



## Relating alternative forms of contingency fit to the appropriate methods to test them

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### ABSTRACT

At the core of contingency theory, a major theory in management accounting, is the concept of fit. We critically discuss forms of fit as presented in overview articles from the management accounting field, highlighting forms of fit that have not appeared in prior overview articles (matching fit with hetero-performance on the fit line and/or asymmetric effects of mis-fit on performance). We also address some confusing arguments in the literature concerning the moderation form of fit and what has been referred as the mediation form of fit. In a second step, we reevaluate the appropriateness of statistical techniques used to test sub-forms of fit, highlighting the difficulties in differentiating conclusively between them. Specifically, we present polynomial regression analysis (PRA) in conjunction with the response surface methodology (RSM) as a powerful methodological alternative and discuss its ability to differentiate between the sub-forms of fit. We also discuss the strengths and weaknesses of structural equation modeling (SEM) to test for forms of fit.

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### 1. Introduction

Contingency theory is a major theory in management accounting research (Chenhall, 2003; Fisher, 1995; Franco-Santos et al., 2012). Much of the contingency work in management accounting evaluates the impact of states of misfit on performance based on the matching, moderation, or mediation form of fit (Gerdin and Greve, 2004, 2008). The challenge for researchers is to theoretically derive and properly test the predicted form of fit. Failure to accept a true form or reject a false form of fit severely impedes the advancement of theory-consistent management accounting knowledge (Luft and Shields, 2003). Hartmann and

Moers (1999, 2003) made a first important step addressing issues related to the mismatch between verbal statements of hypotheses in management accounting research and the use of moderated regression analysis (MRA). More recently, Gerdin and Greve (2008) discussed the suitability of different techniques to test contingency theory's forms of fit, calling for hypothesizing and testing more specific sub-forms of fit. Building on their research, we address several remaining ambiguities regarding how to conduct contingency research. These ambiguities are related to both specific sub-forms of fit and the power of the methods to test them. Our aim is to reinforce the theoretical and methodological ground of future contingency-driven studies in management accounting.

Adequate theoretical progress relies on empirical methods that are able to discriminate between different forms of fit so that they allow "(...) coming up with the most likely story by eliminating alternative explanations" (Hartmann and Moers, 2003, p. 808). Our review of recommendations

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and practices in management accounting reveals a number of unsettled issues related to the theorizing and testing of contingency hypotheses. After addressing the sub-forms of fit, we discuss the appropriateness of various methods to conclusively test for them.

First, we compare different classifications of forms of contingency fit. We find that some forms of fit that have been discussed and tested in management accounting literature do not belong to contingency theory (mediation form of fit) while others have not been addressed (contingency theory's matching form of fit with hetero-performance on the fit-line (Donaldson, 2001) and/or with asymmetric effects of mis-fit on performance (Klaas and Donaldson, 2009)).

Second, we evaluate the main methods discussed in the literature for testing contingency theory predictions based on matching and moderation forms of fit. We build on the work of Gerdin and Greve (2008), who discuss the appropriateness of various methods to test sub-forms of fit but take a more critical view. We find specifically that the traditional approaches used to test matching forms of fit are at high risk of reaching incorrect conclusions. We explain why these methods may either not be powerful enough to detect existing matching forms of fit or may even lead to erroneous acceptance of such a form of fit when the null hypothesis or another form of fit is reflected in the dataset instead. We propose that extending moderated regression analysis (MRA) to polynomial regression analysis (PRA) and using response-surface methodology (RSM) offers a powerful alternative to testing for matching form of fit hypotheses (Edwards, 2007). We point to the increasing relevance of this approach in the organizational behavior field, where its use has been the basis for considerable theory progress.

Third, we address misconceptions regarding how to best test and interpret moderation forms of fit. We challenge the view that the moderator (contingency) variable and the independent variable (e.g., management control systems) should not be conceptually related (and hence correlated). In this regard, previous studies have discussed the possibility that a path model may instead be the correct alternative (Duh et al., 2006; Gerdin, 2005a; Gerdin and Greve, 2004; Hartmann and Moers, 2003; Shields and Shields, 1998). Referring to such arguments, Gerdin and Greve (2004) argue that if the moderator (contingency) and the independent variables are conceptually related and hence significantly correlated, a statistically significant moderation effect should be ignored and a *mediation form of fit* model should be tested instead. In contrast, we argue that contingency theory implies that, in the long run, the contingency variable is associated with the independent variable (so-called *selection forces*) (Donaldson, 2001; Meilich, 2006). Therefore, these variables are likely to be conceptually related and hence significantly correlated. We outline that statistically significant moderation effects should be interpreted and that any path model with performance as the dependent variable is outside the scope of contingency theory.

To corroborate our argument, we perform a Monte Carlo simulation. We find that if the moderation form of fit is ignored (because moderator and independent variable are related) and a mediation form of fit model is tested instead,

true moderation forms of fit will be rejected in up to 100% of cases, and false mediation form of fit models will erroneously be accepted.

In this context, we also address Hartmann and Moers (2003, p. 808) legitimate conjecture that there is a risk associated with accepting a spurious moderation effect if the moderator and independent variable are strongly related. However, when extending moderated regression analysis (MRA) to PRA, thereby adequately controlling for non-linear relationships, this risk is substantially reduced, allowing the moderation form of fit to be interpreted (MacCallum and Mar, 1995). We also address misconceptions in the management accounting field about how to probe for interaction effects in order to differentiate between sub-forms of moderation fit.

Fourth, we provide recommendations on the possibilities of covariance-based structural equation modeling (SEM) to test contingency-based hypotheses and address issues related to avoiding the risk of using these techniques inappropriately (Henri, 2007). Particularly in the context of testing moderating effects and quadratic effects, these advanced statistical techniques can decrease the number of type I and type II errors if applied correctly. Conversely, they *increase* the risk of such errors considerably if applied inappropriately. We contribute to the contingency literature by making researchers in the management accounting field aware of when to use (or not use) a specific SEM approach to test for matching and moderation forms of fit.

The paper proceeds as follows: Section 2 provides an overview of different forms of contingency fit. Section 3 re-evaluates the main methods of testing fit discussed by Gerdin and Greve (2008) and extends the discussion to residual analysis and PRA. Section 4 provides an overview of SEM techniques and discusses when to use them to test contingency hypotheses. Section 5 summarizes the findings and concludes.

## 2. Forms of contingency fit and their implications for performance

In the 1960s, contingency theory emerged as an important organizational theory that views the organization as an open system for which no general optimal structure exists. Instead, external and internal context factors such as size, the company's technology or the competitive environment determine the optimal design of an organizational structure (see Schoonhoven, 1981, for an early discussion). However, contingency theory is properly viewed more as a meta-theory or a general idea than as a conventional theory with a precise set of interrelated propositions (Schoonhoven, 1981). Applying the idea that no general optimal structure exists in the management accounting context, researchers have argued that there is no optimal design of a management control system (MCS)<sup>1</sup>; instead, contingency factors such as size, technology, environmental uncertainty or strategy determine the specific optimal

<sup>1</sup> We follow Chenhall's (2003, p. 129) definition of MCS as encompassing management accounting systems (e.g., cost accounting systems) but also including controls such as personal or clan controls.

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