

Have Socio-Economic Differences in Childhood Cognitive Test Scores Changed? Evidence from the Analysis of Three British Birth Cohorts

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Research Question

- Socio-economic inequalities in cognitive test scores are well documented.
- Have these inequalities changed between three British post-war cohorts?

Methodological Challenges

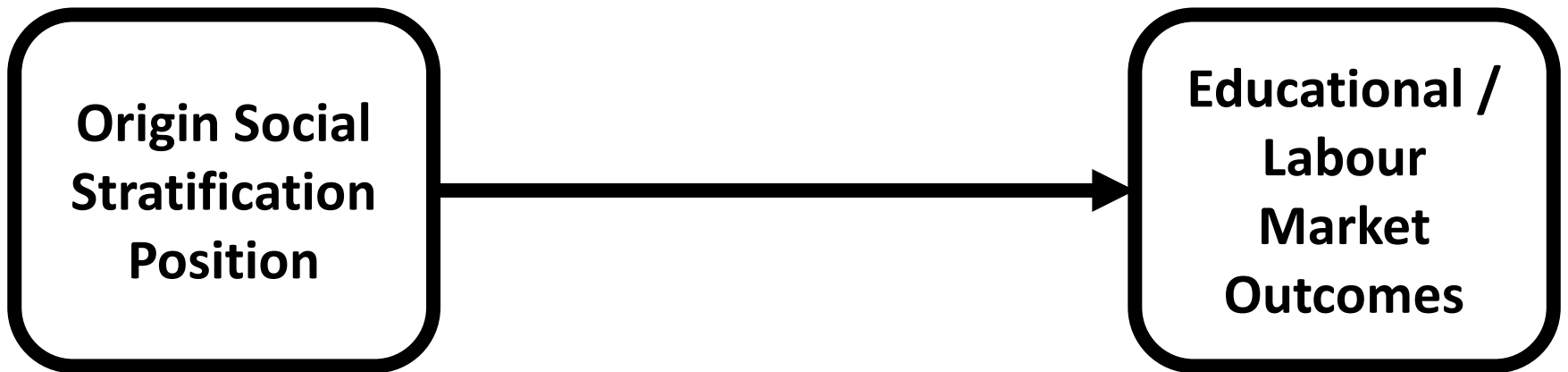
- Development of a strategy for analysing data from the three cohorts within a unified multivariate framework
 - which appropriately accounts for the variation in the design and structure of the datasets.

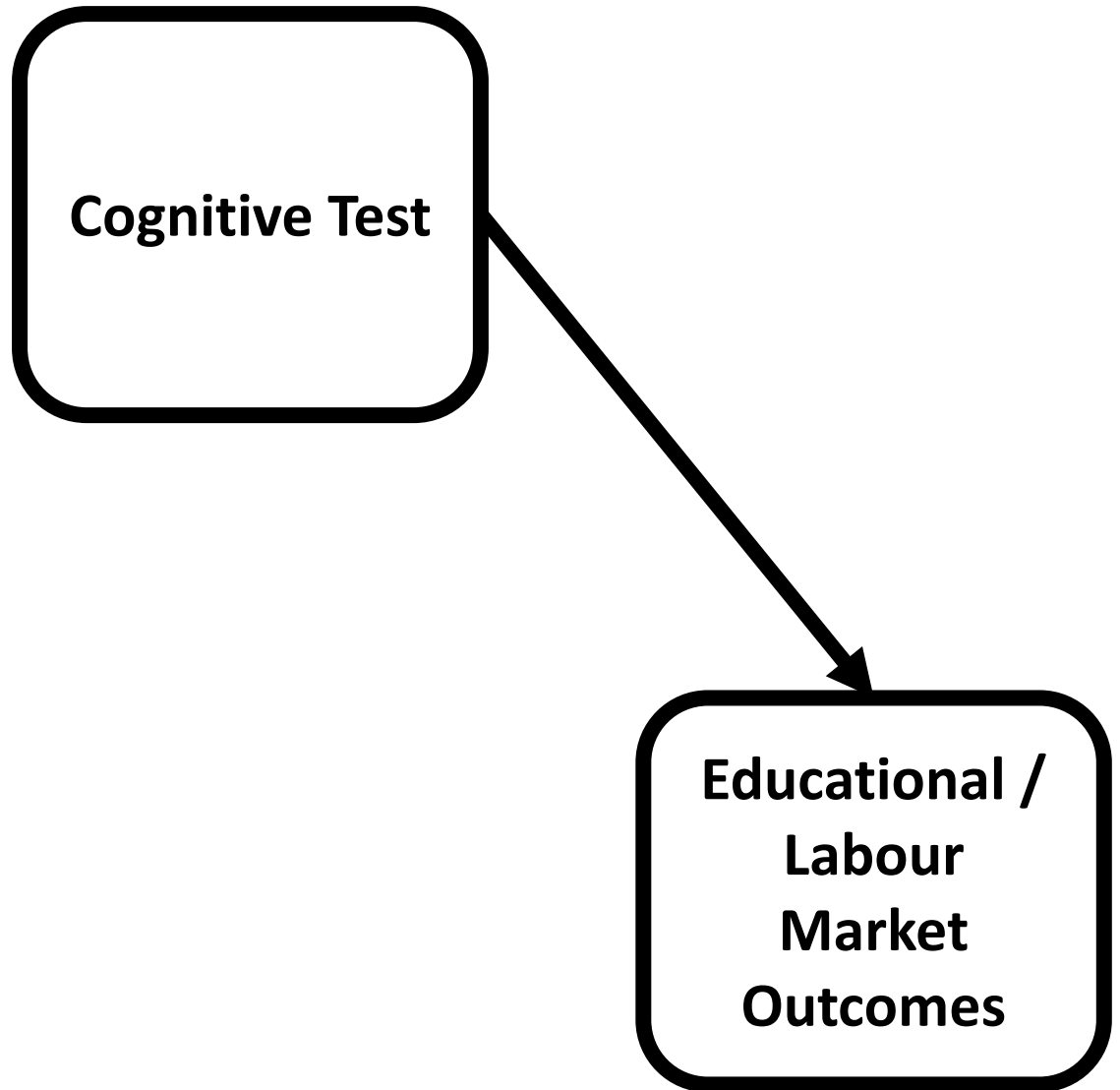
Methodological Challenges

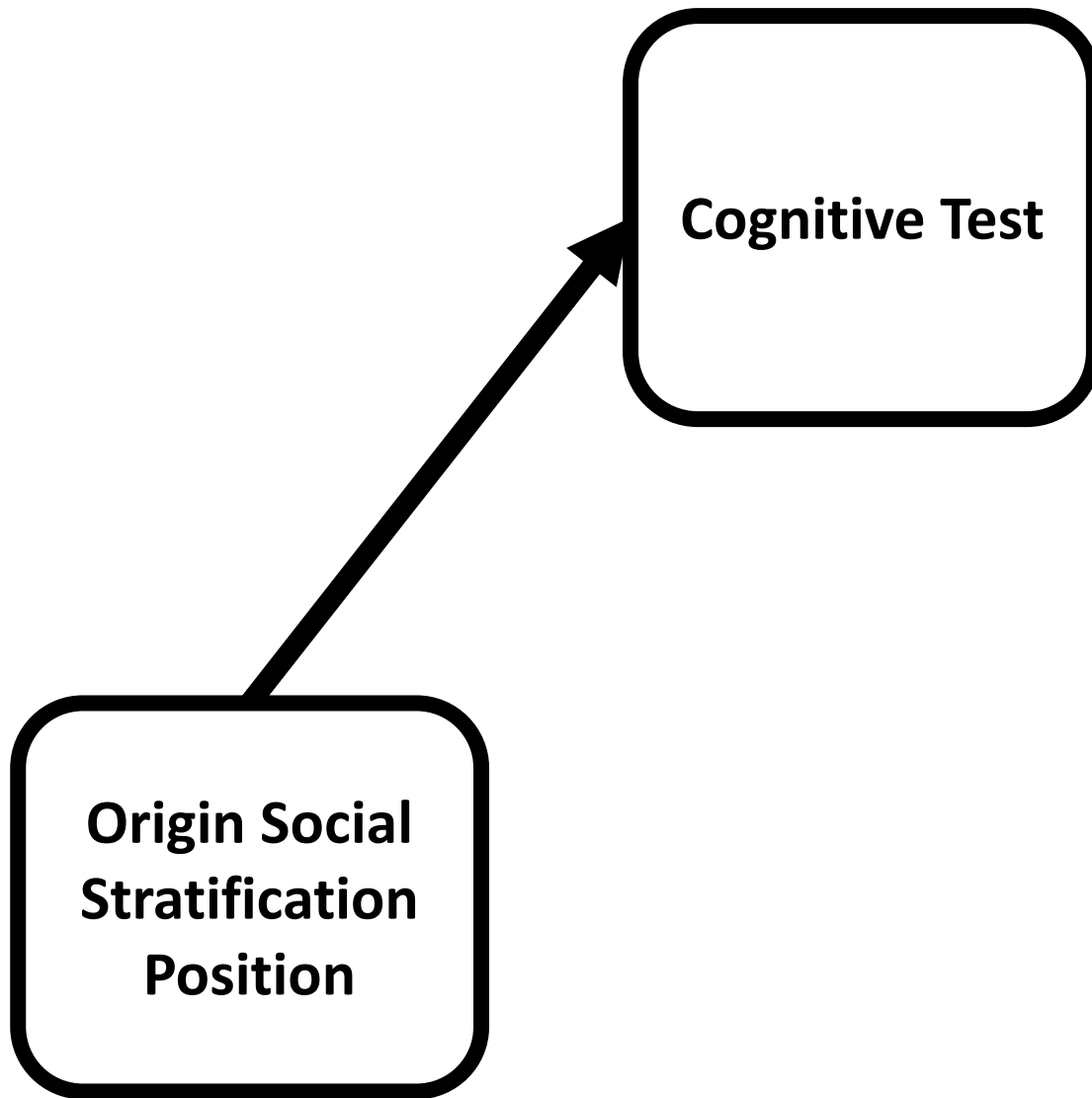
- Development of a strategy for analysing data from the three cohorts within a unified multivariate framework
 - which appropriately accounts for the variation in the design and structure of the datasets.
- Provision of a sensitivity analysis of different measures of parental socio-economic position.

Methodological Challenges

- Development of a strategy for analysing data from the three cohorts within a unified multivariate framework
 - which appropriately accounts for the variation in the design and structure of the datasets.
- Provision of a sensitivity analysis of different measures of parental socio-economic position.
- Development of measures that are comparable across the three cohorts.







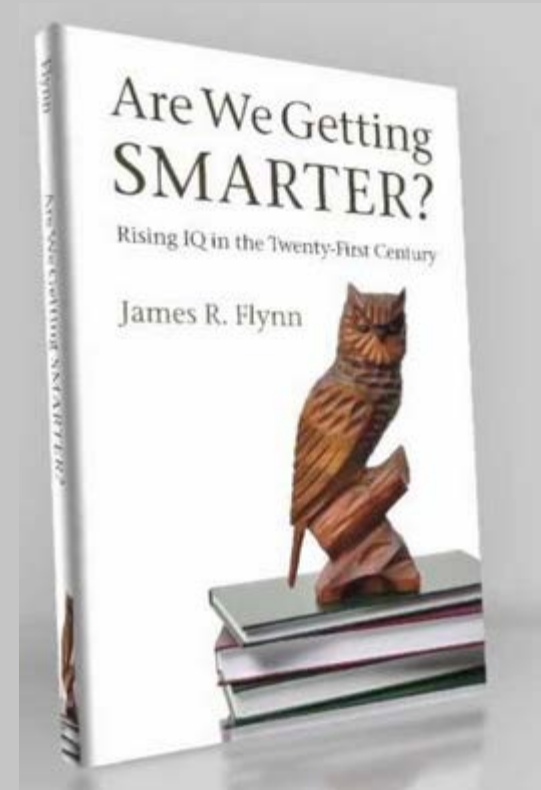
The Flynn Effect

There is a well reported and substantial increase in average intelligence test scores over time.

Flynn calls for a 'sociological imagination'

"Over time, I became uneasy about something that seemed both odd and crippling: the isolation of the study of intelligence from an awareness of the social context within which all human behaviour occurs. Many psychologists are happy to infer the social consequences of what they learn about intelligence. But all the causal arrows tend to run in one way: they do not infuse their study of intelligence with social awareness."

(Flynn 2012: 159)



Flynn, J.R., 2012. Are we getting smarter?: Rising IQ in the Twenty-first Century. Cambridge University Press.

Datasets

- National Child Development Study (NCDS)
 - A systematic sample of babies born in 1958
 - $n=8,937$
- British Cohort Study (BCS)
 - A systematic sample of babies born in 1970
 - $n=7,726$
- Millennium Cohort Study (MCS)
 - A complex sample of babies born in 2000/02
 - $n=9,333$

Methodological Challenge 1

- Development of a strategy for analysing data from the three cohorts within a unified multivariate framework
 - which appropriately accounts for the variation in the design and structure of the datasets.

Structure and Sampling

- **NCDS** (1958) and **BCS** (1970) are systematic samples (babies born in one week).
- These data are usually treated as simple random samples.
- No survey weights deposited with the data.

Structure and Sampling

The MCS (2000/02) has a complex sampling design:

Strata 9 (i.e. Region; Disadvantage; Ethnicity)

PSU Ward level

Weights Selection

FPCF Finite Population Correction Factor

Structure and Sampling

There are stern warnings against ignoring the MCS sampling design because this assumes a simple random sample.

Ketende, S., Jones, E., 2011. The millennium cohort study: User guide to analysing MCS data using STATA. London: Centre for Longitudinal Studies Institute of Education.

Connelly, R., Platt, L., 2014. Cohort profile: UK millennium Cohort study (MCS). *International journal of epidemiology* 43, 1719-1725.

Plewis, I., Calderwood, L., Hawkes, D., Hughes, G., Joshi, H., 2004. Millennium cohort study: technical report on sampling. London: Institute of Education, University of London.

Synthetic Survey Structure

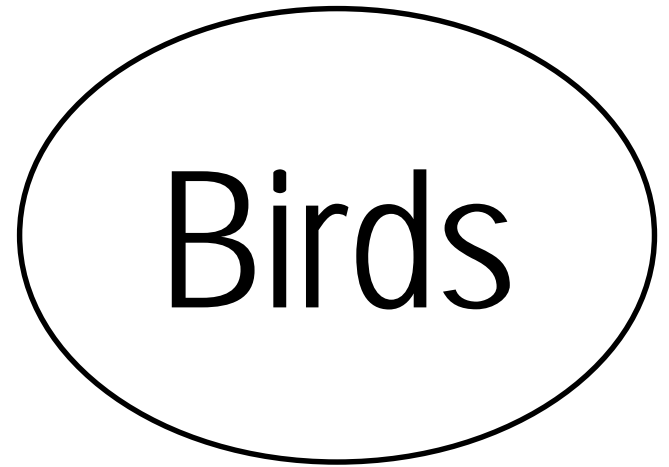
Strata	MCS	1-7 (excluding N.I.)
	NCDS	10
	BCS	11
PSU	MCS	Wards
	NCDS	Unknown (each individual in own PSU)
	BCS	Unknown (each individual in own PSU)
Selection Weights	MCS	Selection weight
	NCDS	Weight = 1
	BCS	Weight = 1
FPCF	MCS	N_{psu}
	NCDS	1
	BCS	1

Verbal Similarities Test

Three items are listed and the child is asked to state the link between them...

Sparrow, Crow, Eagle

Sparrow, Crow, Eagle



Verbal Similarities Test

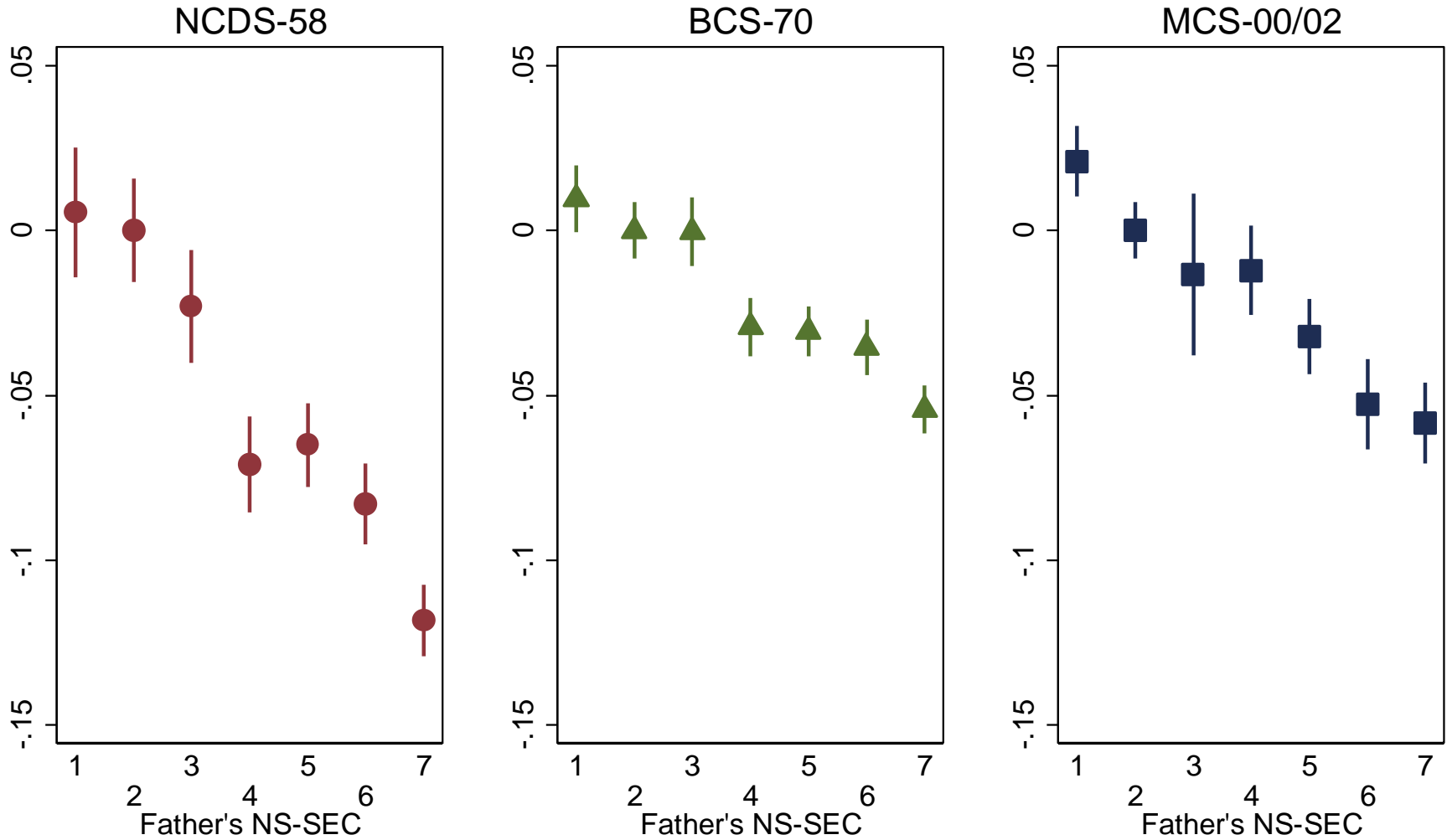
This test is repeated in a similar form in each of the cohorts at a similar age (10/11).

Average scores on **Verbal Similarities** tests have increased substantially (20 points per generation) (Flynn 2000).

Much larger increases than any other cognitive test!

Verbal Similarities Test Scores

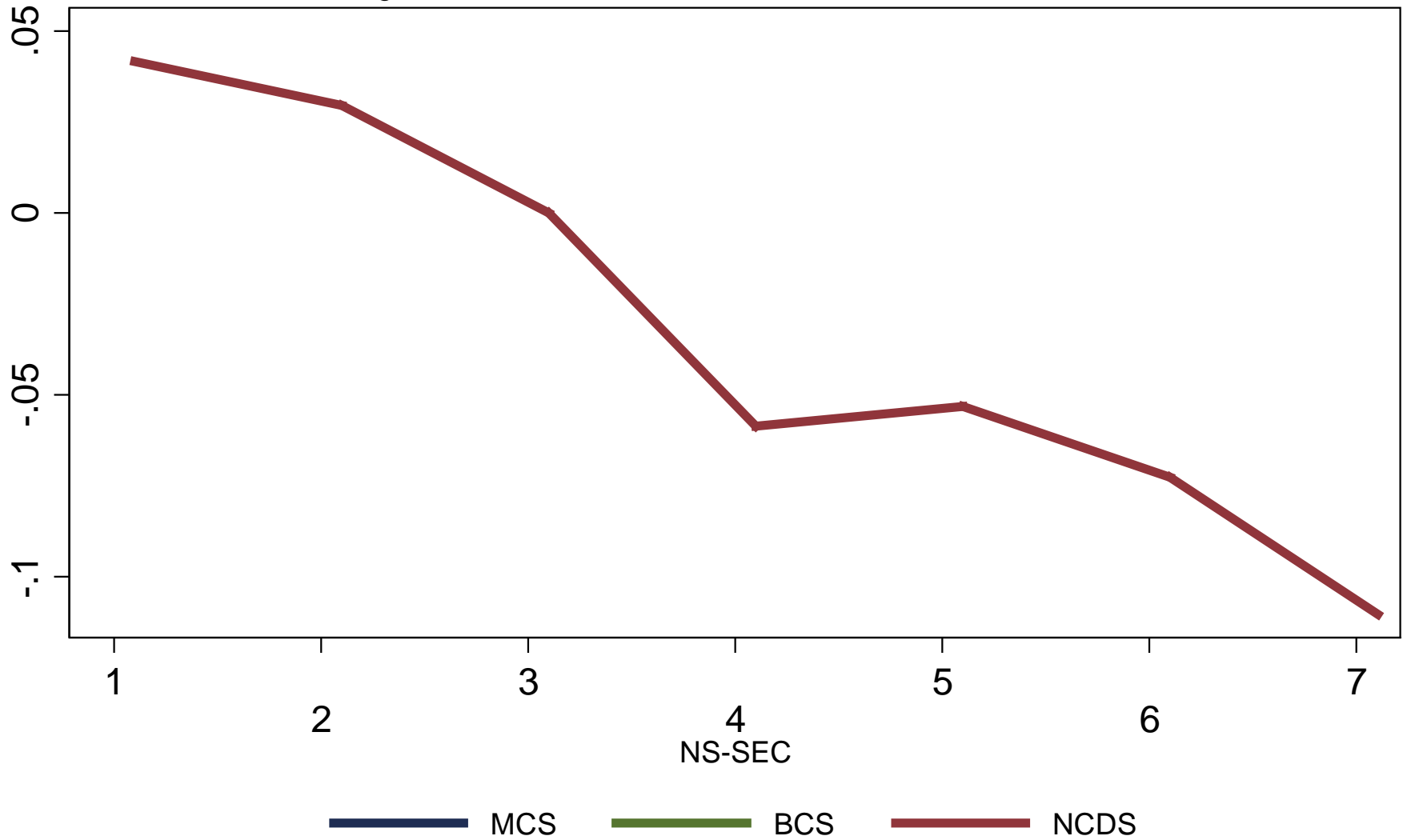
Coefficients and Quasi Standard Errors



Models also contain: gender, mother's education, father's education.

Verbal Similarities Test Score

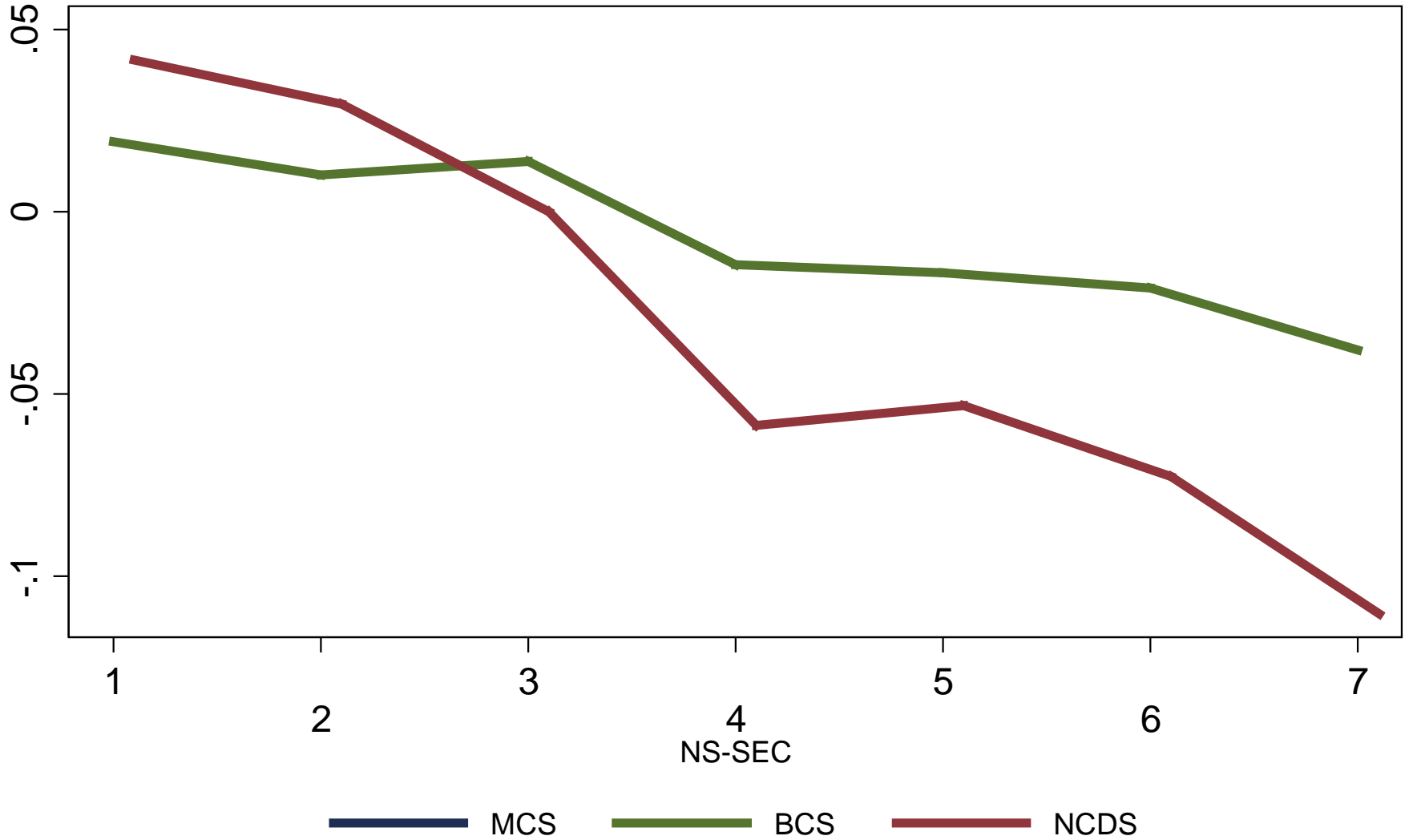
OLS regression coefficients of interaction between NS-SEC and cohort



Models also contain: gender, mother's education, father's education.

Verbal Similarities Test Score

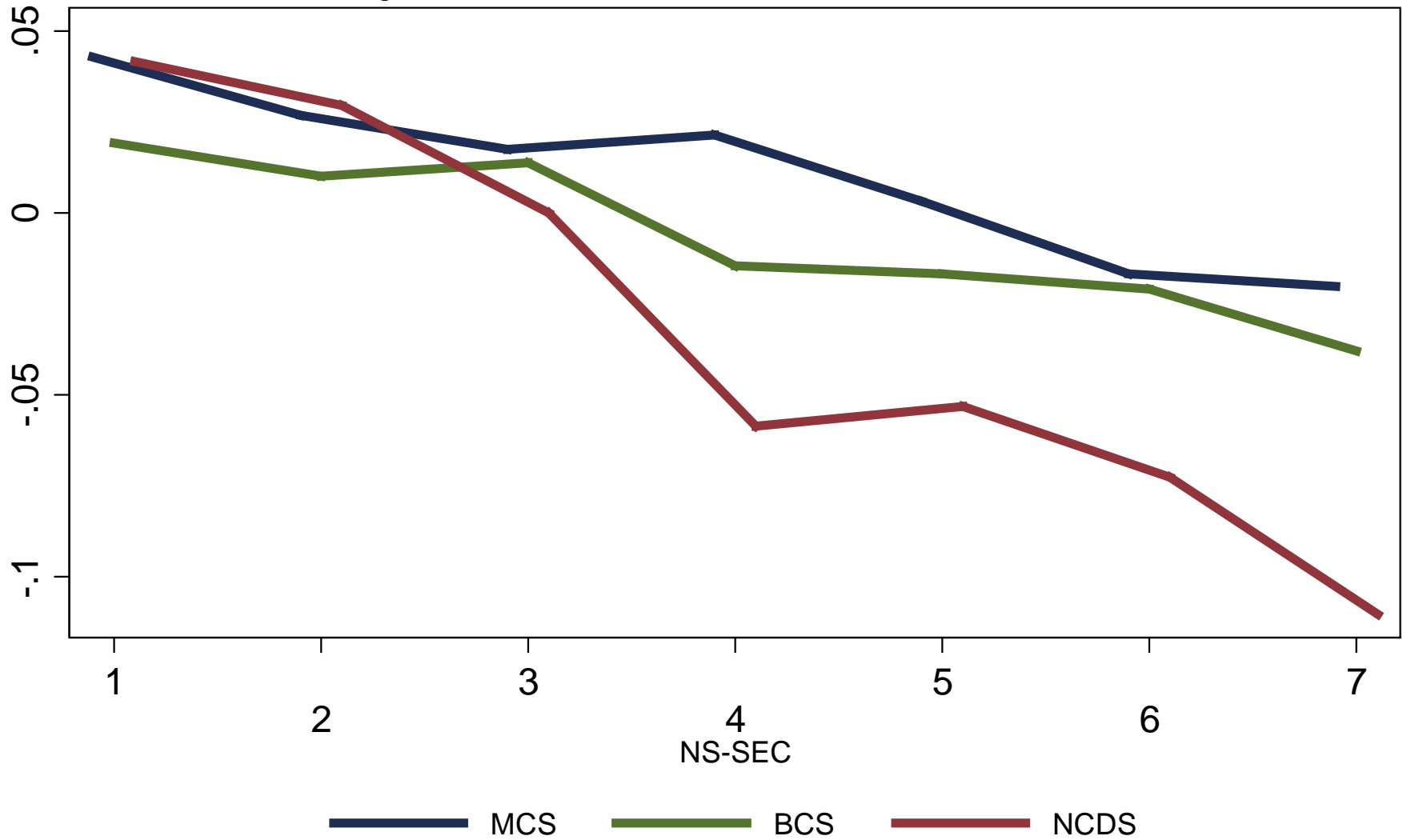
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Models also contain: gender, mother's education, father's education.

Verbal Similarities Test Score

OLS regression coefficients of interaction between NS-SEC and cohort



Models also contain: gender, mother's education, father's education.

Methodological Challenge 2

- Provision of a sensitivity analysis of different measures of parental socio-economic position.
- Comparing results using alternative occupation-based socio-economic measures.

Gayle, V., Connelly, R., Lambert, P., 2015. A review of occupation-based social classifications for social research. CPC Working Paper Series.

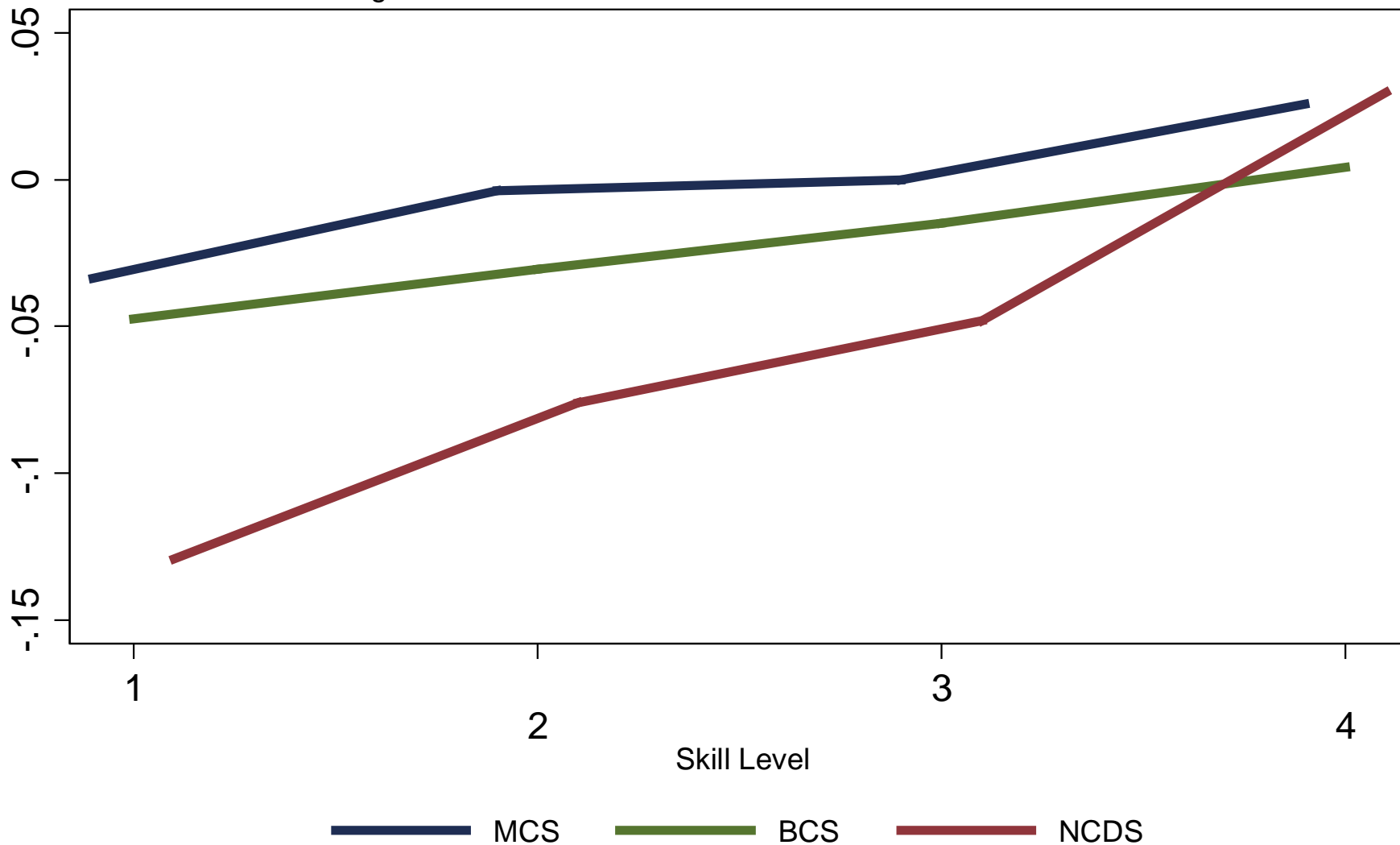
Lambert, P.S., Bihagen, E., 2014. Using occupation-based social classifications. *Work, Employment & Society* 28, 481-494.

Lambert, P., Bihagen, E., 2012. Stratification Research and Occupation-Based Social Classifications. In: Lambert, P., Connelly, R., Blackburn, R. M., and Gayle, V., (Eds.), *Social Stratification: Trends and Processes*. Ashgate, Farnham, pp. 13-28.

Gayle, V., Lambert, P., 2011. An analysis of detailed parental occupational differences and their effects on children's school attainment in Britain., ISA Research Committee 28 Spring Meeting, University of Essex.

Verbal Similarities Test Score

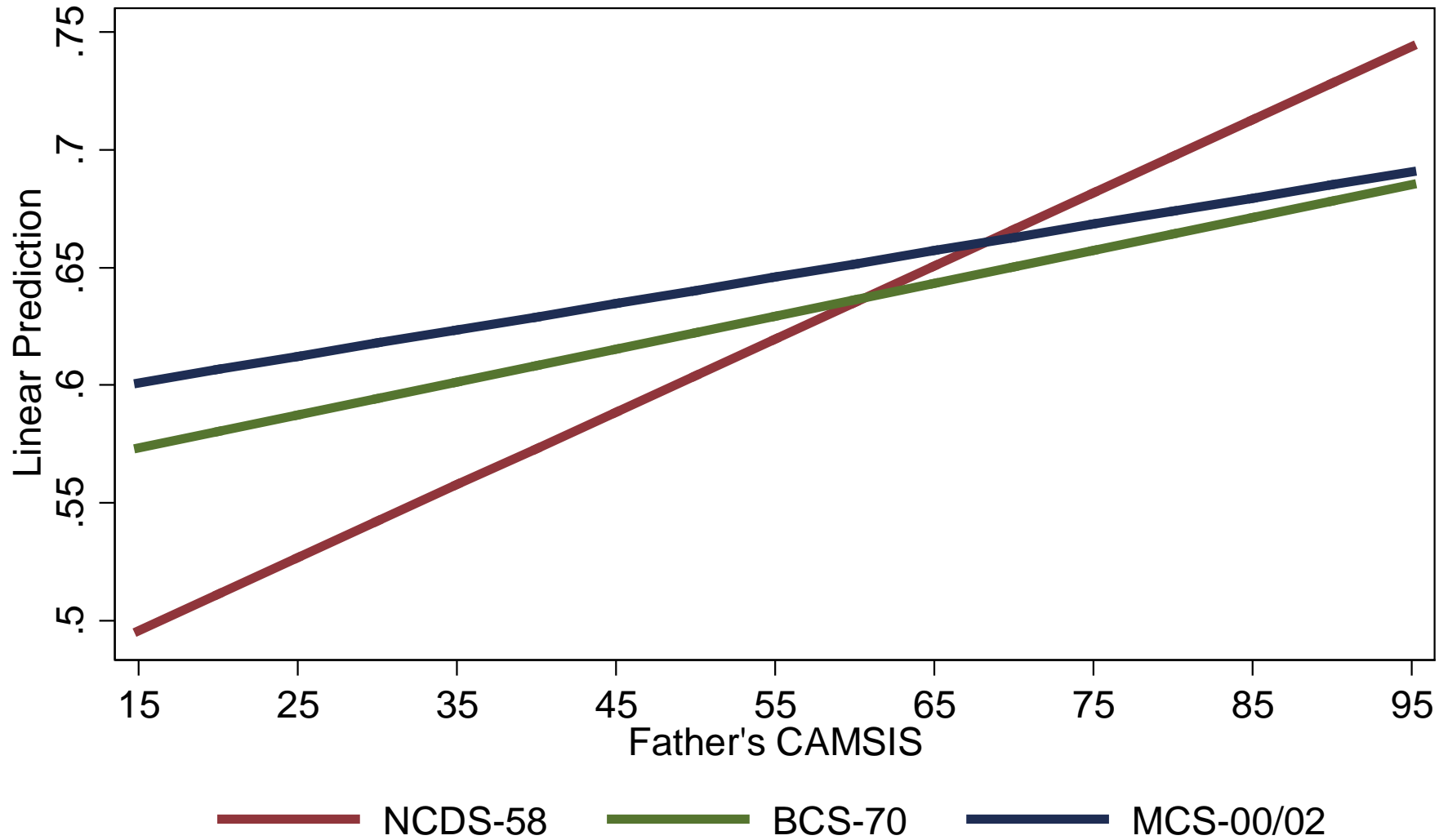
OLS regression coefficients of interaction between Skill Level and cohort



Models also contain: gender, mother's education, father's education.

Verbal Similarities Test Score

Interaction between CAMSIS and cohort



Models also contain: gender, mother's education, father's education.

Methodological Challenge 3

- Development of measures that are comparable across the three cohorts.

Tam, T. (2016). Academic achievement as status competition: Intergenerational transmission of positional advantage among Taiwanese and American students. *Chinese Journal of Sociology*, 2(2), 171-193.

Father's PSI NS-SEC (NS-SEC)

Father's NS-SEC	NCDS (1958) %	BCS (1970) %	MCS* (2000/02) %
1 Higher Managerial and Professional	8	11	17
2 Lower Managerial and Professional			
3 Intermediate			
4 Small Employers and Own Account Workers			
5 Lower Supervisory and Technical			
6 Semi-Routine			
7 Routine			

*MCS Values are survey structure adjusted.

Father's PSI NS-SEC (NS-SEC)

Father's NS-SEC	NCDS (1958) %	BCS (1970) %	MCS* (2000/02) %
1 Higher Managerial and Professional	8	11	17
2 Lower Managerial and Professional	12	14	22
3 Intermediate	9	9	5
4 Small Employers and Own Account Workers	12	13	13
5 Lower Supervisory and Technical	16	17	16
6 Semi-Routine	18	16	13
7 Routine	24	20	14

*MCS Values are survey structure adjusted.

Father's PSI NS-SEC (NS-SEC)

Father's NS-SEC	NCDS (1958) PSI (%)		
1 Higher Managerial and Professional	92 (8)		
2 Lower Managerial and Professional	80 (12)		
3 Intermediate	71 (9)		
4 Small Employers and Own Account Workers	58 (12)		
5 Lower Supervisory and Technical	42 (16)		
6 Semi-Routine	24 (18)		
7 Routine	0 (24)		

*MCS Values are survey structure adjusted.

Father's PSI NS-SEC (NS-SEC)

Father's NS-SEC	NCDS (1958) PSI (%)	BCS (1970) PSI (%)	
1 Higher Managerial and Professional	92 (8)	89 (11)	
2 Lower Managerial and Professional	80 (12)	74 (14)	
3 Intermediate	71 (9)	65 (9)	
4 Small Employers and Own Account Workers	58 (12)	53 (13)	
5 Lower Supervisory and Technical	42 (16)	36 (17)	
6 Semi-Routine	24 (18)	20 (16)	
7 Routine	0 (24)	0 (20)	

*MCS Values are survey structure adjusted.

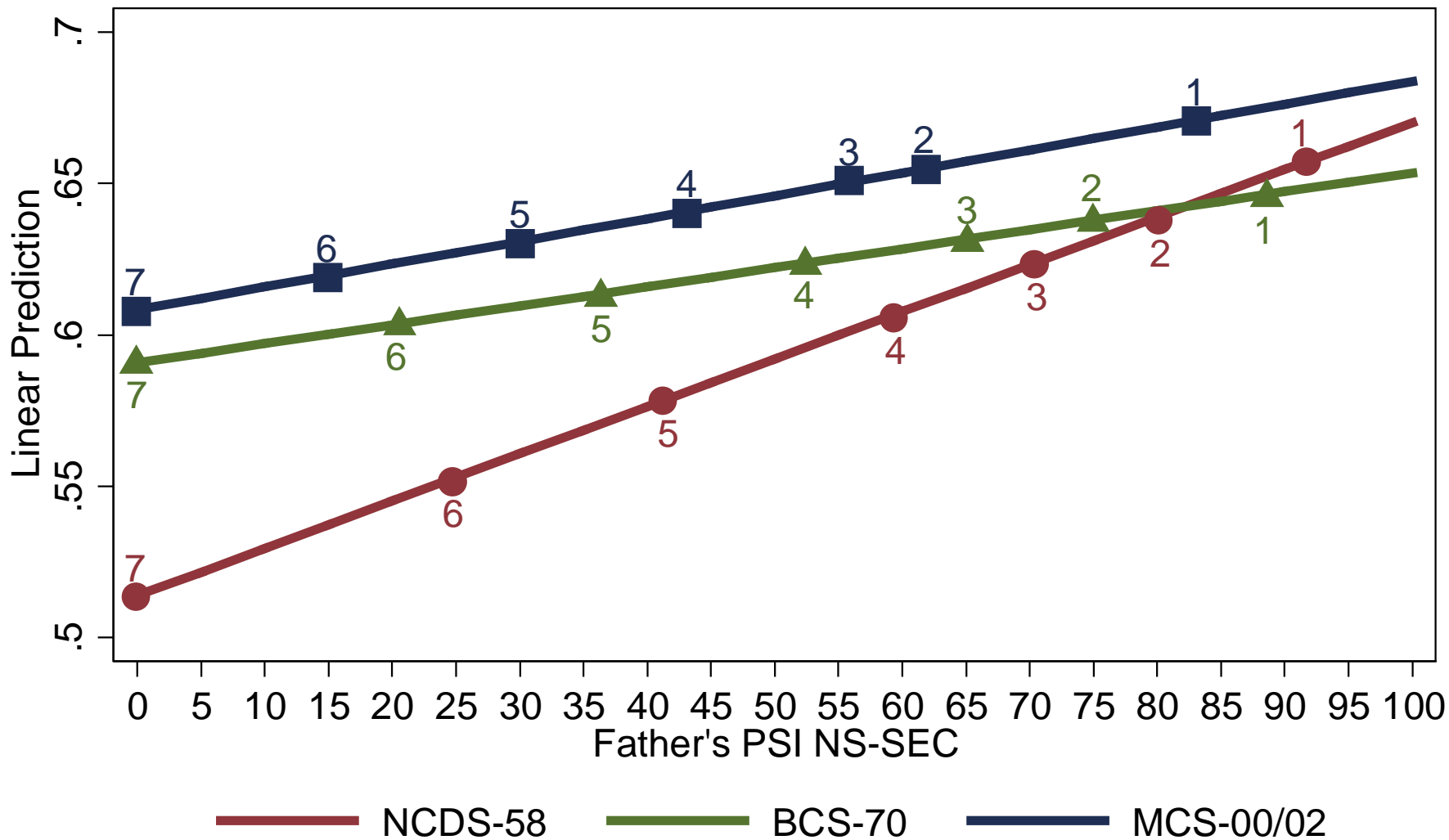
Father's PSI NS-SEC (NS-SEC)

Father's NS-SEC	NCDS (1958) PSI (%)	BCS (1970) PSI (%)	MCS* (2000/02) PSI (%)
1 Higher Managerial and Professional	92 (8)	89 (11)	83 (17)
2 Lower Managerial and Professional	80 (12)	74 (14)	62 (22)
3 Intermediate	71 (9)	65 (9)	56 (5)
4 Small Employers and Own Account Workers	58 (12)	53 (13)	44 (13)
5 Lower Supervisory and Technical	42 (16)	36 (17)	28 (16)
6 Semi-Routine	24 (18)	20 (16)	14 (13)
7 Routine	0 (24)	0 (20)	0 (14)

*MCS Values are survey structure adjusted.

Verbal Similarities Test Score

Interaction between PSI NS-SEC and cohort



Models also contain: gender, mother's education, father's education.

Substantive Conclusions

There are changing socio-economics inequalities in cognitive test performance.

- The inequalities in Verbal Similarities test performance have decreased between cohorts.
- This finding is robust to the use of different occupation-based measures.
- This finding offers important sociological insight into the Flynn effect.

Methodological Conclusions

This complex sample adjustment technique preserves the integrity of the MCS design but brings the older cohorts into a unified analytical framework.

Methodological Conclusions

- This technique will inform future social stratification research:
 - Cross-cohort comparison will become increasingly common as the MCS sample complete their education, move into the labour market and begin having families of their own.

Methodological Conclusions

- This technique can be used when combining data from many surveys with different designs:
 - Comparing the MCS with other 'Growing up in' studies.
 - Comparing the cohorts with Understanding Society.

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We are grateful to The Centre for Longitudinal Studies, UCL Institute of Education for the use of these data and to the UK Data Archive and Economic and Social Data Service for making them available. These organisations bear no responsibility for the analysis or interpretation of these data.

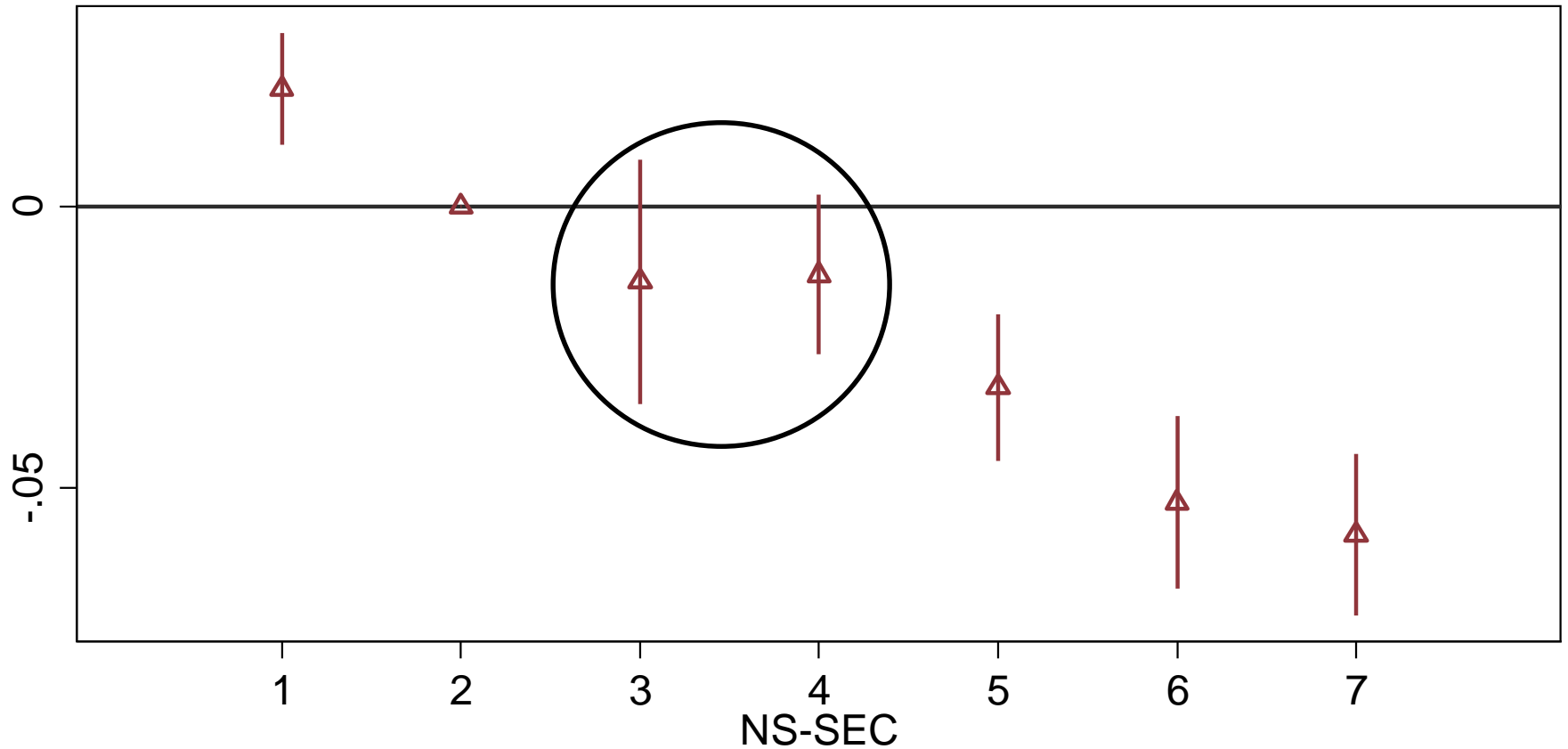
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Verbal Similarities Test Score

OLS regression coefficients and standard errors (with survey design adjustment)

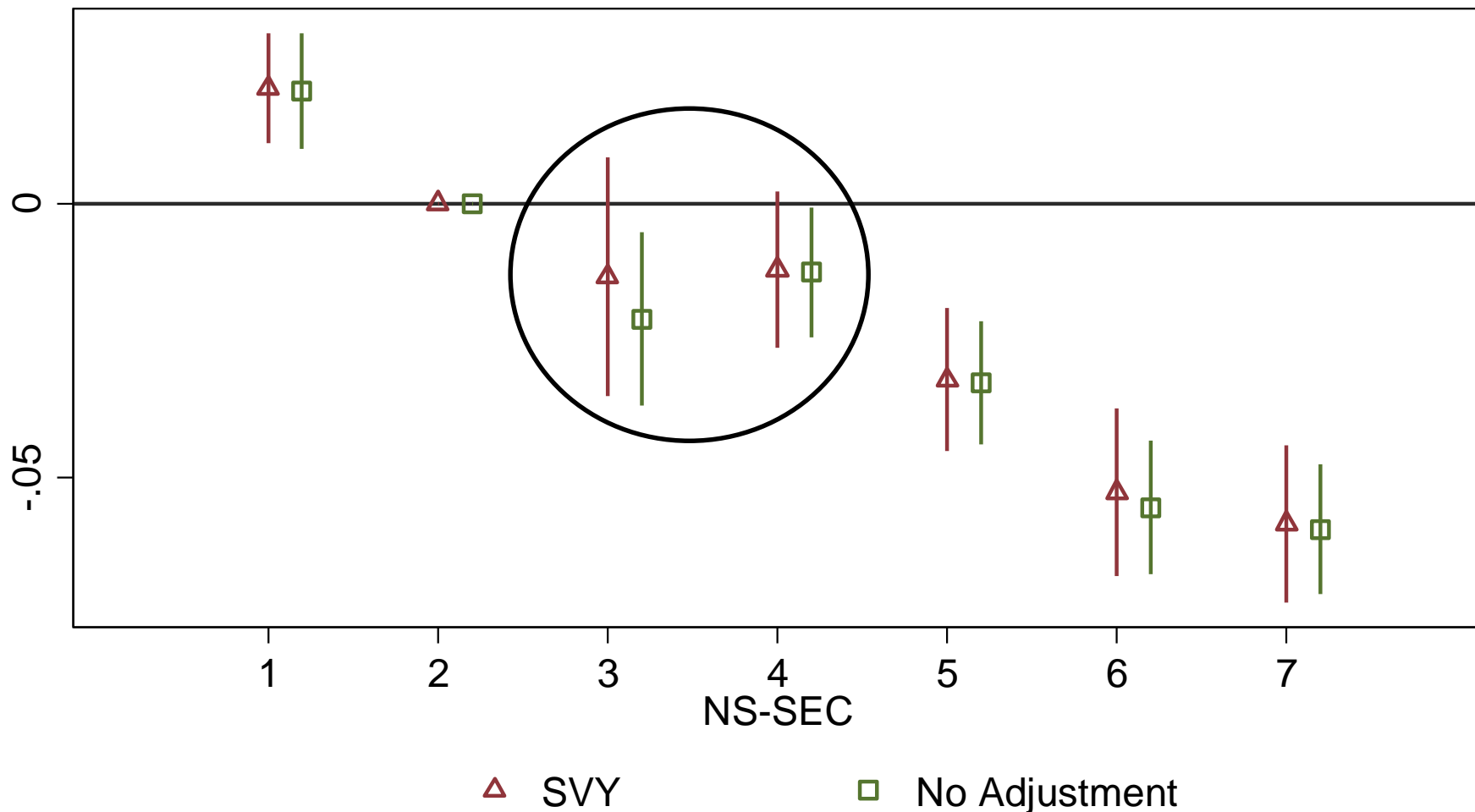


Data: Millennium Cohort Study

Model also contains: gender, mother's education, father's education

Verbal Similarities Test Score

OLS regression coefficients and standard errors (with and without survey design adjustment)

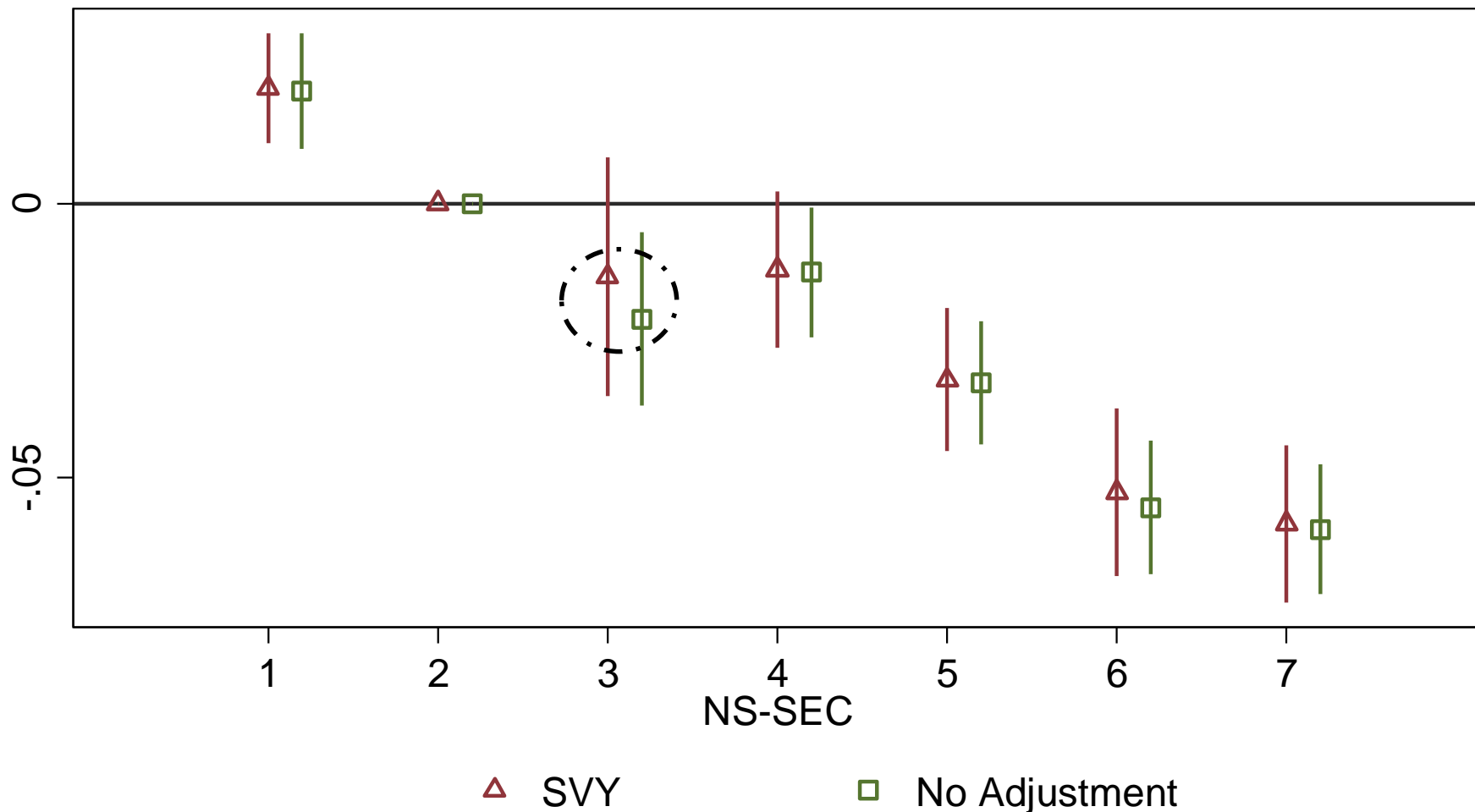


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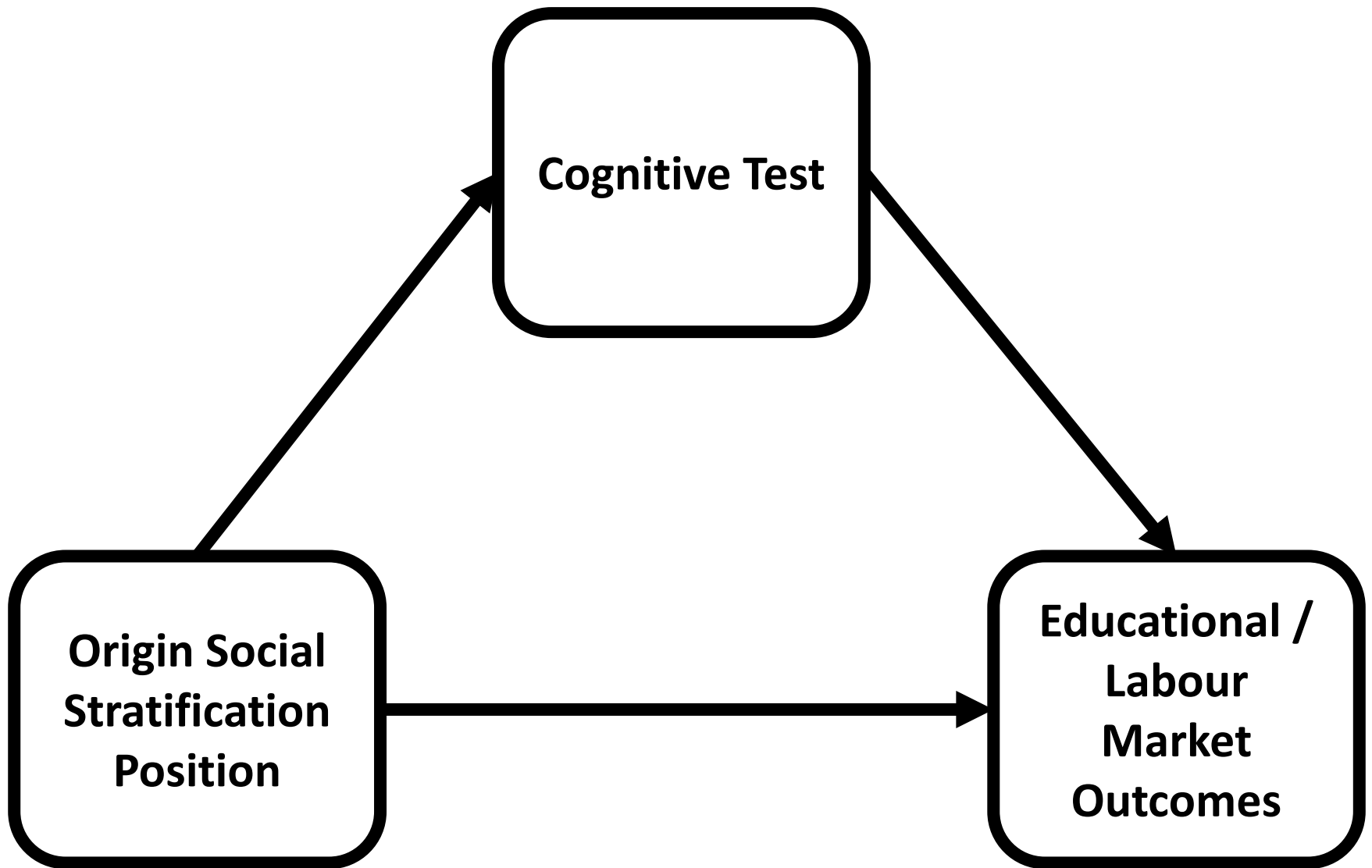
Verbal Similarities Test Score

OLS regression coefficients and standard errors (with and without survey design adjustment)

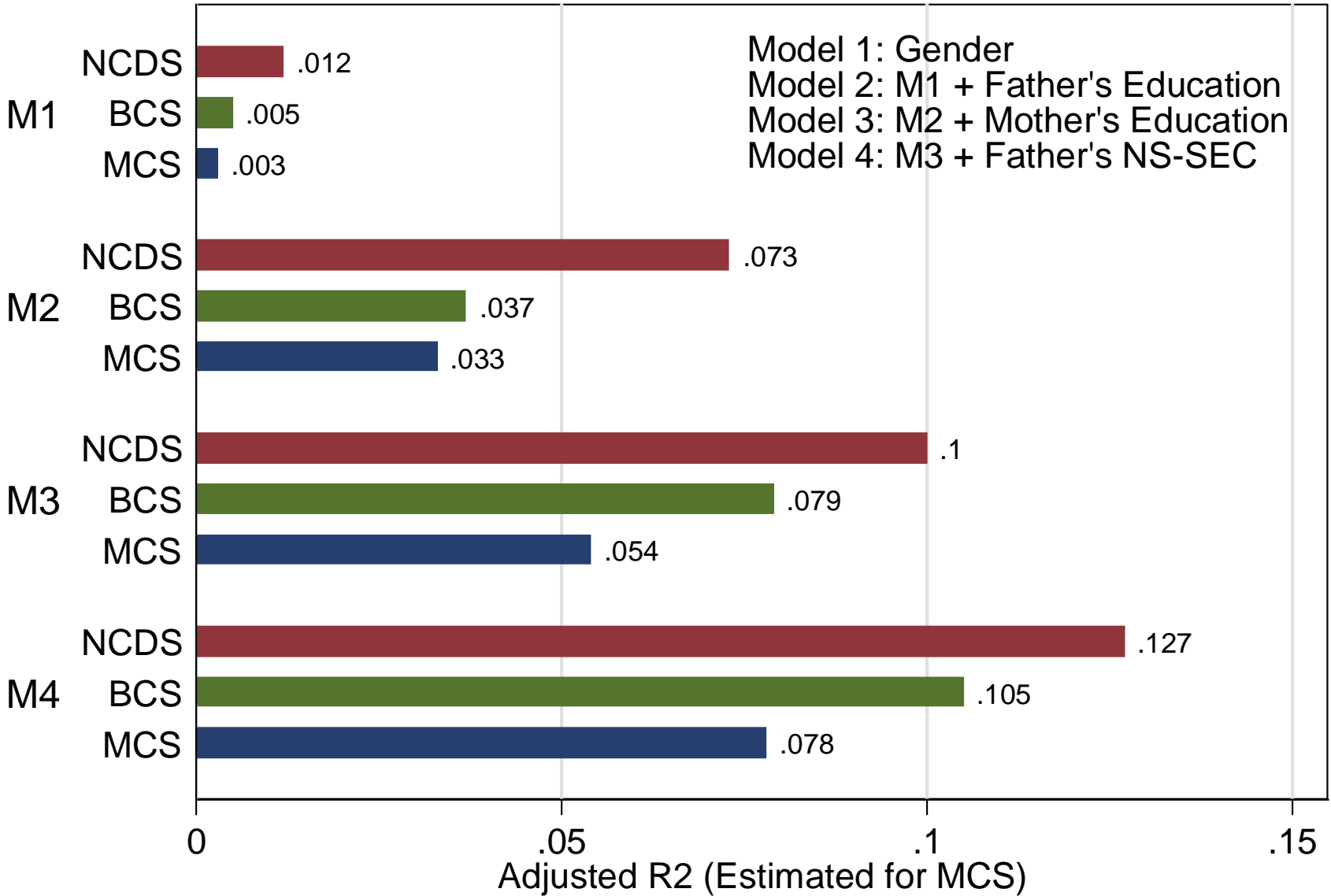


Data: Millennium Cohort Study

Model also contains: gender, mother's education, father's education



Explained Variance in Models Predicting Verbal Similarities Test Scores



Possible Mechanisms

- Improvement in Education
- Improvement in test sophistication
- Greater complexity of more recent environments
- Improvements in child rearing
- The individual multiplier (the intelligent have a thirst for cognitive stimulation)
- The social multiplier (the mean ability of our social environment influences our own ability)
- Decreased family size
- Improvements in nutrition
- Exposure to natural light
- Exposure to lead