Measuring the Governance of Collaborative Practices for Stunting Management in Lampung, Indonesia

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***Abstract*— The phenomenon of stunting is one of the priority issues of national health development in the Republic of Indonesia. In Lampung Province, the government responded to this problem by establishing the Lampung Stunting Agency (LSA), which facilitates collaboration between various parties to overcome stunting. In connection with this development, this article tries to analyze whether there is governance in managing stunting in Lampung Province. This article define collaboration as process in which autonomous or semi-autonomous actors interact through formal and informal negotiation, jointly creating rules and structures governing their relationships and ways to act or decide on the issues that brought them together. It is a process involving shared norms and mutually beneficial interactions and consists five dimensions (governance, administration, organizational autonomy, mutuality, and norms). The researcher distributed questionnaires to 200 respondents who were selected purposively, both offline and online, who intersect with LSA. Primary data were analyzed using principal component analysis (PCA) techniques, reliability test, and confirmatory factor analysis (CFA). The results of PCA indicate that all governance indicators in this study are unidimensional and have internal consistency. The finding confirms that there is governance in the reduction of stunting in Lampung Province empirically. However, this governance still needs to be strengthened, especially in the context of formal agreements, collective decision making, and informal relations.**

Keywords—collaboration; governance; stunting; health; Lampung

I. INTRODUCTION

Stunting is synonymous with health problems because it is related to issues of access to quality, healthy food, and nutritional literacy for pregnant women. In Indonesia, the proportion of stunted children under five years old reaches 27.67 percent or 6.3 million children. This number exceeds the maximum standard (20 percent of the total number of children under five years old in a country) set by WHO [1]. In Lampung Province, according to the 2013 Basic Health Research Survey (RISKESDAS) results, the stunting rate reached 42.6% and decreased to 27.28 percent in 2018. The Government of Lampung Province (GLP) has identified four districts as priority locations for stunting management: Lampung Tengah, Lampung Selatan, Lampung Timur, and Tanggamus [2].

To respond to the stunting phenomenon, Lampung Provincial Government has formed the Lampung Stunting Agency (LSA), which is regulated by the Lampung Governor Regulation (PERGUB) Number 19 of 2019 on the Acceleration of Stunting Reduction in Lampung Province. According to this regulation, the LSA is a communication forum for strategic alliances from various stakeholders, regional work units, professional organizations, community organizations, health study programs, and non-governmental organizations (NGOs) related to accelerating the reduction in the prevalence of stunting in order to ensure the quality of gold generations in Lampung Province. This definition implicitly confirms that the LSA adopts collaborative governance in intervening of stunting in Lampung Province.

Scientifically, the issue of governance in reducing stunting has not yet received researchers' attention in Indonesia. However, it has been voiced by several researchers [3], [4]. The results of the literature review show that previous research on stunting is more concerned with: (a) risk factors, for example, the Human Development Index [5], household welfare [6], sanitary facilities and water treatment [7], and service institutions [8], income and employment [9], infectious diseases [10], food insecurity [11], lower birth weight, six months breastfed or more, having parents who were underweight, and mothers who never attended formal education [12]; (b) protective factors, such as direct cash assistance and prosperous rice program (RASTA or *Beras Sejahtera*), the Program of Family Hope (PKH or *Program Keluarga Harapan*) [13], [14], [15], education, maternal knowledge and feeding practices [16], [17], [18], access to animal products [19]. However, there are not many studies that measure how collaborative practices in governing stunting in Indonesia.

Conceptually, the definition of collaboration that a common and accepted does not exist. This lack of clarity around collaboration is considered an obstacle to supporting and improving collaboration [20]. However, there are generic definitions that suggested for the purpose of the study: "Collaboration is a process involving shared norms to govern the relationship through formal and informal negosiation, and ways to act or decide in the issues that brought them together with mutually beneficial outcomes" [21]. The definition emphasizes that collaboration is a multidimensional, composed five key dimensions, structural in nature (*governance* and *administration*), social capital dimensions (*mutuality* and *norms*), and agency (*organizational autonomy*) [21].

One critical component of the term is "governance". Kooiman defines governance as the forms in which public or private sectors engage in problem solving, not separately but in conjuction with other actors in society [22]. This approach, therefore views governance as forms of multiorganizational actions rather than involving only state institution [23] as

stated by other researchers [24], [25]. For this research, we adopt Stoker's claim that governance is also about collective decision making that includes both public and private actors specifically [26]. Although public agencies may have the ultimate authority to make a decision, the goal of collaboration is typically to achieve some degrees of consensus among stakeholders [27], especially how to solve the collective action problems they face, which actions are allowed or constrained, what information need to be provided, and how cost and benefits are to be distributed [21].

II. METHOD

This study uses a quantitative approach. There were 200 respondents who were selected purposively and involved in the LSA. Data collection by questionnaire, both offline and online via google form.

Because there is no evidence of an existing collaboration measure in Indonesia, use of an international instrument was considered appropriate. The study adopted a research instrument developed by Thomson, Perry, and Miller [21]. This instrument was developed to address the lack of a common theory of collaboration, in order to inform practice. The instrument measures collaboration in general business, not industry-specific settings, and have been empirically tested and proven by other researchers in different research contexts [20]. For these reasons, this instrument is considered suitable for measuring collaborative practice in Indonesia context.

Respondents were asked to choose one of the five answer options available: 5 (strongly agree), 4 (agree), 3 (do not know), 2 (disagree), and 1 (strongly disagree). Data were analyzed in the following stages: (a) data entry and cleaning; (b) PCA analysis to knowing the degree of unidimensional measurement; (b) reliability test ($\alpha < 0.70$ = not reliable; $\alpha > 0.70$ = reliable) to see the internal consistency of the measurement; (c) normality test to see data distribution; (d) CFA analysis to see the relationship between latent variables (governance) and the indicator/measured variable/manifest variable (12 statement items). The primary data analysis process was carried out using STATA 15.1 for Mac software. This research uses CFA because it commonly uses in social sciences to test whether measures of a construct or data are consistent or fit with the nature of that construct or hypothesized measurement model based on theory and/or previous analytic research.

III. RESULT

Descriptive statistics

The number of respondents in this study was 200 people with various socio-demographic attributes. The average age of the respondents was 36.24 years. The youngest respondent was 20 years old, and the oldest respondent was 58 years old. In other words, all respondents are of productive age. In terms of gender, this study was not too gender-biased because the difference between the number of male respondents (54.50%) and female respondents (45.50%) was not too large, only 9%.

Based on their religion, the majority of respondents are Muslim (97.50%). Respondents who are Christian (0.50%) and Catholic (2%) are not very large. Respondents' domicile is quite varied because they are spread over several districts/cities in Lampung Province. Three districts account for more than 10 percent of respondents: West Tulang Bawang District (46.50%), Pringsewu District (16.50%), and North Lampung District (15.50%). The rest contributed respondents below 10 percent. Although the distribution of respondents between districts/cities is not evenly distributed, the total districts/cities that are research locations are already more than half of the total districts/cities in Lampung Province. In other words, research respondents can be considered to represent Lampung Province.

In terms of ethnicity, respondents came from ethnic Javanese (56.00%), Sundanese (3.50%), Lampung (30.50%), South Sumatra (6.50%), West Sumatra (2.50%), North Sumatra (0.50%), and Aceh (0.50%). The composition of respondents based on ethnicity represents the current condition of the population in Lampung Province. Meanwhile, if viewed from the respondents' education level, most respondents in this study have an education of under-graduate/equivalent (57.50%) and high school/equivalent (22.50%). Outside this level of education, the proportion of respondents is smaller than 10 percent.

The majority of respondents (60.50%) came from the Ministry of Villages and Disadvantaged Areas (Kemendesa and PDT). The second position is respondents representing village government institutions. Other respondents came from district/city governments (3%), provincial governments (4.5%), educational institutions (3.50%), central government/vertical agencies (1%), community/professional organizations (0.50%), and international non-governmental organizations (INGO) as much as 0.50%.

Principal component analysis

Before being analyzed by CFA, the first step is to determine whether the twelve statements refer to one dimension of a construct/factor/latent variable or not. Based on the results, it is known that the the eigenvalue score of the twelve statements reaches 3.89. All factors of loading variable score in the Factor1 column are > 3, which indicates that all items are good indicators for the governance construct (See Fig. 1).

Factor analysis/correlation — Number of obs = 200
Method: principal-component factors — Retained factors = 3
Rotation: (unrotated) — Number of params = 33

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	3.89411	2.59782	0.3245	0.3245
Factor2	1.29629	0.28607	0.1080	0.4325
Factor3	1.01022	0.03689	0.0842	0.5167
Factor4	0.97333	0.05537	0.0811	0.5978
Factor5	0.91796	0.13029	0.0765	0.6743
Factor6	0.78768	0.05989	0.0656	0.7400
Factor7	0.72779	0.13500	0.0606	0.8006
Factor8	0.59279	0.02576	0.0494	0.8500
Factor9	0.56703	0.07044	0.0473	0.8973
Factor10	0.49659	0.07243	0.0414	0.9386
Factor11	0.42415	0.11207	0.0353	0.9740
Factor12	0.31208	.	0.0260	1.0000

LR test: independent vs. saturated: chi2(66) = 556.68 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances

Variable	Factor1	Factor2	Factor3	Uniqueness
gov1	0.4414	-0.1624	0.6016	0.4168
gov2	0.5687	0.0933	-0.0653	0.6636
gov3	0.4860	0.0432	0.1998	0.7220
gov4	0.6306	-0.4320	0.0027	0.4158
gov5	0.7242	-0.3310	-0.2174	0.3186
gov6	0.4648	0.4329	-0.4762	0.3697
gov7	0.5737	-0.0855	0.1422	0.6433
gov8	0.6823	-0.3837	-0.2115	0.3425
gov9	0.6202	0.3584	-0.2519	0.4235
gov10	0.6093	-0.0056	-0.0463	0.6266
gov11	0.5917	0.3506	0.4098	0.3598
gov12	0.3175	0.6081	0.1774	0.4979

Fig 1. The output of PCA

Reliability test

Based on the results, it is known that all statements' alpha (α) score reaches 0.7874. Because this score is above the minimum score of reliability (0.70), the twelve statement items above are considered reliable or have internal consistency to explain the concept of governance (See appendix 1).

Confirmatory factor analysis

To obtain the final model, researchers conducted three CFA analyzes (See appendix 2). Modification in model 1 and 2 resulted in model 3, which is the final model produced by this study.

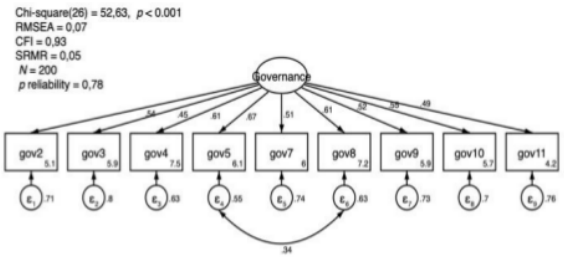

Fig. 2. The visualization of the final model

The final model is not perfect (does not reflect empirical data in the field), X^2 (**26**), p <0.001, because many other indicators have not been included in the model. However, the model is viable and proper, because it passes the goodness-of-fit test. This is indicated by the ideal RMSEA (0.072), CFI (0.933), and SRMR (0.053) scores (RMSEA: 0.05 - 0.08), also ideal (CFI: 0.95), and ideal (SRMR): <0.08) (see Fig. 2).

IV. DISCUSSION

The CFA analysis results confirm the existence of empirical facts about governance practices in reducing stunting in Lampung Province. Of the nine indicators, the gov5 indicator (Partner organizations (including your organization) formally evaluate the success of the collaboration) has the highest loading factor/path loading (See appendix 2), which is 0.67. It indicates a policy learning process between the collaborating actors. However, to what extent this policy learning process has an impact on improving governance as a whole still needs to be further explored. The gov5 indicator correlates with the gov8 indicator (Your organization knows the reasons why the partner organization is part of the collaboration). The gov5 and gov8 indicators' total measurement errors contributed as much as 0.34 percent significantly to the overall model. The factor loading indicator gov8 is also convincing (0.68), taking the second place alongside the gov4 indicator (Partner organizations take your organization's views seriously when decisions about collaboration are made). The gov8 indicator means an exchange of ideas, discussion, dialogue in the process of overcoming stunting. Meanwhile, the gov4 indicator indicates a collective decision-making process characterized by negotiation, compromise, and sharing perspectives.

Indicator of gov2 (Your organization relies on standard operating procedures (such as rules, policies, forms) established by partner organizations to coordinate the activities of each other in collaboration), gov7 (Your organization knows what resources (such as money, time, expertise) the partner organization brings to the collaboration), gov9 (Your organization brainstorms with partner organizations to develop solutions to mission-related problems encountered in the collaborative process), and gov10 (Your organization is involved in implementing specific solutions to mission-related problems facing collaboration) has a factor loading of 0.54, 0.51, 0.52, and 0.55, respectively. It means that the collaborative process in tackling stunting in Lampung Province is formal and uses modern administration (gov2), triggers an exchange of resources (gov7), an exchange of perspectives, and policy learning (gov9), and collective action (gov10).

There are only two indicators that have a factor loading of 0.4: gov3/ Your organization participates in a board/steering committee/agency specially created to make decisions about collaboration (0.45); and gov11/ Partner organizations (including your organization) rely on the mission statement for collaboration that is different from the respective partner organizations' mission statements (0.49). The gov3 indicator confirms the existence of a governance structure in overcoming stunting in Lampung Province. In contrast, the gov11 indicator shows a shared mission and sharing agenda-setting in the collaborative process. So, although each actor

has their agenda, they can agree on issues that become common agendas that require collective action.

Of the twelve indicators of governance, three indicators have a factor loading of < 0.4: gov1 (Your organization relies on a formal agreement that describes the relationship with partner organizations), gov6 (All partner organizations (including your organization) must agree before decisions about collaborative goals and activities are made), and gov12 (Your organization relies on informal personal relationships with partner organizations when making decisions about collaboration). It indicates a weak point of the governance in tackling stunting in Lampung Province. Formal agreements (gov1), mutual consent (gov6), and informal relations (gov12) are still very minimal in tackling stunting in Lampung Province. These three things can be a starting point for strengthening government governance in Lampung Province, especially in stunting.

Although there is already a collective decision-making process that prioritizes negotiation, compromise, and sharing perspectives (gov5), this process does not always guarantee that the final decision regarding collaboration gets mutual agreement (gov6). Some actors may take decisions unilaterally because of certain considerations that all parties may not necessarily agree with. This analysis strengthens theorists' arguments about the influence of governance structures, political-economic interests, authority structures, and motivations that affect the collaboration process [28], [29]. Consequently, today's collective action (gov10), mission and agenda-setting (gov11), and participation in governance structures (gov3) are artificial, for example, a collaborative process that is thought to emerge top-down.

This study's results strengthen the instrument developed by Thomson, Perry, and Miller [21] as a good measuring tool for analyzing governance phenomena in the context of collaboration. The existence of a policy learning process (gov5), dialogical communication (gov8), negotiation, and compromise (gov4) strengthens previous theoretical arguments about mutual adjustment and shared perspectives between actors in the collaboration process [30]. The exchange of resources (gov7) that occurs between actors in the prevention of stunting in Lampung Province also strengthens the results of previous studies [29], [31]. The lack of informal relationships (gov12) reinforces the argument about the importance of building effective personal relationships [32].

Based on the above findings, this study recommends that the parties, especially the Provincial Government of Lampung, are involved in the management of stunting reduction to strengthen collaborative practices into certain legal agreements. LSA institutions need to be strengthened with education and training. LSA is also advised to immediately prepare a road map and document best practices as part of efforts to manage knowledge (knowledge management) to prevent stunting. Informal meetings between actors must be held frequently to improve the quality of informal relations between actors.

V. CONCLUSION

Collaborative practice in reducing stunting in Lampung Province requires strengthening in the aspects of formal agreements, collective agreements, and informal relations. Therefore, there are two main agendas that need to be prioritized; First, related to the governance structure, there needs to be clarity on the position and role of the district/city government in LSA. Second, the need for community participation in educating nutritional issues, and promoting stunting as a common problem that must be intervened with the voluntarism mechanism. The need to package a variety of nutrition education messages (text, images, audio, and audiovisual) that are most readily accepted by the community.

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Appendix 1

Test scale = mean(unstandardized items)

Item	Obs	Sign	item-test corr.	item-rest corr.	interitem cov.	alpha	Label
gov1	200	+	0.4748	0.3249	.1176875	0.7844	gov1
gov2	200	+	0.5671	0.4410	.1125171	0.7710	gov2
gov3	200	+	0.4900	0.3720	.1188433	0.7777	gov3
gov4	200	+	0.5634	0.4782	.1180859	0.7702	gov4
gov5	200	+	0.6484	0.5572	.110804	0.7607	gov5
gov6	200	+	0.4949	0.3640	.1174683	0.7789	gov6
gov7	200	+	0.5586	0.4534	.1155815	0.7703	gov7
gov8	200	+	0.6075	0.5257	.1157378	0.7661	gov8
gov9	200	+	0.6267	0.5270	.1111421	0.7629	gov9
gov10	200	+	0.5925	0.4884	.1132389	0.7668	gov10
gov11	200	+	0.6455	0.5207	.1056592	0.7620	gov11
gov12	200	+	0.4439	0.2596	.118931	0.7972	gov12
Test scale					.1146414	0.7874	mean(unstandardized items)

Figure 1. The output of reliability test

Appendix 2

Model building process

MODEL 1: unstandardized

Structural equation model — Number of obs = 200
Estimation method = ml
Log likelihood = -2256.528

(1) [gov1]Governance = 1

	OIM Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Measurement						
gov1						
Governance	1	(constrained)				
_cons	3.595	.0557214	64.52	0.000	3.485788	3.704212
gov2						
Governance	1.228875	.2906278	4.23	0.000	.6592546	1.798495
_cons	3.8	.0524404	72.46	0.000	3.697219	3.902781
gov3						
Governance	.8755167	.2246705	3.90	0.000	.4351707	1.315863
_cons	3.76	.0454093	82.80	0.000	3.671	3.849
gov4						
Governance	1.030645	.2221983	4.64	0.000	.5951447	1.466146
_cons	3.875	.0366998	105.59	0.000	3.80307	3.94693
gov5						
Governance	1.504531	.3079537	4.89	0.000	.9009532	2.10811
_cons	3.855	.0443833	86.86	0.000	3.76801	3.94199
gov6						
Governance	.9103192	.2442718	3.73	0.000	.4315552	1.389083
_cons	3.795	.0501485	75.68	0.000	3.696711	3.893289
gov7						
Governance	1.031562	.2378845	4.34	0.000	.565317	1.497807
_cons	3.745	.0441574	84.81	0.000	3.658453	3.831547
gov8						
Governance	1.19527	.2487717	4.80	0.000	.7076869	1.682854
_cons	3.855	.0376812	102.31	0.000	3.781146	3.928854
gov9						
Governance	1.16745	.2639388	4.42	0.000	.6501393	1.68476
_cons	3.875	.0463344	83.63	0.000	3.784186	3.965814
gov10						
Governance	1.160279	.2618906	4.43	0.000	.6469828	1.673575
_cons	3.705	.0457152	81.05	0.000	3.6154	3.7946
gov11						
Governance	1.319287	.3059861	4.31	0.000	.7195656	1.919009
_cons	3.42	.0580345	58.93	0.000	3.306255	3.533745
gov12						
Governance	.7051814	.270025	2.61	0.009	.1759422	1.234421
_cons	3.125	.0655506	47.67	0.000	2.996523	3.253477
var(e.gov1)	.5293878	.0549363			.4319584	.6487926
var(e.gov2)	.4116911	.0443796			.3332833	.5085451
var(e.gov3)	.3421957	.0358001			.2787551	.4200744
var(e.gov4)	.1720883	.0196293			.1376128	.2152008
var(e.gov5)	.1866568	.0249933			.1435715	.2426719
var(e.gov6)	.4270784	.0444933			.3482001	.5238252
var(e.gov7)	.2925152	.0315037			.2368506	.361262
var(e.gov8)	.1531269	.0191348			.119863	.1956222
var(e.gov9)	.3045472	.0336853			.2451912	.378272
var(e.gov10)	.2946759	.0323709			.2375954	.3654696
var(e.gov11)	.5141907	.0556881			.4158504	.6357866
var(e.gov12)	.8138304	.0824939			.6671936	.9926953
var(Governance)	.0915872	.035624			.0427316	.1963

LR test of model vs. saturated: chi2(54) = 143.69, Prob > chi2 = 0.0000

MODEL 1: standardized

Structural equation model Number of obs = 200
Estimation method = ml
Log likelihood = -2256.528

(1) [gov1]Governance = 1

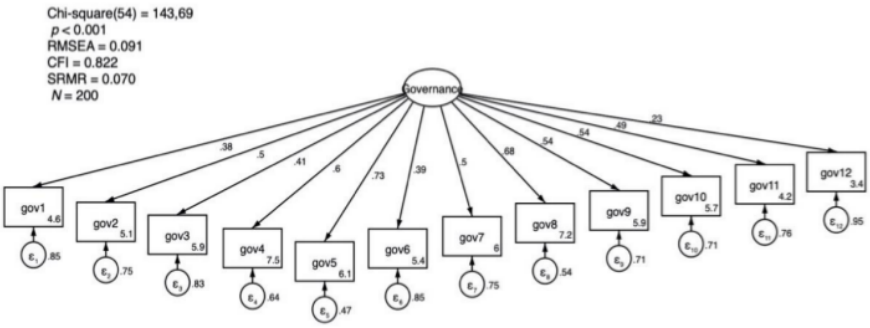
Standardized	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
Measurement						
gov1						
Governance	.3840435	.0676836	5.67	0.000	.251386	.516701
_cons	4.562069	.238812	19.10	0.000	4.094006	5.030132
gov2						
Governance	.5014685	.0608613	8.24	0.000	.3821825	.6207546
_cons	5.123919	.265775	19.28	0.000	4.603009	5.644828
gov3						
Governance	.4125937	.0663187	6.22	0.000	.2826114	.542576
_cons	5.855022	.3011697	19.44	0.000	5.26474	6.445304
gov4						
Governance	.6009634	.0537699	11.18	0.000	.4955763	.7063505
_cons	7.466087	.3799423	19.65	0.000	6.721414	8.210761
gov5						
Governance	.7254114	.044361	16.35	0.000	.6384655	.8123573
_cons	6.141721	.3151219	19.49	0.000	5.524093	6.759348
gov6						
Governance	.3884525	.0680039	5.71	0.000	.2551673	.5217378
_cons	5.351045	.2767385	19.34	0.000	4.808647	5.893442
gov7						
Governance	.499913	.0609361	8.20	0.000	.3804805	.6193455
_cons	5.996992	.3080743	19.47	0.000	5.393177	6.600806
gov8						
Governance	.6788027	.0483701	14.03	0.000	.5839992	.7736063
_cons	7.234097	.3685518	19.63	0.000	6.511749	7.956445
gov9						
Governance	.5391844	.0590076	9.14	0.000	.4235315	.6548372
_cons	5.913619	.3040185	19.45	0.000	5.317754	6.509484
gov10						
Governance	.5431312	.0579319	9.38	0.000	.4295867	.6566757
_cons	5.730771	.2951344	19.42	0.000	5.152318	6.309224
gov11						
Governance	.4864697	.0630718	7.71	0.000	.3628512	.6100881
_cons	4.167015	.2200228	18.94	0.000	3.735778	4.598252
gov12						
Governance	.2302115	.0751457	3.06	0.002	.0829286	.3774944
_cons	3.370999	.1827815	18.44	0.000	3.012754	3.729245
var(e.gov1)	.8525106	.0519869			.7564717	.9607423
var(e.gov2)	.7485293	.0610401			.637964	.8782568
var(e.gov3)	.8297665	.0547254			.7291499	.9442673
var(e.gov4)	.638843	.0646275			.5239426	.7789409
var(e.gov5)	.4737783	.0643599			.3630318	.6183092
var(e.gov6)	.8491046	.0528326			.7516197	.9592334
var(e.gov7)	.750087	.0609255			.6396953	.8795289
var(e.gov8)	.5392269	.0656674			.4247286	.6845914
var(e.gov9)	.7092802	.063632			.5949132	.8456333
var(e.gov10)	.7050085	.0629293			.5918557	.8397942
var(e.gov11)	.7633472	.061365			.6520705	.8936135
var(e.gov12)	.9470027	.0345988			.8815613	1.017302
var(Governance)	1	.			.	.

LR test of model vs. saturated: chi2(54) = 143.69, Prob > chi2 = 0.0000

MODEL 1: Goodness-fit-test

Fit statistic	Value	Description
Likelihood ratio		
chi2_ms(54)	143.691	model vs. saturated
p > chi2	0.000	
chi2_bs(66)	570.467	baseline vs. saturated
p > chi2	0.000	
Population error		
RMSEA	0.091	Root mean squared error of approximation
90% CI, lower bound	0.073	
upper bound	0.109	
pclose	0.000	Probability RMSEA <= 0.05
Information criteria		
AIC	4585.056	Akaike's information criterion
BIC	4703.795	Bayesian information criterion
Baseline comparison		
CFI	0.822	Comparative fit index
TLI	0.783	Tucker-Lewis index
Size of residuals		
SRMR	0.070	Standardized root mean squared residual
CD	0.832	Coefficient of determination

MODEL 1: CFA graphic



Model 1: interpretation

The above finding is the results CFA analysis, especially items gov1 - gov12. We can call the model as Model 1. Factor loading/path loading Model 1 can be read as follows: if a person has one standard deviation higher on Governance (latent variable/factor/construct), then the person will respond to a higher 0.38 standard deviation for gov1, 0.5 standard deviations higher for gov2, 0.41 for gov3, and so on. Some researchers set the factor loading/path loading coefficient > 0.4 to see the contribution of an item to the latent variable/factor/construct. When viewed from the SEM graph above, we can drop items gov1, gov6, and gov12 to improve Model 1.

Model 1 must also be modified because: (a) RMSEA score (0.09) Model 1 exceeds the ideal RMSEA value (0.05 - 0.08); (b) the model's CFI score (0.822) is too low than the ideal CFI score (0.95). The CFI score is significant as follows: the resulting model is 82.2 percent better than the null model (without parameters), assuming that all items do not interact with each other. Only the SRMR score is in line with the recommended value (below 0.08). The researcher performed the second CFA without gov1, gov6, and gov12 and produce Model 2.

As a note, researchers differ opinion on this excellent value of RMSEA, CFI, and SRMR. The above standards follow Acock's opinion [1]. Another opinion was put forward by Weston & Gore [2], who proposed different ideal values: RMSEA (0.00), CFI (0 - 1.0), and SRMR (0.00).

MODEL 2: unstandardized

Structural equation model Number of obs = 200
Estimation method = ml
Log likelihood = -1566.8279

(1) [gov2]Governance = 1

	OIM Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Measurement						
gov2						
Governance	1	(constrained)				
_cons	3.8	.0524403	72.46	0.000	3.697219	3.902781
gov3						
Governance	.7018481	.1523539	4.61	0.000	.40324	1.000456
_cons	3.76	.0454092	82.80	0.000	3.671	3.849
gov4						
Governance	.8510221	.1440766	5.91	0.000	.5686372	1.133407
_cons	3.875	.0366997	105.59	0.000	3.80307	3.94693
gov5						
Governance	1.248911	.1964068	6.36	0.000	.8639608	1.633861
_cons	3.855	.0443832	86.86	0.000	3.768011	3.941989
gov7						
Governance	.7996795	.1571206	5.09	0.000	.4917287	1.10763
_cons	3.745	.0441573	84.81	0.000	3.658453	3.831547
gov8						
Governance	.9839806	.1607519	6.12	0.000	.6689126	1.299049
_cons	3.855	.0376812	102.31	0.000	3.781146	3.928854
gov9						
Governance	.8651355	.1641168	5.27	0.000	.5434725	1.186799
_cons	3.875	.0463343	83.63	0.000	3.784186	3.965814
gov10						
Governance	.9117447	.1697298	5.37	0.000	.5790804	1.244409
_cons	3.705	.0457151	81.05	0.000	3.6154	3.7946
gov11						
Governance	.9589997	.1951168	4.92	0.000	.5765778	1.341422
_cons	3.42	.0580344	58.93	0.000	3.306255	3.533745
var(e.gov2)	.4073146	.0443576			.3290273	.5042292
var(e.gov3)	.3421151	.0359402			.2784523	.420333
var(e.gov4)	.1660375	.0192688			.1322585	.2084439
var(e.gov5)	.1714191	.0245009			.1295379	.2268409
var(e.gov7)	.2987302	.0321513			.2419175	.368885
var(e.gov8)	.1458255	.0187554			.1133328	.1876339
var(e.gov9)	.3225816	.0349721			.2608303	.3989525
var(e.gov10)	.2993646	.032948			.2412779	.3714356
var(e.gov11)	.5423761	.0577466			.4402237	.6682326
var(Governance)	.1426831	.040919			.0813323	.2503123

LR test of model vs. saturated: chi2(27) = 67.20, Prob > chi2 = 0.0000

MODEL 2: standardized

Structural equation model — Number of obs = 200
Estimation method = ml
Log likelihood = -1566.8279

(1) [gov2]Governance = 1

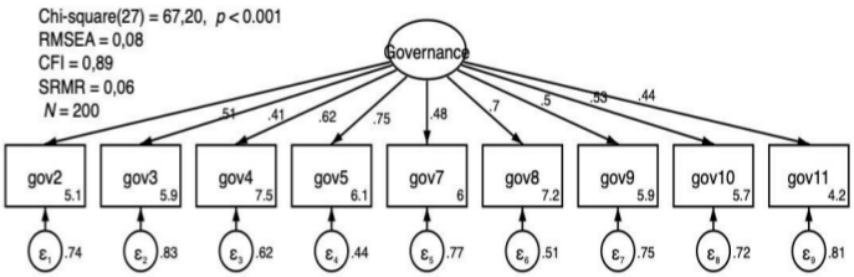
Standardized	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
Measurement						
gov2						
Governance	.5093377	.0610328	8.35	0.000	.3897156	.6289598
_cons	5.12393	.2657722	19.28	0.000	4.603026	5.644834
gov3						
Governance	.4128292	.0669844	6.16	0.000	.2815422	.5441161
_cons	5.855026	.3011695	19.44	0.000	5.264744	6.445307
gov4						
Governance	.6193685	.052519	11.79	0.000	.5164332	.7223038
_cons	7.466099	.3799418	19.65	0.000	6.721427	8.210771
gov5						
Governance	.751596	.0426654	17.62	0.000	.6679733	.8352188
_cons	6.141735	.3151215	19.49	0.000	5.524108	6.759362
gov7						
Governance	.4837091	.0626638	7.72	0.000	.3608903	.606528
_cons	5.996997	.3080741	19.47	0.000	5.393183	6.600811
gov8						
Governance	.697483	.0469576	14.85	0.000	.6054478	.7895183
_cons	7.234111	.3685512	19.63	0.000	6.511764	7.956459
gov9						
Governance	.4987151	.0617811	8.07	0.000	.3776264	.6198038
_cons	5.913625	.3040182	19.45	0.000	5.31776	6.509489
gov10						
Governance	.5327027	.0593286	8.98	0.000	.4164208	.6489846
_cons	5.730778	.2951342	19.42	0.000	5.152325	6.30923
gov11						
Governance	.4413712	.0659774	6.69	0.000	.3120579	.5706846
_cons	4.167018	.2200227	18.94	0.000	3.735782	4.598255
var(e.gov2)	.7405751	.0621726			.6282163	.8730297
var(e.gov3)	.8295721	.0553062			.7279573	.9453711
var(e.gov4)	.6163826	.0650572			.5011974	.7580397
var(e.gov5)	.4351034	.0641344			.3259306	.5808444
var(e.gov7)	.7660255	.0606221			.6559645	.894553
var(e.gov8)	.5135174	.0655043			.3999226	.6593781
var(e.gov9)	.7512833	.0616223			.639714	.8823108
var(e.gov10)	.7162278	.063209			.602463	.8514752
var(e.gov11)	.8051914	.0582411			.6987633	.9278296
var(Governance)	1	.			.	.

LR test of model vs. saturated: chi2(27) = 67.20, Prob > chi2 = 0.0000

MODEL 2: goodness-fit-test

Fit statistic	Value	Description
Likelihood ratio		
chi2_ms(27)	67.196	model vs. saturated
p > chi2	0.000	
chi2_bs(36)	433.691	baseline vs. saturated
p > chi2	0.000	
Population error		
RMSEA	0.086	Root mean squared error of approximation
90% CI, lower bound	0.061	
upper bound	0.112	
pclose	0.012	Probability RMSEA <= 0.05
Information criteria		
AIC	3187.656	Akaike's information criterion
BIC	3276.710	Bayesian information criterion
Baseline comparison		
CFI	0.899	Comparative fit index
TLI	0.865	Tucker-Lewis index
Size of residuals		
SRMR	0.060	Standardized root mean squared residual
CD	0.825	Coefficient of determination

MODEL 2: CFA graphic



Model 2: interpretation

In Model 2, three items (gov1, gov6, gov12) were excluded from the model due to factor loading/path loading <0.4. Model 2 remains imperfect because X^2 (**27**) = 67.20, p <0.001. However, the exclusion of three items (gov1, gov6, gov12) resulted in improvements in the RMSEA (0.086), CFI (0.899), and SRMR (0.060) scores. The RMSEA (0.086) and SRMR (0.060) values have met the ideal values. Meanwhile, the CFI value increased by 0.077 points or 7.70 percent and was almost close to the ideal value (0.95). To improve Model 2, according to Acock [1], we can enter the covariance parameter (correlation between two latent variables). In SEM, error of term / indicator error / measurement error (e) is a form of latent variable [2].

To determine which covariance was included in the next model (Model 3), it could be seen from the estimated score for the modification index (MI). In simple terms, the MI score means how much the chi squared (X^2) score will decrease if the covariance is added to the model. The large MI number indicates that the e scores are statistically correlated with each other. In the context of this research, the greatest MI scores were relations e.g.ov5 and e.g.ov8. Therefore, covariance (e.g.ov5, e.g.ov8) would be entered into Model 3. Theoretically, this suggests that the items gov5 (partner organizations, including yours, formally evaluate the success of the collaboration) and gov8 (organizations you know the reasons why partner organizations are part of the collaboration) explain the same empirical phenomenon. It could also be that respondents are aware of why they collaborate, but they never evaluate the collaboration process.

MODEL 3: unstandardized

Structural equation model Number of obs = 200
Estimation method = ml
Log likelihood = -1559.5435

(1) [gov2]Governance = 1

	OIM Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Measurement						
gov2						
Governance	1	(constrained)				
_cons	3.8	.0524404	72.46	0.000	3.697219	3.902781
gov3						
Governance	.7197637	.1467959	4.90	0.000	.4320489	1.007478
_cons	3.76	.0454093	82.80	0.000	3.671	3.849
gov4						
Governance	.7894894	.1349987	5.85	0.000	.5248968	1.054082
_cons	3.875	.0366998	105.59	0.000	3.80307	3.94693
gov5						
Governance	1.051924	.1709007	6.16	0.000	.716965	1.386883
_cons	3.855	.0443833	86.86	0.000	3.76801	3.94199
gov7						
Governance	.7938569	.1511157	5.25	0.000	.4976756	1.090038
_cons	3.745	.0441574	84.81	0.000	3.658453	3.831547
gov8						
Governance	.8034998	.1410245	5.70	0.000	.5270968	1.079903
_cons	3.855	.0376812	102.31	0.000	3.781146	3.928854
gov9						
Governance	.844593	.1553223	5.44	0.000	.540167	1.149019
_cons	3.875	.0463344	83.63	0.000	3.784186	3.965814
gov10						
Governance	.8817788	.1622651	5.43	0.000	.5637451	1.199813
_cons	3.705	.0457152	81.05	0.000	3.6154	3.7946
gov11						
Governance	1.003797	.1880818	5.34	0.000	.6351631	1.37243
_cons	3.42	.0580345	58.93	0.000	3.306255	3.533745
var(e.gov2)	.3888505	.0440967			.3113537	.4856364
var(e.gov3)	.3289149	.0354614			.2662642	.406307
var(e.gov4)	.1689315	.0204885			.1331909	.2142628
var(e.gov5)	.2156559	.0286408			.1662322	.2797741
var(e.gov7)	.2884172	.0319567			.2321174	.3583724
var(e.gov8)	.179935	.0223036			.1411256	.2294168
var(e.gov9)	.314421	.0352609			.252379	.3917148
var(e.gov10)	.2926758	.0332629			.2342323	.3657015
var(e.gov11)	.5112245	.0567177			.4113157	.6354013
var(Governance)	.1611495	.044107			.0942439	.2755528
cov(e.gov5,e.gov8)	.0677681	.0199274	3.40	0.001	.0287111	.106825

LR test of model vs. saturated: chi2(26) = 52.63, Prob > chi2 = 0.0015

MODEL 3: standardized

Structural equation model Number of obs = 200
Estimation method = ml
Log likelihood = -1559.5435

(1) [gov2]Governance = 1

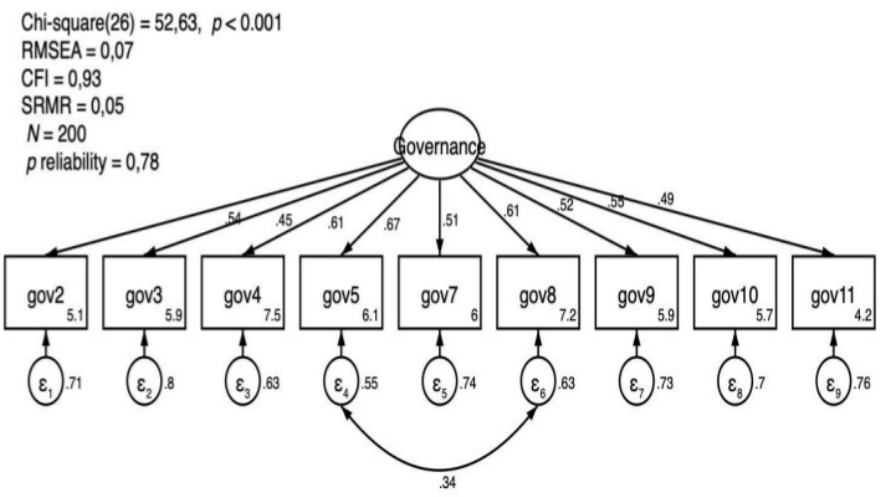
Standardized	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
Measurement						
gov2						
Governance	.5412939	.0609845	8.88	0.000	.4217666	.6608213
_cons	5.123919	.265775	19.28	0.000	4.603009	5.644828
gov3						
Governance	.4499302	.0667536	6.74	0.000	.3190956	.5807648
_cons	5.855022	.3011697	19.44	0.000	5.26474	6.445304
gov4						
Governance	.6106357	.0566414	10.78	0.000	.4996207	.7216507
_cons	7.466087	.3799423	19.65	0.000	6.721414	8.210761
gov5						
Governance	.6727669	.0525568	12.80	0.000	.5697574	.7757764
_cons	6.141721	.3151219	19.49	0.000	5.524093	6.759348
gov7						
Governance	.510315	.0626926	8.14	0.000	.3874399	.6331902
_cons	5.996992	.3080743	19.47	0.000	5.393177	6.600806
gov8						
Governance	.6052854	.0589671	10.26	0.000	.489712	.7208588
_cons	7.234097	.3685518	19.63	0.000	6.511749	7.956445
gov9						
Governance	.5174205	.0630184	8.21	0.000	.3939067	.6409342
_cons	5.913619	.3040185	19.45	0.000	5.317754	6.509484
gov10						
Governance	.5475188	.0603667	9.07	0.000	.4292022	.6658354
_cons	5.730771	.2951344	19.42	0.000	5.152318	6.309224
gov11						
Governance	.4909748	.0652622	7.52	0.000	.3630633	.6188863
_cons	4.167015	.2200228	18.94	0.000	3.735778	4.598252
var(e.gov2)	.7070009	.066021			.5887531	.8489981
var(e.gov3)	.7975628	.0600689			.6881073	.9244291
var(e.gov4)	.627124	.0691745			.5051988	.7784749
var(e.gov5)	.5473847	.070717			.4249378	.705115
var(e.gov7)	.7395786	.0639859			.624225	.8762489
var(e.gov8)	.6336295	.0713839			.5080895	.7901884
var(e.gov9)	.7322761	.065214			.6149924	.8719266
var(e.gov10)	.7002232	.0661038			.581942	.8425453
var(e.gov11)	.7589438	.0640841			.6431842	.8955377
var(Governance)	1	.			.	.
cov(e.gov5,e.gov8)	.3440223	.0768404	4.48	0.000	.1934179	.4946268

LR test of model vs. saturated: chi2(26) = 52.63, Prob > chi2 = 0.0015

MODEL 3: goodness-fit-test

Fit statistic	Value	Description
Likelihood ratio		
chi2_ms(26)	52.627	model vs. saturated
p > chi2	0.002	
chi2_bs(36)	433.691	baseline vs. saturated
p > chi2	0.000	
Population error		
RMSEA	0.072	Root mean squared error of approximation
90% CI, lower bound	0.043	
upper bound	0.099	
pclose	0.098	Probability RMSEA <= 0.05
Information criteria		
AIC	3175.087	Akaike's information criterion
BIC	3267.440	Bayesian information criterion
Baseline comparison		
CFI	0.933	Comparative fit index
TLI	0.907	Tucker-Lewis index
Size of residuals		
SRMR	0.053	Standardized root mean squared residual
CD	0.791	Coefficient of determination

MODEL 3: CFA governance graphic



MODEL 3: Final table for CFA

	Unstandardized value	Standardized value
Loading		
gov2:	1 (fixed)***	0,54***
gov3:	0,71***	0,44***
gov4:	0,78***	0,61***
gov5:	1,05***	0,67***
gov7:	0,79***	0,51***
gov8:	0,80***	0,60***
gov9:	0,84***	0,51***
gov10:	0,88***	0,54***
gov11:	1,00***	0,49***
Variance		
error.gov2:	0,38	0,70
error.gov3:	0,32	0,79
error.gov4:	0,16	0,62
error.gov5:	0,21	0,54
error.gov7:	0,28	0,73
error.gov8:	0,17	0,63
error.gov9:	0,31	0,73
error.gov10:	0,29	0,70
error.gov11:	0,51	0,75
Governance	0,16	1 (fixed)
cov (e.gov5, e.gov8)	0,67***	0,34***

*** $p < 0{,}001$

Model 3: interpretation

In Model 3, three items (gov1, gov6, gov12) were excluded from the model because of factor loading/path loading <0.4. The model also adds covariance by letting the error of term/indicator error/measurement error/predictor error (***e***) *cov(e.gov5, e.gov8)* be correlated. The result, X^2 (**26**), p <0.001 indicates that Model 3 is not perfect. However, Model 3 is appropriate with empirical phenomena because of the RMSEA score of 0.072 is ideal (0.05 - 0.08), a CFI of 0.933 is also ideal (0.95), and an SRMR of 0.053 also is ideal (below 0.08).

Additional reference

[1] A. C. Acock, *Discovering Structural Equation Modeling Using Stata*, Kindle. Texas, USA: STATA Press, 2013.

[2] R. Weston and P. A. Gore, "A Brief Guide to Structural Equation Modeling," *Couns. Psychol.*, vol. 34, no. 5, pp. 719–751, Sep. 2006.

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