WHEN IT COMES TO INNOVATION, CULTURE MATTERS !

EMPIRICAL EVIDENCE ON THE RELATIONSHIP BETWEEN NATIONAL CULTURE AND INNOVATE OUTCOME

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OBJECTIVE AND RQ

What is the relationship between national culture and innovation?

- Which dimensions of culture matters ?
- Which dimensions of culture matters most?
- Does specific innovation relevant combinations of cultural dimensions (cultural configurations) exist ?
- Does innovation related cultural clusters of countries exist ?
  - If they do, which clusters exist and how do they differ ?

BACKGROUND
DIMENSIONS OF NATIONAL CULTURE

Hofstede:

- Power distance
- Collectivism vs. individualism
- Femininity vs. masculinity
- Uncertainty avoidance
- Long vs. short time orientation

(Hofstede ,1980, 1988)

GLOBE:

- Power distance
- Uncertainty avoidance
- In-group collectivism
- Institutional collectivism
- Gender egalitarianism
- Assertiveness
- Future orientation
- Performance orientation
- Human orientation

(House et al., 2004)

- Number of dimensions
- Methodological approaches
- Age of data
- Differentiation between cultural values and practices

PREVIOUS RESEARCH
RELATIONSHIP BETWEEN NATIONAL CULTURE AND INNOVATION

Study	Data Sources	Results
Shane, 1993	Culture: Hofstede Innovation: Patents, per Capita income	Individualism (+) Uncertainty Avoidance (-) Power Distance (-)
Lynn, 1996	Culture: Hofstede Innovation: Adaption rates for innovative technological products, RDE	Individualism (+) Uncertainty Avoidance (-)
Steensma, 2000	Culture: Hofstede Innovation: Own measure	Significant influence of National cultural factors
Van Everdingen, 2003	Culture: Hofstede, Hall Innovation: Software (ERP Systems)Adaptions in SMEs	Hofstede: Individualism (+, for early adopters), Long Term Orientation (+), Uncertainty Avoidance (-), Power Distance (-), Masculinity (-) Hall: Low Context + Monochronic Cultures (+), High Context + Polychronic Cultures (-)
Sun, 2009	Culture: Hofstede Innovation: Porter & Stern Index	Individualism (+) Power distance (-) Uncertainty Avoidance (-, indirect)
Taylor et al., 2012	Culture: GLOBE, Hofstede, Schwartz Innovation: Citation-weighted technology patents, and scientific publications	In Group Collectivism (-) Institutional Collectivism (+)

↓ Power Distance ↑ Individualism ↓ Uncertainty avoidance

EMPIRICAL DATA
PREVIOUS RESEARCH VS. OUR STUDY

Previous research

IV:
- Hofstede dimensions

DV:
- Mixture of different indicators

RQ:
- Relationship national culture and innovation

Our study

IV:
- GLOBE dimensions

DV:
- Global Innovation Index
- Porter & Stern Index

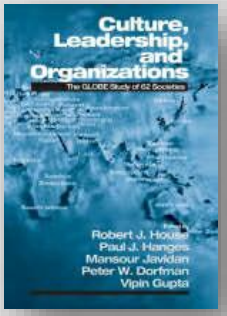
RQ:
- Relationship national culture and innovation
- Strength and consistency of predictors
- Cultural configurations
- Clusters of countries

EMPIRICAL DATA
GLOBE DIMENSIONS

Most up-to date and elaborate research project on national culture

Data for:

- 62 Countries
- 17.300 Observations (middle management)
- 951 Organizations (no multi nationals)



Aim:
Overcome the weaknesses of the Hofstede study

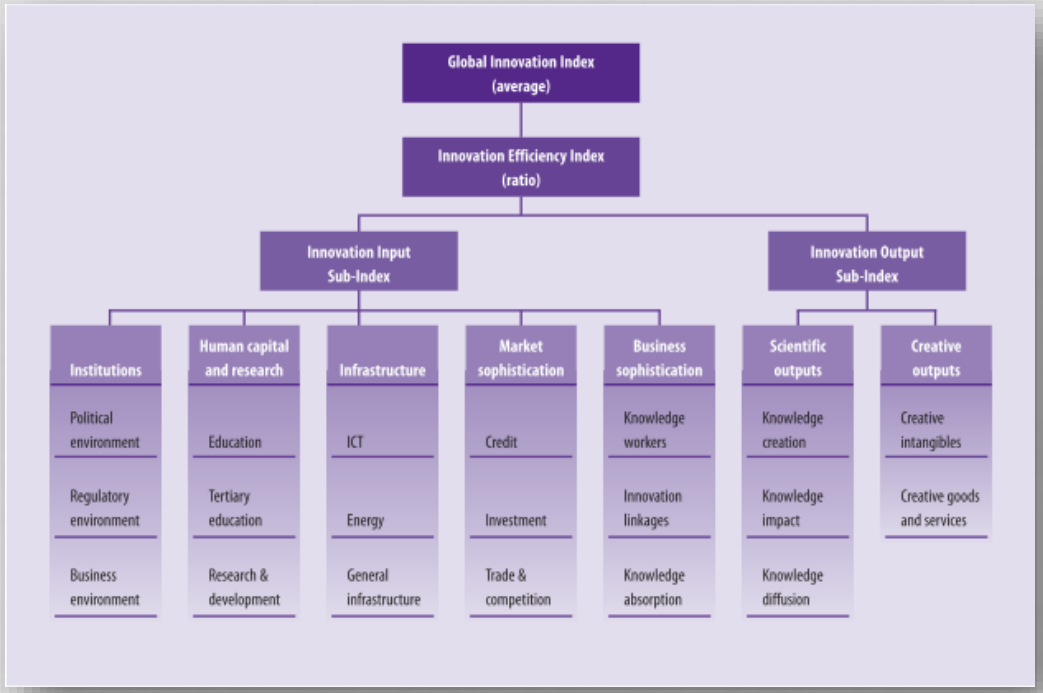
EMPIRICAL DATA
GLOBAL INNOVATION INDEX (1)

Most elaborate and comprehensive innovation index

- Integration of innovation relevant data
- +60 variables
  - Every variable is based on multiple indicators
  - Economical indicators (UN, World Bank, UNESCO)
  - Survey data indicators
  - Conceptual and statistical coherence approved by European Joint Commission Research Center

Aim:
Most elaborate measure of innovation on the national level

EMPIRICAL DATA
GLOBAL INNOVATION INDEX (2)



Indonesia

Key indicators

Population (millions)	232.5
GDP per capita, PPP (current international $)	4,198.8
GDP (US$ billions)	540.3

	Score 0–100	Rank
Global Innovation Index	**27.8**	**99**
Innovation Output Sub-Index	22.0	97
Innovation Input Sub-Index	33.6	95
Innovation Efficiency Index	0.7	80
Global Innovation Index 2010		72
Global Innovation Index 2009		49

1	**Institutions**	**53.4**	**90**
1.1	*Political environment*	*44.3*	*80*
1.1.1	Political stability*	24.1	92
1.1.2	Government effectiveness*	46.7	80
1.1.3	Press freedom*	62.1	83
1.2	*Regulatory environment*	*45.8*	*95*
1.2.1	Regulatory quality*	42.9	89
1.2.2	Rule of law*	34.4	90
1.2.3	Rigidity of employment*	60.0	93
1.3	*Business environment*	*70.1*	*92*
1.3.1	Time to start a business, days	55.8	111
1.3.2	Cost to start a business, % income/cap.	82.6	91
1.3.3	Total tax rate, % profits	71.9	55
2	**Human capital & research**	**29.6**	**96**
2.1	*Education*	*46.1*	*99*
2.1.1	Education expenditure, % GNI	3.9	120
2.1.2	Public expenditure/pupil, % GDP/cap.	12.3	92
2.1.3	School life expectancy, years	54.2	62
2.1.4	PISA scales in reading, maths, & science	23.9	56
2.1.5	Pupil-teacher ratio, secondary	86.9	48
2.2	*Tertiary education*	*24.6*	*83*
2.2.1	Tertiary enrolment, % gross	23.6	79
2.2.2	Graduates in science, %	19.4	73
2.2.3	Graduates in engineering, %	51.8	19
2.2.4	Tertiary inbound mobility, %	n/a	n/a
2.2.5	Tertiary outbound mobility, %	6.1	113
2.2.6	Gross tertiary outbound enrolment, %	1.2	101
2.3	*Research & development (R&D)*	*18.1*	*86*
2.3.1	Researchers headcount/million pop.	1.2	79
2.3.2	Gross expenditure on R&D, % GDP	0.5	94
2.3.3	Quality research institutions†	52.6	41
3	**Infrastructure**	**24.5**	**81**
3.1	*Info & comm. technologies (ICT)*	*16.2*	*95*
3.1.1	ICT access*	26.0	94
3.1.2	ICT use*	3.9	94
3.1.3	Government's Online Service*	24.4	93
3.1.4	E-Participation*	12.9	76
3.2	*Energy*	*14.9*	*90*
3.2.1	Electricity output, kWh/cap.	3.3	95
3.2.2	Electricity consumption, kWh/capita	2.3	95
3.2.3	GDP/unit of energy use, PPP$/kg oil eq.	20.7	79
3.2.4	Share of renewables in energy use, %	21.1	30
3.3	*General infrastructure*	*42.4*	*22*
3.3.1	Quality of trade & transport infrastructure*	38.5	67
3.3.2	Gross capital formation, % GDP	50.6	15
3.3.3	Ecological footprint & biocapacity, ha/cap.	38.2	29
4	**Market sophistication**	**32.2**	**97**
4.1	*Credit*	*23.0*	*105*
4.1.1	Strength of legal rights for credit*	30.0	97
4.1.2	Depth of credit information*	66.7	66
4.1.3	Domestic credit to private sector, % GDP	9.1	83
4.1.4	Microfinance gross loans, % GDP	0.2	66
4.2	*Investment*	*27.0*	*67*
4.2.1	Strength of investor protection*	60.0	34
4.2.2	Market capitalization, % GDP	13.1	54
4.2.3	Total value of stocks traded, % GDP	11.9	38
4.2.4	Venture capital deals/tr GDP PPP$	18.7	66
4.3	*Trade & competition*	*46.7*	*82*
4.3.1	Applied tariff rate weighted mean, %	82.4	57
4.3.2	Market access trade restrictiveness*, %	70.6	51
4.3.3	Imports of goods & services, % GDP	8.0	115
4.3.4	Exports of goods & services, % GDP	16.7	93
4.3.5	Intensity local competition†	67.8	51
5	**Business sophistication**	**28.2**	**94**
5.1	*Knowledge workers*	*7.0*	*124*
5.1.1	Knowledge-intensive employment, %	10.4	93
5.1.2	Firms offering formal training, % firms	0.0	90
5.1.3	R&D performed by business, %	4.4	75
5.1.4	R&D financed by business, %	17.0	62
5.2	*Innovation linkages*	*40.8*	*36*
5.2.1	University/industry collaboration†	52.7	36
5.2.2	State of cluster development†	58.3	20
5.2.3	R&D financed by abroad, %	n/a	n/a
5.2.4	JV/strategic alliance deals/tr GDP PPP$	14.0	44
5.2.5	PCT patent filings with foreign inventor, %	25.0	38
5.3	*Knowledge absorption*	*36.7*	*51*
5.3.1	Royalty & license fees payments, % GDP	28.6	33
5.3.2	High-tech imports less re-imports, %	n/a	n/a
5.3.3	Computer & comm. service imports, %	41.8	61
5.3.4	FDI net inflows, % GDP	39.6	101
6	**Scientific outputs**	**18.3**	**94**
6.1	*Knowledge creation*	*1.0*	*116*
6.1.1	Domestic resident patent ap/bn GDP PPP$	2.1	77
6.1.2	PCT resident patent ap/bn GDP PPP$	0.2	83
6.1.3	Domestic res utility model ap/bn GDP PPP$	2.0	39
6.1.4	Scientific & technical articles/bn GDP PPP$	0.4	122
6.2	*Knowledge impact*	*23.2*	*92*
6.2.1	Growth rate of GDP PPP$/worker, %	50.0	31
6.2.2	New businesses/1,000 pop. 15–64 yrs.	1.4	85
6.2.3	Computer software spending, % GDP	13.5	44
6.3	*Knowledge diffusion*	*30.5*	*51*
6.3.1	Royalty & license fees receipts, % GDP	0.9	69
6.3.2	High-tech exports less re-exports, %	n/a	n/a
6.3.3	Computer & comm service exports, %	41.7	49
6.3.4	FDI net outflows, % GDP	48.8	52
7	**Creative outputs**	**25.7**	**89**
7.1	*Creative intangibles*	*48.6*	*50*
7.1.1	Domestic res trademark ap/bn GDP PPP$	29.9	28
7.1.2	Madrid resident trademark ap/bn GDP PPP$	n/a	n/a
7.1.3	ICT & business models†	59.1	60
7.1.4	ICT & organizational models†	56.8	48
7.2	*Creative goods & services*	*2.8*	*111*
7.2.1	Recreation & culture consumption, %	n/a	n/a
7.2.2	National feature films/mn pop.	3.7	67
7.2.3	Daily newspapers/1,000 literate pop.	n/a	n/a
7.2.4	Creative goods exports, %	n/a	n/a
7.2.5	Creative services exports, %	2.4	71

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EMPIRICAL DATA
OUR SAMPLE

- Criteria to be included into our sample
  - Data about national culture available from the GLOBE study

    &
  - Data about innovation available from the Global Innovation Index

Resulting sample:
n = 55 countries; based on more than 13,500 observations

- Benefits of our approach
  - No common source & common method bias
  - No culture specific bias
  - No ecological or reversed ecological fallacy

METHOD & RESULTS
CORRELATION ANALYSIS

Relationship to national innovation (10 dimensions)

Uncertainty avoidance (V (-) & P (+))
Institutional collectivism (V (-) & P(+))
Future orientation (V (-) & P(+))

In-group collectivism (P (-))
Gender egalitarianism (V(+))
Performance orientation (P(+))
Human orientation (V(+))

No relationship to national innovation (8 dimensions)

Power distance (V & P)
Assertiveness (V & P)

In-group collectivism (V)
Gender egalitarianism (P)
Performance orientation (V)
Human orientation (P)

Cultural Dimensions	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. Assertiveness (p)	--																				
2. Assertiveness (v)	-.32*	--																			
3. Institutional Collectivism (p)	-.36**	.33*	--																		
4. Institutional Collectivism (v)	.18	-.39**	-.69***	--																	
5. In-group Collectivism (p)	.00	.17	-.37**	.27*	--																
6. In-group Collectivism (v)	-.30*	.20	-.08	.15	-.14	--															
7. Future Orientation (p)	.16	.14	.50***	-.29**	-.54***	-.35**	--														
8. Future Orientation (v)	-.06	-.11	-.36**	.31*	.42**	.37**	-.50**	--													
9. Gender Egalitarianism (p)	.86	-.13	-.06	-.17	-.27*	.28*	.00	-.29*	--												
10. Gender Egalitarianism (v)	.29*	-.31*	-.10	.11	-.52**	.26	.29*	-.36*	.48***	--											
11. Human Orientation (p)	-.55***	.33*	.33**	-.22	.06	.03	.02	-.02	-.21	-.34*	--										
12. Human Orientation (v)	.36**	-.14	.19	-.23	-.35**	-.11	.40**	-.32*	.29**	.45***	-.38**	--									
13. Performance Orientation (p)	.12	.28*	.49***	-.29*	-.34*	-.36**	.64***	-.33*	-.27	-.03	.11	.07	--								
14. Performance Orientation (v)	-.05	-.16	-.34	.30*	-.22	.52***	-.15	.23	.22	.36**	-.15	.06	-.24	--							
15. Power Distance (p)	.09	-.16	-.38*	.27*	.34*	.25	-.46**	.50***	-.11	.05	-.30*	.20	-.39**	.28*	--						
16. Power Distance (v)	-.04	.17	.30*	-.35*	.14	-.15	.07	-.18	.12	-.29*	.16	-.27	.33*	-.25	-.46***	--					
17. Uncertainty Avoidance (p)	.02	.08	.50***	-.23	-.67***	-.20	.77***	-.50***	.01	.20	.01	.34*	.65***	.10	-.40**	.20	--				
18. Uncertainty Avoidance (v)	-.08	.08	-.40**	.25	-.71***	.03	-.67***	.50***	-.08	-.59***	.05	-.41**	-.48**	-.12	.31*	.05	-.67***	--			
Innovation Indicies																					
19. Porter & Stern Index	.22	-.04	.42**	-.45**	-.66**	-.16	.51***	.46**	.16	.47**	.20	.69***	.41**	.01	-.14	.02	.59***	-.72**	--		
20. Global Innovation Index 09	.06	.05	.46***	-.32*	-.61**	-.13	.61***	.45**	.03	.38**	-.17	.51***	.49***	-.07	-.15	-.03	.62***	-.69**	.92***	--	
21. Global Innovation Index 10	.05	.08	.51***	-.40**	-.68**	-.09	.61***	.48***	.12	.40**	-.16	.48***	.54***	-.02	-.22	.06	.67***	-.76**	.92***	.95***	--
22. Global Innovation Index 11	.11	-.01	.40**	-.33*	-.65**	-.12	.56***	.52***	.16	.46***	-.26	.50***	.45**	-.01	-.16	-.01	.62***	-.71**	.88***	.91***	.95***

Notes. Pearson correlations. Two-tailed significance.
Sample Size is *N*=55 Countries (Correlations between the three editions of the Global Innovation Index) and *N*= 45 Countries
(correlations with Porter & Stern Index)
* $p < .05$. ** $p < .01$. *** $p < .001$.
(p) = GLOBE Practice Dimension; (v)=GLOBE Value Dimension

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METHOD & RESULTS
HIERARCHICAL REGRESSION ANALYSIS

	Criteria			
	Porter & Stern Index	GII 2009	GII 2010	GII 2011
Predictors	ß	ß	ß	ß
Assertiveness (practice)	.03	-.14	.01	-.01
Assertiveness (values)	.02	.07	.16	.11
Institutional Collectivism (practice)	-.12	.14	.32**	.01
Institutional Collectivism (value)	-.20*	-.07	-.01	-.11
In-group Collectivism (practice)	-.26*	-.21	-.23**	-.28*
In-group Collectivism (value)	-.09	.01	-.08	-.13
Future Orientation (practice)	-.10	.08	.04	.08
Future Orientation (value)	.01	-.06	-.07	-.17
Gender Egalitarianism (practice)	-.04	-.03	-.01	-.02
Gender Egalitarianism (value)	.04	-.02	-.07	-.05
Human Orientation (practice)	-.04	-.07	-.22*	-.16
Human Orientation (value)	.44***	.31**	.10	.23*
Performance Orientation (practice)	.08	.26*	.16	.19
Performance Orientation (value)	-.05	-.09	-.07	-.13
Power Distance (practice)	.09	.03	.07	.03
Power Distance (value)	-.01	-.02	-.01	.04
Uncertainty Avoidance (practice)	-.01	.14	.13	.16
Uncertainty Avoidance (value)	-.25	-.43***	-.46**	-.41**
Values of the model				
R	.86	.77	.83	.77
R^2 (R^2_{adj})	.75(.72)	.59(.56)	.70(.67)	.59(.57)
F	29.26***	23.09***	28.77***	24.37***
df	4	4	4	4
N	45	55	55	55

	Porter & Stern	GII 2009	GII 2010	GII 2011
Uncertainity Avoidance (V)		-.431	-.457	-.412
Human Orientation (V)	.444	.314		.229
In Group Collectivism (P)	.261		-.227	-.282
Institutional Collectivism (P)			.319	
Performance Orientation (P)		.263		
Human Orientation (P)			-.224	
Institutional Collectivism (V)	-.199			

Notes. ß = standardized regression coefficient. *R* = multiple correlation coefficient. R^2 = part of explained variance. R^2_{adj}=adjusted R^2.
Sample Size is *N*=55 Countries (Correlations between the three editions of the Global Innovation Index) and *N*= 45 Countries (correlations with Porter & Stern Index)
* $p < .05$. ** $p < .01$. *** $p < .001$.

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METHOD & RESULTS
RELEVANT DIMENSIONS: UNCERTAINTY AVOIDANCE

Uncertainty avoidance:

"… is the extent to which members of a organization or society strive to **avoid uncertainty** by relying on **established social norms**, **rituals,** and **bureaucratic practices**."

Uncertainty avoidance - high

- Many rules and rigid planning
- Many control systems
- Formalized procedures
- Little tolerance for new and different ideas and approaches
- Expertise „persons beyond uncertainty"

Uncertainty avoidance - low

- Higher trust
- Higher tolerance for new and different ideas and approaches
- Higher participation
- Willingness to make mistakes
- Willingness to handle uncertainty and risks

(Hofstede, 2009; de Luque, 2004; Herbig, 1998)

METHOD & RESULTS
RELEVANT DIMENSIONS: IN-GROUP COLLECTIVISM

In-group collectivism:

"… is the degree to which individuals express **pride, loyalty**, and **cohesiveness** in their organizations or families."

In-group collectivism - high

- Higher rigid structures and more hierarchies
- Less openness to novelty and new ideas
- Less contact and exchange between the hierarchical levels
- Higher group-think

In-group collectivism – low

- Higher openness to novelty and new ideas
- Higher autonomy of the individual
- Higher outward orientation
- More contact to other groups > exchange of ideas
- Less group-think

(Shane, 1993; Schwartz ,1999; Hofstede, 1990; Gelfand et al., 2004; Taylor & Wilson, in Press)

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METHOD & RESULTS
RELEVANT DIMENSIONS: HUMAN ORIENTATION

Human orientation:

"… is the degree to which individuals in organizations or societies encourage and reward individuals for being fair, altruistic, friendly, generous, caring, and kind to others."

Human orientation - high

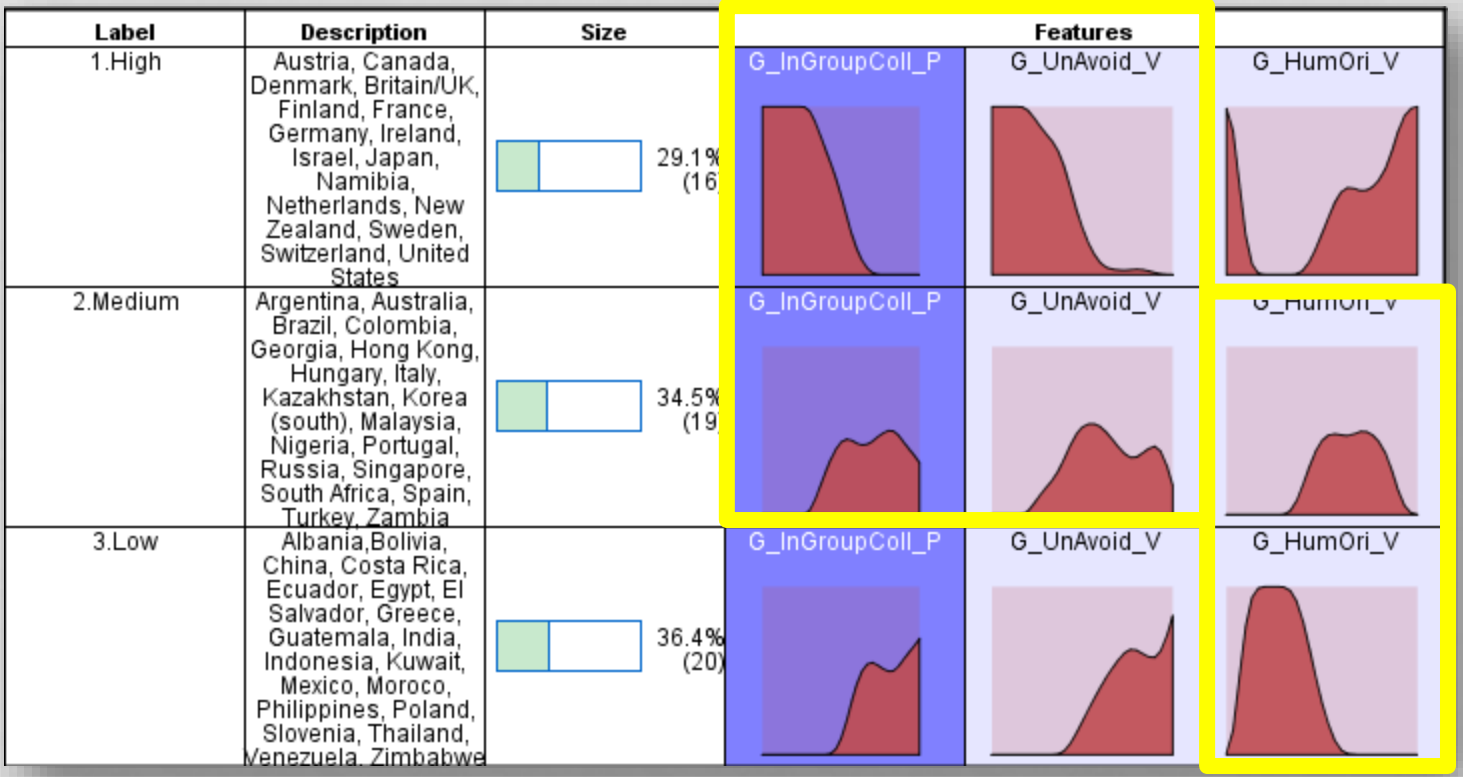
- More help and support
- Higher tolerance
- More equal distribution of resources and education
- Lower need for narrow, restrictive relationships and patronage
- More stable environment

Human orientation - low

- Inferior economic, physic and psychic conditions
- Lower autonomy
- Lower tolerance and support for everything novel and new ideas
- Higher self-intrest
- Less stable environment

(Kabasakal, 2004; Schwartz, 1992; Triandis, 2006)

METHOD & RESULTS
CLUSTER ANALYSIS



Label	Description	Size	Features		
			G_InGroupColl_P	G_UnAvoid_V	G_HumOri_V
1.High	Austria, Canada, Denmark, Britain/UK, Finland, France, Germany, Ireland, Israel, Japan, Namibia, Netherlands, New Zealand, Sweden, Switzerland, United States	29.1% (16)			
2.Medium	Argentina, Australia, Brazil, Colombia, Georgia, Hong Kong, Hungary, Italy, Kazakhstan, Korea (south), Malaysia, Nigeria, Portugal, Russia, Singapore, South Africa, Spain, Turkey, Zambia	34.5% (19)	G_InGroupColl_P	G_UnAvoid_V	G_HumOri_V
3.Low	Albania,Bolivia, China, Costa Rica, Ecuador, Egypt, El Salvador, Greece, Guatemala, India, Indonesia, Kuwait, Mexico, Moroco, Philippines, Poland, Slovenia, Thailand, Venezuela, Zimbabwe	36.4% (20)	G_InGroupColl_P	G_UnAvoid_V	G_HumOri_V

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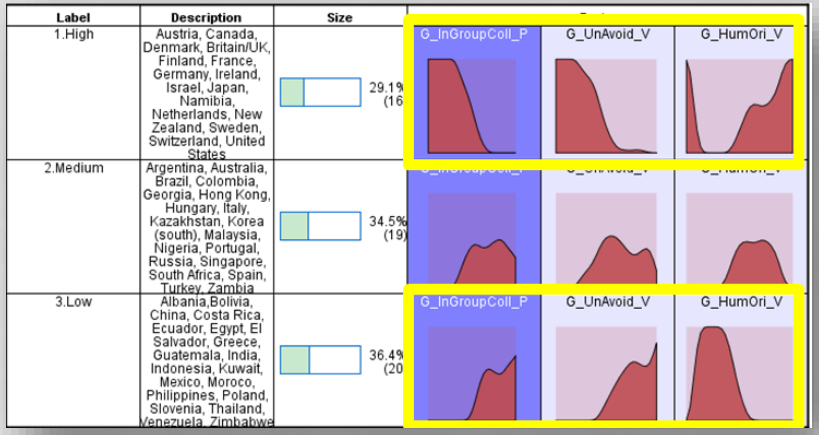
OVERALL RESULTS
CULTURAL CONFIGURATION & NATIONAL INNOVATION

Cultural configuration of high innovative countries:
-Low Uncertainty avoidance (V)
-Low In-group collectivism (P)
-High Human orientation (V)



Cultural configuration of low innovative countries:
- High In-group collectivism (P)
- High Uncertainty avoidance (V)
- Low Human orientation g (V)

Uncertainty avoidance (V) ↓
In-group collectivism (P) ↓
Human orientation (V) ↑

Cluster 1	Austria, Canada, Denmark, Britain/UK,Finland, France, Germany, Ireland, Israel, Japan, Namibia, Netherlands, New Zealand, Sweden, Switzerland, United States
Cluster 2	Argentina, Australia, Brazil, Colombia, Georgia, Hong Kong, Hungary, Italy, Kazakhstan, Korea (south), Malaysia, Nigeria, Portugal, Russia, Singapore, South Africa, Spain, Turkey, Zambia
Cluster 3	Albania,Bolivia, China, Costa Rica, Ecuador, Egypt, El Salvador, Greece, Guatemala, India, Indonesia, Kuwait, Mexico, Moroco, Philippines, Poland, Slovenia, Thailand, Venezuela, Zimbabwe

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PRACTICAL EXCURSION
CURRENT DEVELOPMENTS IN EUROPE

Cultural configuration of low innovative countries:

- High In-group collectivism (practice)
- High Uncertainty avoidance (value)
- Low Human orientation (value)

Cluster 1	Austria, Canada, Denmark, Britain/UK,Finland, France, Germany, Ireland, Israel, Japan, Namibia, Netherlands, New Zealand, Sweden, Switzerland, United States
Cluster 2	Argentina, Australia, Brazil, Colombia, Georgia, Hong Kong, Hungary, Italy, Kazakhstan, Korea (south), Malaysia, Nigeria, Portugal, Russia, Singapore, South Africa, Spain, Turkey, Zambia
Cluster 3	Albania,Bolivia, China, Costa Rica, Ecuador, Egypt, El Salvador, Greece, Guatemala, India, Indonesia, Kuwait, Mexico, Moroco, Philippines, Poland, Slovenia, Thailand, Venezuela, Zimbabwe

DISCUSSION

„Culture matters“

However:

National culture is only one influence factor of national innovation

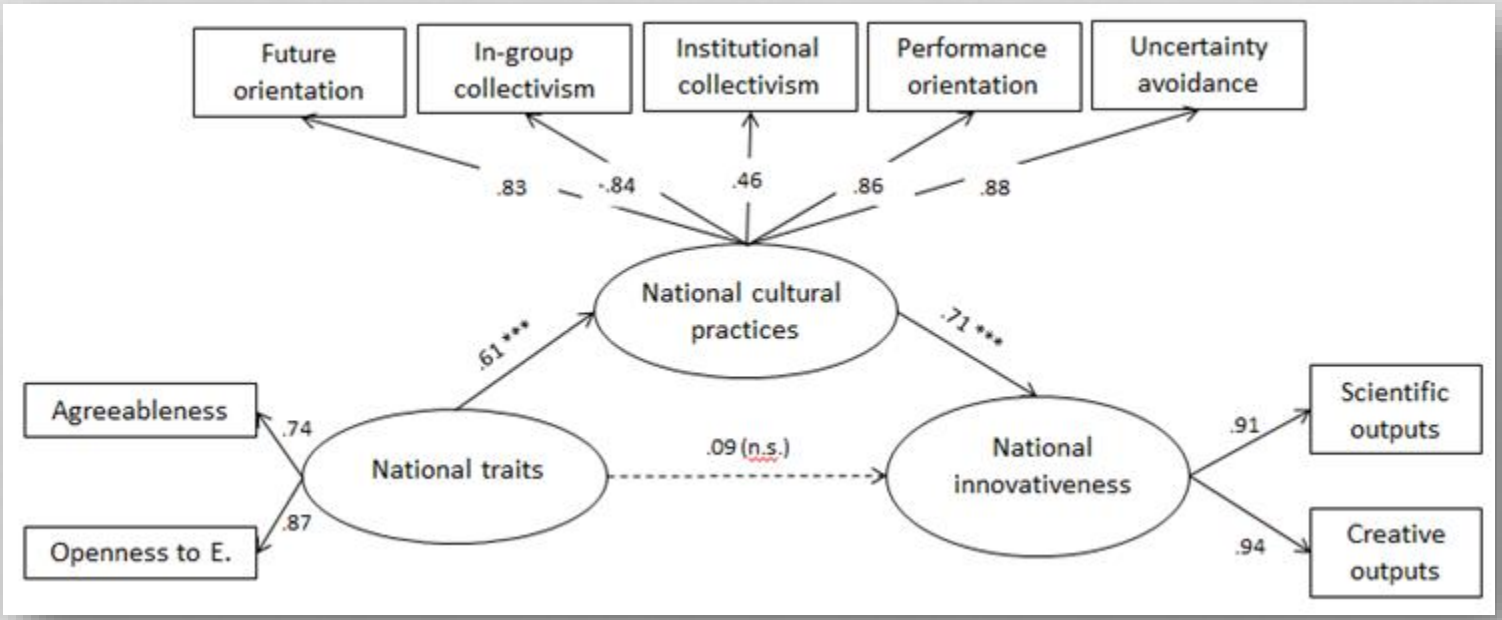
Other factors have to be considered as well

- Antecedents
- Contingency factors

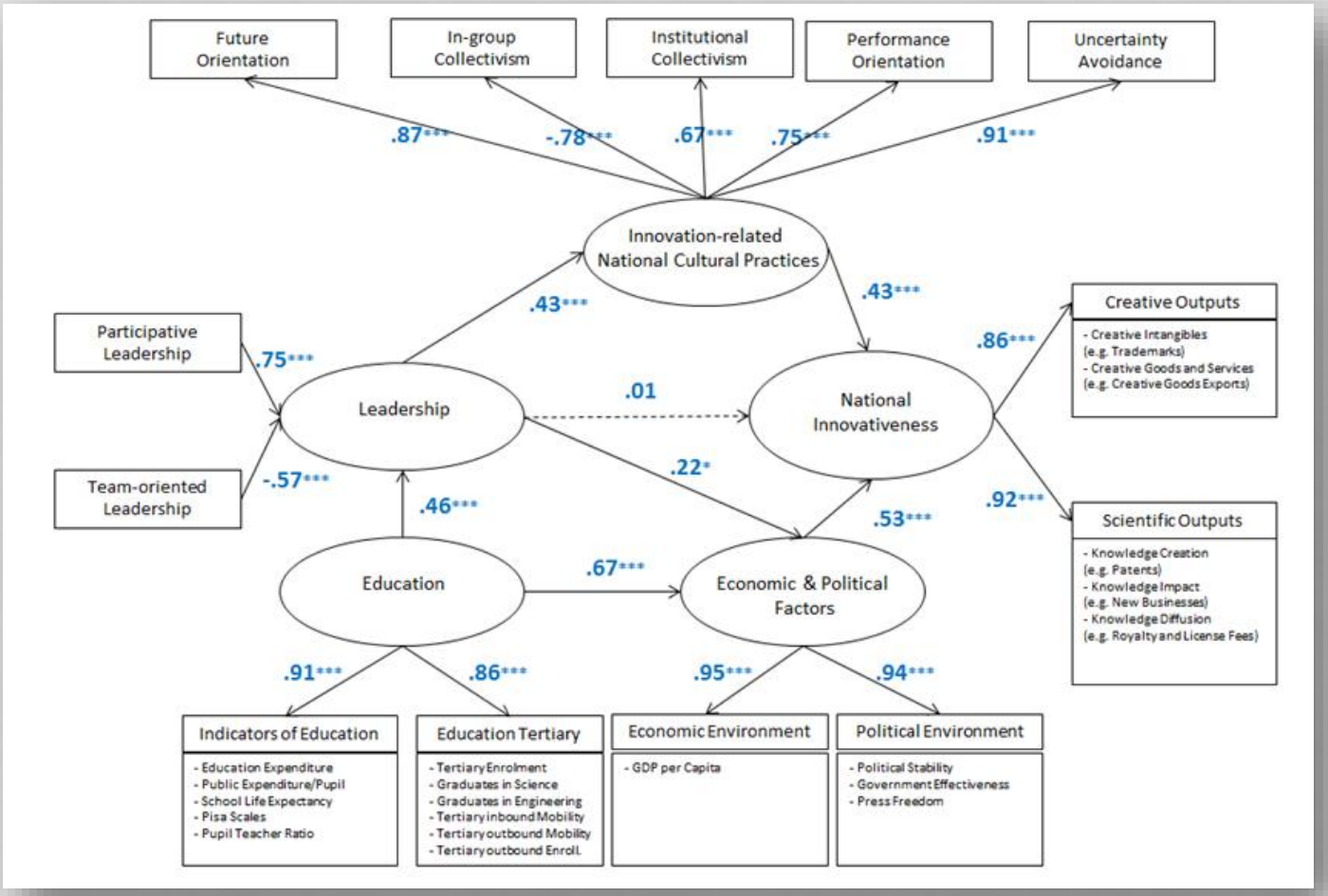
National culture has multidimensional effects
&
National innovation depends on multidimensional conditions

- Interaction of different levels of analysis have to be considered

RESEARCH PREVIEW
- ANTECEDENTS-



RESEARCH PREVIEW
LEADERSHIP & CONTINGENCY FACTORS



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OVERALL CONCLUSION

„Culture matters“

Theory

- National culture and innovation
  - Related Globe dimensions
- Cultural configurations
  - Uncertainty avoidance
  - In-group collectivism
  - Human orientation
- Cultural clusters
  - Three clusters

Practice

- Education
  - Self reliance, independent action (UV)
  - Tolerance, social competence (HO)
  - Flexibility & creativity (IGC)
- Leadership
  - Expert knowledge, information (UV)
  - Autonomy, degrees of freedom (IGC)
  - Tolerance (HO)
- Personal selection
  - Job requirements
  - Methods

Terima kasih!