Assessing Measurement Models
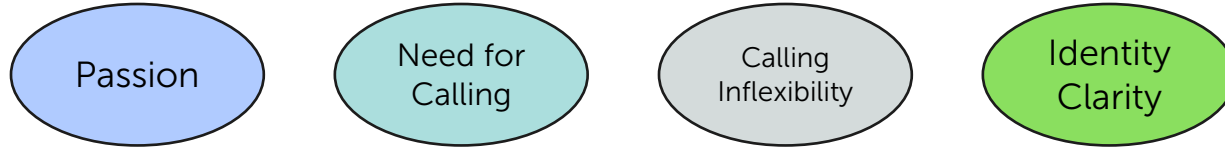
Leander De Schutter

Example

- Study on Career calling in academia

- Several distinguishable subdimensions such as

  - Passion

  - Need for calling

  - Calling inflexibility

  - Clear career identity

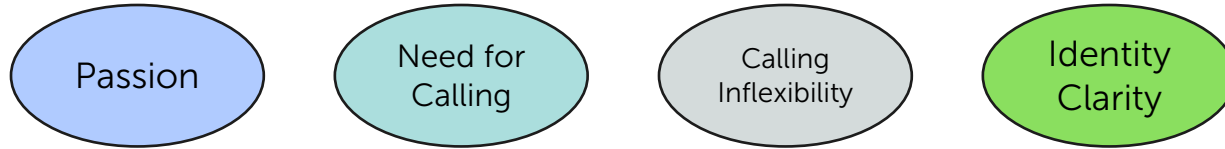- **Survey with items that measure each of these dimensions**

Vianello, M., Dalla Rosa, A., Anselmi, P., & Galliani, E. M. (2018). Validity and measurement invariance of the Unified Multidimensional Calling Scale (UMCS): A three-wave survey study. *Plos one*, *13*(12), e0209348

Our proposed measurement model

What we want to know: people's true level of

But we cannot directly measure them
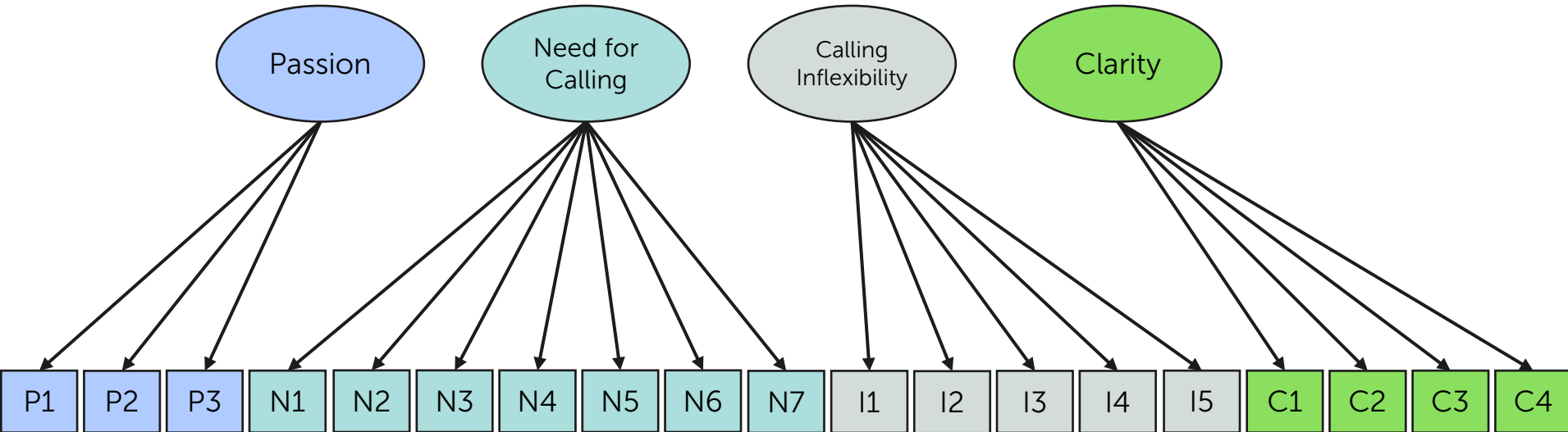
Our proposed measurement model

How respondents see the survey

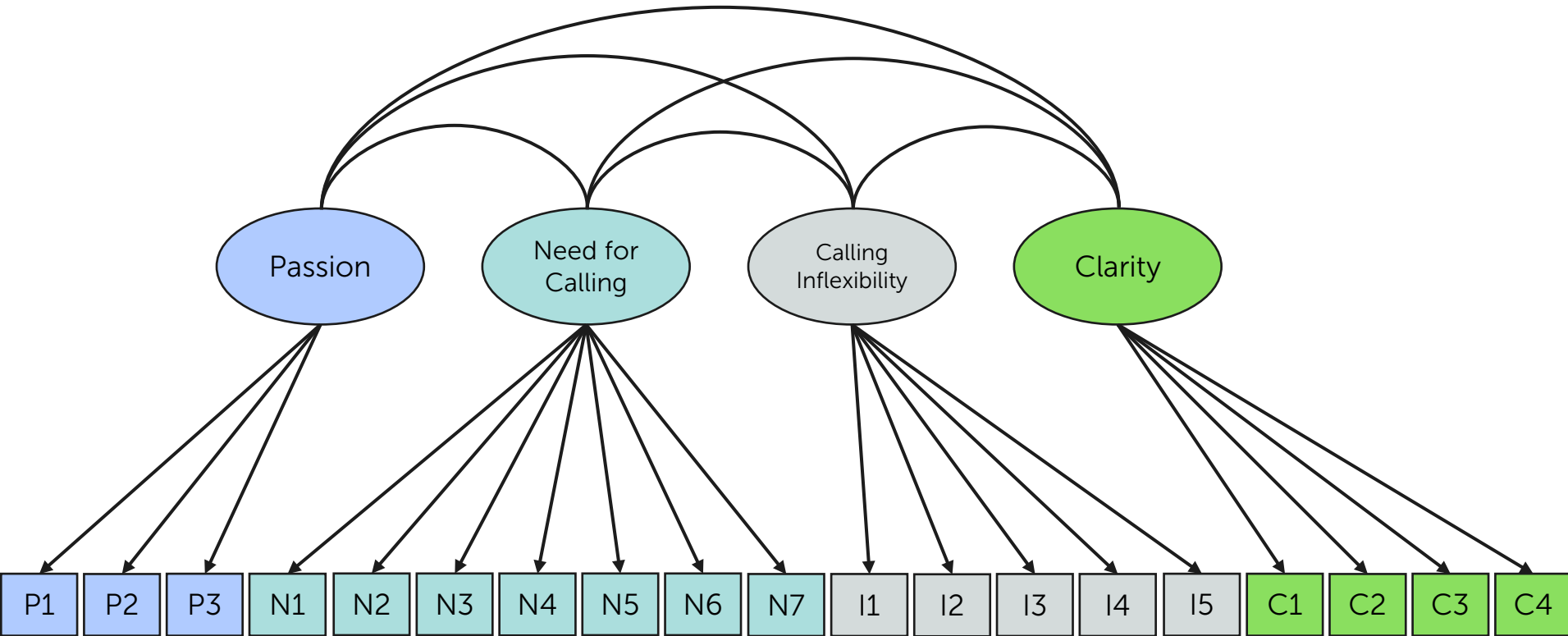|	Please indicate the extent to which you agree with the following statements	1 (strongly disagree)	2	3	4	5 (strongly agree)
	I am passionate about what I am studying					
	I enjoy what I study more than anything else					
	This line of studies gives me immense personal satisfaction					
	I need to realize myself at work					
	I need to feel a vocation for work					
	I need to have passion for my work					
	I need to find a job that has a great meaning for me					
	I need to do a job for which I have a bent					
	I need to find a job that is useful to others					
	I need to feel "called" to do my job					
	No other field of study inspires the same passion in me					
	I feel that there are other areas for which I am bend for					
	I feel this is the only path for me					
	The path I took is the only one that can give meaning to my life					
	I feel that there are other areas in which I can realize myself					
	I have clear career goals					
	I know what my professional identity is					
	I know what my future career is					
	I have a clear idea of my future career					

What we will test

		1 (strongly disagree)	2	3	4	5 (strongly agree)
P1	I am passionate about what I am studying					
P2	I enjoy what I study more than anything else					
P3	This line of studies gives me immense personal satisfaction					
N1	I need to realize myself at work					
N2	I need to feel a vocation for work					
N3	I need to have passion for my work					
N4	I need to find a job that has a great meaning for me					
N5	I need to do a job for which I have a bent					
N6	I need to find a job that is useful to others					
N7	I need to feel "called" to do my job					
I1	No other field of study inspires the same passion in me					
I2	I feel that there are other areas for which I am bend for					
I3	I feel this is the only path for me					
I4	The path I took is the only one that can give meaning to my life					
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C1	I have clear career goals					
C2	I know what my professional identity is					
C3	I know what my future career is					
C4	I have a clear idea of my future career					

Our proposed measurement model

We assume that the latent ("hidden") constructs "give rise to" high values of the indicators.
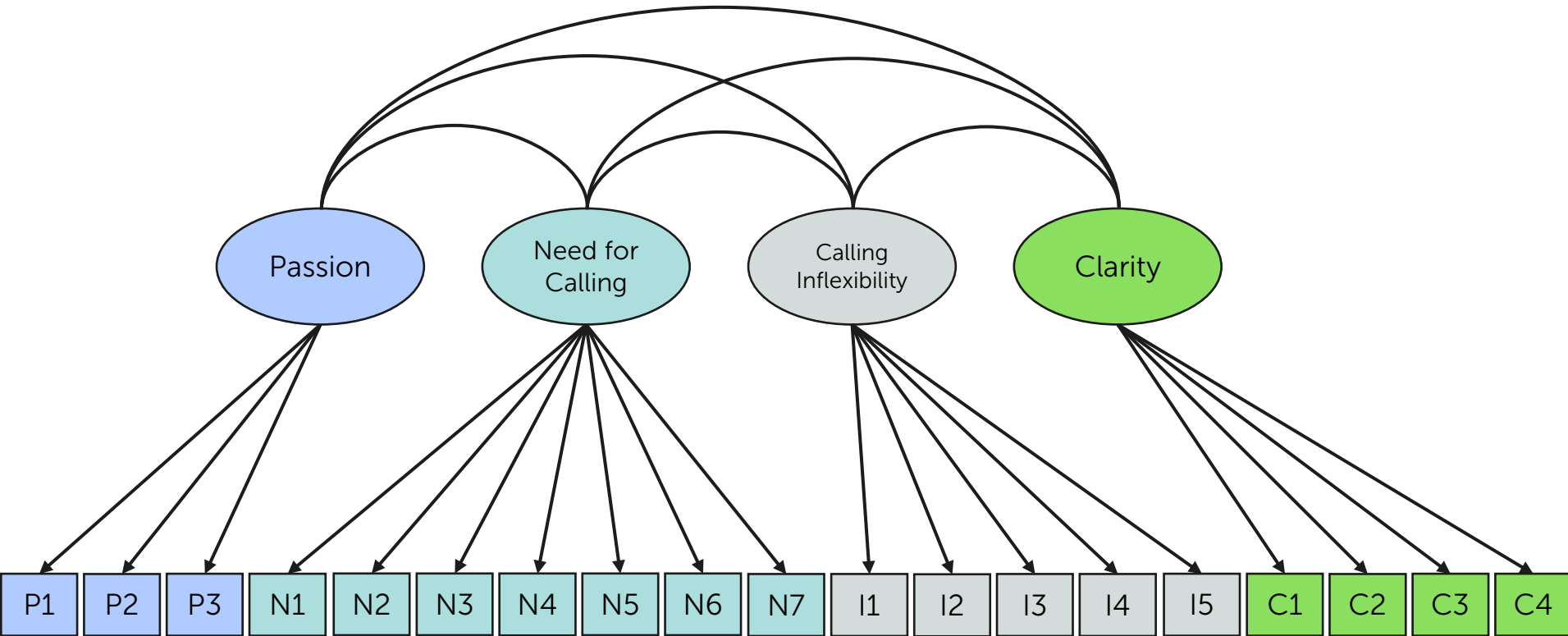
Our proposed measurement model

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Confirmatory Factor Analysis

- Are our measures **consistent with our understanding** of the construct?
  - Do the items from the same scale also cluster around one single construct
  - Do the four constructs sufficiently cover the pattern in the data
  - Is there convergent/discriminant validity

- **Method bias**? E.g., positive correlations because some people just agree with everything

→ **CFA to show we measured different constructs and rule out bias**

Our proposed measurement model

We assume that the latent ("hidden") constructs "give rise to" high values of the indicators.

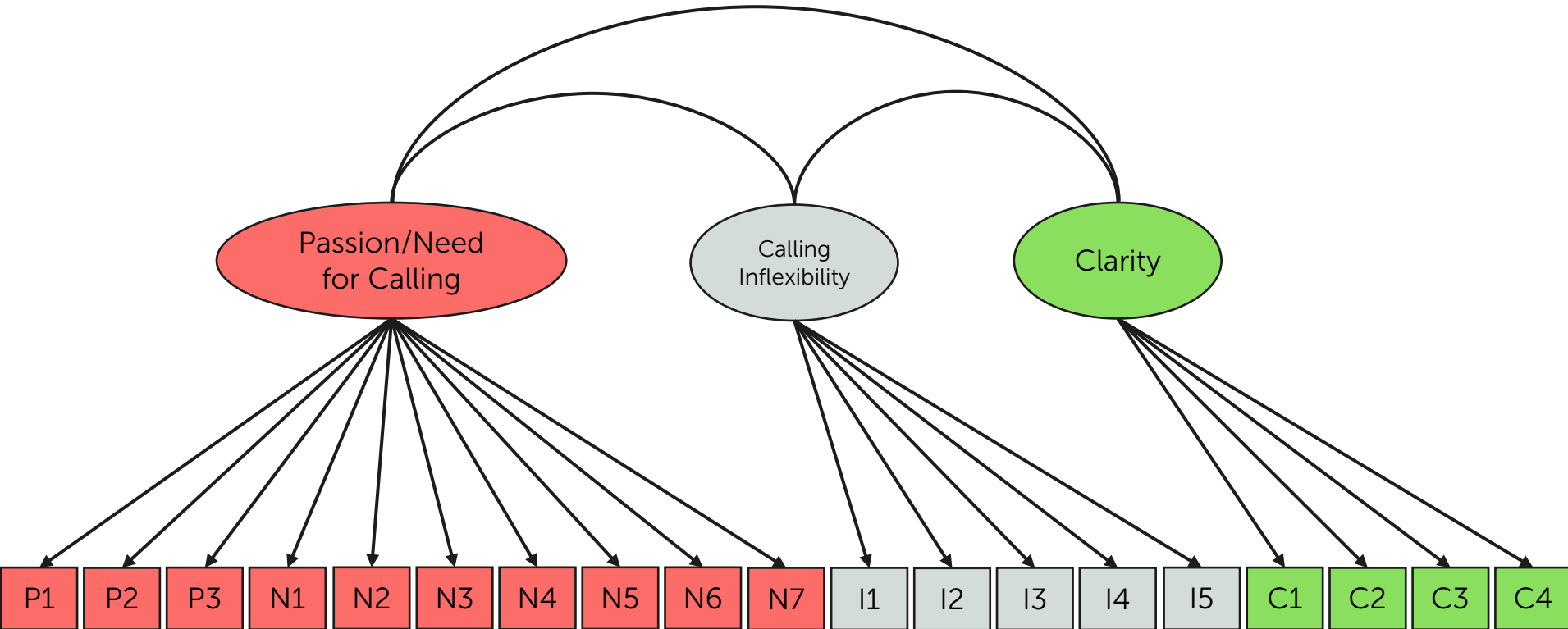# Nested Model: Are passion and need really distinct?

CFAs in papers

Table 2

Model Fit Results for Confirmatory Factor Analyses in Study 1

Models	χ^2	*df*	$\Delta\chi^2/\Delta df$	SRMR	RMSEA	CFI	TLI
Hypothesized five-factor model	107.09	67		.04	.05	.98	.97
Four-factor model—combining subordinate self-serving attribution and subordinate psychological entitlement	269.11	71	162.02/4***	.09	.10	.88	.85
Four-factor model—combining leader humility and subordinate psychological entitlement	589.23	71	482.14/4***	.14	.16	.69	.60
Four-factor model—combining subordinate psychological entitlement and workplace deviance	279.58	71	172.49/4***	.09	.10	.87	.84

Note. Δ = change relative to the measurement model; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean squared error of approximation; SRMR = standardized root mean-square residual.
*** $p < .001$.

Qin, X., Chen, C., Yam, K. C., Huang, M., & Ju, D. (2020). The double-edged sword of leader humility: Investigating when and why leader humility promotes versus inhibits subordinate deviance. *Journal of Applied Psychology, 105*(7), 693

CFAs in papers

The hypothesized six-factor model (i.e., each construct modeled as a separate factor) fit the data well, $\chi^2(155) = 691.469$; CFI = .961; RMSEA = .057; SRMR = .043, with all factor loadings being high ($\geq .476$) and significant ($p < .001$). This six-factor model demonstrated better fit than a two-factor model distinguishing between the Time 1 and the Time 2 variables, $\Delta\chi^2(14) = 5,513.941$, $p < .001$, and a one-factor model, $\Delta\chi^2(15) = 7,723.070$, $p < .001$.

Wanberg, C. R., van Hooft, E. A., Dossinger, K., van Vianen, A. E., & Klehe, U. C. (2020). How strong is my safety net? Perceived unemployment insurance generosity and implications for job search, mental health, and reemployment. *Journal of Applied Psychology, 105*(3), 209.

CFAs in Practice

- Steep learning curve (e.g., learning lavaan or Mplus)
- Tediously coding every CFA model separately
- Manually compare models
- Iteratively putting output in a table

→ Measurement assessment often ignored

→ I wrote an app that makes measurement assessment considerably easier

Item-level assessment

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