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The selection, use, and reporting of control variables in international business research: A review and recommendations

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ABSTRACT

This study explores the selection, use, and reporting of control variables in studies published in the leading international business (IB) research journals. We review a sample of 246 empirical studies published in the top five IB journals over the period 2012–2015 with particular emphasis on selection, use, and reporting of controls. Approximately 83% of studies included only half of what we consider Minimum Standard of Practice with regards to controls, whereas only 38% of the studies met the 75% threshold. We provide recommendations on how to effectively identify, use and report controls in IB studies.

1. Introduction

Control variables (CVs) constitute a central element of the research design of any empirical study. Confounding variables are likely to covary with the hypothesized focal independent variables thus limiting both the elucidation of causal inference as well as the explanatory power of the model (Stone-Romero, 2009; Pehazur & Schmelkin, 1991). Therefore, researchers must seek to rule out threats to valid inferences in order to determine to what extent the focal independent variables behave as hypothesized. This is typically done by including (controlling for) extraneous variables that are deemed theoretically (or empirically) important but are not focal variables of the study (Kish, 1959). The literature sometimes refers to such variables as covariates, confounding variables, nuisance variables, control variables or simply controls (Atinc, Simmering, & Kroll, 2012; Breaguh, 2008). Researchers need to account for these variables either through experimental design (before the data gathering) or through statistical analysis (after the data gathering process). In this way the researchers are said to account for their effects to avoid a false positive (Type I) error (i.e. falsely concluding that the dependent variables are in a causal relationship with the independent variable). Inadequate attention to controls is a major threat to the validity of inferences made about cause and effect (internal

validity).¹

One way of controlling by inclusion is to use a matched-group design where particular entities (e.g., state-owned and privately owned firms) that vary in terms of independent and dependent variables are matched on specific criteria (Estrin, Meyer, Nielsen, & Nielsen, 2016). An alternative way of controlling is exclusion by holding particular variables constant, such as limiting a study to emerging market firms only (Buckley, Elia, & Kafouros, 2014). Yet the most common way to control for extraneous influences is via statistical controls. Statistical controls aim at identifying potential sources of influence during study design and including CVs representing these sources of influence during data collection. During data analysis, researchers then control for these extraneous effects by mathematically partialling out variance associated with CVs in calculating relationships between other variables, thereby reducing the risk of Type II errors (Carlson & Wu, 2012; Spector, Zapf, Chen, & Frese, 2000). In this study we focus on IB research that includes statistical controls as non-hypothesized variables in regression type studies.

When regressing for instance firm performance (or entry mode) on other variables, IB researchers attempt to establish which specific variables influence the prediction and which do not. This is typically done by considering whether each variable's contribution remains

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¹ We note that causal inferences in IB studies are difficult to make and point to the excellent Editorial in JIBS by Reeb and colleagues (Reeb, Sakakibara, & Mahmood, 2012) on endogeneity in international business research for recommendation as to how to best approximate randomized-controlled experiments.

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statistically significant after controlling for other predictors. In multiple regression, when the coefficient of a predictor variable differs significantly from zero, most scholars conclude that this variable makes a “unique” contribution to the outcome. CVs are assumed to be confounding, that is, producing distortions in observed relationships. For this reason, researchers typically clearly assign some variables as being merely controls, or variables of no particular theoretical interest, that need to be somehow removed in their effects on the study. While statistical controls *are* able to adjust relationships between variables for the action of other variables, this ability is based on certain implicit assumptions about the underlying role of control variables on either the observed measures or the underlying constructs of interest. More generally, the argument seems to be that we decrease the aggregate bias for every additional relevant variable that we include. The inefficiency part of the equation is, however, rarely mentioned, as control variables often do have real effects. Yet, the mathematics of regression analysis do not support the argument that more variables in a regression, even relevant ones, necessarily makes the regression results more accurate (Clarke, 2005). In fact, even small amounts of measurement error in control variables “are magnified as more variables are added to the equation in an attempt to control for other possible sources of bias.” (Griliches, 1977: 12).

Control variables are of extreme importance in econometric analyses for a number of reasons. First, the variables included in the analysis drive the results of any statistical analysis of data. Hence, the improper use (inclusion or exclusion) of CVs may distort results and produce misleading findings. Similar to any other variable included in a model (e.g., any predictor or criteria variable), decisions regarding which controls to include affect the significance levels and estimated effect sizes of the other variables. Second, replication and generalizability of results cannot be done without specific knowledge of which factors were controlled, the measurement of these controls, and the specific method utilized for controlling. Finally, inadequate justification and reporting of controls render any extension difficult. This includes meta-analyses, which cannot be conducted on studies where controls are unknown, unjustified, or measurement and descriptive statistics are not reported. In order to advance IB research and build a cumulative body of knowledge about certain phenomena, the correct selection, inclusion and treatment as well as documentation and reporting of CVs is critical since controls often serve as inspiration for new studies of relationships (i.e., as potential moderators/mediators, IVs or even DVs).

We build upon insights from previous articles on the role of control variables in social science research (e.g., Atinc et al., 2012; Becker, 2005; Becker et al., 2015; Bernerth & Aguinis, 2015; Breaugh, 2006; Carlson & Wu, 2012; Spector & Brannick, 2011). These studies document the (mis)use of control variables in social science research by analyzing how published work in the top tier management and organizational psychology journals have treated controls inadequately. To the best of our knowledge, however, this is the first comprehensive review of the selection, use, and reporting of control variables in IB research (also see Aguinis, Cascio, & Ramani, 2017). As such, we join an important (recent) conversation within the IB research community which calls for more attention to both methodological rigor in empirical testing and preciseness in presentation and reporting of results (e.g., Andersson, Cuervo-Cazurra, & Nielsen, 2014; Ahlstrom, 2015; Cortina, Köhler & Nielsen, 2015; Cuervo-Cazurra, Andersson, Brannen, Nielsen, & Reuber, 2016; Kingsley, Noordewier, & Bergh, 2017; Welch & Piekkari, 2017).

IB research is particularly vulnerable to issues arising from poor treatment in terms of selection, analysis and reporting of control variables due to its complex and multi-disciplinary nature, often spanning multiple countries and contexts (Aguinis et al., 2017; Cuervo-Cazurra et al., 2016). IB studies involve phenomena where country level context (e.g., institutional or cultural) often play a decisive role as boundary conditions for theory development. In fact, what sets IB studies apart from more general strategy, management or organizational research is

the cross-border (international) business context in which actors (individuals, teams, firms or even industries) act and interact (Zaheer, Schomaker, & Nachum, 2012). This international context has important implications for use of control variables as it helps establish the boundaries of applicability surrounding a particular empirical argument and rule out alternative or confounding explanations of findings (Teagarden, Von Glinow, & Mellahi, 2018). As noted by Cho and Padmanabhan (2005: 309) “no international business study can be complete unless there is an explicit variable controlling for cultural distance.”

This study seeks to investigate the state-of-the-art of treatment of control variables in IB studies. For comparison reasons, we focus on specific issues pertaining to the selection, use and reporting of control variables studied previously, but re-interpret these in terms of specific importance to IB research. Together with our concrete recommendations, this approach is intended to provide IB scholars with a comprehensive yet easy to follow guide to improve their treatment of control variables. In addition, we specifically examine the treatment of country level, contextual variables as controls in IB research, and recommend ways to improve practice with regards to such controls.

We start by introducing our sample and method followed by a thorough analysis of the current CV use and reporting in 246 empirical articles published in the top five IB journals during the period 2012–2015. We compare and contrast the use of controls both between the five IB journals and with result from previous studies in other fields. Based on our findings, we provide a set of recommendation to guide future authors, reviewers and editors toward a more consistent and accurate way of controlling for extraneous variables in IB research.

2. Method

2.1. Selection of articles

In an attempt to be comprehensive, we coded all empirical articles published in five top IB journals over the period 2012–2015 with regards to the use and reporting of controls. Given our focus on use and reporting of statistical extraneous CVs,² we did not evaluate non-empirical studies, editorials or research forums, qualitative studies, simulations or experimental studies. To further ensure clarity and comparability, we omitted longitudinal panel data studies and studies using SEM, GMM, multilevel, 3-stage least square, meta-analysis or other methods where use of control variables is less equipollent. We also omit studies where the use of control variables could not easily be discerned from information provided, including studies with no correlation table and articles with no control variables at all. In articles that reported multiple studies with different controls (often as robustness checks), we focused on the primary test of hypotheses and thus treated it as a single article. Our final sample consisted of 246 articles published in *Journal of World Business* (JWB – 54 articles), *Journal of International Business Studies* (JIBS – 44 articles), *Journal of International Management* (JIM – 34 articles), *Management International Review* (MIR – 35 articles), and *International Business Review* (IBR – 79 articles).

2.2. Coding of articles

Building on insights from prior research on controls in empirical research, we developed a coding scheme designed to identify both

² Achieving appropriate statistical control depends on the researcher’s intent; different objectives such as a) “purification” of relationship between variables, b) estimating a “controlled” relationship between two variables that accounts for the effects of other meaningful variables, or (c) determining the “incremental” contribution that a variable makes to the prediction of a DV after the effects of other variables have been considered may require different types of information and analytical strategies (Carlson & Wu, 2012; Conger & Jackson, 1972). Where appropriate, we discuss these differences in relation to our recommendations.

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