

Methods for testing for threshold in associations between child care quality and child outcomes

Q-DOT Team
CCPRC 2011 Meetings

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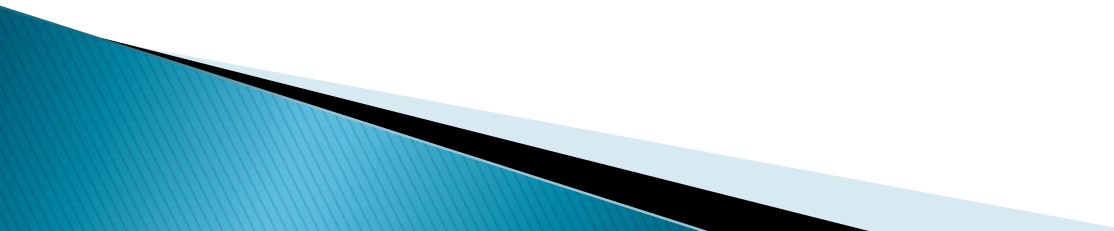
Project led by Louisa Tarullo at MPR and
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Margie

Background

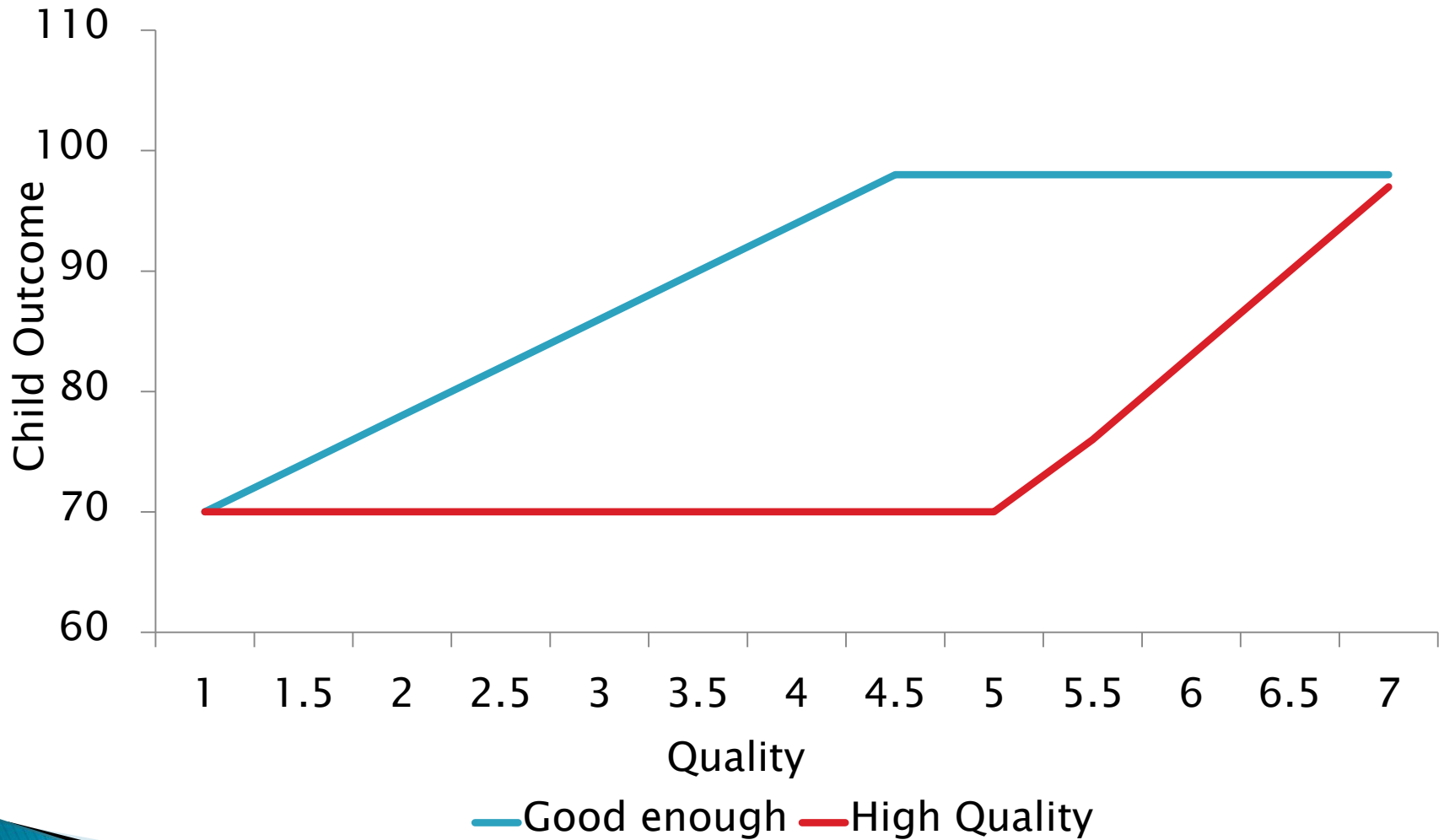
- ▶ Some evidence that the association between classroom quality and child outcomes may not be linear for early care and education
 - Burchinal, Kainz, & Cai, 2010:
 - Secondary data analysis of Head Start and Pre-K data:
 - Quadratic models for ECERS total and factor scores
 - Vandell et al, 2010:
 - Analysis of 15 year outcomes in NICHD SECCYD.
 - Quadratic models – ORCE Teacher Sensitivity
 - Burchinal et al, 2009
 - Analysis of NCEDL pre-K data.
 - Piecewise models – CLASS Instructional and Emotional Support

Background

- ▶ Hypothesized
 - Stronger associations between more specific quality measures and aligned child outcomes

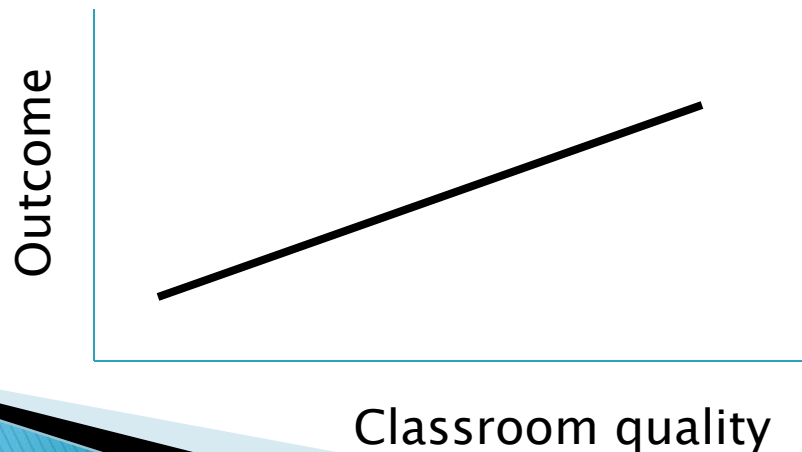
 - ▶ Important implications for quality improvement efforts
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Two examples of “Thresholds”



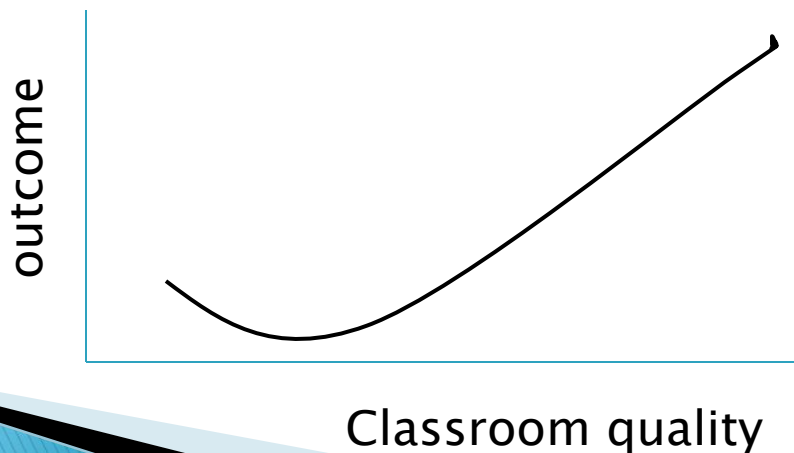
Q-DOT: Linear Regression Models

- ▶ Typical model used in analysis
- ▶ Spring child outcome_{ij} =
$$B_0 + B_1 \text{Quality}_j + B_2 \text{Covariates} + e_{ij} + u_j$$



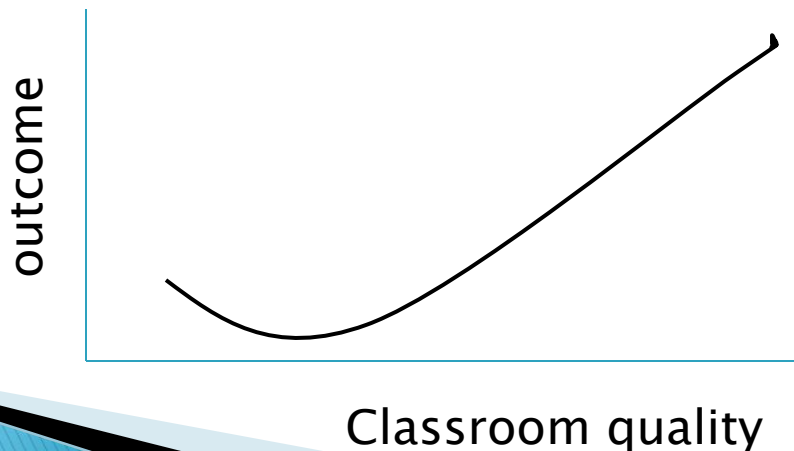
Q-DOT: Quadratic Models

- ▶ Spring child outcome_{ij} =
 $B_0 + B_1 \text{Quality}_j + B_2 \text{Quality}_j^2 +$
 $B_3 \text{Fall outcome score} + B_4 \text{gender} + B_5 \text{race} +$
 $B_6 \text{time between fall and spring assessments} +$
 $B_7 \text{whether child speaks English at home} +$
 $e_{ij} + u_j$



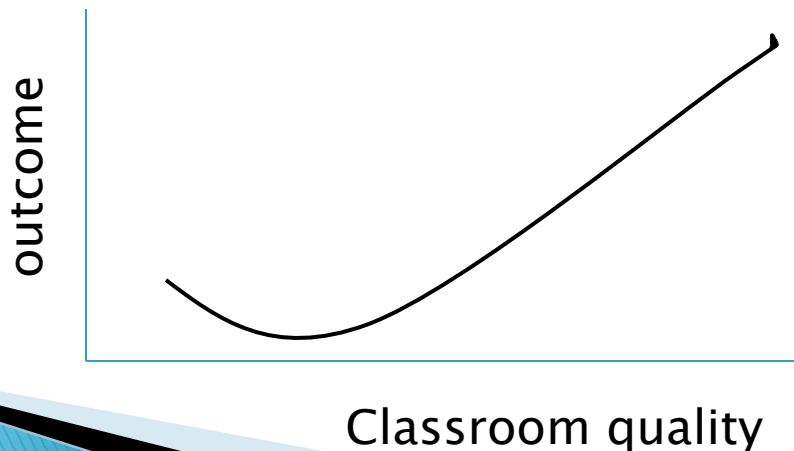
Q-DOT: Quadratic Models

- ▶ Full Model: $\text{Outcome}_{ij} = B_0 + B_1 \text{Quality}_i + B_2 \text{Quality}_i^2 + B_3 \text{Covariates}_{ij} + \zeta_i + \varepsilon_{ij}$
- ▶ HLM:
 - level 1: $\text{Outcome}_{ij} = \delta_{0i} + \delta_{1i} \text{Covariates}_{ij} + \varepsilon_{ij}$
 - level 2: $\delta_{0i} = B_0 + B_1 \text{Quality}_i + B_2 \text{Quality}_i^2 + \zeta_i$



Q-DOT: Quadratic Models

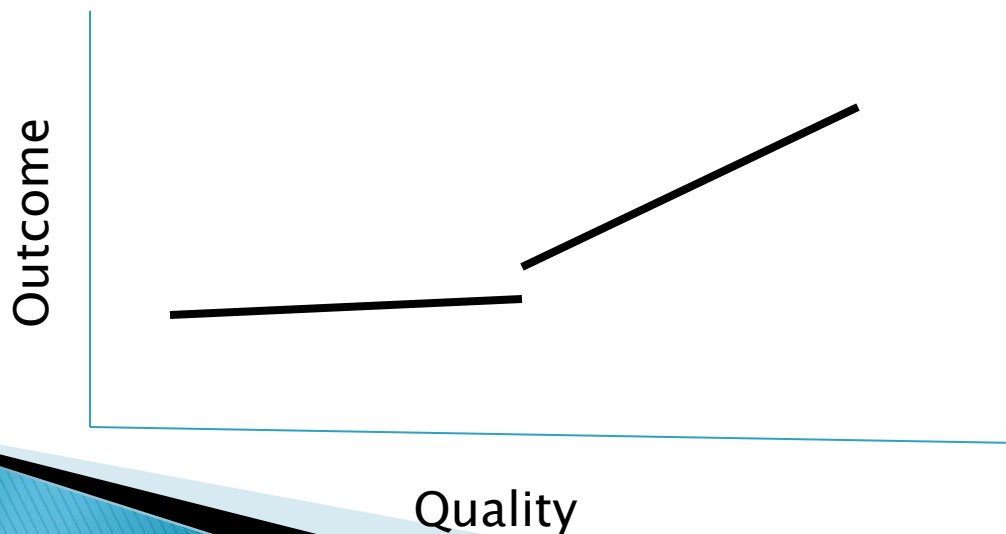
- ▶ Quadratic regression models
 - B_0 Intercept: predicted outcome when quality and covariates are 0
 - B_1 Linear Slope: expected change in outcome with 1 point change in quality when quality=0
 - B_2 Quadratic Slope: rate of acceleration or deceleration in slope



Q-DOT: Piecewise Regression Model

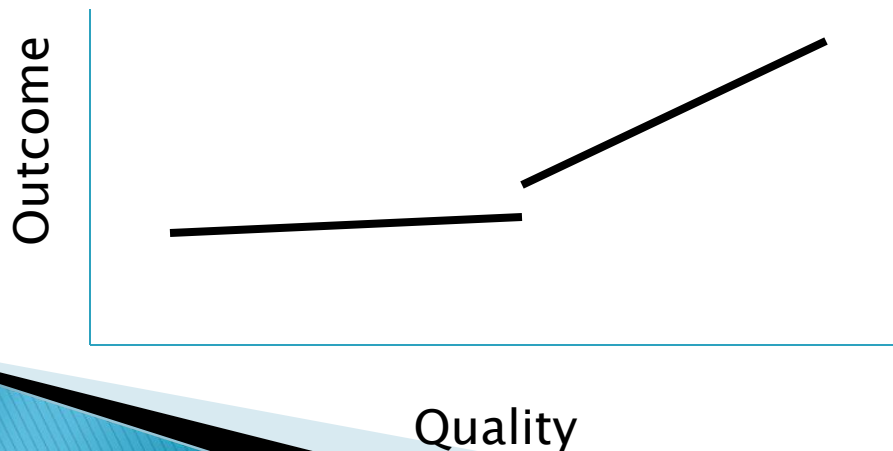
Spring child outcome_{ij} =

$$B_0 + B_1 \text{Quality}_j + B_2 \text{Quality}_j * (\text{high quality room})_i + B_3 \text{Fall outcome score} + B_4 \text{gender} + B_5 \text{race} + B_6 \text{time between fall and spring assessments} + B_7 \text{whether child speaks English at home} + \zeta_i + \varepsilon_{ij}$$



Q-DOT: Piecewise Regression Model

- ▶ Full Model: $\text{Outcome}_{ij} = B_0 + B_1 \text{Quality}_i + B_2 \text{Quality}_j * (\text{high quality room})_i + B_3 \text{Covariates}_{ij} + \zeta_i + \varepsilon_{ij}$
- ▶ HLM:
 - level 1: $\text{Outcome}_{ij} = \delta_{0i} + \delta_{1i} \text{Covariates}_{ij} + \varepsilon_{ij}$
 - level 2: $\delta_{0i} = B_0 + B_1 \text{Quality}_i + B_2 \text{Quality}_j * (\text{high quality room})_i + \zeta_i$




Q-DOT: Analyses testing thresholds

- ▶ Secondary data analysis
 - Large child care studies
 - School readiness assessments
 - Preschoolers
 - Baseline and endpoint
 - Direct assessment of classroom quality
 - HLM analyses –
 - Children nested in classrooms
 - Predicting endpoint scores from classroom quality

Q-DOT: Projects

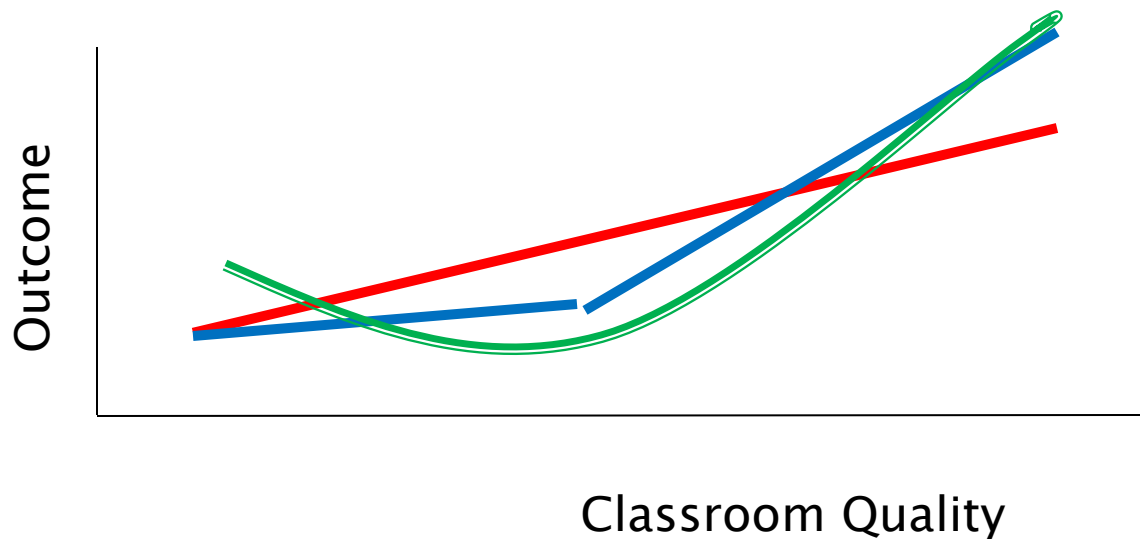
- ▶ Head Start Family and Child Experiences Survey (FACES) – 2006
 - ~3000 children in ~ 335 classrooms
- ▶ Early Head Start Follow-Up (EHS)
 - ~1500 children in ~ 1000 classrooms
- ▶ More-at-Four (MAF): evaluation of NC Pre-K
 - ~1200 children in ~ 200 classrooms
- ▶ NCEDL 11-state Pre-K study
 - ~2400 children in ~ 700 classrooms

Q-DOT: Projects

- ▶ **Preschool Curriculum Evaluation Research (PCER) Study**
 - ▶ ~2700 children in ~ 1000 classrooms
 - ▶ **My Teaching Partner (MTP): Professional Development project in VA Pre-K**
 - ▶ ~600 children in ~ 1000 classrooms
 - ▶ **NICHD Study of Early Child Care (SECC)**
 - ▶ ~1000 children in ~ 1000 classrooms
 - ▶ **Miami/Dade County Literacy Intervention Studies**
 - ▶ ~1500 children in ~ 750 classrooms
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Q-DOT: Approach

- ▶ 2-level HLM analyses of project data
 - Quadratic quality model
 - Linear quality model
 - “Piecewise quality model”: allow separate linear slopes in lower and higher quality classrooms



Q-DOT: Analyses Approach

- ▶ Focus on in this presentation on analyses of measures of quality of instruction
 - CLASS Instruction Support and academic outcomes
 - TBRS Literacy Scale and literacy outcomes
- ▶ Outcomes: Spring Pre-K assessments of
 - Language (PPVT, TOPEL)
 - Reading (WJ LW, TOPEL)
 - Math (WJ AP)

Q-DOT: Approach

▶ Spline cut-points

- Same cut-points used with all projects
- Chosen theoretically – “high quality” and adapted if insufficient sample size

▶ Cut-points

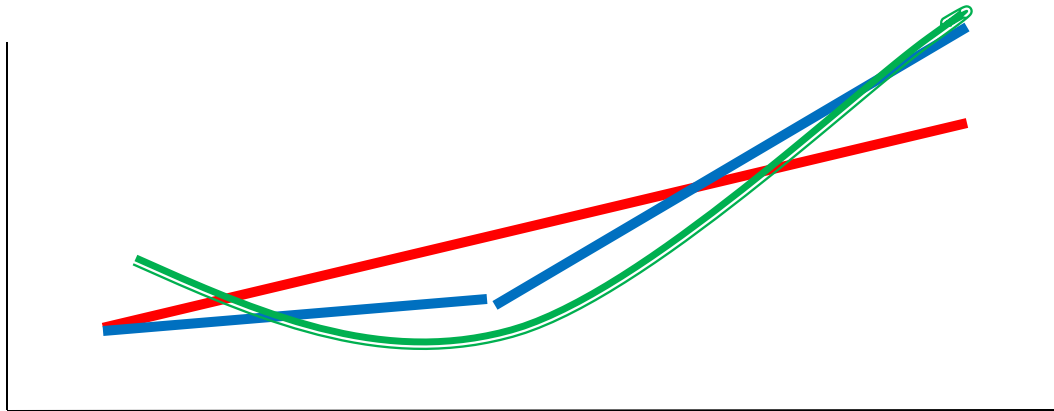
- **CLASS Instructional Support 2.75:** (range 1–7)
- **TBRS :Literacy Scale** (range 1–3)

Q-DOT: Approach

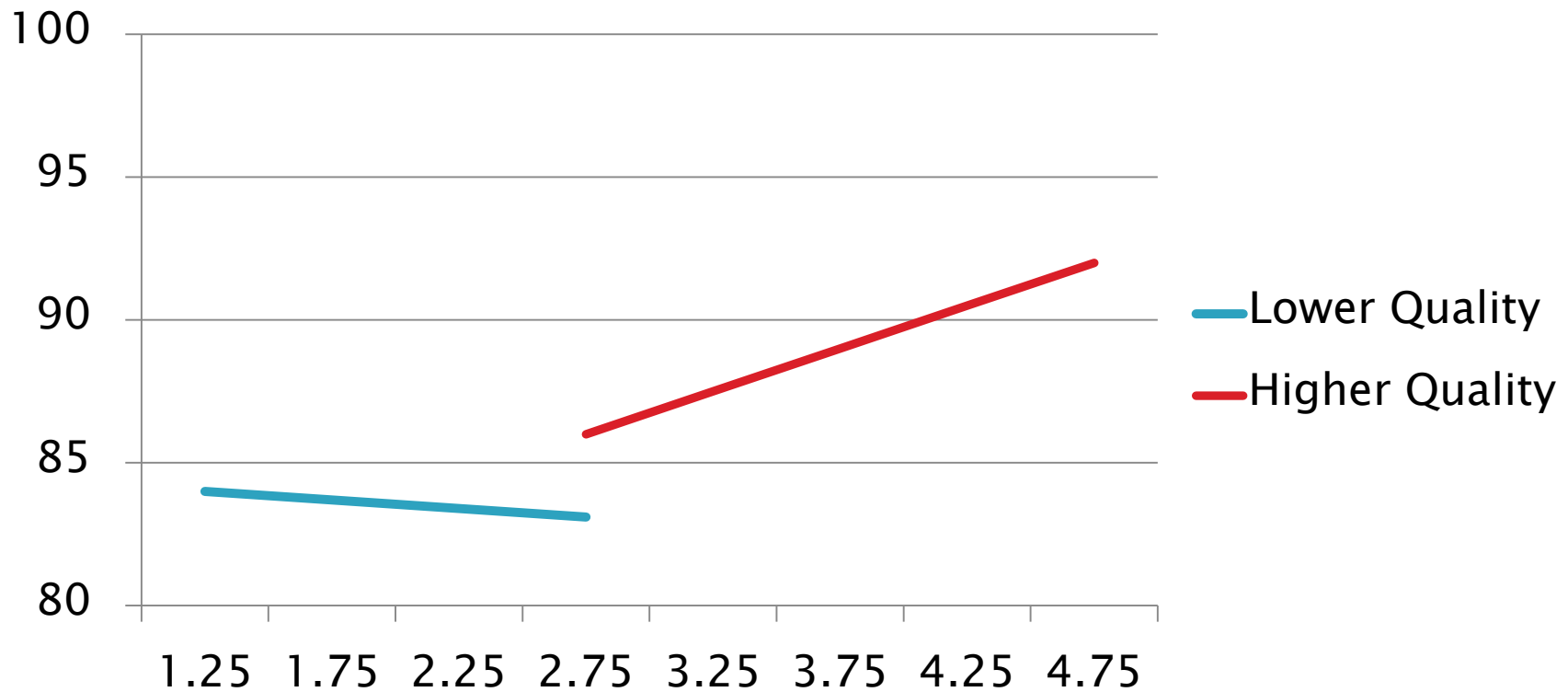
- ▶ Separate analyses
 - For each quality score and outcome in each project
- ▶ Effect sizes:
 - How much change in outcomes (in SD units) do we expect with a one SD increase in classroom quality
 - Gives us a statistic that means the same thing across all analyses
 - $d = B \text{ sd}(\text{quality}) / \text{sd}(\text{outcome})$
- ▶ Meta-analysis combined results across projects
 - Separate analysis for linear models and spline models

Q-DOT: Approach

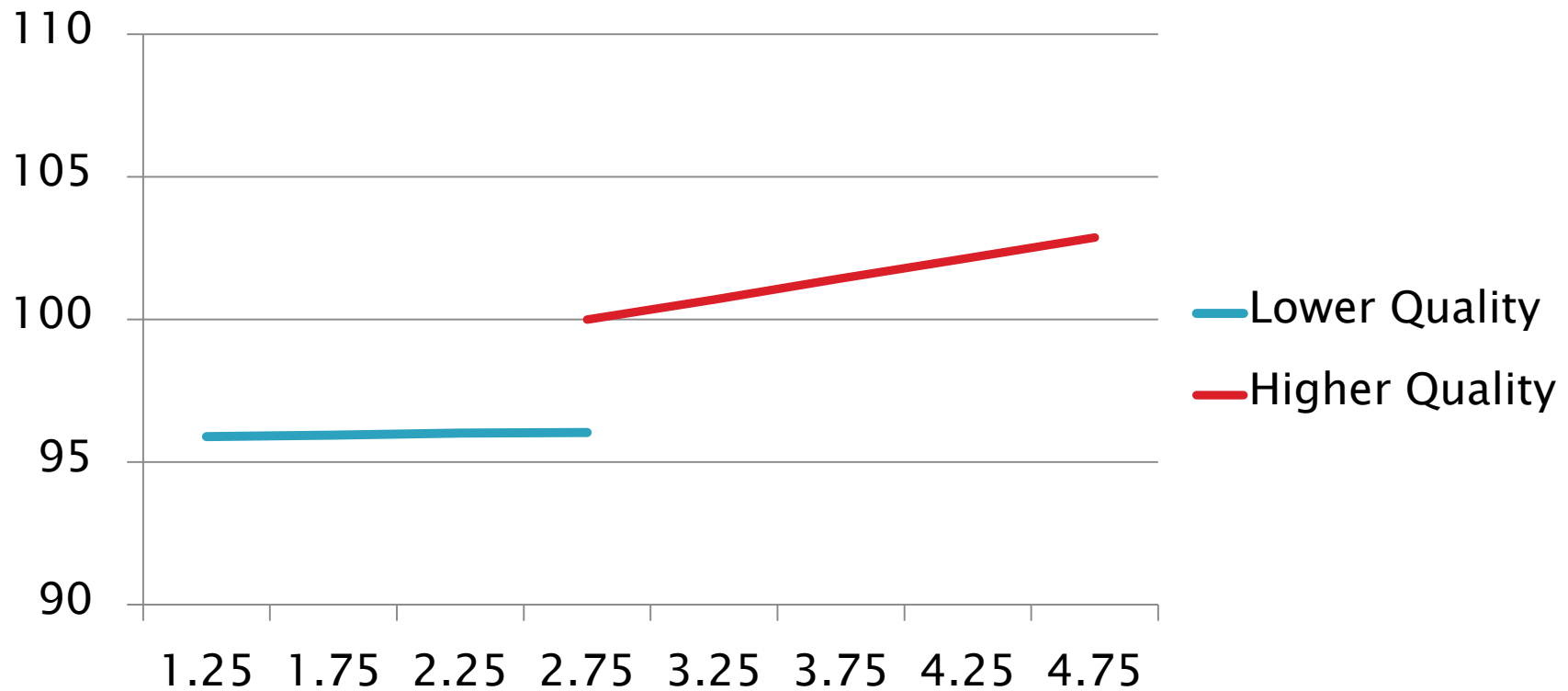
- ▶ Reminder: 3 models examined
 - Quadratic quality model,
 - if nonsignificant then fit Linear quality model
 - “**Piecewise quality model**”: allow separate linear slopes in lower and higher quality classrooms



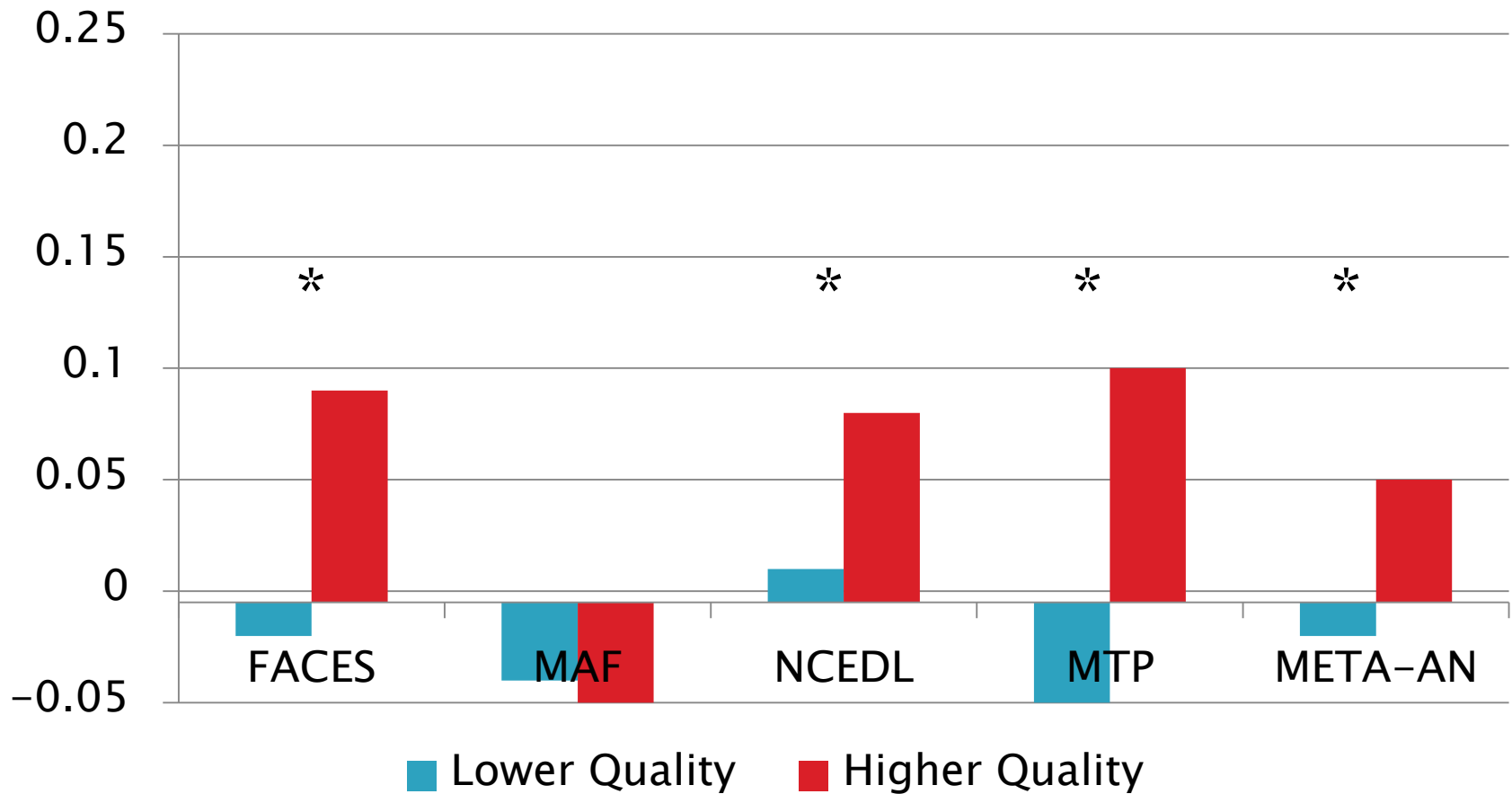
Predicted FACES language scores by level of CLASS Instruction Support



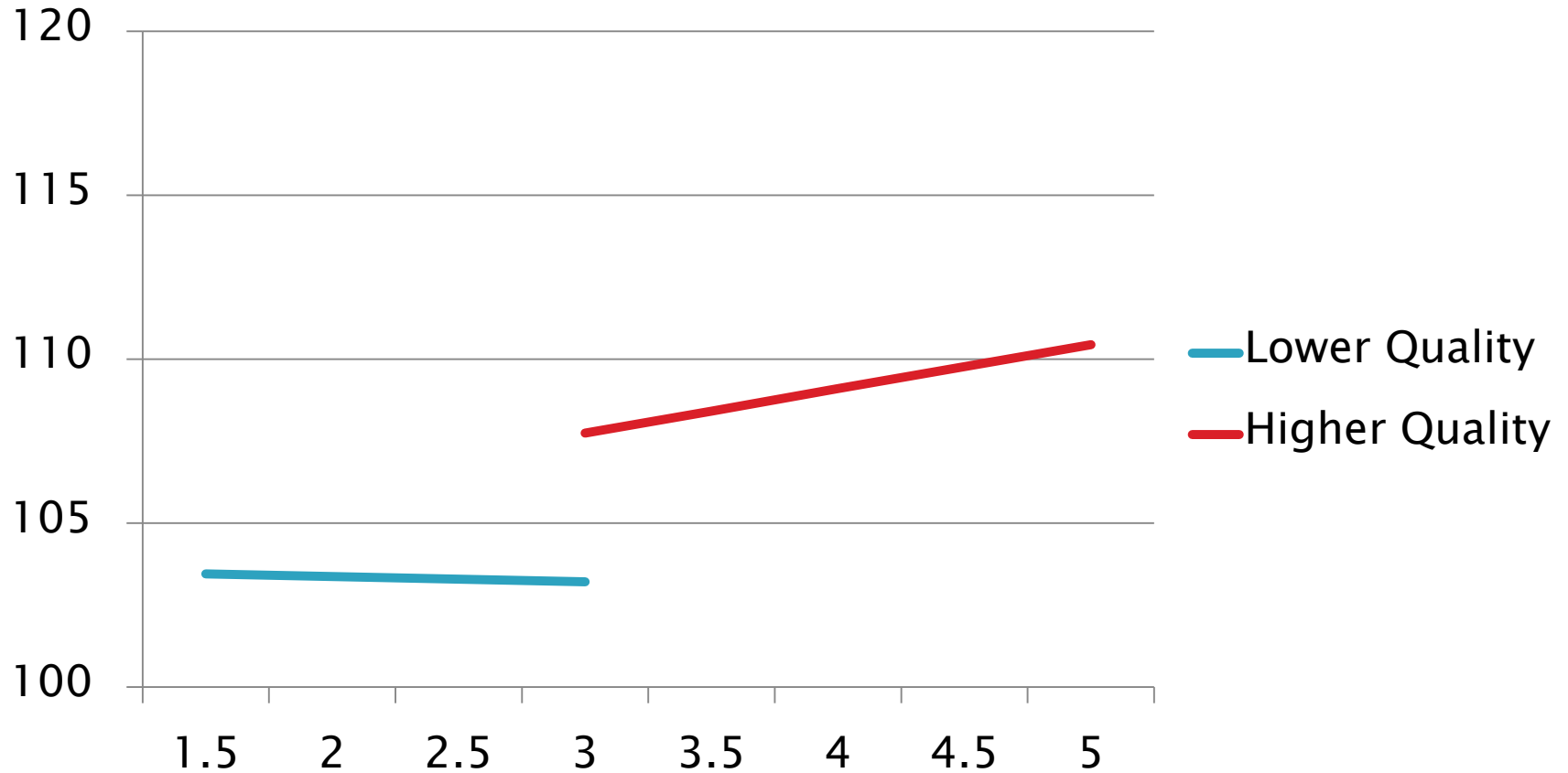
Predicted NCEDL language scores by level of CLASS Instruction Support



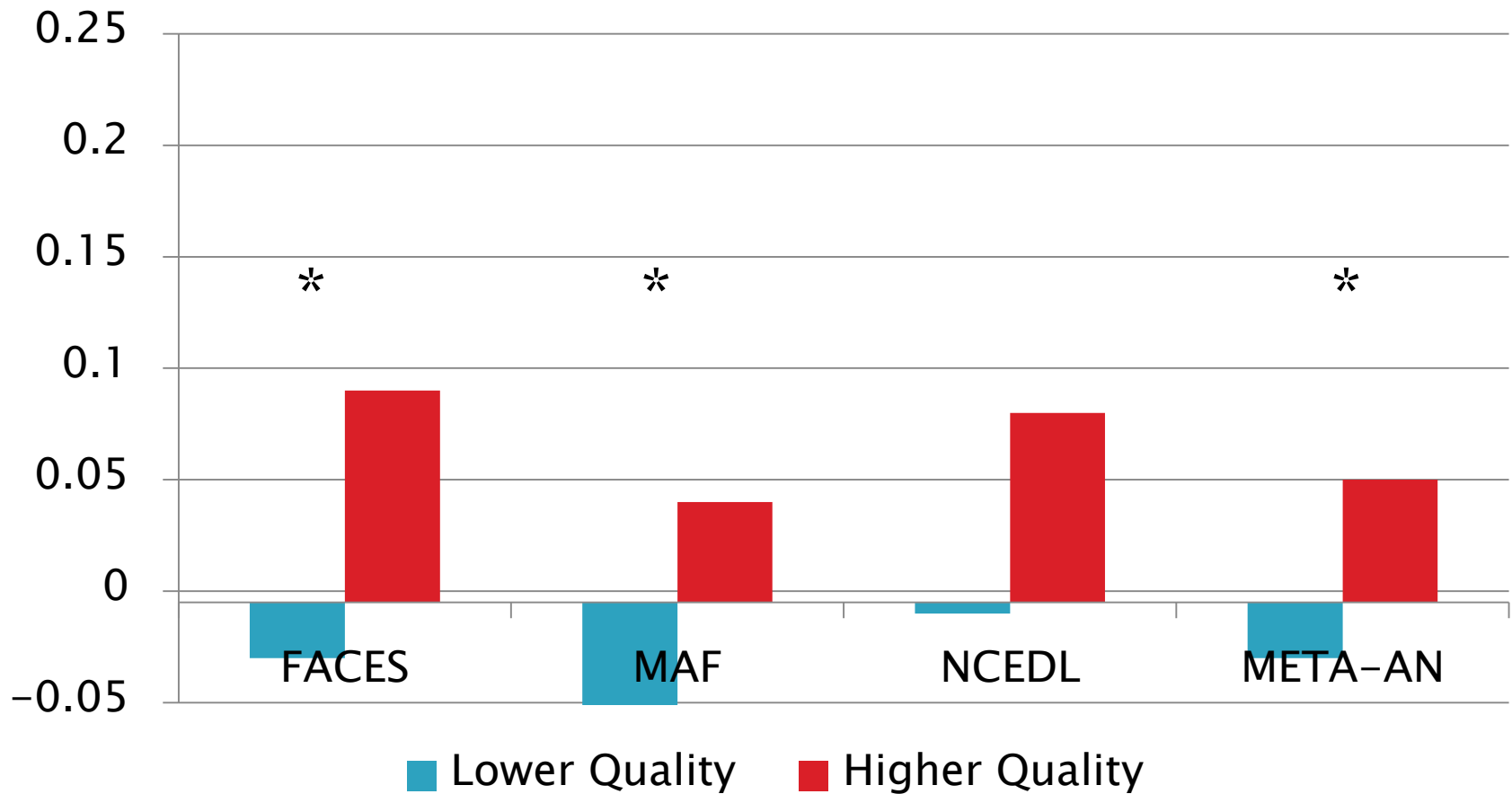
Findings: CLASS Instructional Support and Language Skills



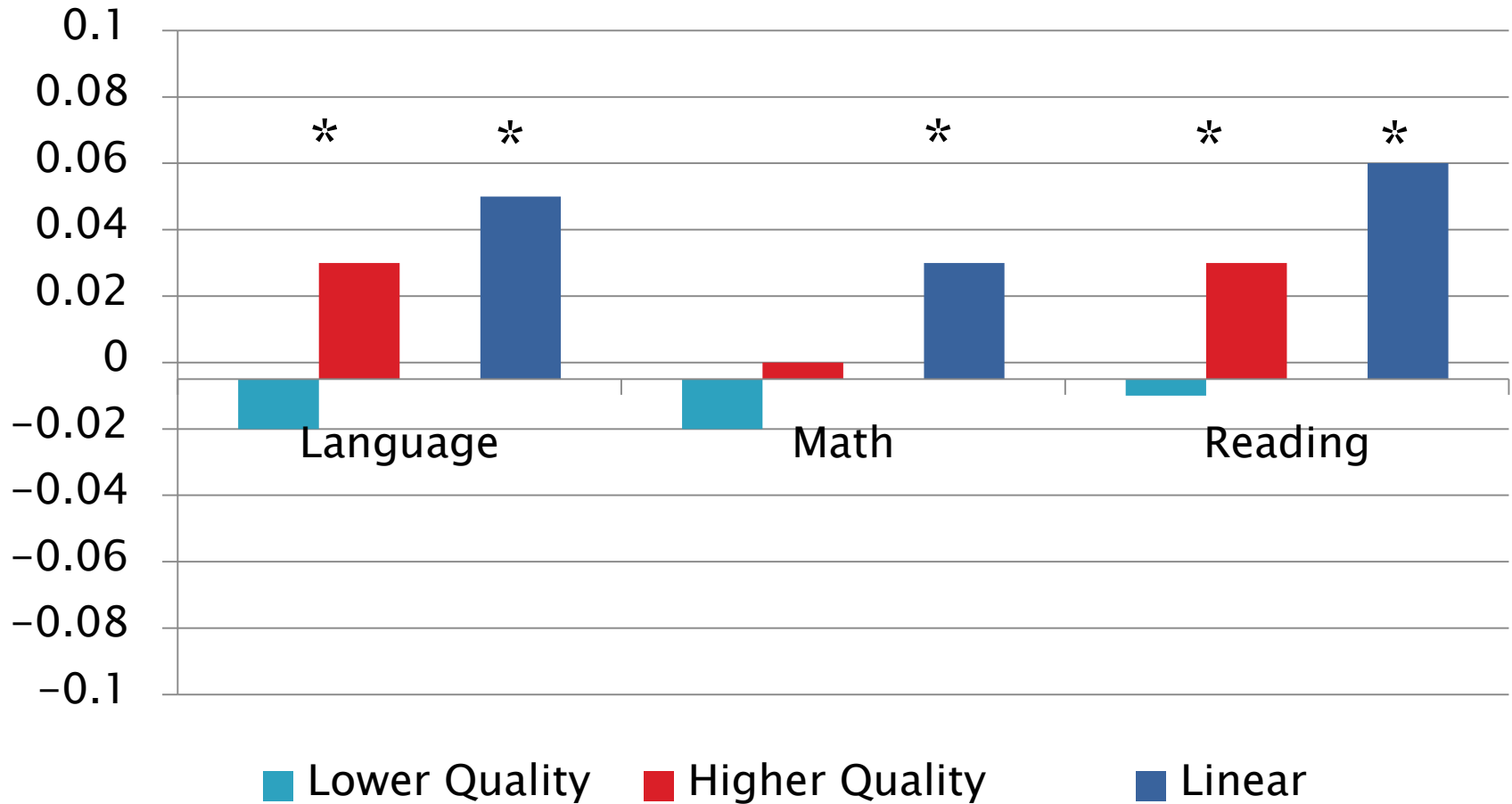
Predicted NCEDL reading scores by level of CLASS Instruction Support



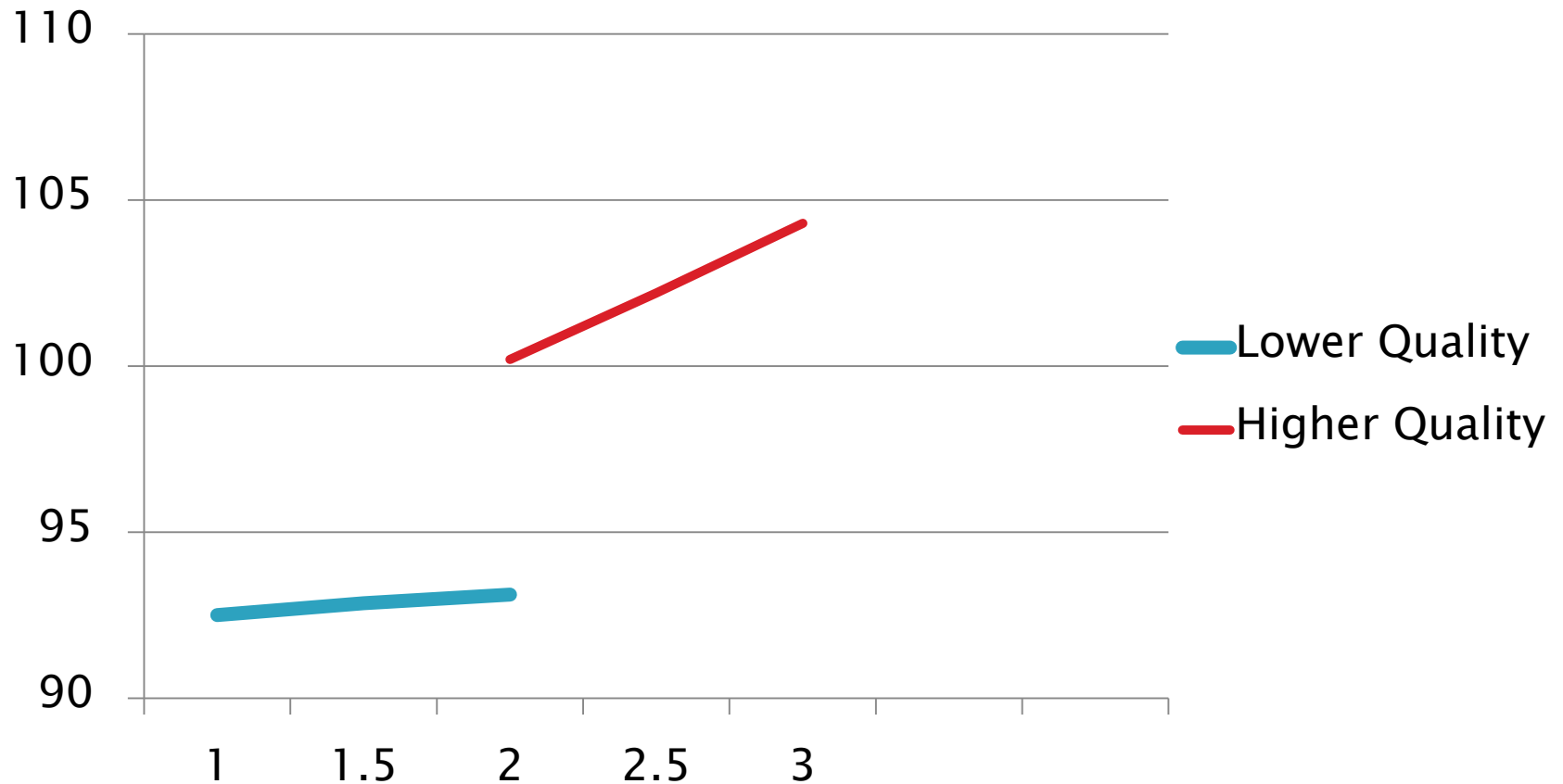
Findings: CLASS Instructional Support and Reading Skills



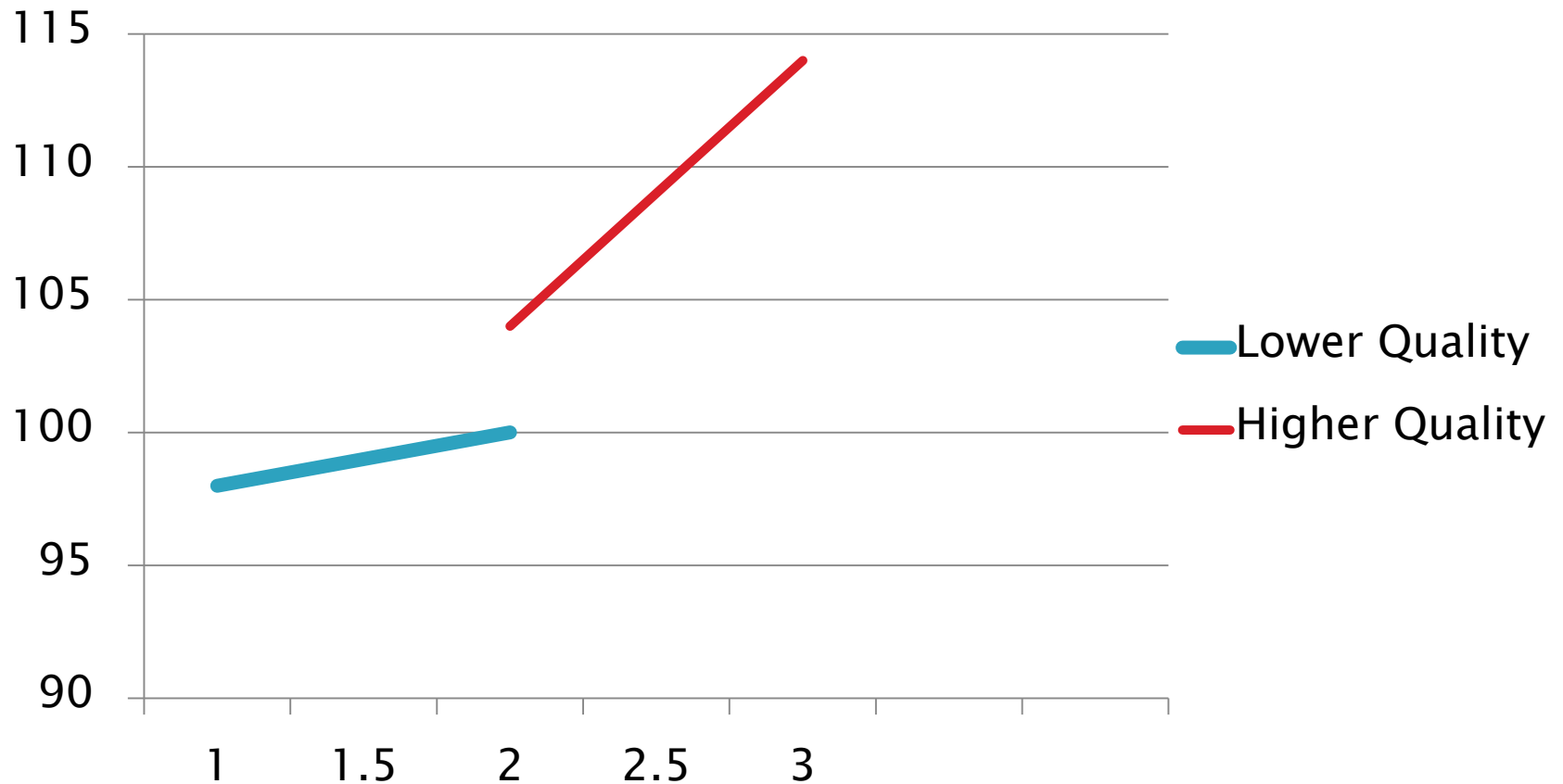
T-C Interaction Specific Quality: CLASS Instructional Support



Predicted PCER language scores by level of TBRS Literacy Quality

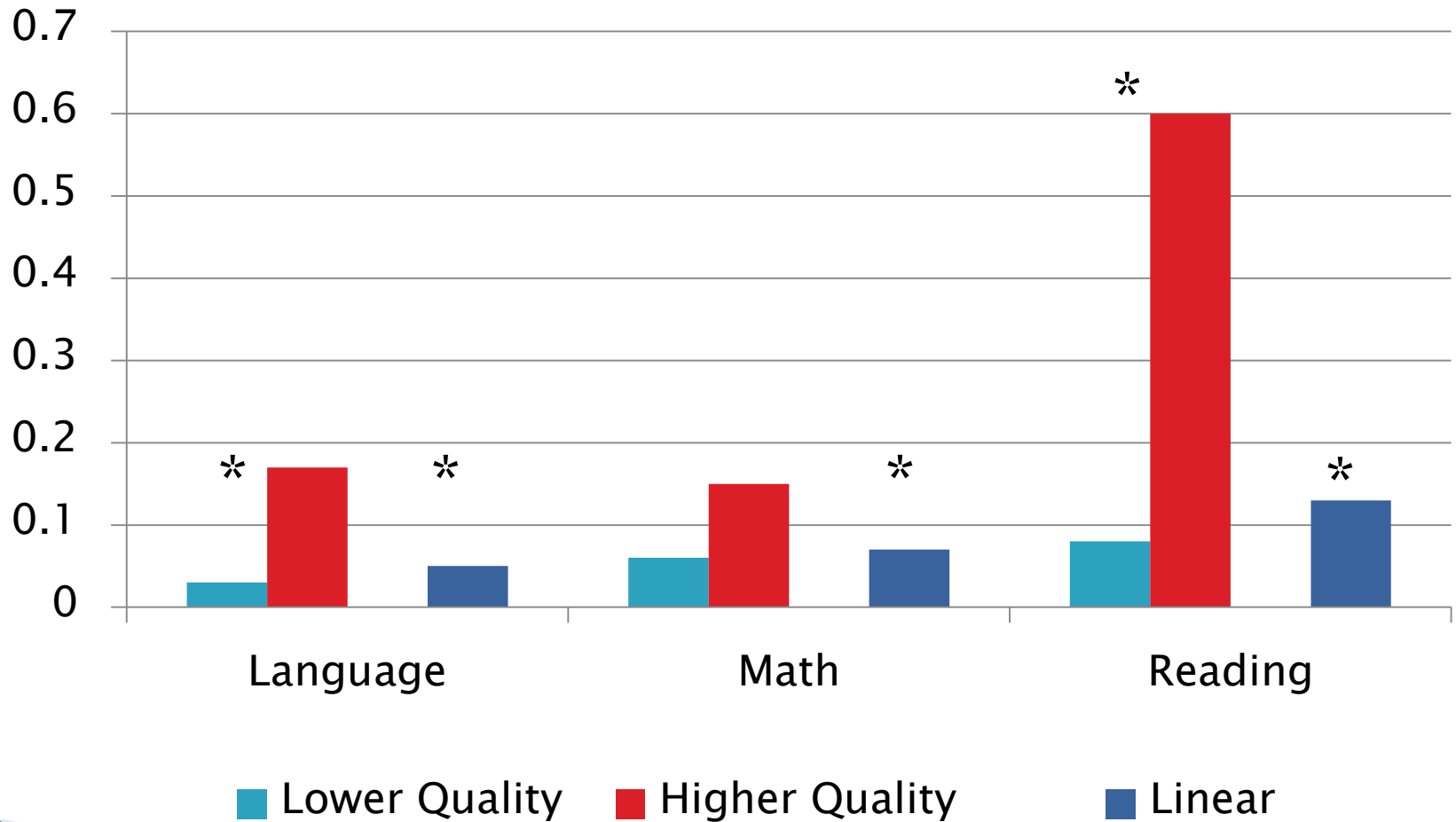


Predicted PCER reading scores by level of TBRS Literacy Quality

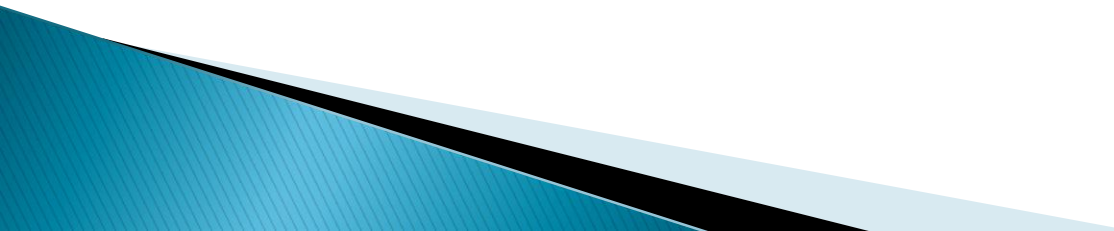


Domain Specific Quality

TBRS: PCER only



Summary: Thresholds?

- ▶ **Some evidence for thresholds, especially within measures of instructional quality**
 - Teacher–child relationships (CLASS)
 - Domain specific quality measures (TBRS)
 - ▶ **NOTE: our thresholds were selected conceptually and our results do not test whether these are the best cut–points**
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Summary

▶ Methods

- Quadratic approach was not useful in detecting cut-points in our analyses
- Piecewise approach provided some evidence – but we set and did not test the cut-points
 - This allowed us to easily combine data across studies and look at replication
- Further work is needed to estimate cut-points