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ABSTRACT

The objective of the underlying study was to find evidence that Top Management Team (TMT) national culture was significantly related to international banking corporate profitability during the 2008 global economic crisis. In order to accomplish this objective, the authors constructed demographic heterogeneity and national culture indices for investigation of the 57 TMTs that were leading Fortune Global 500 banking companies before and during the crisis. Indexing enabled the authors to improve statistical power while using this relatively small population. The authors found significant input-process-output relationships between (1) national culture and corporate profitability changes over two time periods, and (2) between national culture and TMT demographic heterogeneity. This article concerns itself primarily with the construction of the indices as a guide for future TMT demographers.

Keywords: Hofstede, TMT demography, TMT National Culture Index, TMT Demographic Heterogeneity Index

INTRODUCTION

This article provides a detailed methodology for index creation and use with Top Management Team (TMT) demographic research. The current authors sought to determine if the world's 57 largest banks' change in profitability during the 2008 global financial crisis was related to their TMTs' demographic characteristics. These banks were facing an acutely complex set of macroeconomic problems during this period. These problems may have served to intensify demographic differences and associated strategies employed ahead of and during the crisis (Carpenter & Fredrickson, 2001; Carpenter, forthcoming). While there were many internal and external variables that could not be measured or included in the analysis, the global crisis provided unique and dramatic circumstances for the examination of demographic inputs and profitability outcomes within a shared environmental context. Through the use of a social science framework of cooperation/competition, the authors developed hypotheses for relating national culture to Hambrick's (2007) level of TMT integration and TMT process leakage (Edmondson, Roberto, & Watkins, 2003). Using indices improved a priori statistical power through the creation of national culture and demographic heterogeneity composite variables. It is proposed that these indices can be applied to a range of TMT studies by future researchers; thus, the motivation for the current article. Other aspects of the underlying study are discussed in Gerecke and House (2012a).

LITERATURE REVIEW

Vasquez, Gangstead, and Henson (2000) pointed out that acceptable study design relies not only on the ability to achieve significant statistical results, but also on planning and executing the study using sound empirical and theoretical context. Demonstrating statistical relationships with the appropriate contextual groundwork and good judgment improves the "meaningfulness" (2000, p.3) of the study. The absence of theoretical context amounts to no more than "a look-around-the-barn" (van Wagenen, 1991, p.17) in search of relationships between variables. TMT demographic studies have been famously criticized for leading the management research community on meaningless ventures through the barn without proper theoretical context or explanation (Lawrence, 1997). The analysis in the current underlying study was contextualized using social science theory, upper echelon theory, demographic research precedent, Hofstede's (2001) national culture dimensions, and the indexing data analysis techniques typically used in the social sciences.

Upper Echelon Theory

Hambrick and Mason described TMTs as single entities and advocated that they be studied using their observable composite characteristics. They asserted that "organizational outcomes – both strategies and effectiveness – are viewed as reflections of the values and cognitive bases of powerful actors in the organization" (1984, p.193). Further, they contended that TMT "upper echelons" (p.193) act collectively as a single entity, not as individual executives. This collectivity of action provides a basis for studying whole group characteristics as independent composite variables; this group-level analysis was a critical element of the study's methodology. In a later article, Hambrick (2007) discussed lack of TMT integration as a reason for TMT decision making and related business results being less than optimal. Edmondson, Roberto, and Watkins (2003) termed this to be leakage in the intervening TMT processes.

Demographic Research

Demographic TMT research makes use of an input-process-output model, but often centers exclusively around inputs and outputs, due to the researchers' practical inability to gain access for observation/measurement of process. Despite an enormous amount of effort over the last several decades, using demographic heterogeneity variables to understand TMT interactions and outcomes has led to a set of equivocal results (Edmondson, Roberto, & Watkins, 2003), and researchers have challenged the ability of demographic TMT characteristics to capture cognitive and interactive processes (Chen, Ge, & Song, 2010). Some have argued that higher levels of TMT demographic heterogeneity will lead to more effective decision making due to diversity in collective cognition. Others have argued that less effective decisions would result from highly diverse groups due to reduced communication, increased conflict, and lack of teamwork (Priem, Lyon, & Dess, 1999).

Although there has been a large body published research, demography has been challenged and its limitations as a research tool have been elucidated. Pettigrew (1992) argued that attempts to relate demographic variables to company performance have been inconsistent and cannot be generalized for the most part. Others have written that demographic attributes have not been consistently shown to influence certain outcomes across various studies, are not reliable predictors of group outcomes, and that demography is unable to explain why variable relationships exist (Lawrence, 1997; Priem, Lyon, & Dess, 1999). Consequently, management scholars have put forward TMT study designs that emphasize underlying processes including communication (Wiersema & Bird, 1993), cooperation and collaboration (Barsade, Ward, Turner, & Sonnenfeld, 2000), conflict (Pelled, 1996; Pelled, Eisenhardt, & Xin, 1999), risk taking (Hsu & Huang, 2011), power sharing (Chen, Ge, & Song, 2010), and decision making (Eisenhardt, 1989; Schneider, 1989). Indeed, there has even been a call for the ending of studies using input-output demographic designs altogether in favor of focus on underlying processes exclusively (Certo, Lester, Dalton, & Dalton, 2006). On the occasions when researchers have been able to directly measure TMT processes, they have often been able to predict outputs more reliably than by using input variables alone (Edmondson, Roberto, & Watkins, 2003).

Conversely, Pfeffer (1985) advocated for the use of purely demographic studies – in which member characteristics are objectively measured and easily calculated – for the study of TMTs. He stated that demographic characteristics are more meaningful as predictors than subjective constructs (TMT underlying processes) derived from psychology or sociology. According to Pfeffer, explaining group output and work product using subjective constructs and intervening processes actually diminishes the value of the resulting theory through the introduction of supposition and interpretation. There are noted examples in the literature (Smith, Smith, Sims, O'Bannon, Scully, & Olian, 1994; Certo et al., 2006) where researchers have empirically related, although with small effect sizes, underlying TMT demographic heterogeneity attributes and associated corporate financial performance. These examples were leveraged and their independent variables were chosen for inclusion in the current underlying study.

Indexing as a Tool for the Social Sciences

G.R. Carli invented the first index number to measure changes in the level of commodity prices; publishing his methodology for the first time in 1764 (Mitchell, 1965). Although the use of indexing was initially in economics, indexing has since gained prominence in the fields of education, public health, and sociology. Indexing in social science research has become a common practice and it has been shown to be a useful tool over the years (Baur, 1954; Jae-On & Rabjohn, 1980). A statistical index is an indirect, quantitative representation of something that is not directly measurable. Most commonly, indices measure indirectly the presence, absence, or frequency of a characteristic. In some cases, the index is made up of components of the overall characteristic. In other cases, the index is composed of components that are not part of the characteristic of interest, but are related to the characteristic in some way (Baur, 1954; Hagood, 1941). To construct an appropriate index, a researcher is faced with the problems of defining the characteristic to be represented by the index, determining the components of the index, obtaining data, combining the components using the appropriate mathematical operands, validating the index, and determining the reliability of the index (Baur, 1954).

Social science researchers have faced two main issues: (a) ensuring the chosen indicator variables relate to a single overall dimension, and (b) combining the variables into a single index in such a way that it has a high probability of representing a single composite dimension. This requires that researchers make inferences from the observable indicators to describe the latent characteristics of the investigated object (Lazarsfeld, 1955; Jae-On & Rabjohn, 1980). Simple indices measure one definable characteristic, and are normalized so that they are independent of sample size. Composite indices are made up of more than one simple index. There are several ways of combining simple indices into a composite index, but the most often used is arithmetic addition. Since upper echelon theory and demographic research require the use of measurable whole group characteristics, it follows that the combination of these underlying characteristics into composite variables is a reasonable procedure.

Index design is a balance between economy and accuracy. Choosing an insufficient number of index components can cause a distorted or incomplete representation of the overall characteristic to be measured, even with a high level of accuracy imbedded in each component (Zeisel, 1957). However, the number of index components should be kept to the minimum needed for representation of the underlying characteristic to the fullest extent possible. Importantly, when combining demographic variables into a single index, the contribution of any single variable is diluted, and this is a characteristic disadvantage to the indexing approach (Olsen, Parayitam, & Twigg, 2006). Appropriate selection of index components can allow the researcher to see an overall relationship of the underlying latent characteristic with a given dependent variable and without undue dilution. Pelled (1996) attempted to strike the proper balance by reducing her variable set to those with the most perceived influence on TMT performance. Although Pelled did not suggest the use of indexing, the problem of overall relationship detection versus demographic variable dilution was clearly elucidated in her reference to TMT demography studies (p. 618).

The components of the index are ideally weakly correlated with each other, but strongly correlated to the latent characteristic that they are designed to represent – if a subset of index components are strongly inter-correlated, they have potential to skew the representation of the latent characteristic (Baur, 1954). Coefficients are used to reflect the relative influences of each component on the overall characteristic represented by the resultant composite index (Hagood, 1941). The weighting of individual components of a composite index is extremely important and needs to be a deliberate decision of the researcher. Weighting is not possible when there is no available evidence about the relative influence of the individual components (Alwin, 1973). Mitchell (1965, p.60) points out that the value of a composite index can be undermined by introducing seemingly innocuous errors via the coefficient weights of the index's components.

Indexing is sometimes used in conjunction with sampling and scaling within a social science investigation. Indexing and sampling are related in that they both use parts of the whole to represent the whole; however, an index is purposefully constructed to be a non-random representation of the whole and therefore is lacks the quality of simply being a subset. The index components are often chosen based on previous empirical evidence, as was the case in the underlying study. Indices and scales have a common purpose in that they both seek to order series of data so that they can be related to each other. The position of a particular data point in the series represents its relationship with the other data in the same series. One difference between indices and scales is that indices use quantitative data and scales seek to combine qualitative components into a quantitative variable (Baur, 1954). Only continuous variables are valid for the construction of scales (Jae-On & Rabjohn, 1980), and therefore, binary or category data need to be converted to continuous functions prior to use.

CONTRIBUTION TO THE LITERATURE

The 2008 global economic crisis was largely unpredicted. Therefore, contemporaneous study of TMT process for the banks in the sample was not possible, leaving little choice but indirect process measurement. While the current authors have no disagreement that the direct measurement of TMT processes is critically important, it is equally important that input-output demographic TMT research be continued and enhanced. The two research models are not mutually exclusive, but rather complimentary. The current authors' input-process-output model is shown in Figure 1 (Appendix). A demographic methodology was chosen for the study since it allowed retrospective, albeit indirect, examination of TMTs' strategic decision making processes across the sample of global banking companies. The current methodology followed from the work of Hambrick and Mason (1984), in which they proposed that TMTs operate as single executive entities to make strategic decisions that influence corporate outcomes. Within the underlying study, the authors sought to improve upon the problematic history of equivocal results and the resulting loss of scholarly enthusiasm for demographic TMT studies.

Composite TMT Heterogeneity Measurement

Borrowing from classical social science methodology, the authors suggest combining heterogeneity variables into an index. Researchers have used many demographic variables as proxies for overall heterogeneity, so which one(s) of these variables provide the most information about various TMT processes and results? This has not been made clear. For example, Certo et al. (2006) suggested that it would be useful to know whether educational or functional heterogeneity better gauges the actual levels of heterogeneity within a particular TMT. Their recommendation was to create a "scale" (2006, p.834) as part of construct development to determine the most influential demographic variables on overall TMT heterogeneity measures. With no direct process measurement possible in many TMT studies, the current authors recommend combining job-related demographic variables into TMT-specific indices that describe each company's executive team heterogeneity – in other words, measure overall heterogeneity directly through a single index variable rather than attempting to select the most indicative heterogeneity variables. This approach is consistent with Hambrick and Mason (1984) who spoke of TMT heterogeneity as a broad concept rather than one that focuses on just a few variables.

Composite TMT Values Measurement

Values are a significant motivator behind goal development and choice of action, and yet, TMT values are ineffectively measured by typical demographic variables (Dose & Klimoski, 1999). TMT members' perceptions of their internal and external environments are filtered through their individual cognitive paradigms, shaped by their values and culturally-influenced preferences. Further, although executives gain experience throughout their lifetimes, early cultural experiences tend not to change appreciably (Geletkanycz, 1997; Whitely & England, 1977). Therefore, it is recommended to augment job-related demographic variables with national culture variables. The authors chose an international population for the current underlying study specifically to test the relatedness of national culture and corporate performance. The pre-supposition was that national culture variables would provide deeper information about TMT members, how they manage their interrelationships, how they manage information, and how subsequent outcomes would be affected. The underlying study used Hofstede's (2001) national culture variable set, converted to a single index variable, to demonstrate relatedness between national culture and corporate profitability.

Statistical Power Improvement

The minimization of independent variables, and therefore, potentially greater statistical power, is optimized through the use of indexing. In TMT studies, the population and/or sample sizes are often limited in comparison to other social science populations and samples. According to Higgs, when describing his own TMT sample, "In looking at empirical research examining more senior level management teams, the current sample [n = 54] represents a relatively large number of such teams" (2006/2007, p.82). Further, in the current authors' (non-random) literature review of 20 quantitative demographic TMT studies, the authors found the average number of company TMTs was 101, with a standard deviation of 78 (see Table 1, Appendix). Therefore, the current underlying study (n = 57) was not atypical. Having fewer demographic input variables improves a priori effect size of the input-output model, theoretically improving the probability of detecting co-variation with corporate output results.

THEORY AND HYPOTHESES DEVELOPMENT

Small Group Social Interactions

Deutsch (2001) described interactions in small groups by differentiating between those groups prone to cooperation as opposed to those groups predisposed to competition. Importantly, Deutsch postulated that the overall level of cooperation or competition within a particular group was related to the values and beliefs of the members of that group. This theoretical relationship between group member values/beliefs and cooperation/competition provided the basis for building hypothetical relationships between national culture variables and the level of cooperation or competition within each TMT. French (1956) modeled how small group power structure, hierarchy, communication channels, and cohesion, serve to influence communication, decision making speed, and consensus building. In the underlying study, the authors made a hypothetical argument that predictable relationships exist between national culture, cooperation/competition, and TMT intervening processes; thereby defining the theoretical framework and justification for studying TMTs within a social science paradigm.

Hypothesis 1: Cooperative environments lead to higher levels of communication, collaboration, and conflict resolution in small groups. These attributes provide faster, more effective decision making with higher levels of consensus. Therefore, cooperative environments lead to superior TMT strategic decisions.

National Cultural Dimensions

Whitely and England (1977; 1980) found national culture, which creates a framework for interpreting and assigning meaning to certain information, to be related to values. To characterize international executives' values, the authors' underlying study incorporated five national cultural dimensions as they were identified and developed by Hofstede (2001). These dimensions were (a) long term orientation, (b) individualism, (c) masculinity, (d) power distance, and (e) uncertainty avoidance. These five dimensions characterize national cultures, and their associated values and beliefs, in a way that they are meaningfully and quantitatively differentiated. The descriptive breadth and depth of Hofstede's national culture dimensions allowed for their mapping to the integrated theory (French, 1954; Deutsch, 2001) of cooperation/competition and communication in small groups (as outlined in Table 3, Appendix).

Hofstede's (2001) work is well known and has been often used to define national culture within the literature. Further, his cultural dimensions are often used as taken-for-granted information to support empirical research (Sondergaard, 1994). Hofstede's results have shown validity and reliability over several decades. Triandis offered that "Hofstede's work has become the standard against which new work on cultural differences is validated. Almost every publication that deals with cultural differences and includes many cultures is likely to reference Hofstede" (2004, pp.89-90). Importantly, Hofstede's quantification of national culture allows for its incorporation into statistical studies of TMT demography. Table 2 (Appendix) summarizes how the current authors combined Hofstede's dimensions into a single index, based on how they were hypothesized to influence TMT process.

Hypothesis 2: Due to their influence on cooperation/competition, national culture demographic variables will have a stronger relationship with change in profitability over time than job-related demographic heterogeneity variables in international TMT populations.

METHODOLOGY

Sampling the 2006 Fortune Global 500 Banking Industry TMT Population

The underlying study used change in profitability as a percent of assets from 2007 through 2009, $\%\Delta PPA_{(2007\text{-}2009)}$, as the outcome variable. Profitability change from 2004 through 2006, $\%\Delta PPA_{(2004\text{-}2006)}$, was the control variable. The use of change variables is acceptable when the initial and final components are not correlated (Dimitrov & Rumrill, 2003), as was the case in the current study. The Fortune Global 500 databases for the years 2004 through 2009 were used to access key financial information related to the control variable and the dependent variable.

Banking industry TMTs that were incumbent during the year 2006 were used as the study population. These TMTs had significant influence on how they positioned their companies in the years preceding the 2007-2009 crisis period (mean TMT tenure was 4.5 years; standard deviation was 2.5 years) and were likely responsible for the decision making and outcomes as the crisis progressed. The authors chose to investigate the largest revenue-generating firms from the banking sector as opposed to selecting another market segment of the banking and finance industry. The associated rationale was that the largest firms were those most likely to be involved in banking and investment activities that spanned continental boundaries; therefore, global economic conditions were most likely to have affected them in similar ways, independent of their home countries. This rationale justified the assumption that the companies' home country economy, taxes, regulations, and so forth were relatively insignificant as compared to the global economic conditions present in the period of interest.

The 2006 Fortune Global 500 database contained the names of the banks' TMTs listed by job title. The generic TMT members' titles included in the 2006 Fortune Global 500 database were: CEO, CFO, Human Resources, Technology, Communications, Marketing, Legal, and Business Development; defining the TMT size for the study at eight members. This TMT size is approximately the same as that found by Hambrick (1995), well within the range found by Certo et al. (2006), and on the upper limit of the range found by Barsade et al. (2000). Biographical data available in the public domain were gathered through the process of internet searching using all publicly available sources. Overall, the underlying study includes approximately 80% of the demographic and national culture data available for the 439 named TMT members in the population of 57 banks (see Table 4, Appendix). The designation of TMT membership from archival sources is often a source of error, since it is not possible to determine which team members actually act interdependently and strategically (Certo et al., 2006; Cohen & Bailey, 1997) and these interactions are likely to be somewhat different in every TMT. The current authors obviously had no first-hand knowledge of the TMT members, their companies, or their interactive social processes.

The study made use of sampling, scaling, and indexing. The combination of these techniques was necessary to convert categorical demographic heterogeneity variables into scalar variables, as required by the regression models. Sampling was used in the initial data collection of demographic and national culture variables. Scaling was used to convert individual qualitative demographic variables into demographic heterogeneity variable quantitative scores. Indexing was used to combine the individual quantitative variable scores into composite variables representing demographic heterogeneity and national culture for each company in the chosen population. The selection of Demographic Heterogeneity Index components was guided by two different criteria: (a) those that have been shown to have a relationship with corporate profitability in previous TMT studies (Certo et al. 2006; Smith et al, 1994), and (b) those that were job-related in nature (Pelled, 1996). These criteria called for the inclusion of TMT tenure, company tenure, years of education, education specialization, and functional specialization. In the case of the national culture index components, those variables determined by Hofstede (2001) to have provided a comprehensive description of national culture characteristics were used.

Converting Individual-Level TMT Data to Group Level Variables

The construction of both the Demographic Heterogeneity Index and the Hofstede National Culture Index were accomplished using the methodology described below and summarized in Figure 2 (Appendix). Demographic studies are grounded in upper echelon theory (Hambrick and Mason, 1984), which states that TMTs function as a collective entity. For this reason, the data needed to be analyzed for its TMT group level attributes. The two TMT-level attributes used in this study were central tendency and dispersion. The calculation for these TMT-level attributes is described below.

Central tendency was calculated for each TMT scale variable using the simple arithmetic mean (Equation 1).

$$\text{Mean}_{(TMT)} = \frac{\text{sum of variable } x \text{ for TMT}_n}{\text{number of TMT members in } n} \quad \text{; where } n = \text{each TMT} \qquad (1)$$

Dispersion was used as the measure of the data distribution around the central tendency in the current study. Dispersion was calculated by two methods, depending on the type of data that was used in a particular calculation. For scale variables, dispersion was calculated at a TMT-level using the coefficient-of-variation (CV) as is recommended by O'Reilly, Caldwell, and Barnett (1989).

$$CV_{(TMT)} = \frac{\text{Standard Deviation}_{(TMT)}}{\text{Mean}_{(TMT)}} * 100\% \qquad (2)$$

For categorical variable dispersion, Teachman's index was calculated for each of the TMTs. This was the method utilized by Pelled, Eisenhardt, and Xin (1999). A modified version of Teachman's index (H) is reproduced in Equation 3.

$$H_{(TMT)} = - \sum_{I=1}^{I} P_i * (ln\ P_i) + C \qquad (3)$$

where: I = categories; P_i = fraction TMT in each category;
C = small constant (to maintain validity when $P_i = 0$)

A summary of how the individual underlying independent variables were converted to group level central tendency and dispersion variables is shown in Table 3 (Appendix). It should be noted that both the coefficient-of-variation and Teachman's index, by their nature, provide continuous functions that are normalized for sample size; thus meeting the standard requirements for scales and indices (Hagood, 1941; Jae-On & Rabjohn, 1980).

Conversion of the Index Components to a Common Scale

To calculate both the Demographic Heterogeneity Index (original data calculated as either coefficient of variation (Equation 2) or Teachman's Index (Equation 3)) and the Hofstede Cultural Index means (Equation 1), the first step was to re-scale the ten demographic and cultural variables to a 0 – 100 scale. Since the independent variable indices required the mathematical addition of the terms, re-scaling the variables allowed for their combination into respective indices without any re-scaled variable having an over-weighted effect on the numerical size of the index. The authors determined this procedure to be advantageous since the indices were to be further used in regression analysis and re-scaling was considered to be helpful in the avoidance of numerical bias. Importantly, the re-scaling technique does not change the relative position of the data points within their original ranges, nor does it change the distribution of the data within their ranges. The calculation used to convert the independent variables into re-scaled variables is shown in Equation 4:

$$\text{Re-Scaled Data Point} = RP = ((100/R) * DP) - (Min * (100/R)) \quad (4)$$

where: R = Original Data Range = (Maximum (Max) – Minimum (Min));
DP = Data Point within original range R

Evaluating the Statistical Power of the Study

Vasquez, Gangstead, and Henson (2000) discussed the importance of using a priori procedures for the estimation of effect size when planning multivariate regression analyses. Effect size estimates are required to determine the magnitude of the relationship between the independent variables and the dependent variables and are considered to be necessary, along with p-levels, in order to determine the practical significance of the co-variation. An effect size calculator was accessed on the internet (Soper, 2010) for the purpose of performing this estimate. Setting alpha = 0.05 (by convention), power = 0.8 (by convention), number of independent variables = 11 (not indexing the demographic heterogeneity or national culture variables, plus inclusion of the control variable), and sample size = 57 (number of companies in the sample) yielded an effect size of $f^2 = \sim 0.35$. This a priori effect size was considered to be high, meaning that there would need to be a strong co-variation between the 11 independent variables and the dependent variable to detect it using a sample size of 57. Alternatively, using the independent variable indices enabled multivariate regression involving only three independent variables (Demographic Heterogeneity Index, Hofstede Cultural Index, and the control variable) and, therefore, predicted detection of significant co-variation with an anticipated $f^2 = \sim 0.21$. Since this effect size was considered to be closer to a medium level, using fewer independent variables (via indexing) theoretically provided more assurance of detecting co-variation with a sample size of 57 banks from the 2006 Fortune Global 500 database. Given the theoretical and empirical underpinnings of the study, a medium a priori effect size was considered to be sufficient.

Calculating the Re-Scaled Indices

Upon the re-scaling of each of the ten original data points within their respective ranges, the demographic heterogeneity variables and the Hofstede cultural variables were summed to form two indices (Equations 5 and 6). A detailed discussion of index construction, to include the relative merits of averaging and aggregating the individual components is provided by Mitchell (1965, p. 68). According to Baur (1954), there are several methods of combining the index components. These include using sums, weighted sums, averages, weighted averages, averages of percentages, weighted averages of percentages, sums of deviations, and weighted sums of deviations. Review of previous empirical studies provided no evidence that any of the demographic or national culture index components, based on their relative influence on profitability, justified a differentiated weight in their respective composite indices. Therefore, an un-weighted summation was used. Once the two indices were constructed, validity and reliability were evaluated as discussed below.

The Demographic Heterogeneity Index is comprised of the individual re-scaled components of job-related demographic heterogeneity, summed to provide a total. Higher index values indicate higher levels of overall heterogeneity within any TMT.

$$\text{Re-scaled } HI_D = H_{\text{TMT Ten}} + H_{\text{Co Ten}} + H_{\text{Yrs Edu}} + H_{\text{Edu Special}} + H_{\text{Funct Special}} \quad (5)$$

where: HI_D = Demographic Heterogeneity Index

For the national culture index, re-scaled components of each Hofstede (2001) national culture dimension were averaged across each TMT, and then summed. The current authors hypothesized relationships between each of the national culture dimensions and the TMT processes of communication, collaboration, cooperation, risk taking and power sharing using the integrated theory of French (1956) and Deutsch (2001). Each individual component in the index was summed, or its reverse was summed according to the hypothetical relationships summarized in Table 2 (Appendix) and used for the derivation of equation 6.

Hypothesis 2a: When constructed as in Table 2 and Equation 6, the Hofstede National Culture Index will be negatively related to $\%\Delta PPA_{(2007\text{-}2009)}$ across the 2006 Fortune Global 500 banking companies.

$$\text{Re-scaled } I_H = LTO(REV) + PDI + IDV + MAS + UAI(REV) \quad (6)$$

where: I_H = Hofstede National Cultural Index;

$LTO(REV) = (100 – LTO)$; $UAI(REV) = (100 – UAI)$

DATA ANALYSIS

Descriptive Statistics and Composition of the Indices

The underlying study's data inclusion rate, by TMT member generic functional job description, is shown in Table 4 (Appendix). Table 4 and its associated note describe what percentages of the job-related demographic data and national culture data were available to be included in the indices. The two indices were calculated for each TMT and were saved for regression analyses. The descriptive characteristics of the Demographic Heterogeneity Index and the Hofstede National Culture Index are shown in Table 5 (Appendix). Figures 3 and 4 (Appendix) show histograms of the Hofstede National Culture and the Demographic Heterogeneity indices, superimposed with standard normal curves. The results of the regression analyses are shown in Table 7 (Appendix) and discussed below. Hypotheses 1, 2, and 2a were supported.

DISCUSSION

Zeisel (1957) recommended that validity, reliability, and overall usefulness of the calculated indices be examined as part of any research study. The current authors performed this examination to ensure that the indices measured what they were intended to measure, that they did so in a fashion that did not introduce bias or skew into the study, and that they met the requirements of linear regression. The results of the evaluation are presented here.

Validity

A social science index is considered valid if it measures the characteristic that it purports to measure (Baur, 1954; Hagood, 1941; Zeisel, 1957). There are two different types of validity approximations that can be made; the choice is dependent on the nature of the index. In the first case, when the index is composed of portions of the overall characteristic of interest, each individual component is said to have partial validity (Hagood, 1941). Classic examples, given by Baur (1954, p. 67) are crime indexes composed of various types of crimes (murder, larceny, and so forth) and their frequency of occurrence within certain localities. Balancing efficiency with accuracy, not all crime types are used in the index, but the most indicative are. The TMT Demographic Heterogeneity Index is an example of this index type, and it is typical of demographic indices used in other populations (Baur, 1954). To ensure the highest possible validity of the index representing the overall characteristic, it is incumbent on the researcher to select the most representative components. The current authors performed this selection based on a literature review of previous empirical TMT studies that related demographic variables to profitability. Smith et al. (1994) and Certo et al. (2006) identified statistically significant relationships between TMT members' corporate tenure, TMT tenure, years of education, educational background, and functional background and the dependent variable, corporate profitability. These two studies guided the inclusion decision to a large extent. The components of the Demographic Heterogeneity Index were highly job-related, and, therefore, were likely to be more influential on TMT performance (Pelled, 1996). Choosing job-related variables, that were previously shown to be related to a conceptually identical dependent variable, improved the likelihood that the Demographic Heterogeneity Index represented the characteristic of overall demographic heterogeneity. Importantly, to avoid index over-dilution, other readily available data such as sex and age of the TMT members were not included in the composite Demographic Heterogeneity index because these were (a) not found to have a significant relationship with profit measures in previous studies, and (b) were not assessed to be highly job related.

In certain types of indices, the components are not directly a part of the characteristic the index is designed to represent. An example, given by Baur, is a social well-being index, comprised of an "average of relative scores for income, housing, voting, education, health, and medical facilities" (1954, p.68). In cases such as this, past empirical results and researcher judgment play key roles in determination of validity, as do comparison with previously existing indices if they are available. The appropriate measure of validity for this type of index is called correlative validity (Hagood, 1941). Correlative validity is the applicable measure for national culture as determined by Hofstede's (2001) national culture dimensions. As with social well-being, there is no one all-inclusive measure of national culture, but rather it is up to the researcher to choose the best components for a valid overall index. The initial Hofstede Culture Index was composed of the five national culture dimensions that were derived empirically from very large, matched data sets, and have been shown to through numerous validations over the last several decades to rigorously describe national cultures. The choice of reversed or un-reversed cultural dimensions was determined by the presumed hypothetical relationship with TMT cooperation/competition and resultant percent change in profitability over time (see Table

2, Appendix). Of course, there are numerous ways to measure national culture, and there is variability within any particular measurement. Importantly, the attribution of overall national culture characteristics to individual executives contributes variability. Applying data at one level of analysis to another was termed by Hofstede as “ecological fallacy” (2001, p.16). While the authors acknowledge this source of variability, they followed established precedent (Geletkanycz, 1997; Jackofsky, Slocum Jr., & McQuaid, 1988) in assigning national level data to individual executives.

Reliability

The reliability of an index is determined by whether or not the index provides a measure of the chosen underlying characteristic in a consistent fashion. Accuracy of the sample data, to a large extent, determines the reliability of the resultant index. If the data are field measurements, they need to be gathered with consistent specification and without the introduction of researcher bias (Hagood, 1941). In the underlying study’s design, data accuracy was addressed by obtaining individual TMT member data directly from objective sources and/or by triangulating from multiple sources. According to Baur (1954), approximation of a normal curve is considered to be evidence of index reliability. The Demographic Heterogeneity Index and the Hofstede Cultural Index were approximately normally distributed (see Figures 3 and 4, Appendix) with similar variability (coefficients-of-variation were approximately = 0.2) and approximately the same data ranges (183 and 190 units respectively). Since the indices both contain data points that are relatively evenly and symmetrically spaced, the latent characteristic measurements of demographic heterogeneity and national culture can be considered reliable (Baur, 1954).

Usefulness for Intended Purpose

The indices met the requirements for linear regression. According to Norusis (2006), linear regression requires that independent and dependent variables are at least ordinal in nature, have a linear relationship to each other, contain independent observations, and have a normal distribution of dependent variable values for each value of the independent variable. Both indices constructed for the current study met these criteria. The indices were scalar in nature. They both had an approximately linear relationship with the dependent variable. TMT composition was unique for each corporation and independent of the compositions found in the remainder of the population. There were not sufficient dependent variable observations for each index value to determine the characteristics of the distribution, and this was a weakness in the study design, attributable to the limited sample size.

As expected, a statistically significant negative relationship (with medium effect size) between the Hofstede Culture Index and $\%\Delta PPA_{(2007\text{-}2009)}$. Also found was a congruent significant negative correlation between the Hofstede National Culture Index and the control variable, $\%\Delta PPA_{(2004\text{-}2006)}$. This was true despite no significant statistical relationship being found between the control and dependent variables. The current authors found weakly negative, non-significant relationships between job-related heterogeneity and change in profitability over both time periods. Thus, the hypothesis that national culture variables would provide superior explanation for profit change in the international sample was supported. Unexpectedly, the use of the two indices also allowed for the discovery of a strong relationship between demographic heterogeneity and national culture in the current study’s population. The relationship between demographic heterogeneity and national culture is discussed in Gerecke and House (2012b). All of these relationships are quantified in Table 7 (Appendix).

IMPLICATIONS FOR FUTURE RESEARCH

Using the Hofstede Index for Future TMT Investigations

While the Hofstede National Culture Index is predictive of profit change in the current study, it can be improved for future use. Although not fully anticipated in advance, the underlying study revealed significant actual effect sizes between individual Hofstede dimensions and the dependent variable (LTO: 0.427, p=0.001; PDI: 0.385, p=0.003; IDV: -0.328, p=0.013; MAS: -0.316, p=0.017). Therefore, it is proposed that a Revised Hofstede Cultural Index be explored to predict levels of TMT member cooperation, integration, and the corresponding extent of process leakage. The Revised Hofstede Cultural Index is shown in Equation 7 below. PDI has been reversed; the actual data showed that high values of PDI led to favorable changes in profitability. UAI has been eliminated as it did not correlate with profit change in the underlying study. These findings are congruent with those found by others (Smith, Houghton, Hood, & Ryman, 2006; Hsu & Huang, 2011). Some of the index components showed stronger relationships, with less error probability, when correlated to the dependent variable. Although this was the case, additional studies will be needed to determine if the coefficients of the index should be weighted. As with the original Hofstede Cultural Index, low values of the index, indicating cultural propensity for high cooperation, high integration, and low process leakage, are expected to be correlated with higher levels of profit over time (Hypothesis 2a).

$$I_{(H(revised))} = LTO(REV) + PDI\ (REV) + MAS + IDV \qquad \text{Eq. 7}$$

where: $I_{(H(revised))}$ = Revised Hofstede Cultural Index

$LTO(REV) = 100 – LTO$; $PDI(REV) = 100 – PDI$

The data in Table 7 (Appendix) demonstrate that the revised index is likely superior to the original index in its ability to predict profitability changes over time. The revised index maintained its correlation with the Demographic Heterogeneity Index, and, as expected, improved its correlation with $\%\Delta PPA_{(2007\text{-}2009)}$. Notably, the revised Hofstede Cultural Index also improved the correlation between national culture and the control variable, $\%\Delta PPA_{(2004\text{-}2006)}$.

One expected criticism of the Revised Hofstede Cultural Index is that different combinations of index component scores can lead to an identical composite index score. While this is mathematically true of all indices, the Revised Hofstede Cultural Index components are inter-correlated (see Table 6, Appendix), and therefore, they generally do not move independently of each other within this index. In fact, three of the four index components (PDI-LTO, PDI-IDV, and IDV-LTO) were shown to be inter-correlated in the current underlying study with directionally congruent inter-correlations found by Hofstede (2001) across a variety of country and region subsets. No inter-correlations with MAS were found in the current study, and Hofstede only noted MAS correlations with other cultural dimensions in poorer countries. The current study used TMTs working within very large, global banks as its population. These banks tended to be from relatively wealthy countries, and their TMTs tended to have nationalities aligned with those countries. The Revised Hofstede Cultural Index will likely show different correlations with profit change when applied across different populations. That being said, PDI-LTO, PDI-IDV, and IDV-LTO maintain their directional inter-correlation patterns across all reported country sub-groupings. Therefore, there exists substantial motivation to experiment with the index to see if it is directionally predictive of TMT cooperation, integration, and profitability using other populations. Index construction can/should be an empirically iterative process.

CONCLUSIONS

In the current underlying demographic TMT study, indexing both job-related demographic heterogeneity and national cultural data allowed for a greater a priori effect size using a not atypically small TMT sample size. With greater statistical power, the indices enabled the discovery of information about the relationship between demographic heterogeneity and national culture and also about their confluent relationship with the dependent and control variables of interest, change in profitability over time. The constructed indices were determined to be valid, reliable, and fit for regression analysis. It is recommended that future TMT demographers consider indexing as an approach for improving the ability to detect overall effects of co-variation in their studies.

As expected, TMT national culture demographic variables provided significantly more explanatory power with the current international population than did job-related demographic variables in the current study. This is due to national culture's ability to provide deep information about the values and beliefs likely to be manifested in TMT interrelationships and the quality of decisions that result from those relationships. Future studies are required in order to generalize these findings. It is possible that the Revised Hofstede Cultural Index may generally provide meaningful insight involving TMT communication, collaboration, conflict resolution, power sharing, strategic decision making, and/or overall business results.

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APPENDIX

Tables and Figures used in the Article

Table 1. Non-random listing of TMT studies.

Demographic TMT Study Citation	Number of TMTs Included
Norburn & Birley (1988)	150
Mitchel and Hambrick (1992)	123
Wiersema & Bantel (1992)	87
Smith, Smith, Sims Jr., O'Bannon, Scully, & Olian (1994)	53
Wiersema & Bird (1994)	40
Amason (1996)	45
West & Anderson (1996)	27
West & Schwenk (1996)	65
Corner & Kiniki (1997)	50
Hitt, Dacin, Tyler, & Park (1997)	199
Iaquinto & Fredrickson (1997)	65
Amason & Moody (1999)	44
Knight, Pearce, Smith, Olian, Sims, Smith, & Flood (1999)	76
Barsade, Ward, Turner, & Sonnenfeld (2000)	62
Higgs (2006/2007)	54
Barrick, Bradley, Kristof-Brown, & Colbert (2007)	94
Lankau, Ward, Amason, Ng, Sonnenfeld, & Agle (2007)	31
Hsu & Huang (2011)	198
Carpenter & Fredrickson (2001)	300
Carpenter (forthcoming)	247

Note: Number of studies = 20; average number of TMTs included = 101 with standard deviation = 78.

Table 2. The hypothetical relationship between social science theory, national culture, and the TMT processes of communication, cooperation, collaboration, risk taking, and power sharing.

Integrated Theory of French (1954) and Deutsch (2001) and relationship to group process	Hypothetical relationship of Hofstede's national culture dimensions with group processes	How individual cultural dimensions are summed to create the Hofstede National Culture Index (I_H)
Cooperative environments are characterized by: - effective communication - friendliness, helpfulness - coordination of effort - information sharing - high trust - common values	Low power distance (PDI) has been related to independent thinking, consultative decision making, and open information sharing (Hofstede 1984; 2001)	Calculated using TMT average re-scaled PDI
- constructive conflict - comparison to norms Cooperative environments lead to: - shared power structures - bi-directional communication - low hierarchy	High uncertainty avoidance (UAI) cultures innovate within established limits, are involved in operations and strategy, and make decisions using cooperative fact-based debate (Hofstede, 2001)	Calculated using (100 – TMT average re-scaled UAI)
- fast decision making - high consensus levels Competitive environments are characterized by: - imposed solutions - individual power	Low individualism (IDV) cultures believe success comes from trust, information sharing, strong co-worker alliances, and collective decision making (Hofstede 1984; 2001)	Calculated using TMT average re-scaled IDV
- coercive influence - emotional conflict - win/lose confrontations - comparison with members Competitive environments lead to: - unbalanced power	Low levels of masculinity (MAS) favor cooperative working environments, compromise, and negotiation. (Hofstede, 2001)	Calculated using TMT average re-scaled MAS
- slow communication - layered hierarchy - slow decisions - slow or no consensus	High levels of long-term orientation (LTO) favor cooperation and mutual support (Hofstede, 2001)	Calculated using (100 – TMT average re-scaled LTO)

Note 1: Cooperative environments are hypothesized to lead to effective TMT processes and more effective strategic decision making (Hypothesis 1).
Note 2: As constructed for this study, low I_H was hypothesized to lead to positive change in profitability from 2007-2009 (Hypothesis 2a).

Table 3: Summary of variable conversions for central tendency and dispersion.

TMT Member Variable Name	Variable Type	Measure of Central Tendency for TMT	Measure of Dispersion for TMT
TMT tenure (years)	Scale	Mean	Coefficient of Variation
Company tenure (years)	Scale	Mean	Coefficient of Variation
Education (years)	Scale	Mean	Coefficient of Variation
Educational specialization	Category	Mode	Teachman's Index
Functional specialization	Category	Mode	Teachman's Index
Long-Term Orientation (LTO)	Scale	Mean	Coefficient of Variation
Individualism (IDV)	Scale	Mean	Coefficient of Variation
Masculinity (MAS)	Scale	Mean	Coefficient of Variation
Power-Distance (PDI)	Scale	Mean	Coefficient of Variation
Uncertainty Avoidance(UAI)	Scale	Mean	Coefficient of Variation

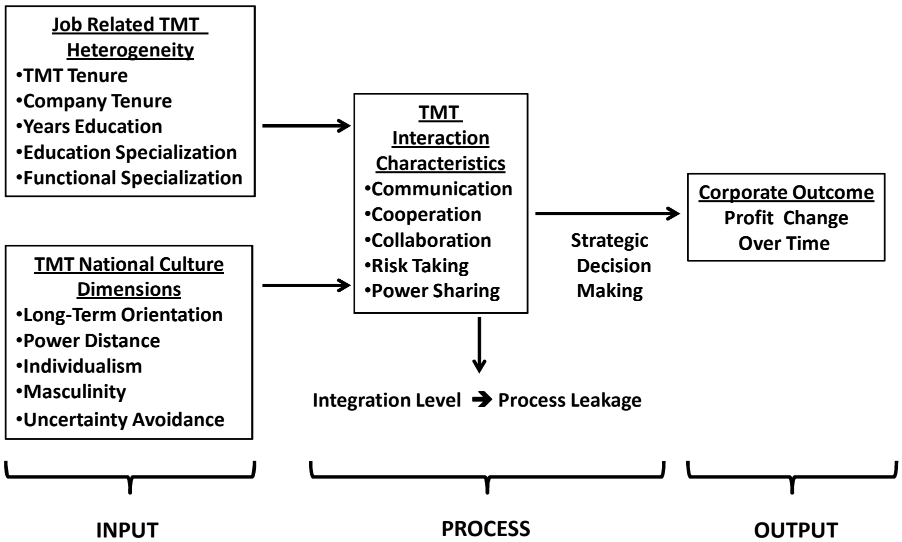

Figure 1. Input-Process-Output TMT demography model that was used as the framework for the underlying study.

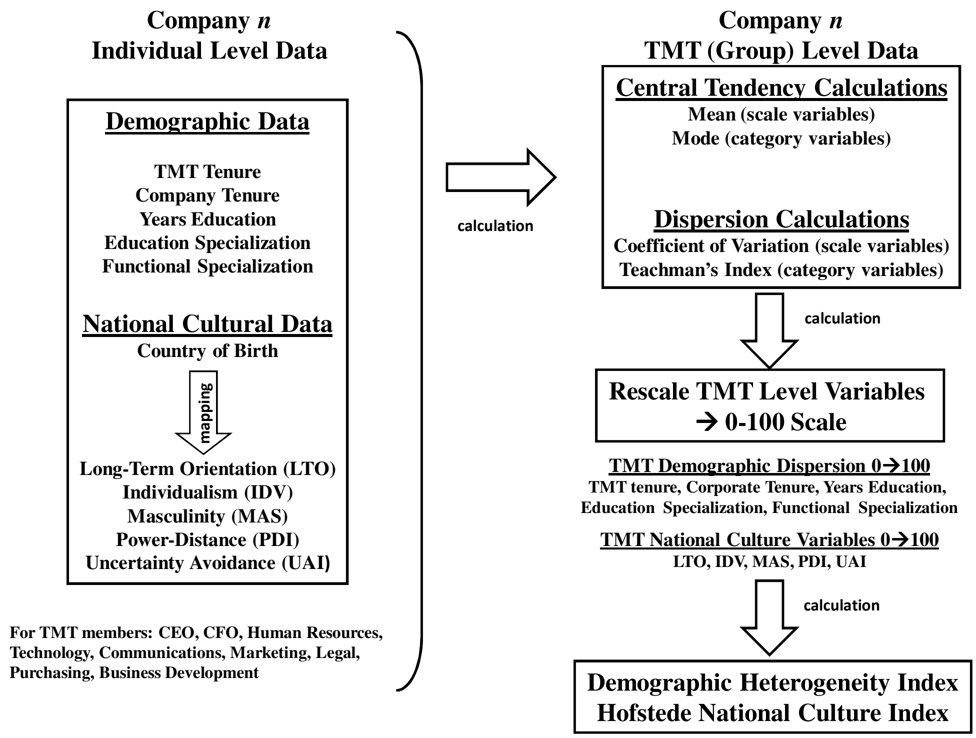

Figure 2. Creation of TMT indices through the conversion of individual level demographic and cultural data to TMT level data

Table 4. Means, Standard Deviations, Minimums and Maximums for *2006 Fortune Global 500* Banking Companies' TMT-Level Data Inclusion Rates in the Underlying Study (Gerecke & House, 2012a)

TMT Position Title	Mean%	SD%	Min%	Max%
CEO	98	8	50	100
CFO	93	19	10	100
HR	84	29	0	100
Technology	71	40	0	100
Communications	52	43	0	100
Marketing	62	41	0	100
Bus Dev	72	39	0	100
Legal	81	34	0	100
Total Company	80	16	35	100

Note: There were 439 named TMT members in the 2006 Fortune Global 500 database for the 57 banks listed. Of the possible 4560 data points in the study, 3637 were collected and included. The total company inclusion rate for demographic data was 80% with SD = 16%; the company inclusion rate for cultural data was 80% with SD = 20%.

Table 5. Descriptive statistics for the Demographic Heterogeneity Index and the Hofstede Cultural Index for the 57 TMTs in the *2006 Fortune Global 500* banking industry

Variables	Mean	SD	Min	Max	Range
Demographic Heterogeneity Index	175.1	42.2	71	261	190
Hofstede Cultural Index	292.2	45.3	173	356	183

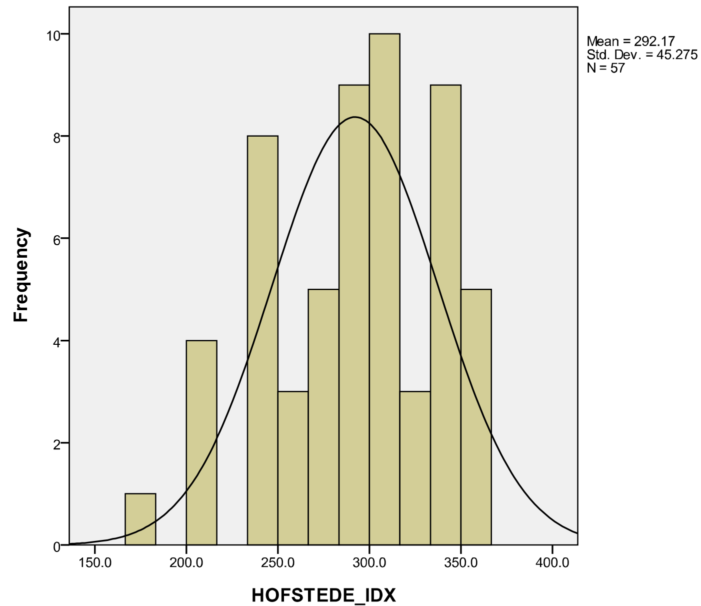

Figure 3. Histogram of the Hofstede Cultural Index superimposed with standard normal distribution curve.

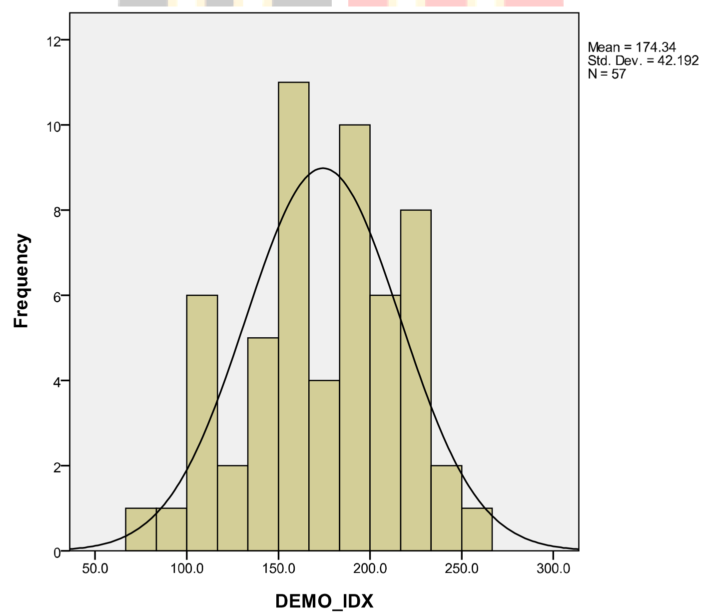

Figure 4. Histogram of the Demographic Heterogeneity Index superimposed with standard normal distribution curve

Table 6. The statistically significant relationships (Pearson's r values) reported among the national cultural dimensions used to compose the Hofstede National Culture Index (I_H) and the Revised National Culture Index ($I_{H(revised)}$) in the current study

National Culture Dimension Inter-Correlations	Mean of TMT Values from Underlying Study (Gerecke & House, 2012a)	As reported by Hofstede (2001, p.63 & p.357)[a] [relevant dataset in brackets]
PDI-LTO	0.762**	0.72^{++} [11 wealthier countries]
PDI-IDV	-0.756**	-0.68^{+++} [53 countries & regions] -0.77^{+++} [20 countries] -0.88^{+++} [11 wealthier countries]
IDV-LTO	-0.902**	-0.77^{++} [11 wealthier countries]
MAS-PDI		0.72^{+} [9 poorer countries]
PDI-UAI	-0.359**	-0.71^{+} [9 poorer countries] 0.28^{+} [40 countries] 0.63^{++} [22 wealthier countries]
IDV-UAI		-0.33^{++} [53 countries & regions] -0.69^{+++} [22 wealthier countries]
MAS-UAI		-0.47^{++} [31 poorer countries & regions]

[a] Adapted from Culture's Consequences (2nd ed.), Copyright 2001 by Geert Hofstede.
Note 1: ** Correlation is significant at the 0.01 level (2-tailed)
Note 2: $^{+}$ denotes p=0.05; $^{++}$ denotes p=0.01; $^{+++}$ denotes p=0.001, according to Hofstede (2001)

Table 7. Relationships among the Demographic Heterogeneity Index, the Hofstede National Culture Index, The Revised Hofstede National Culture Index, Percent Change in Profitability as a Percentage of Assets (2004-2006), and Percent Change in Profitability as a Percentage of Assets (2007-2009) as calculated for the 57 TMTs in the 2006 Fortune Global 500 banking industry

Variables	%ΔPPA (2004-2006)	HI_D	I_H	$I_{H(revised)}$
Change in Profitability as a Percentage of Assets from 2004 through 2006 (%ΔPPA$_{(2004\text{-}2006)}$)				
Demographic Heterogeneity Index (HI_D)	-0.249 (0.062)			
Hofstede National Culture Index (I_H)	-0.299* (0.024)	0.499** (< 0.001)		
Revised Hofstede National Culture Index ($I_{(H(revised))}$)	-0.404** (0.002)	0.493** (< 0.001)	0.905** (< 0.001)	
Change in Profitability as a Percentage of Assets from 2007 through 2009 (%ΔPPA$_{(2007\text{-}2009)}$)	0.053 (0.696)	-0.197 (0.142)	-0.351** (0.008)	-0.471** (< 0.001)

Note 1: Index variables are calculated for the 57 TMTs in the 2006 *Fortune Global 500* Index banking companies at a group level. Probabilities are shown in parentheses beneath each associated correlation. ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed)

Note 2: $\%\Delta PPA_{F\text{-}I} = \frac{(PPA_F - PPA_I)}{|PPA_I|} * 100$