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Risk Profile Contingent Performance Analysis of Management Control Systems

Institut für Managementwissenschaften
Bereich Finanzwirtschaft und Controlling
Doctoral Thesis
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Abstract

- In literature there is a call for future research to conceptualize “fit” between risk management practices and types of risk (Mikes & Kaplan, 2015):
  →risk profile contingent performance analysis of MCS

- Development of a framework for risk-based MCS:
  → extension of Simons’ 4 levers of control framework of MCS (Simons, 1995)

- Contingency (Otley, 1980) & predictive validity (Libby et al., 2002) framework:
  → operationalizing the extended framework for risk-based MCS
  - Item identification for operationalization
  - Validation of survey constructs
  - Analysis (multiple regression, cluster analysis, logistic regression)

- Contributions:
  - theoretical development of a risk-based MCS framework
  - empirical investigation of the interrelationship between risk profile, (risk-based) MCS design, and firm performance

Research Questions

RQ1: How are the choices of (risk-based) control systems associated with the nature of the firms' risk profile?

RQ2: What different configurations of (risk-based) MCS (=cluster) are put in place in practice and does the risk profile have an influence on cluster membership?

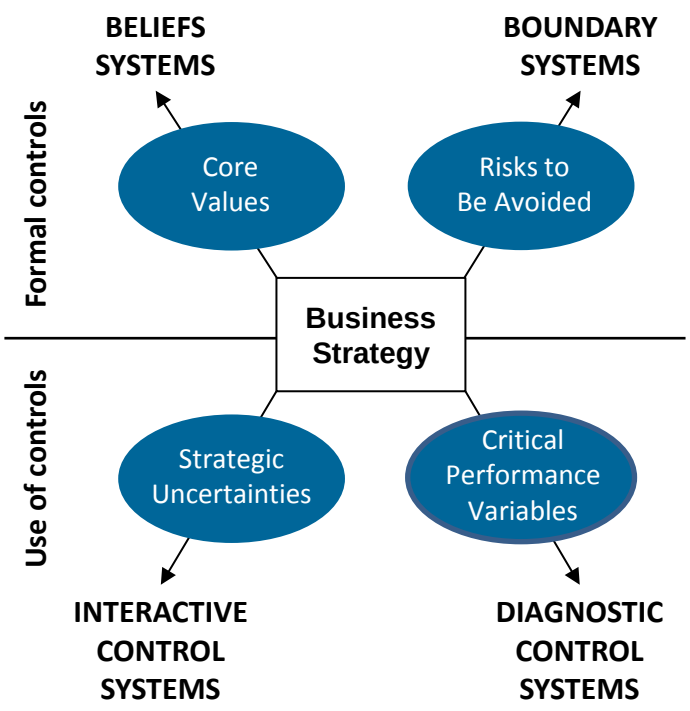
RQ3: Are firm performance and perceived usefulness of MCS related to the fit between (risk-based) MCS design and the firms' risk profile?

I hypothesize that the choice among the categories of (risk-based) MCS reflects the firms' risk profile, and that firms that choose (risk-based) MCS better suited to their risk profile perform better than others

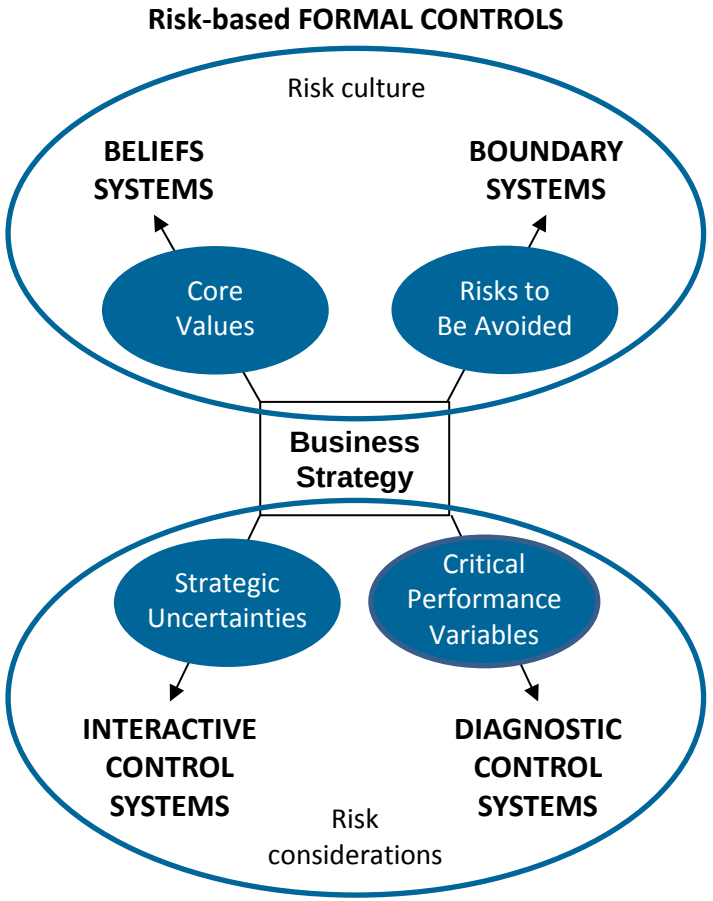
Agenda

- Theory development
- Methods
- Results

Extending the framework of Simons' MCS to risk-based MCS



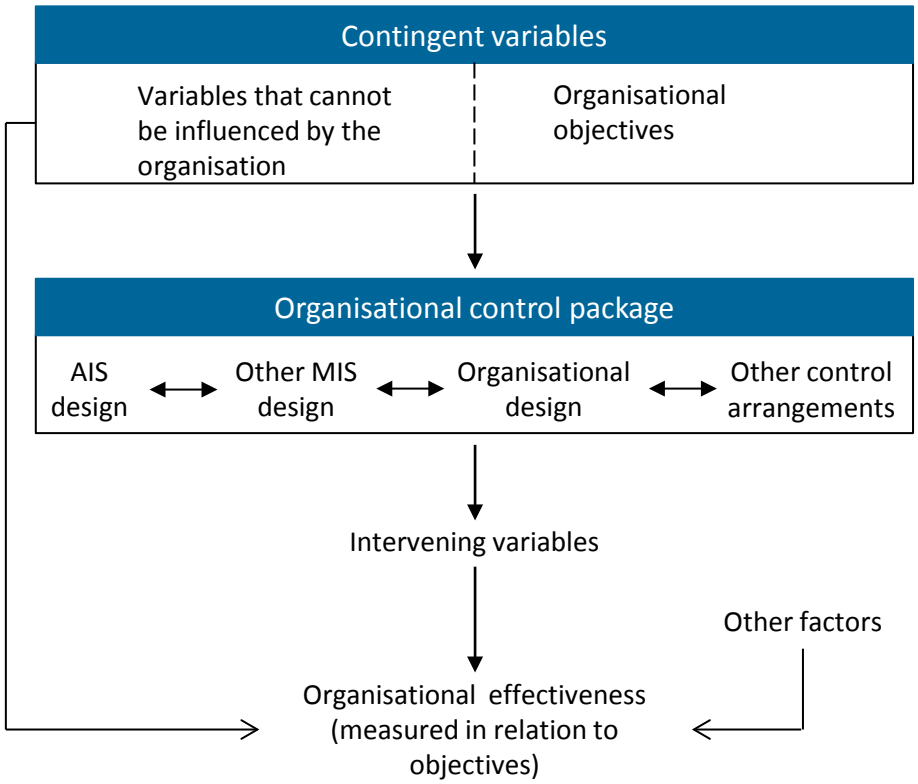
Controlling Business Strategy (Simons, 1995, p. 7)



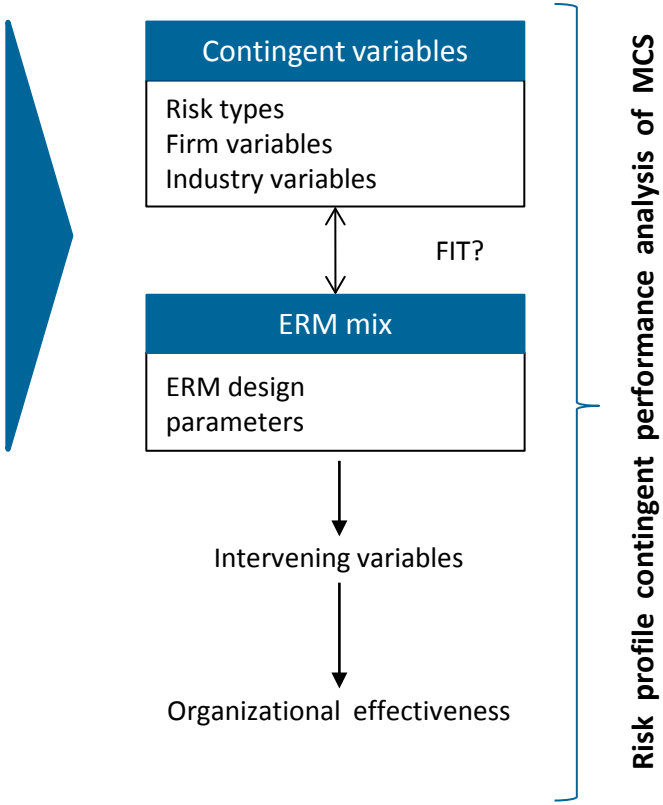
Adapted from Simons (1995, p. 7)

Theory development

Contingency Frameworks



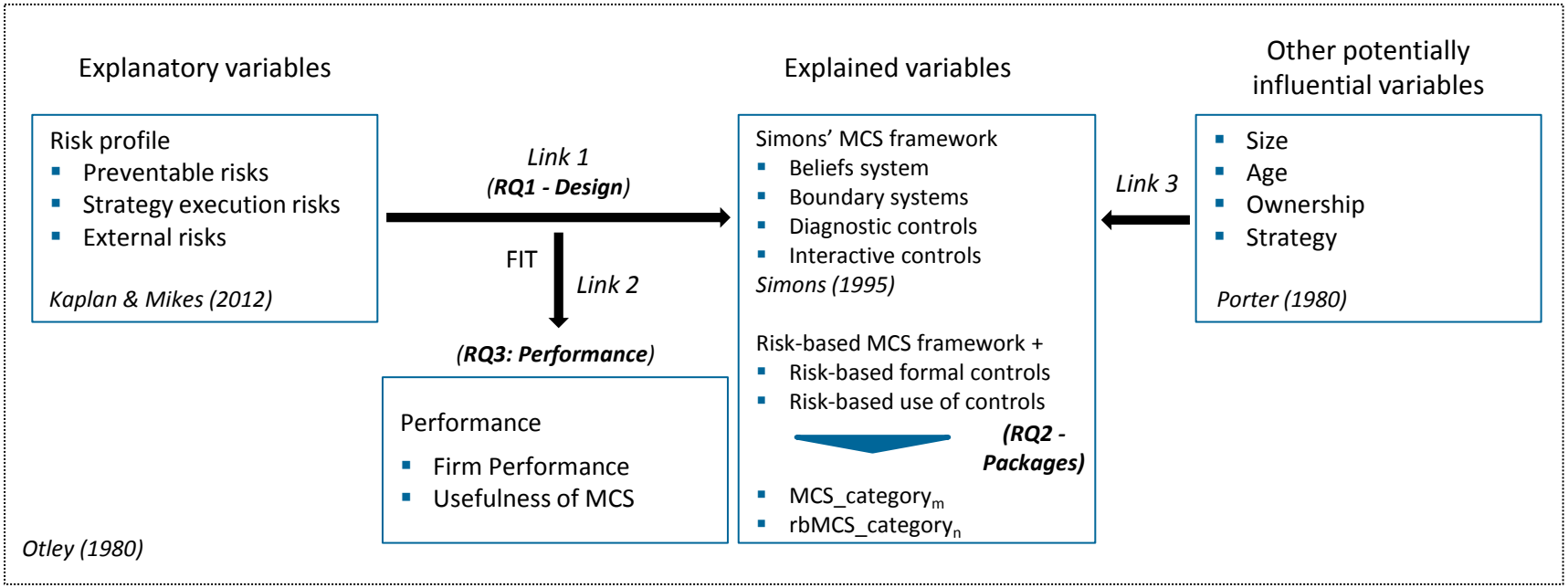
The minimum necessary contingency framework
(Otley, 1980, p. 421)



Minimum Necessary Contingency Framework for ERM
(Mikes & Kaplan, 2014, p. 38)

Theory development

Risk Profile Contingent Performance Analysis of MCS



Conceptual

Predictive validity framework
(see Libby et al., 2002)

Theory development

Link 1: Association between preventable risks and (risk-based) controls

- First line of defense against preventable risks is an integrated culture-an-compliance model comprising monitoring, values as well as rules and boundary systems (Kaplan & Mikes, 2012)
- Diagnostic use is described as a negative force that creates constraints and ensures compliance with orders (Simons, 1995; Henri, 2006)
- Features of diagnostic style of use are tight control of operations and highly structured channels of communication and restricted flows of information (Henri, 2006)

Firms facing preventable risks to a greater extent will introduce / focus on …

H1a: beliefs systems

H1b: boundary systems

H1c: diagnostic controls

H1d: risk-based formal controls

… more intensively than firms facing preventable risks to a lower extent.

Theory development

Link 1: Association between strategy execution risks and (risk-based) controls

- The control model for strategic risks are interactive discussions about risks to strategic objectives (Kaplan & Mikes, 2012)
- Interactive use is described as a positive force that focuses attention and forces dialogue throughout the organization (Simons, 1995; Henri, 2006);
- Diagnostic controls provide the necessary structure for the interactive controls to be effective (Widener, 2007)
- Beliefs systems are important for communicating the vision and core values of a firm and therefore facilitating execution of strategy and strategic change (Simons, 1994)

Firms facing strategy execution risks to a greater extent will introduce / focus on …

H2a: beliefs systems

H2b: diagnostic controls

H2c: interactive controls

H2d: risk-based formal controls

H2e: risk-based use of controls

… more intensively than firms facing strategy execution risks to a lower extent.

Theory development

Link 1: Association between external risks and (risk-based) controls

- The control model for external risks is interactive envisionment using experience, intuition and imagination to identify the non-controllable external events that can cause the strategy to fail (Kaplan & Mikes, 2012)
- Interactivity leads to a process of confrontation potentially able to prepare managers for black swans (Arena, Arnaboldi & Azzone, 2010)
- Empirical research shows that interactive systems are effective in firms facing various types of risk and uncertainty, including competitive, market, and technological risk and environmental uncertainty (Simons, 1995; Bisbe & Otley, 2004; Widener, 2007)

Firms facing external risks to a greater extent will introduce / focus on …

H3a: diagnostic controls

H3b: interactive controls

H3c: risk-based use of controls

… more intensively than firms facing external risks to a lower extent.

Theory development

MCS/Link 1: Association between packages of (risk-based) MCS and risks

- Based on prior research on MCS as a package I expect to find several packages (=clusters) of (risk-based) MCS that differ significantly in their risk profile
- As this study will be exploratory I will not develop ex ante assumptions what these relationships look like

H4a: There are types of (risk-based) MCS (=clusters) which are put in place in practice.

H4b: The types of risks an organization faces have an significant influence on MCS cluster membership.

Theory development

Link 2: Competitive advantage through matching (risk-based) MCS and risks

- I argue that competitive advantage can be gained through matching combinations of (risk-based) MCS design and types of risk an organization faces.
- In addition, I assume that firms that have a competitive advantage to have a higher performance than their competitors.

H5a: Firms with a better fit between their (risk-based) MCS and their risk profile experience a superior firm performance.

H5b: Firms with a better fit between their (risk-based) MCS and their risk profile experience a higher perceived usefulness of its MCS.

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- **Methods**
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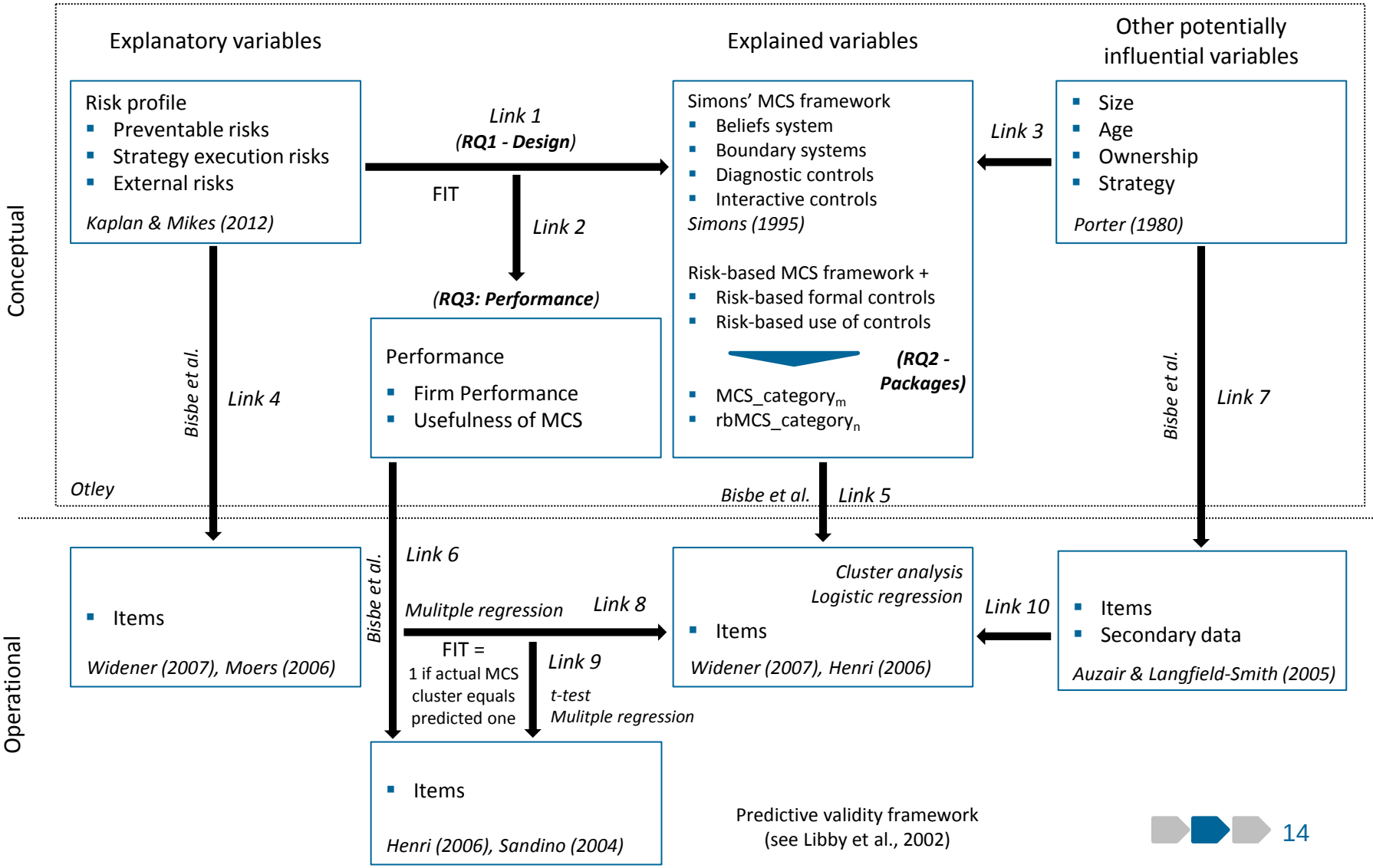
Methods

Risk Profile Contingent Performance Analysis of MCS



Predictive validity framework
(see Libby et al., 2002)

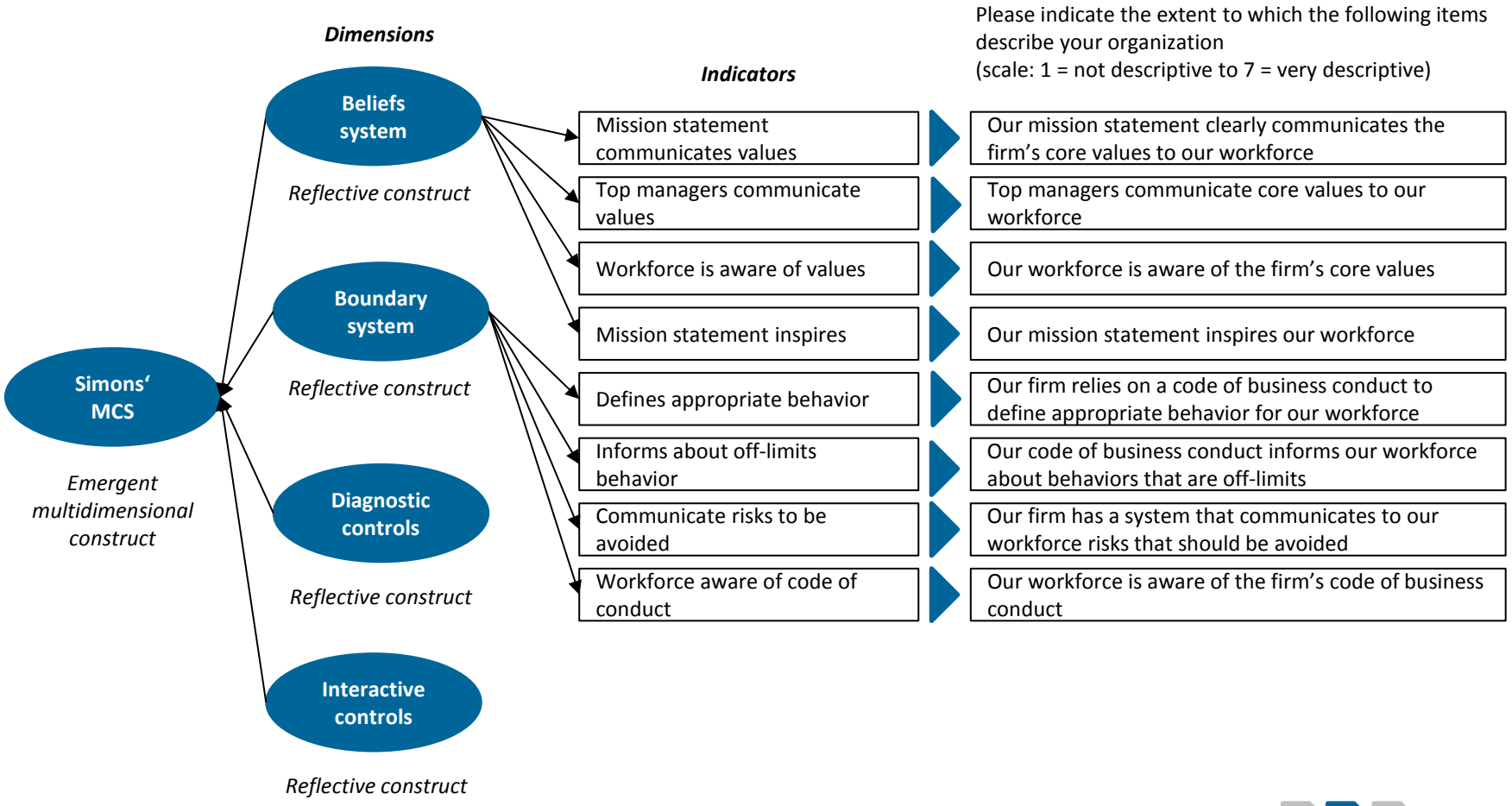
Data Set and Collection

- empirical study in the Austrian and German mechanical engineering industry exploring medium-sized firms that have between 50 and 250 employees
- target populations consists of 2.311 firms, response rate 16.5 %
- Data collection through a structured online questionnaire using a single respondent approach and sending the questionnaire to the CEOs of the firms
- Content and construct validity have to be assessed to establish validity of the survey constructs:
  - items from previous research are used whenever possible
  - Conceptual specification of newly developed constructs
  - Interviews with managing directors
  - Pre-test with academicians and practitioners
  - Non-response bias
  - Empirical tests (Factor analyses and Cronbach's alpha)

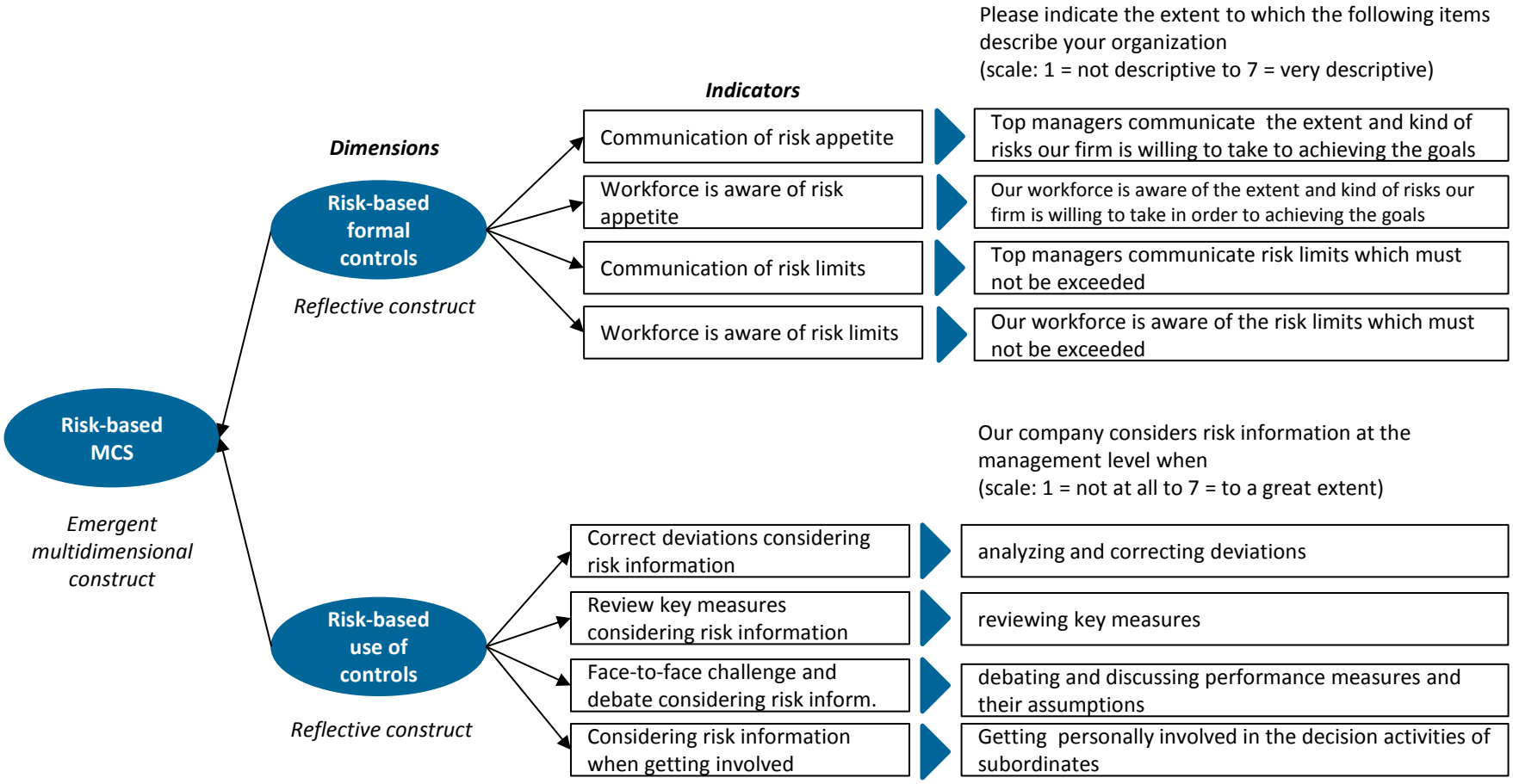
Link 4, 5, 6 and 7: Variable measurement

	Variables	Operationalization	scale	items	Cronbach alpha
Risks	Preventable risks	Reflective construct	Adapted (Widener, 2007)	3	.86
	Strategy execution risks	Reflective construct	Newly developed	1	-
	External risks	Formative construct	Adapted (Moers, 2006)	5	-
MCS	Beliefs system	Reflective construct	Published (Widener, 2007)	4	.85
	Boundary system	Reflective construct	Published (Widener, 2007)	4	.91
	Diagnostic controls	Reflective construct	Published (Widener, 2007; Henri, 2006)	4	.94
	Interactive controls	Reflective construct	Adapted (Bisbe et al., 2007; Widener, 2007)	4	.92
	Risk-based formal controls	Reflective construct	Newly developed	4	.87
	Risk-based use of controls	Reflective construct	Newly developed	4	.89
Perfor.	Perceived firm performance	Reflective construct	Published (Henri, 2006)	3	.86
	Perceived MCS usefulness	Reflective construct	Published (Sandino, 2004)	3	.85
Strategy	Low cost strategy	Reflective construct	Published (Auzair & Langfield-Smith, 2005)	2	.71
	Differentiation strategy	Reflective construct	Published (Auzair & Langfield-Smith, 2005)	2	.68
Others	Ownership	Dummy variable indicating if CEO is owner of the company	-	-	-
	Organizational size	Natural logarithm of number of employees	-	-	-
	Company age	Natural logarithm of number of years since the date of founding	-	-	-

Link 5: Conceptual specification of Simons' MCS



Link 5: Conceptual specification of risk-based MCS



Data Analysis

	Purpose	Method
Hypothesis 1-3	Analysis of the association between risk-based controls and types of risk	Multiple regression $rbMCS\_design_{j,i}=f(PREVENTABLE\_risk_i, STRATEGY\_risk_i, EXTERNAL\_risk_i, CONTROLS_i)$
Hypothesis 4	Identification of clusters of rbMCS Developing a choice model with a categorical variable describing the categories of rbMCS and analyzing the influence of types of risks on MCS cluster membership	Cluster analysis Discriminant analysis Logistic regression $rbMCS\_category_i=f(PREVENTABLE\_risk_i, STRATEGY\_risk_i, EXTERNAL\_risk_i, CONTROLS_i)$
Hypothesis 5	Comparison of the actual and predicted cluster membership of each firm and building two groups of firms Comparing the performance of firms with matching rbMCS and risks with firms with non-matching rbMCS and risks	t-test, Wilcoxon Test Multiple regression $PERFORMANCE_i=f(FIT_i, CONTROLS_i)$

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RQ1: Multiple regression for BELIEF and BOUND variables

Multiple regression

	Explained variable: BELIEF				Explained variable: BOUND			
Explanatory variables								
Step 1: Control Variables	b	β	p-value		b	β	p-value	
Constant	4.295		.000	***	3.714		.000	***
SIZE	0.120	.113	.038	*	0.260	.173	.001	**
AGE	0.012	.010	.851		0.009	.005	.919	
OWN	0.008	.004	.943		-0.574	-.195	.000	***
Step 2: + Strategy Profile								
Constant	1.991		.000	***	0,954		.151	
SIZE	0.064	.060	.247		0.190	.126	.014	*
AGE	0.046	.039	.456		0,035	.021	.682	
OWN	0.045	.021	.668		-0,508	-.173	.000	***
COSTSTRAT	0.241	.220	.000	***	0,426	.274	.000	***
DIFFSTRAT	0.180	.189	.000	***	0,085	.063	.222	
Step 3: + Risk Profile								
Constant	0.897		.088		-0.490		.502	
SIZE	0.029	.028	.587		0,146	.097	.053	
AGE	0.063	.053	.289		0,059	.035	.481	
OWN	0.125	.060	.232		-0,407	-.138	.006	**
COSTSTRAT	0.072	.066	.283		0,203	.131	.031	*
DIFFSTRAT	0.108	.114	.037	*	-0,011	-.008	.879	
PREVRISK	0.277	.223	000	***	0,362	.206	.001	**
STRATRISK	0.104	.125	.020	*	0,112	.095	.071	
EXTRISK	0.076	.059	.311		0,129	.071	.219	

Step	R^2	F	Sig.		R^2	F	Sig.	
1	.013	1,617	.185		.074	9,473	.000	***
2	.120	9,747	.000	***	.161	13,626	.000	***
3	.175	9,388	.000	***	.206	11,421	.000	***

n=362

*p<.05, **p<.01, ***p<.001, two-tailed tests.

RQ2: Multiple regression for rbFORMALMCS and rbUSEMCS variables

Multiple regression

	Explained variable: rbFORMALMCS				Explained variable: rbUSEMCS			
Explanatory variables								
Step 1: Control Variables	b	β	p-value		b	β	p-value	
Constant	4.010		.000	***	4.481		.000	***
SIZE	0.168	.143	.008	**	0.214	.178	.001	**
AGE	0.009	.007	.903		-0.090	-.067	.206	
OWN	-0.336	-.146	.005	**	-0.422	-.179	.001	**
Step 2: + Strategy Profile								
Constant	2.173		.000	***	1,617		.002	**
SIZE	0.121	.103	.050	*	0.141	.117	.018	*
AGE	0.024	.018	.723		-0,064	-.048	.329	
OWN	-0.289	-.126	.013	*	-0,352	-.149	.002	**
COSTSTRAT	0.298	.245	.000	***	0,452	.363	.000	***
DIFFSTRAT	0.043	.041	.445		0,079	.073	.144	
Step 3: + Risk Profile								
Constant	1.240		.037	*	0.736		.198	
SIZE	0.094	.079	.129		0,117	.097	.049	*
AGE	0.038	.029	.570		-0,051	-.038	.428	
OWN	-0.208	-.090	.080		-0,265	-.113	.020	*
COSTSTRAT	0.161	.132	.036	*	0,329	.264	.000	***
DIFFSTRAT	-0.024	-.022	.689		0,012	.011	.832	
PREVRISK	0.177	.129	.042	*	0,118	.084	.156	
STRATRISK	0.072	.077	.155		0,054	.057	.268	
EXTRISK	0.150	.105	.080		0,211	.145	.010	*

Step	R^2	F	Sig.		R^2	F	Sig.	
1	.045	5.667	.001	**	.067	8.582	.000	***
2	.111	8.895	.000	***	.216	19.617	.000	***
3	.141	7.228	.000	***	.244	14.220	.000	***

n=362

*p<.05, **p<.01, ***p<.001, two-tailed tests.

RQ1: Effects of risk types on different MCS

- Overview of significant findings:

Risk-based MCS

Simons' MCS

EXPLAINED / EXPLANATORY	BELIEF	BOUND	DIAG	INTERACT	rbFORMALMCS	rbUSEMCS
PREVRISK	**.000*** **	**.001** **	.111	.870	**.042***	.156
STRATRISK	**.020***	.071^{+}	**.037***	.854	.155	.268
EXTRISK	.311	.219	.051^{+}	**.002** **	.080^{+}	**.010***

p-values of regression coefficients.
$^{+}$p<.1,*p<.05, **p<.01, ***p<.001, two-tailed tests.

Hypothesized associations

RQ2: cluster analysis and logistic regression for MCS classification

- I conduct a cluster analysis to derive actual (risk-based) MCS cluster membership

Standard model
Cluster analysis

Panel A: Cluster distribution

		N	% of Combined
CLUSTER	1	201	55.5
	2	161	44.5
	Combined	362	100.0

Managers of firms of cluster 1 perceive that they place more emphasis on each of the four types of control systems than managers from cluster 2 (DA: 96.1% correctly classified)

Extended model
Cluster analysis

Panel A: Cluster distribution

		N	% of Combined
CLUSTER	1	192	53.0
	2	170	47.0
	Combined	362	100.0

Managers of firms of cluster 1 perceive that they place more emphasis on each types of risk-based control systems than managers from cluster 2 (DA: 97.2% correctly classified)

- I conduct a logistic regression analysis to derive predicted (risk-based) MCS cluster membership

$$P(MCS\_cluster) = \frac{1}{1+e^{-(b_0+b_1 PREVRISK_i+b_2 STRATRISK_i+b_3 EXTRISK_i+b_4 COSTSTRAT_i+b_5 DIFFSTRAT_i+b_6 SIZE_i+b_7 AGE_i+b_8 OWN_i)}}$$

Results

RQ2: logistic regression for MCS and rbMCS cluster membership

Logistic regression

	explained variable: MCScluster			explained variable: rbMCScluster		
Predictors						
Step 1: Control Variables	b	EXP(b)	p-value	b	EXP(b)	p-value
Constant	1.058			.915		
SIZE	-0.327	0.721	.011 *	-.355	.701	.006 **
AGE	0.039	1.040	.760	.127	1.136	.323
OWN	0.496	1.641	.021 *	.610	1.841	.005 **
Step 2: + Strategy Profile						
Constant	6,648			6.297		
SIZE	-0.226	0,798	.099	-.263	.769	.054
AGE	0.013	0,013	.921	.112	1.119	.406
OWN	0.461	1,585	.046 *	.591	1.805	.010 *
COSTSTRAT	-0.864	0,421	.000 ***	-.837	.433	.000 ***
DIFFSTRAT	-0.158	0,854	.164	-.148	.863	.192
Step 3: + Risk Profile						
Constant	8.865			9.024		
SIZE	-0.189	0.828	.191	-.219	.803	.495
AGE	-0.005	0.995	.972	.093	1.098	.209
OWN	0.216	1.241	.378	.308	1.360	.001 **
COSTSTRAT	-0.655	0.519	.000 ***	-.591	.554	.974
DIFFSTRAT	-0.034	0.966	.780	-.004	.996	.252
PREVRISK	-0.169	0.844	.361	-.216	.806	.001 **
STRATRISK	-0.266	0.767	.011 *	-.344	.709	.023 *
EXTRISK	-0.374	0.688	.036 *	-.410	.663	.000 ***

Step	Nagelkerke R2	Chi-square	Sig.	Nagelkerke R2	Chi-square	Sig.
1	.049	13.481	.004 **	.064	17.772	.000 ***
2	.210	61.915	.000 ***	.211	62.326	.000 ***
3	.256	76.942	.000 ***	.277	84.108	.000 ***

n=362

*p<.05, **p<.01, ***p<.001, two-tailed tests.

Simons' MCS:
Model is able to correctly classify 67.1 % of the firms

Risk-based MSC:
Model is able to correctly classify 67.7 % of the firms

Performance analysis of MCS: model of fit

- With the logistic regression analysis I yield a model of fit between the category of (risk-based) MCS chosen by a firm and its risk profile
- I assume that the logit model captures, on average, optimal behavior, and I use deviations from the model's predictions to answer research question 3
- Through comparison of the actual and predicted cluster membership of each firm, I calculate a dummy variable FIT, equal to 1 if the firm actually chose that predicted category of (risk-based) MCS, and 0 otherwise
- Standard model:

$$PERCPERF_{i} = b_0 + b_1FIT_i + b_4COSTSTRAT_i + b_5DIFFSTRAT_i + b_6SIZE_i + b_7AGE_i + b_8OWN_i + \varepsilon_i$$

- To improve the validity of my model and to avoid spurious correlation I control for strategy, size, age and ownership of the firms; additional tests are carried out be ensure that the assumptions for regression analysis have been met

Performance analysis of MCS: multiple regression

Multiple regression

	Explained variable: PERCPERF				Explained variable: USEFULMCS			
Explanatory variables								
Step 1: Control Variables	b	β	p-value		b	β	p-value	
Constant	3.582		.000	***	3.062		.000	***
SIZE	0.241	.191	.000	***	0.266	.195	.000	***
AGE	-0.066	-.047	.382		0.009	.006	.909	
OWN	-0.016	-.006	.903		-0.205	-.077	.137	
Step 2: + Strategy Profile								
Constant	2.958		.000	***	0,816		.187	
SIZE	.228	.180	.001	**	0,211	.155	.003	**
AGE	-.047	-.034	.533		0.040	.026	.616	
OWN	-.021	-.008	.873		-0,166	-.062	.218	
COSTSTRAT	-.027	-.020	.712		0,258	.183	.001	**
DIFFSTRAT	.137	.121	.028	*	0,154	.126	.018	*
Step 3: + FIT_MCS								
Constant	2.776		.000	***	0,684		.272	
SIZE	0.213	.169	.002	**	0.200	.147	.005	**
AGE	-0.041	-.029	.589		0,044	.029	.573	
OWN	-0.004	-.002	.974		-0,154	-.058	.252	
COSTSTRAT	-0.024	-.018	.739		0.260	.185	.001	**
DIFFSTRAT	0.136	.120	.028	*	0,154	.126	.018	*
FIT_MCS	0.318	.121	.020	*	0.230	.081	.106	

Step	R^2	F	Sig.		R^2	F	Sig.	
1	.034	4,246	.006	**	.047	5.874	.001	**
2	.048	3.560	.004	**	.109	8.715	.000	***
3	.062	3,917	.001	**	.116	7.733	.000	***

n=362

*p<.05, **p<.01, ***p<.001, two-tailed tests.

RQ3: performance analysis of MCS

- Overview of significant findings:

EXPLAINED / EXPLANATORY	PERCPERF	USEFULMCS
FIT_MCS	**.020***	.106
FIT_rbMCS	**.043***	.418

p-values of regression coefficients.
$^{+}$p<.1,*p<.05, **p<.01, ***p<.001, two-tailed tests.

Conclusions

- RQ1:
  - **preventable risks** are associated with beliefs and boundary systems, as well as risk-based formal controls
  - **strategy execution risks** are associated with beliefs systems and diagnostic controls
  - **external risks** are associated with diagnostic and interactive controls as well as risk-based use of controls
- RQ2:
  - **two classifications** of (risk-based) MCS are put in place in practice
  - strategy execution risks and external risks have a significant **influence** on MCS cluster membership
  - strategy execution risks, external risks and preventable risks have a significant **influence** on risk-based MCS cluster membership
- RQ3:
  - firms that have MCS design consistent with their risk profile show **superior** perceived firm performance
  - firms that have risk-based MCS design consistent with their risk profile show **superior** perceived firm performance

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