The Best of Two Worlds?
Merging psychometrics and econometrics

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UiO : University of Oslo

Our starting point
A simple linear regression
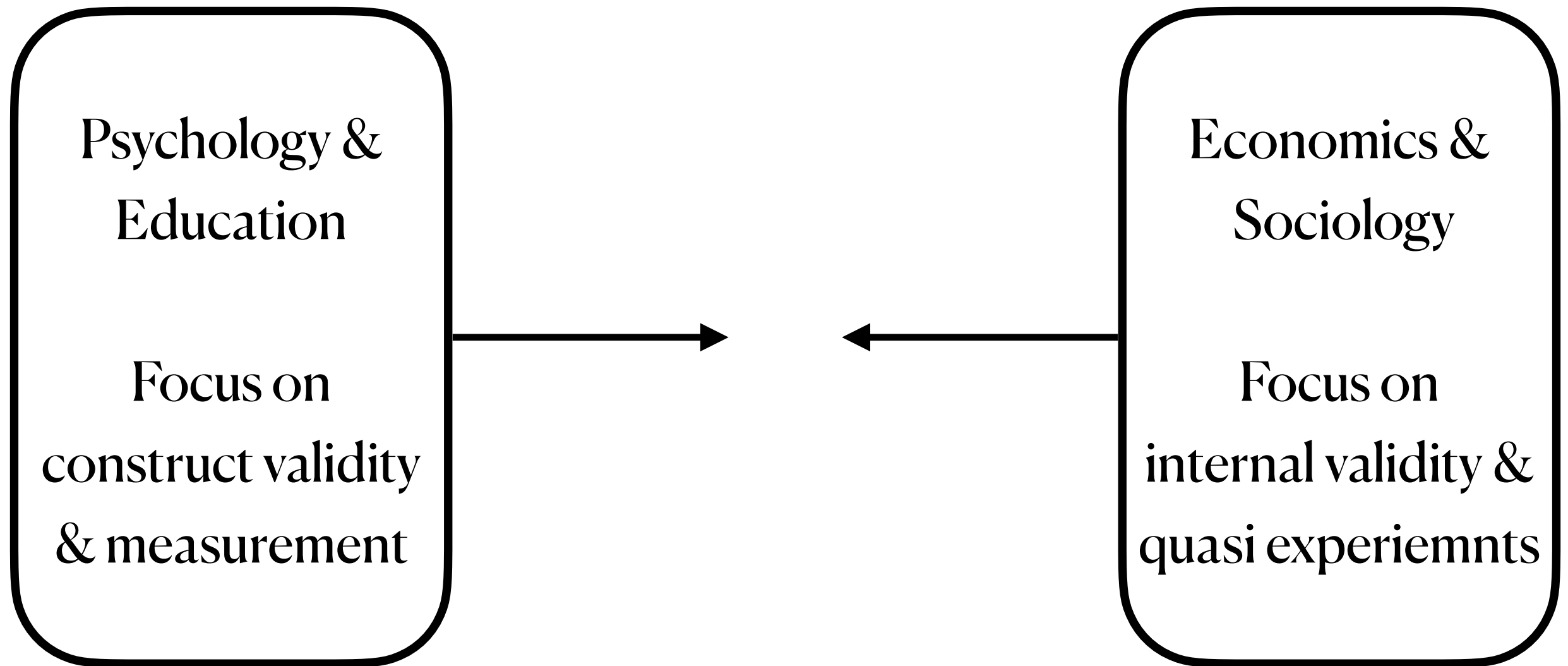
$$y = a + bx + e$$

Simplified model

Measurement issues apply to all measured variables (x and y-side)

Our theory

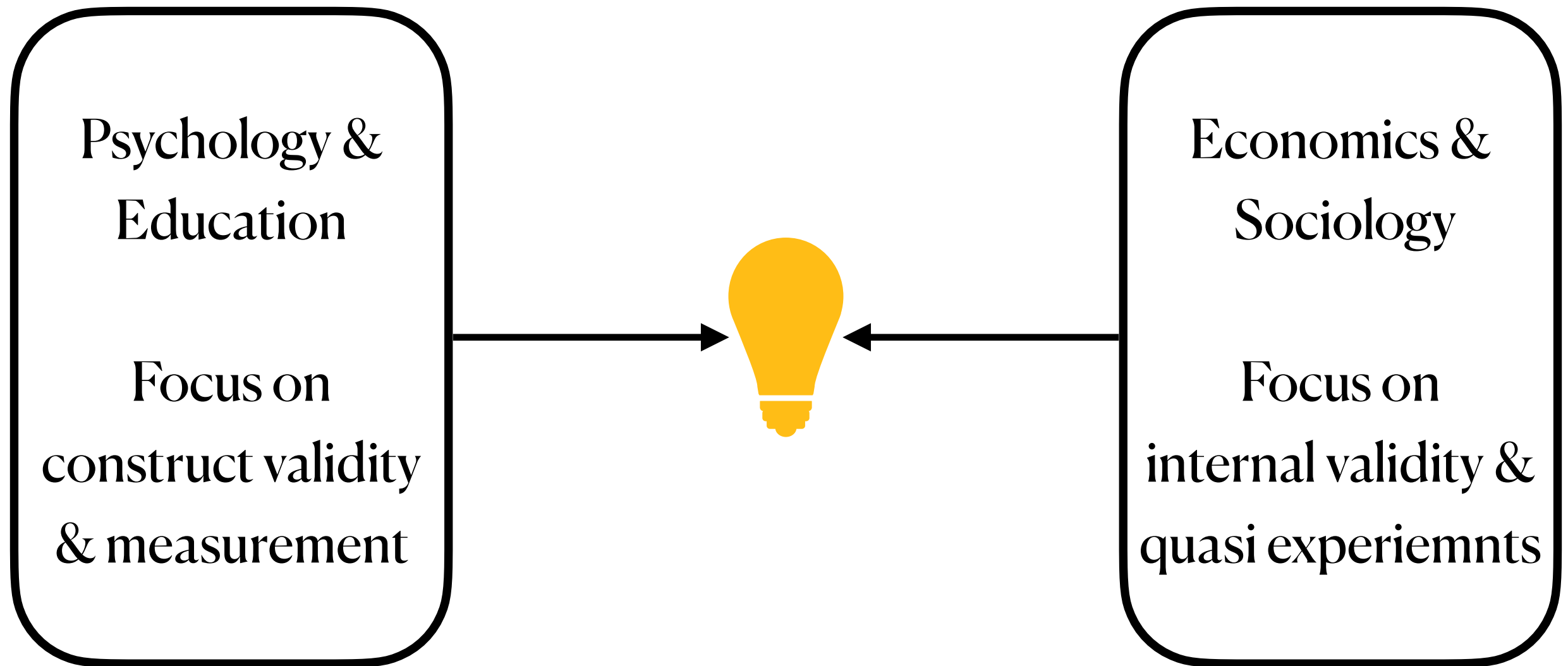Early child care (x) causes better language skills (y)

The opportunity of interdisciplinarity

Differences in strengths

Psychology &
Education

Focus on
construct validity
& measurement

→ ←

Economics &
Sociology

Focus on
internal validity &
quasi experiemnts

The opportunity of interdisciplinarity

Differences in strengths

Psychology & Education

Focus on construct validity & measurement

Economics & Sociology

Focus on internal validity & quasi experiemnts

What are people doing?

A brief review of *Child Development* in 2020

Papers with latent measurement models

24/208

Papers with quasi-experimental design

1/208

Papers doing both

0/208

Why is this merging not done?

Tradition/culture?

    What fields/journals emphasize

    Psych: measure; Econ: identification; Sociology: context

    Practical needs?

        Not all constructs need a measurement model

        Not all questions can (should) be tested with quasi experiments

Skills

    Bandwith—hard to be on top of all things…

Ontology

    «Truth» in design vs measurement

The *y*-side: Why should we care?
Measurement validity & precision

Construct validity (Messick, 1995)

    e.g., dimensionality

    Construct over/under representation
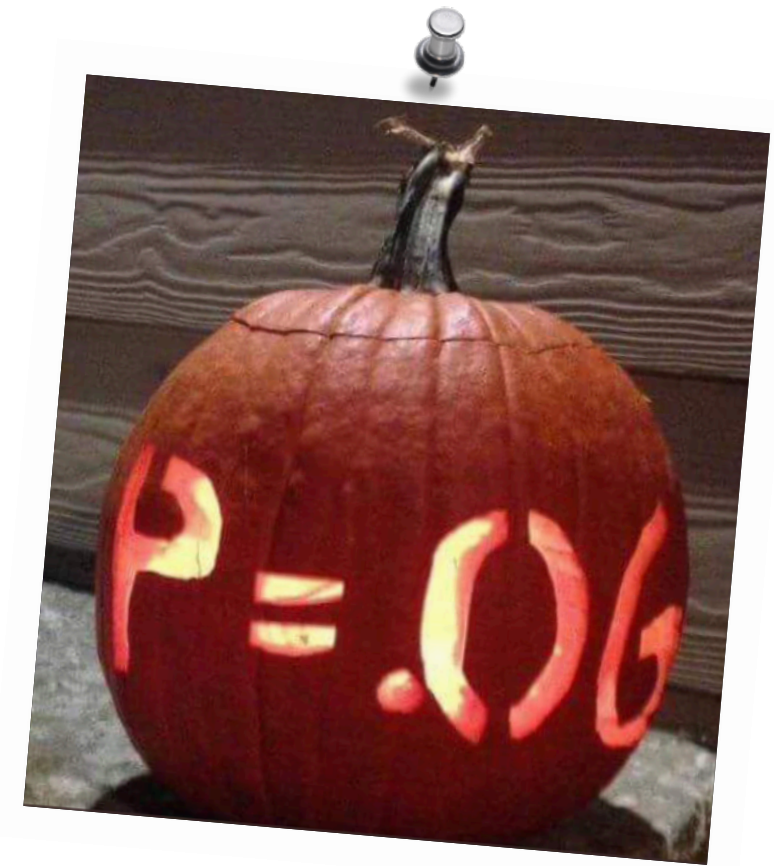
    Measurement variance

       (e.g., over time/groups)

Measurement error

    Over- or underestimated coefficients

    Precision/efficiency (s.e.)

(e.g., Bollen, 1989; Cole & Preacher, 2014)

The *y*-side: What should we do?

Latent measurement models

    Approach to construct validity

        Ensures unidimensionality

        Removes measurement error

Invariance across time/groups

True on both *x* and *y*-side

The *x*-side: Why should we care?

Endogeneity bias—causal inference

Causel inference is biased if..

Unmeasured causes correlated with the error-term

  e.g., unobserved selection into child care correlated with language skills

(e.g., Duncan et al., 2004; McCartney et al., 2006; Foster, 2010)

The *x*-side: What should we do?

For some questions—and some data—go beyond statistical control

Designs for identification for causal effects

Instrumental variables

Difference-in-difference

Regression discontinuity

Fixed effects—sibling or within person

(e.g., Murnane & Willett, 2010; Angrist & Pischke, 2008; Miller et al, 2018)

Example: IV with latent Y

Data from the Norwegian Mother, Father, and Child Cohort Study linked with national registries (n= app. 100,000), see <u>uio.no/eqop</u> & <u>fhi.no/moba</u>

Y (outcome)

    Language skills/problems at age 8 years

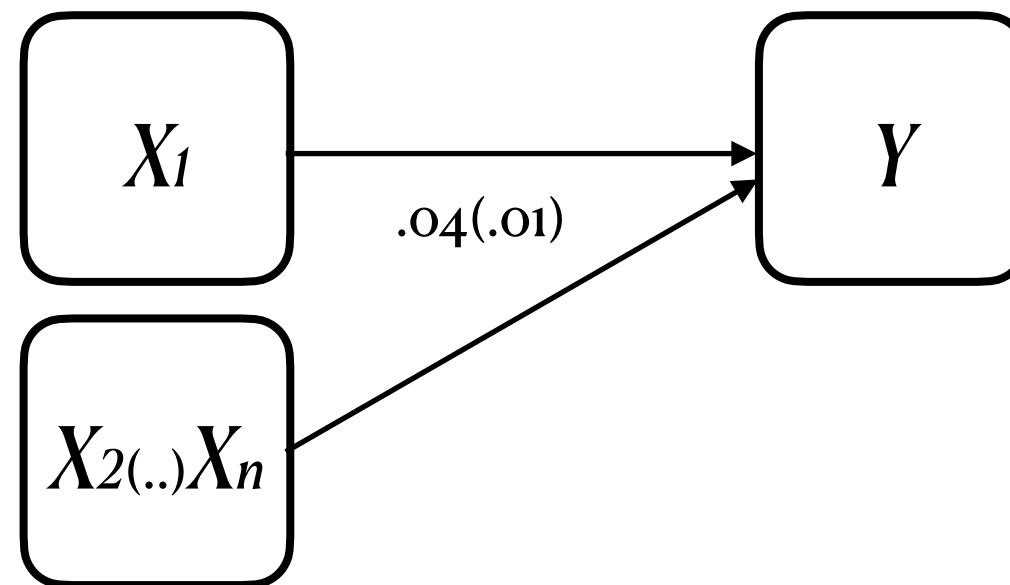   CCC2, 2 subscales (deficits [9 items] & strengths [7])

X (treatment)

    Child care attendance, 18 months of age

Z (instrument)

    Public child care expansion in Norway
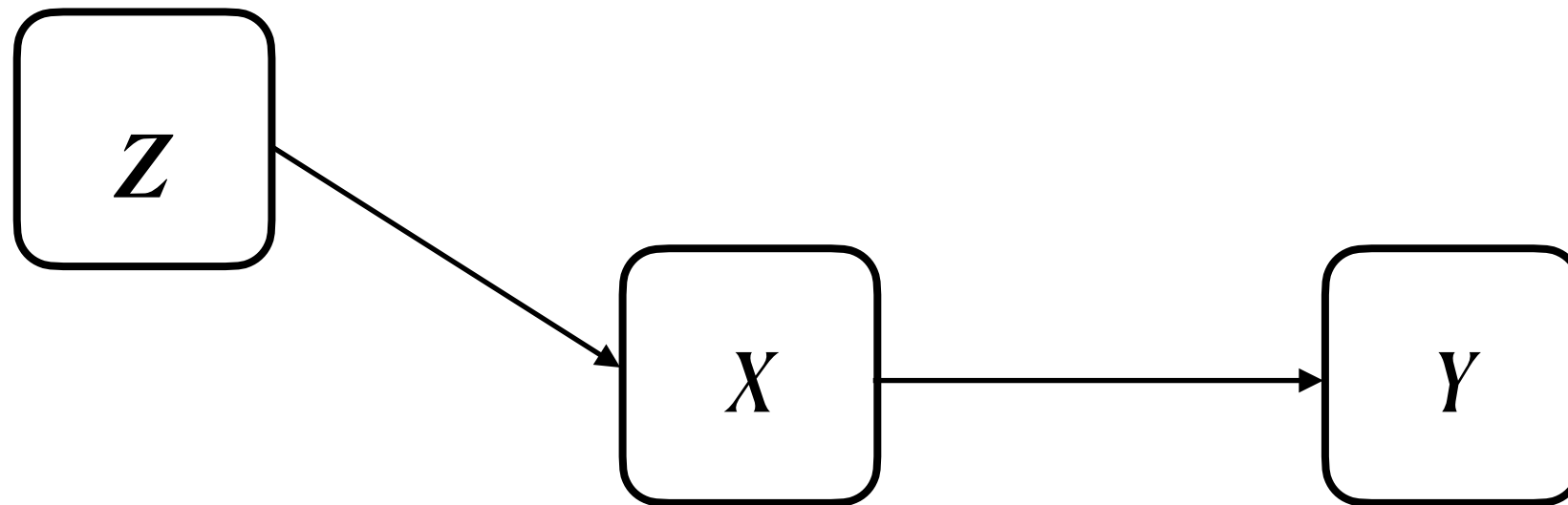
Observed outcome

Statistical control (naïve estimate)
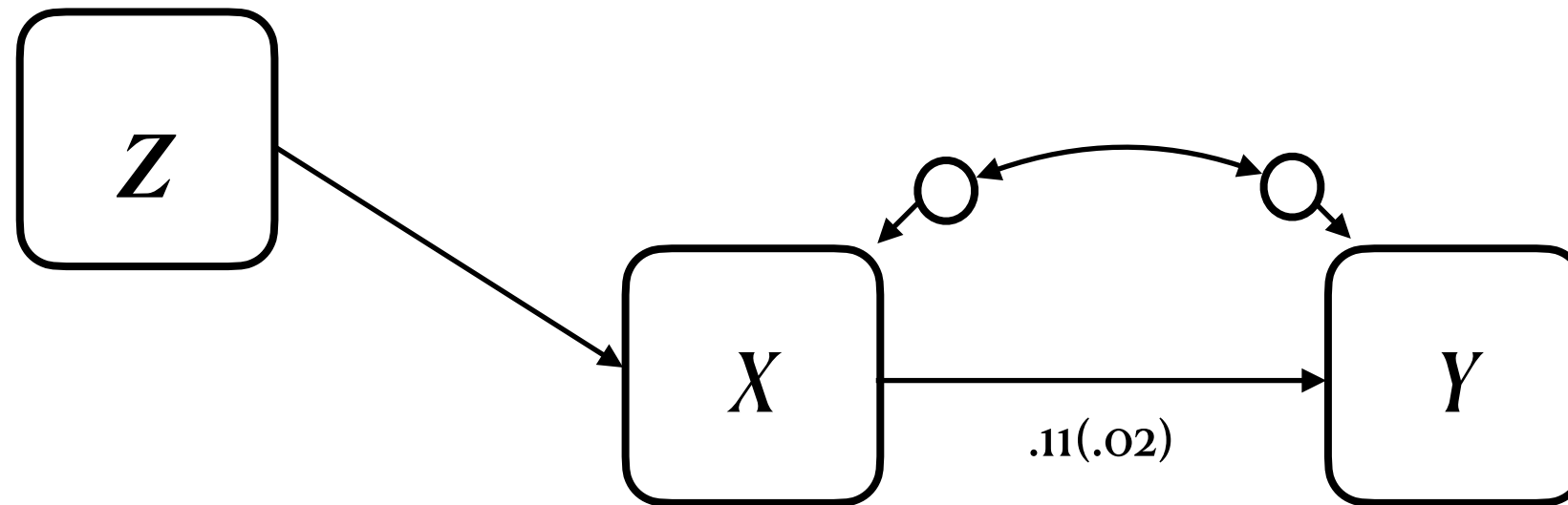

Y mean score, Cronbach's aplha of y = .82
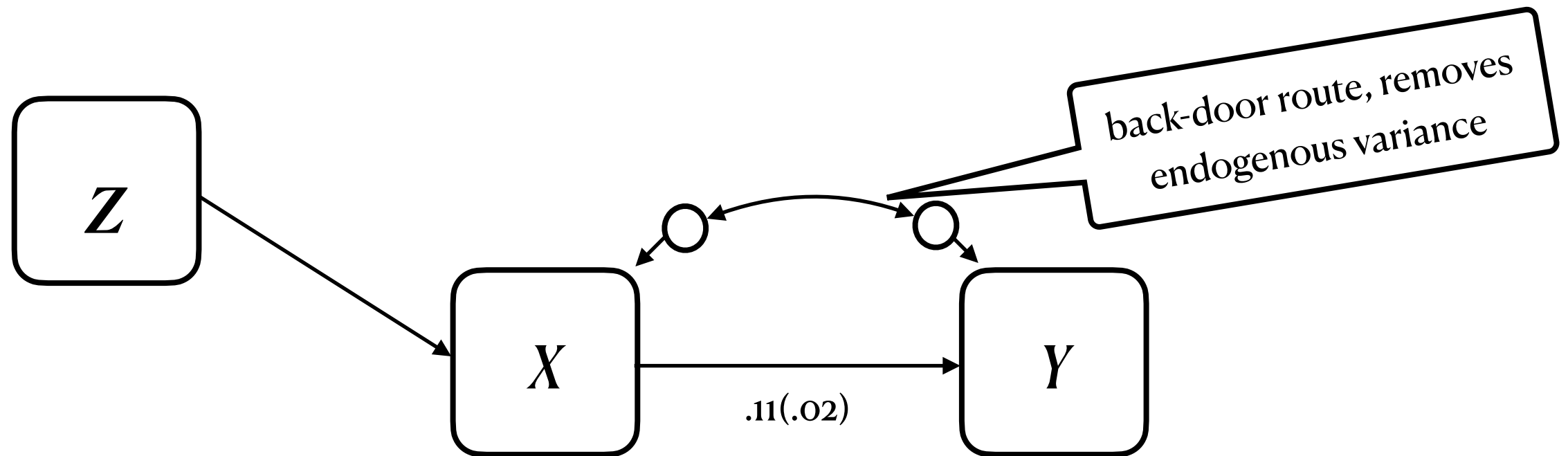
Observed outcome

Quazi-randomized assignment to X

Observed outcome

Single equation IV (Murnane & Willett, 2010)

$Z \rightarrow X$
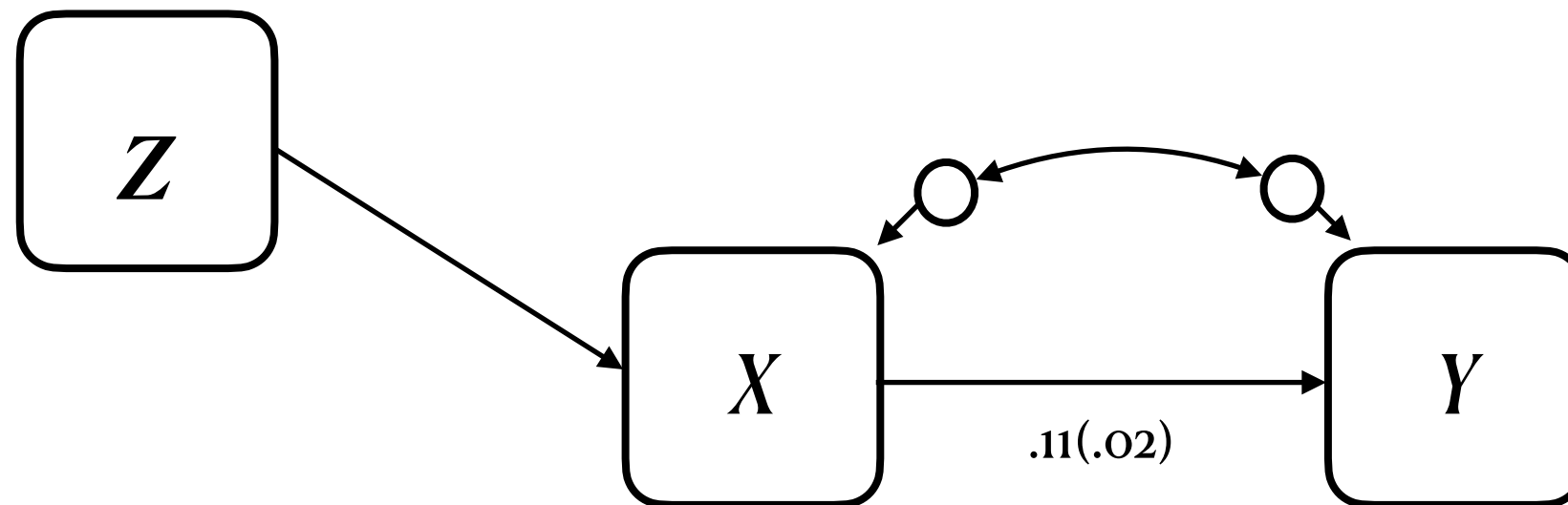
$X \xrightarrow{.11(.02)} Y$

Observed outcome

Single equation IV (Murnane & Willett, 2010)
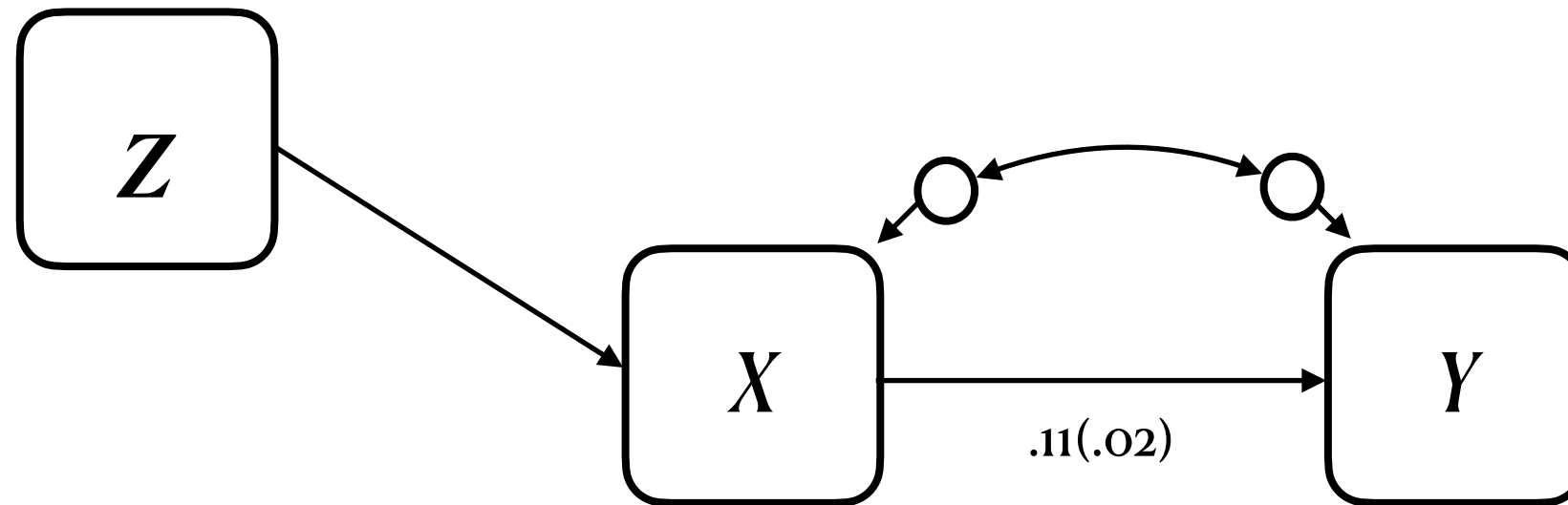
Observed outcome

Single equation IV (Murnane & Willett, 2010)

Y mean score, Cronbach's aplha of y = .82

Observed outcome

Single equation IV (Murnane & Willett, 2010)
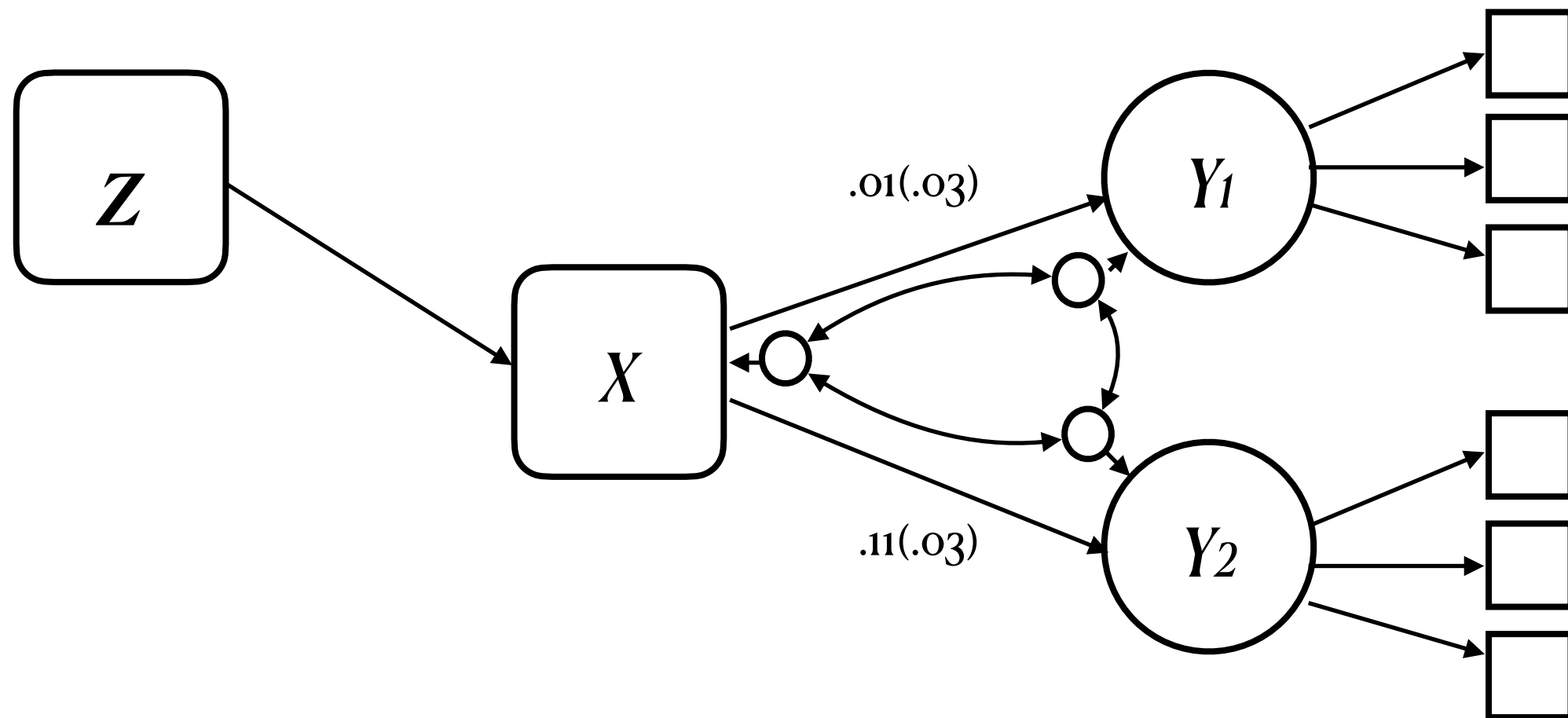

But CCC2 is two-dimensional

One factor: loadings .48-.87, RMSEA=.09, CFI= .85

Two factors: loadings .53-.92, RMSEA=.06, CFI= .95, r = .64
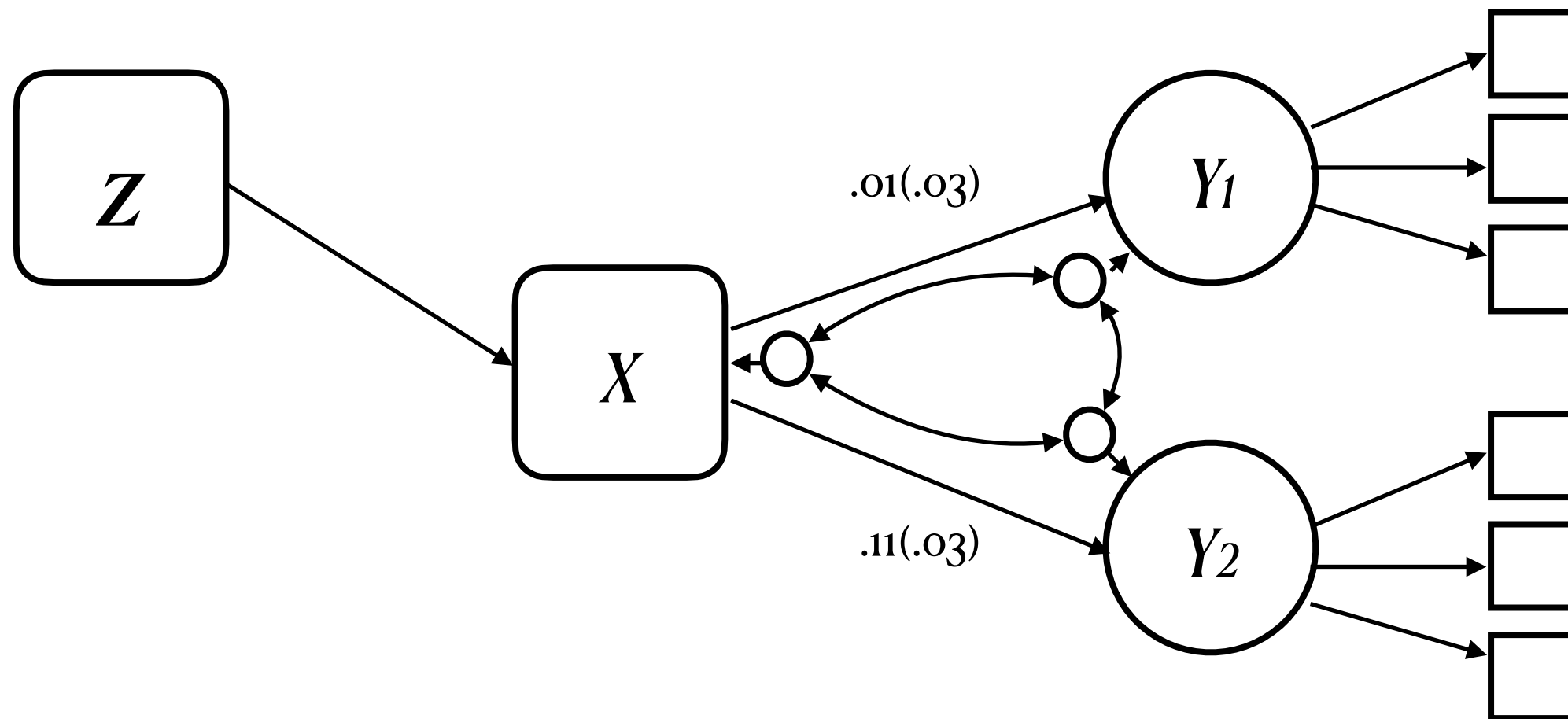
Latent outcomes

Single equation latent IV

Latent outcomes

Single equation latent IV

Substantive conclusion

Crude: idenitical (child care is good for language)

Nuanced: It matters for language strengths, but not for weaknesses

Upsides

Imagine a world where we think equally about these two things...

Can improve internal- and construct validity

 Remove errors and bias on both sides

Can be generalized to all quasi-experimental setups

 DiD, RD, FE...

Flexibility in modelling

 e.g., change in y over time, multi-group

Downsides

Words of caution...

Requires even more hard work

    Adds substantial complexity

    Need for additional skillset (or a team...)

Risk of getting lost

    In measuring constructs (Rhemtulla et al., 2020)

    In assumptions for causal identification (Angrist & Pischke, 2008)

SEM software is almost too flexible

    You need to know what you are doing

Thank you for your attention!

www.uio.no/eqop

Resources

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