

Partial Least Squares Structural Equation Modeling IV

Mediation and moderation

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Outline

- 1 Introduction
- 2 Mediation
- 3 Moderation
- 4 R example

Outcome

This lecture will help you to understand

- ▶ The basic concepts of mediation and moderation
- ▶ How to perform a mediation and moderation analysis
- ▶ Understand how to interpret the results of a mediation and moderation analysis

Advanced analyses

- ▶ SEM models in general and hence PLS-SEM allow for several advanced analysis possibilities
- ▶ Mediation and moderation are two of the most profound examples
- ▶ Mediation is not available in plain vanilla regression but only for the more complex models we study
- ▶ Moderation is also known in regression analysis (based on simple/naive measurement models)

Mediation – overview I

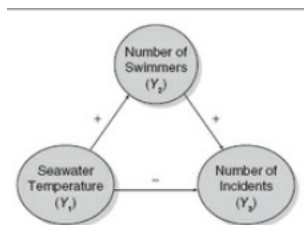


Figure: Simple analyses might lead to wrong conclusions. (Source: Hair et al. 2022)

- ▶ Simple data exploration might lead to false conclusion – use theory and logical reasoning

Mediation – overview II

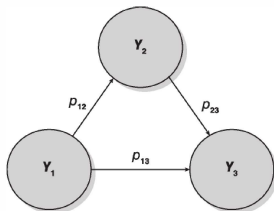


Figure: Fig 7.1

- ▶ A mediation occurs when a third variable, referred to as a mediator variable, intervenes between two related constructs
- ▶ Y_2 is a mediator in the relationship between Y_1 and Y_3
- ▶ $p_{12} \cdot p_{23}$ is the indirect of Y_1 on Y_3
- ▶ p_{13} is the direct effect of Y_1 on Y_3
- ▶ $p_{12} \cdot p_{23} + p_{13}$ is the total effect of Y_1 on Y_3

Mediation – procedure

► The mediating analysis procedure

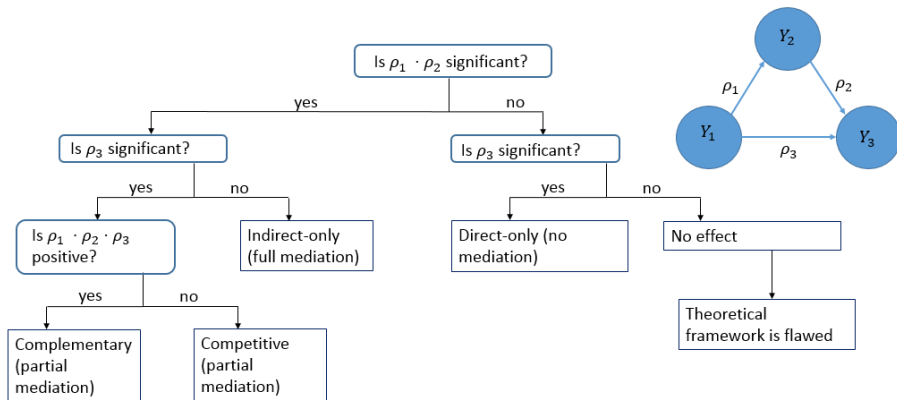


Figure: Fig 7.2

Mediation – multiple mediation

- ▶ Individual mediating effect: Effect through one mediator (e.g. $p_1 \times p_2$)
- ▶ Serial mediating effect: Effect through several mediators (e.g. $p_1 \times p_6 \times p_5$)
- ▶ Joint mediating effect (or total indirect effect): Effect through all mediators (e.g. $p_1 \times p_2 + p_4 \times p_5 + p_1 \times p_6 \times p_5$)

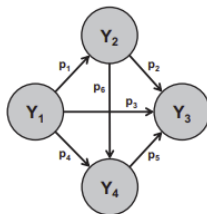


Figure: Fig 7.3

Moderation – overview

- ▶ A moderator variable changes the strength or the direction of a relation between two constructs. Accounts for heterogeneity in the data
- ▶ A priori hypothesis about the data: Is it some specific relation that is influenced by the moderator variable (interaction effect), or is it the entire model (multigroup analysis)?
- ▶ Moderators can be single variables or constructs measured either formatively or reflectively
- ▶ Can be categorical variables, e.g. the strength of the relation between satisfaction and loyalty could depend on gender. Most often used in multigroup analysis
- ▶ Can be continuous variables, e.g. the relation between satisfaction and loyalty is influenced by the level of income

Moderation II – implementation

- ▶ We must add both the moderator and an interaction term to the model describing the endogenous construct

$$Y_2 = \rho_1 Y_1 + \rho_2 M + \rho_3 (Y_1 M) + \varepsilon$$

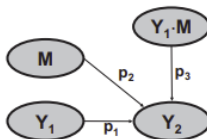


Figure: Fig 8.3

Moderation – how to create the interaction term

- ▶ Two-stage approach
 - ▶ If moderator and/or exogenous constructs are formative
 - ▶ If moderator and exogenous construct are reflective and the goal is to reveal significance of the moderating effect
- ▶ Orthogonalizing approach
 - ▶ Only use when moderator and exogenous construct are reflective
 - ▶ The goal is to minimize estimation bias of the moderating effect or to maximize prediction
- ▶ Product indicator
 - ▶ Generally not recommended

Moderation – two-stage approach

- ▶ Creating the interaction term using the two-stage approach involves
 1. Estimate the model without the interaction term (but with the moderator variable)
 2. Create the interaction term by multiplying the latent variable scores of the exogenous and the moderator latent variable. Use all latent variables scores as single indicators and run the estimation again

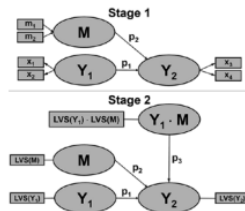


Figure: Fig 8.4

Moderation – evaluation and interpretation

► Model evaluation

- The moderator variable must meet all relevant measurement model criteria
- The interaction terms measurement model should not be evaluated (can be viewed as an auxiliary measurement which does not stem from a specific conceptual domain)

► Results interpretation

- Conclude we have moderation if the interaction term have a significant effect
- Product indicator or two-stage approach: Effect ρ_1 is considered a simple effect (the effect of the exogenous variable when the moderator is 0). Thus, standardization of the moderating effect facilitates interpretation.
- When using the orthogonalizing approach then ρ_1 in a model without interaction is almost identical to ρ_1 in a model with interaction

Corporate reputation model – mediation and moderation

► Mediation

- *CUSA* fully mediates the relation from *COMP* to *CUSL*
- *CUSA* partially mediates the relation from *LIKE* to *CUSL* – we have complementary mediation because the mediating and direct effect works in the same direction

► Moderation

- Based on existing theory the Switching Cost (*SC*) construct is introduced as a moderator of the relationship between satisfaction and loyalty (reflectively measured)
- The respecified measurement models do fulfill the necessary requirements
- The interaction term ($CUSA * SC$) is significant with a negative sign whereas the associated simple effect of *CUSA* on *CUSL* is positive – the latter relationship is thus moderated by *SC*

Exercises

- ▶ Answer question 1, 2, 3, and 4 on page 151 in Hair et al. 2021
- ▶ Answer question 1, 2, 3, and 4 on page 170 in Hair et al. 2021