

Gender differences at GCSE



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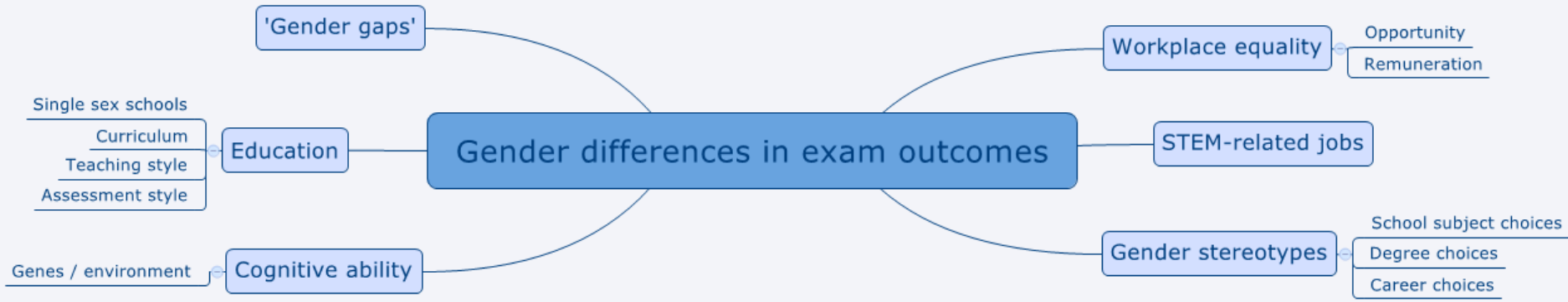
Outline

Brief summary of research on gender differences in examination outcomes

GCSE data from England (2014)

- Gender differences in subject choice
- Gender differences in outcomes (grades)
- Gender differences in outcomes (scores)

Background



Previous research

Maths and related abilities

- ‘Trivial differences’ in school years (US)
- Male advantage in maths sections of SAT / ACT (US)
- Slight female advantage at GCSE (England)
- Inconsistent pattern across countries (TIMMS & PISA)
- Male advantage at top end?
- Differences in favoured item types / skills:
 - Boys: spatial, problem solving, geometry, statistics
 - Girls: algebra, numerical patterns, representing quantities
- Explanations?

Previous research

Verbal and related abilities

- Small differences in favour of females?
- Consistent advantage across countries in reading and writing (PIRLS & PISA)
- UK – government initiatives to improve boys' writing
- No difference in vocabulary and reading comprehension; female advantage in writing and verbal reasoning (US SAT/ACT)

Previous research

GCSE and A Level

- Consistently find female advantage
 - Girls entered for more GCSEs
 - Girls achieve better scores; more 5 A*-C
 - Girls half a grade better in English (but equal in Maths)
- Effect sizes small compared with other demographic variables (e.g. SES, ethnicity)
- Effect of assessment type (multiple-choice, coursework)

Subject groupings

For presentation purposes only...

STEM

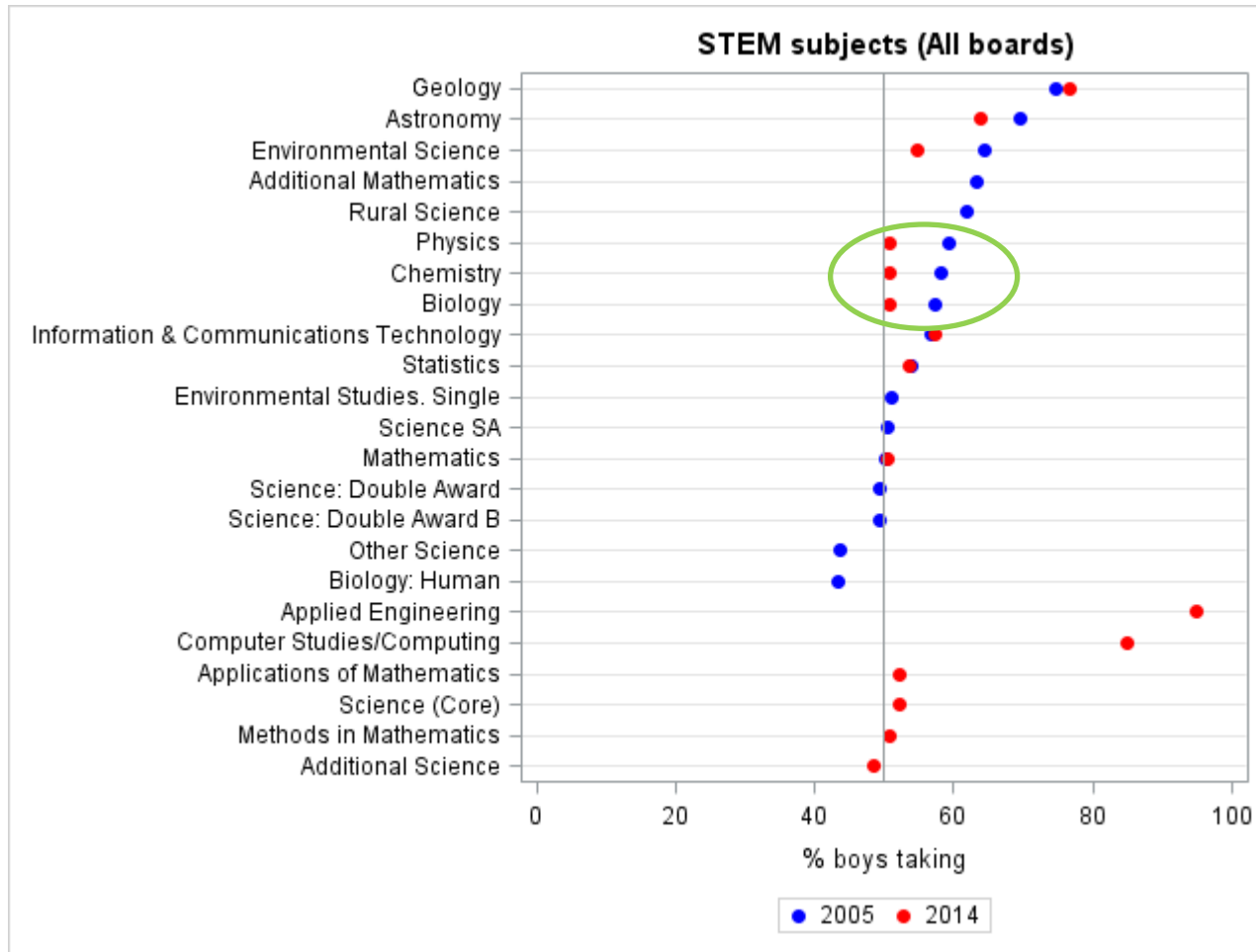
Humanities (e.g. English, History, Geography)

Languages (e.g. French, German, Latin)

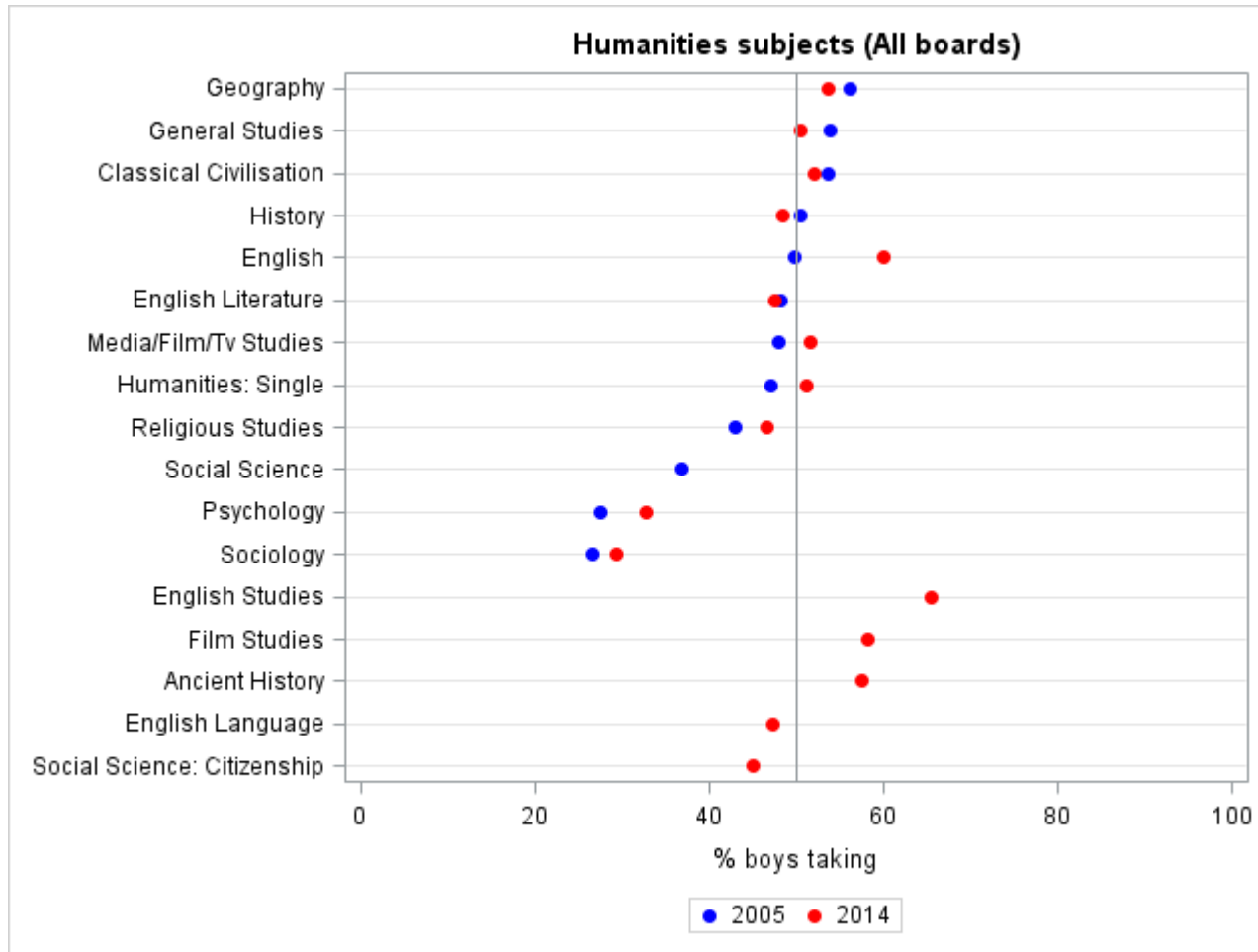
Expressive (e.g. Music, Drama, Art)

Applied (e.g. Law, Accounting, Tourism)

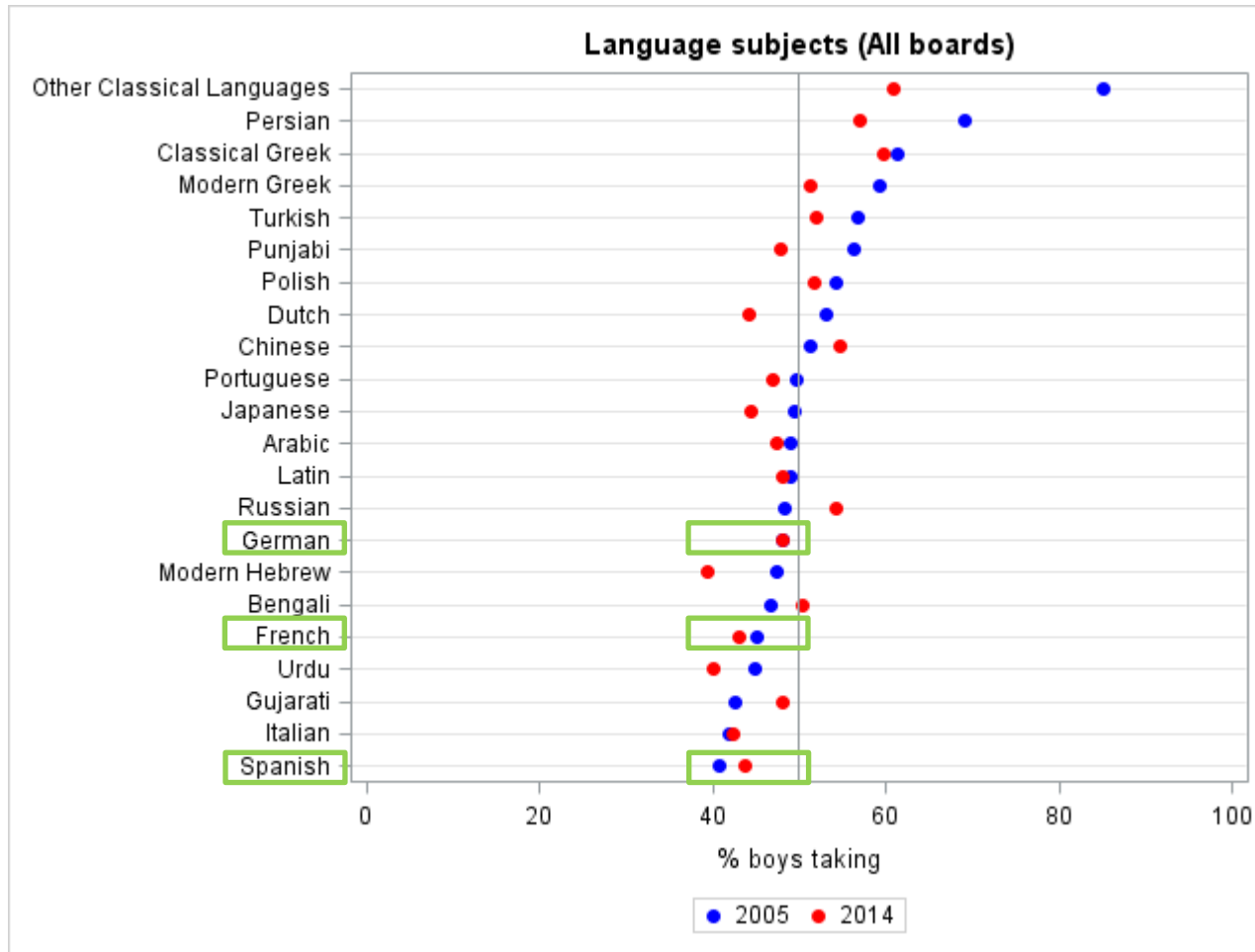
GCSE subject choice



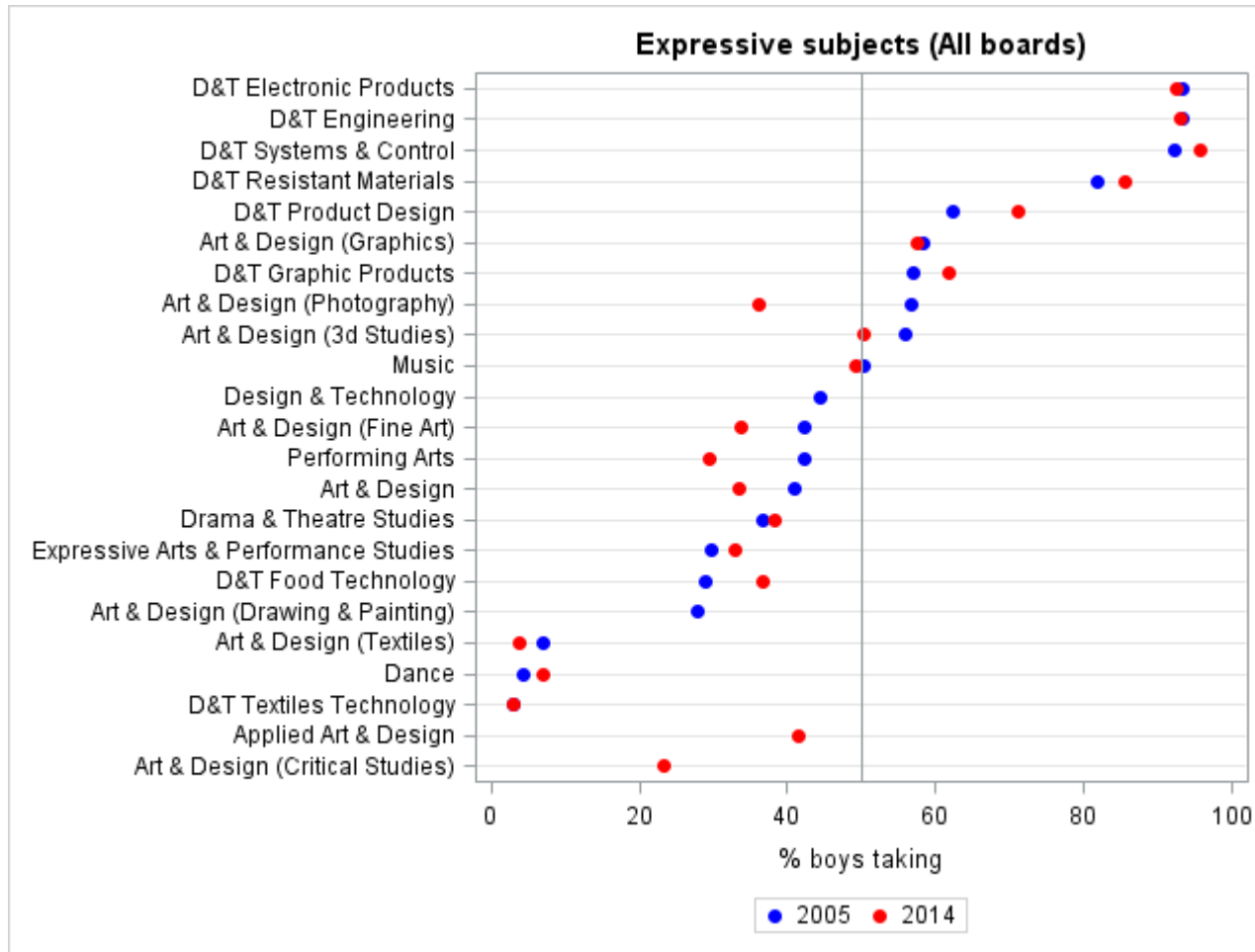
GCSE subject choice



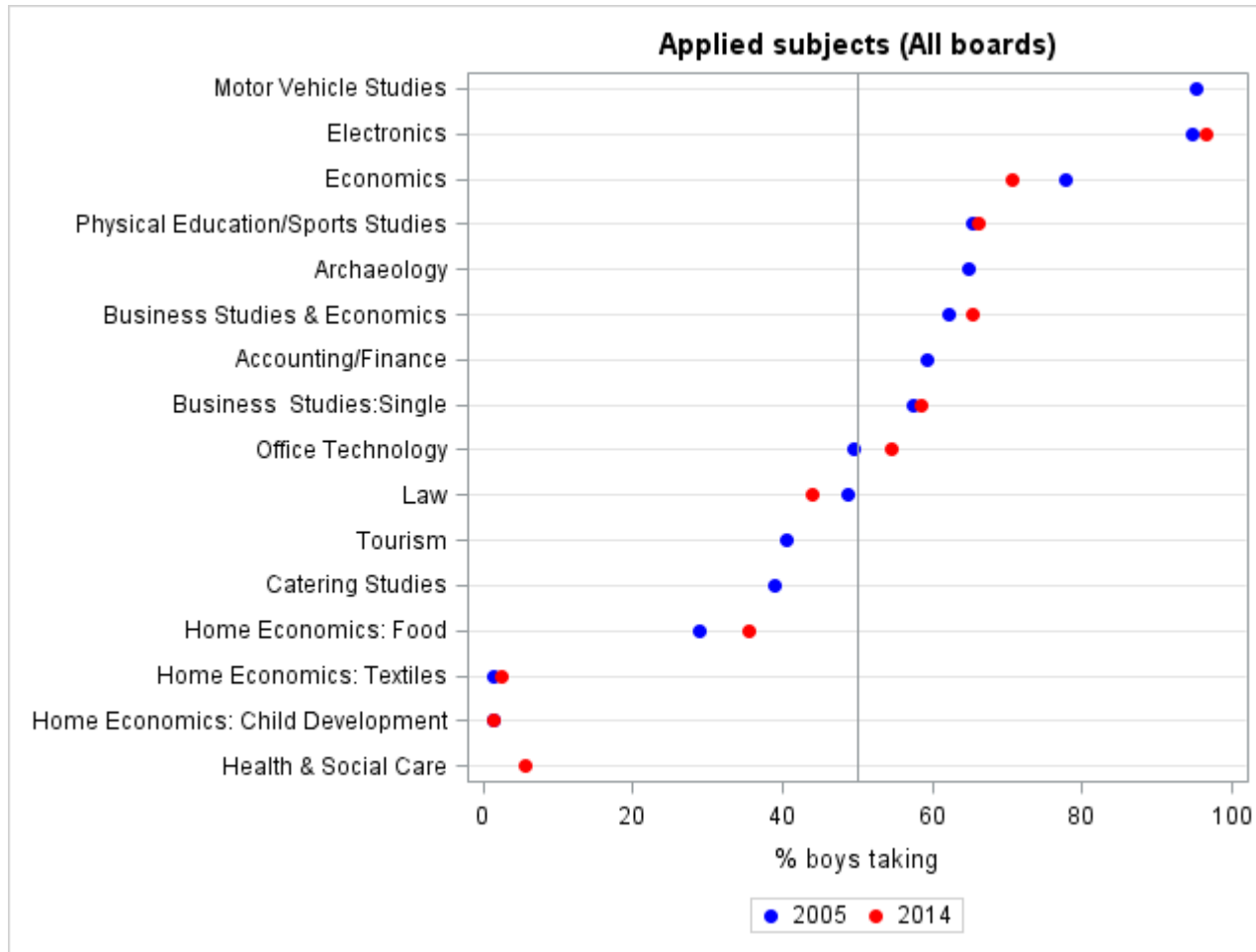
GCSE subject choice



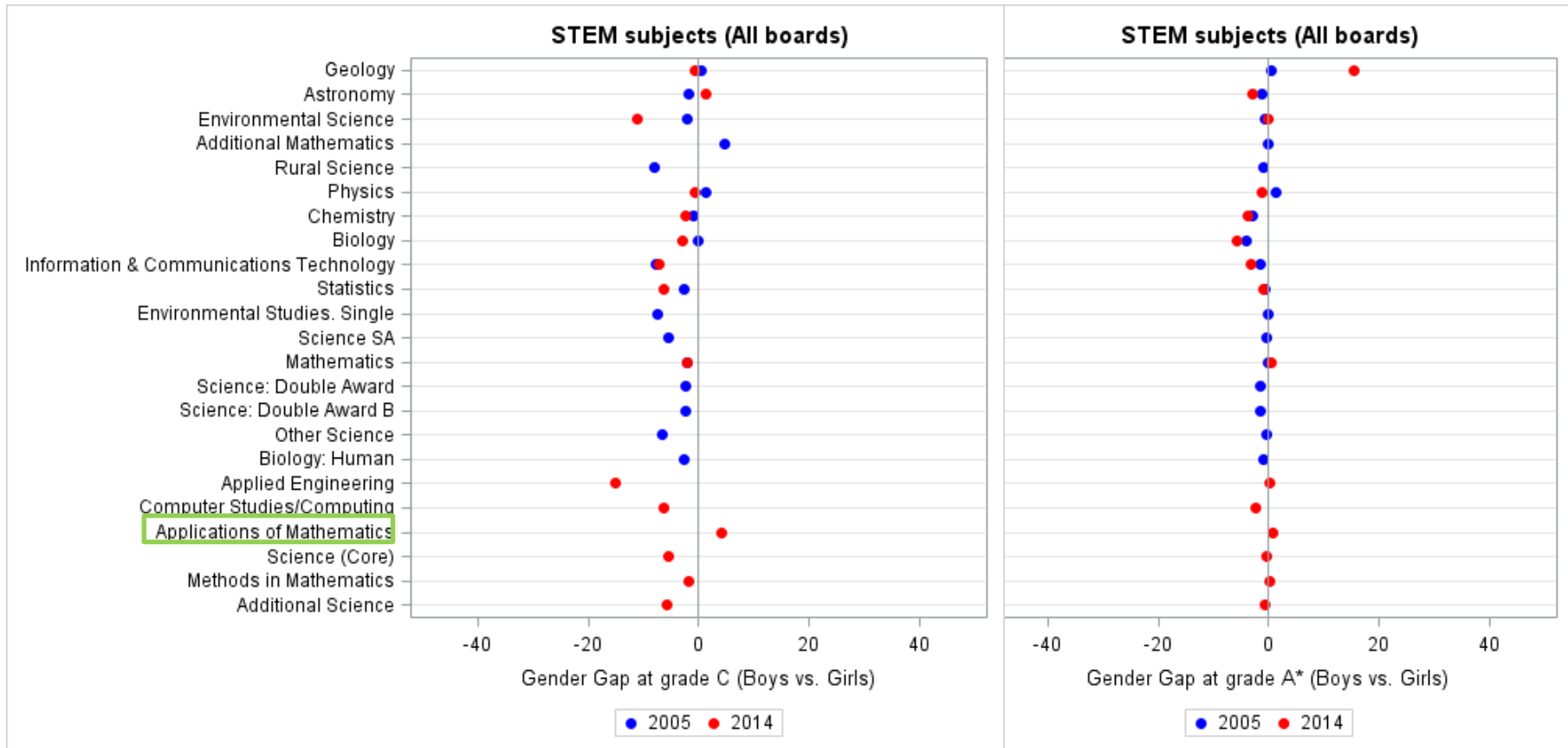
GCSE subject choice



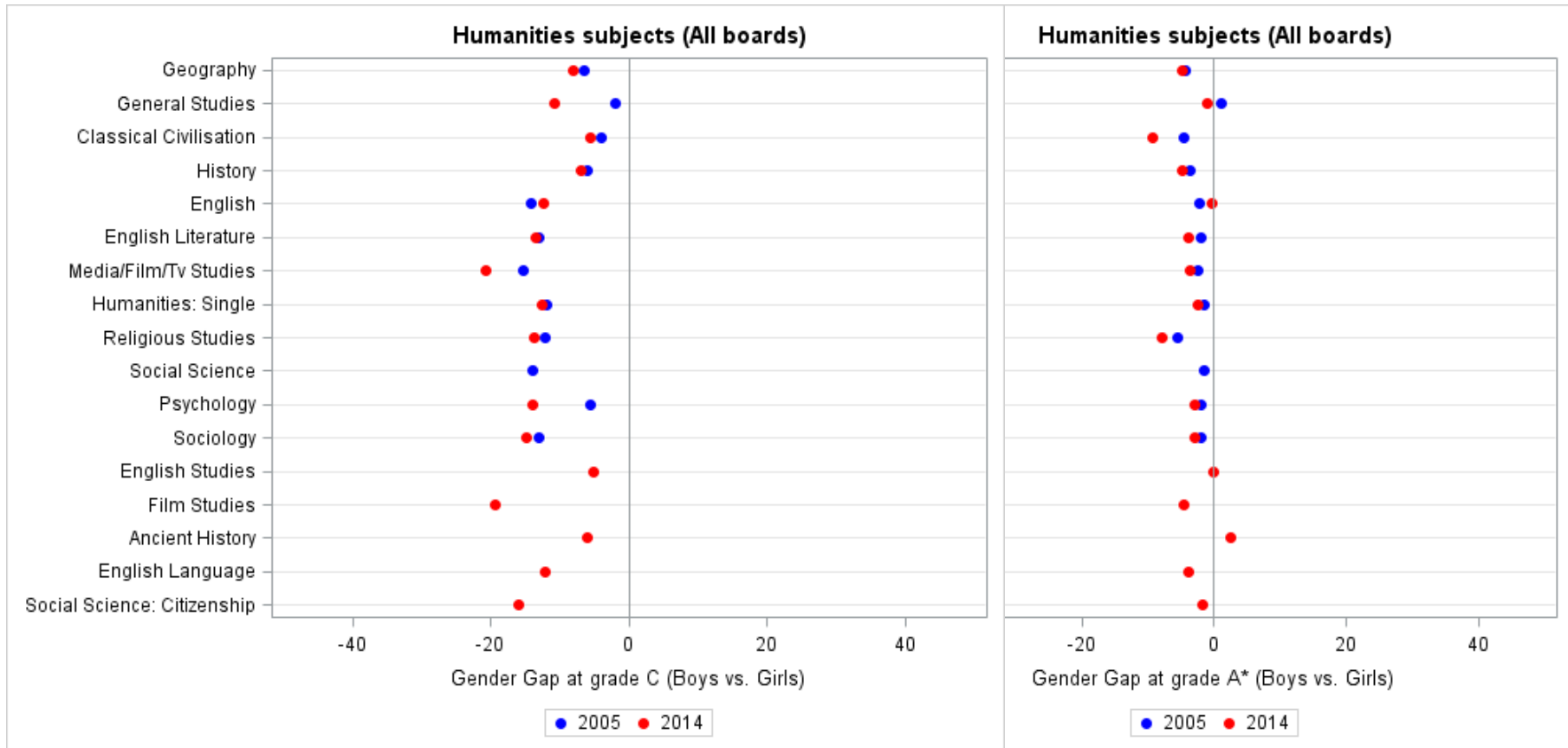
GCSE subject choice



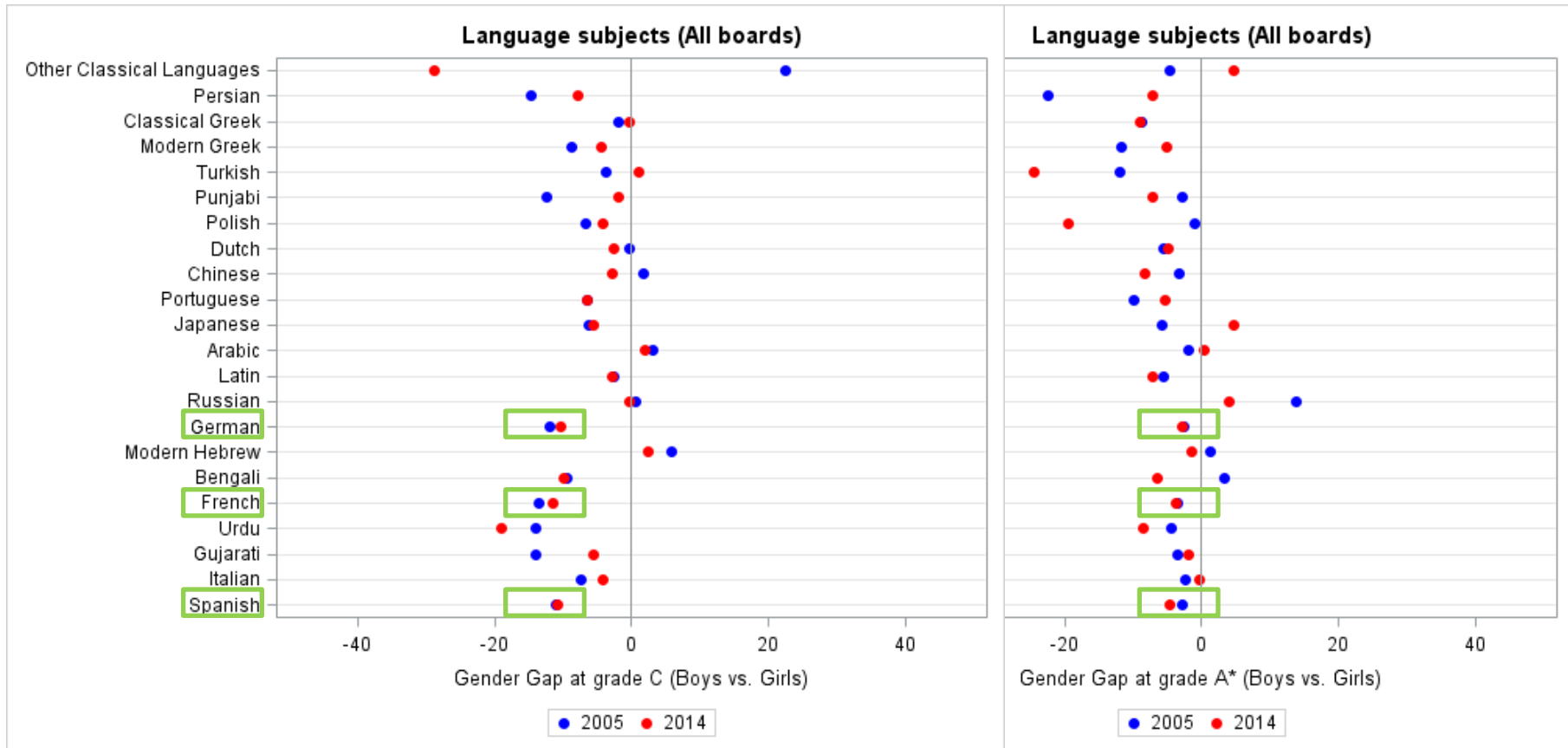
GCSE subject outcome



GCSE subject outcome



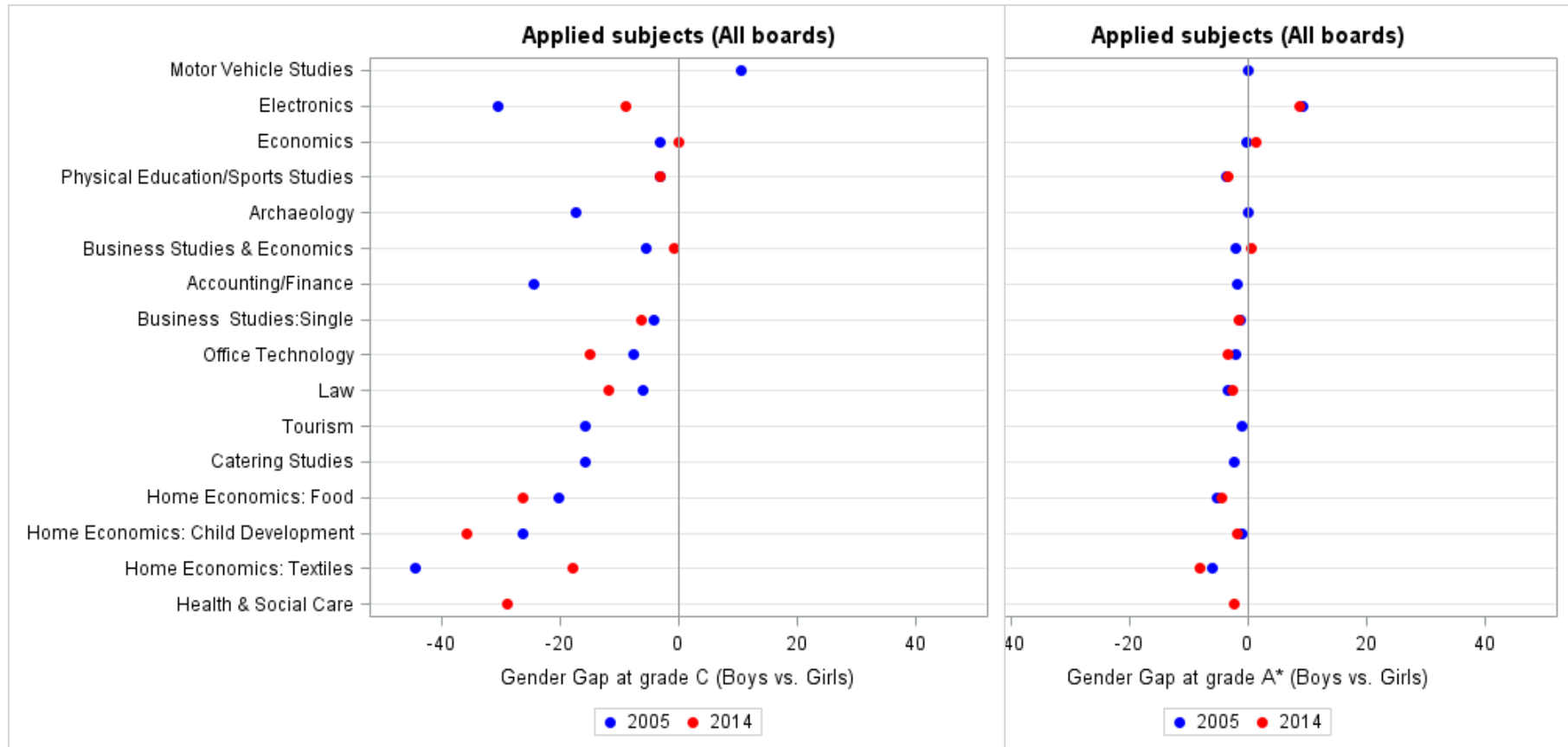
GCSE subject outcome



GCSE subject outcome



GCSE subject outcome



Analysis of scores

Scores more fine-grained than grades

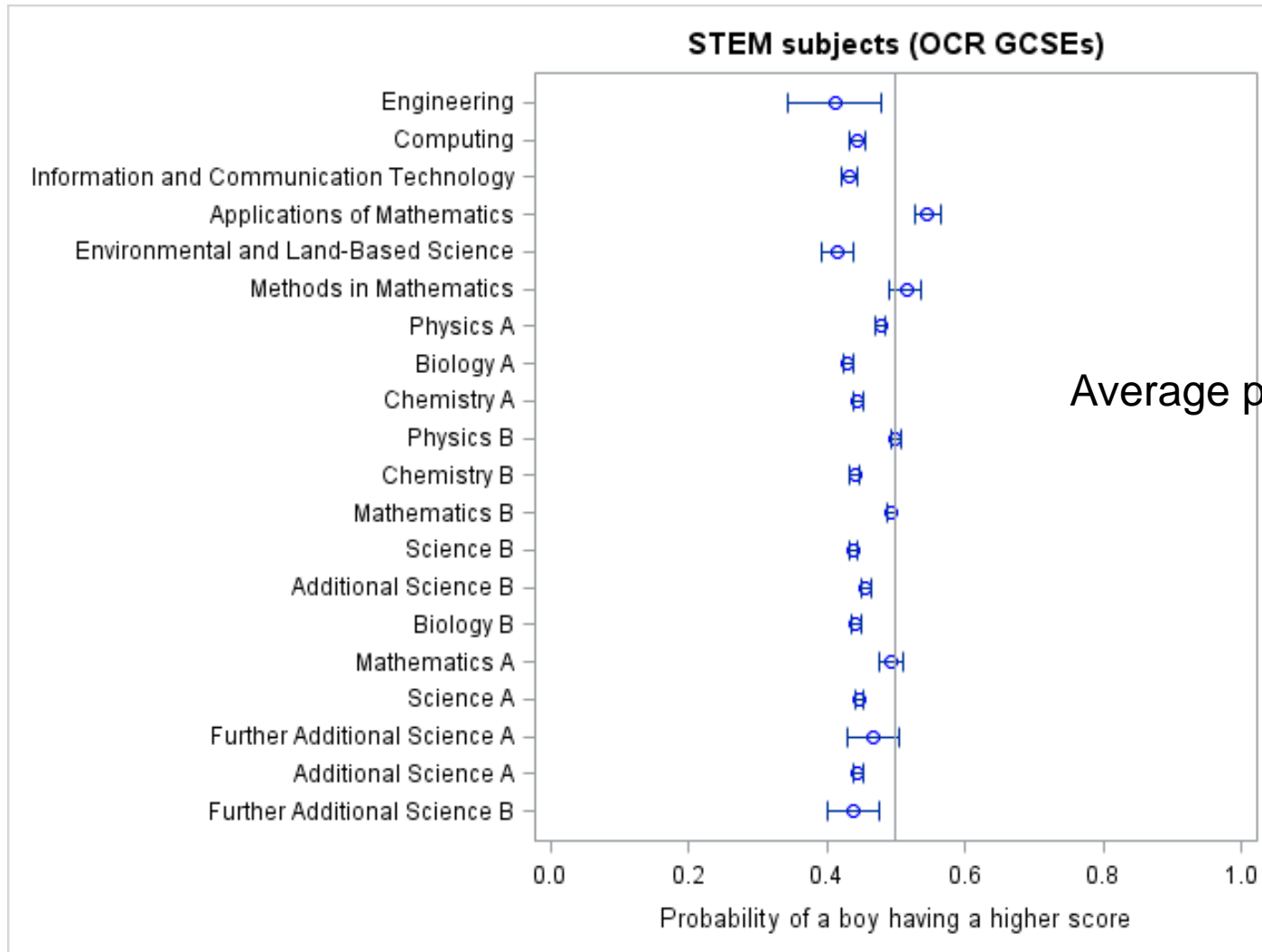
OCR data only (June 2014 again)

‘Probability of superiority’ $p(\text{sup})$:

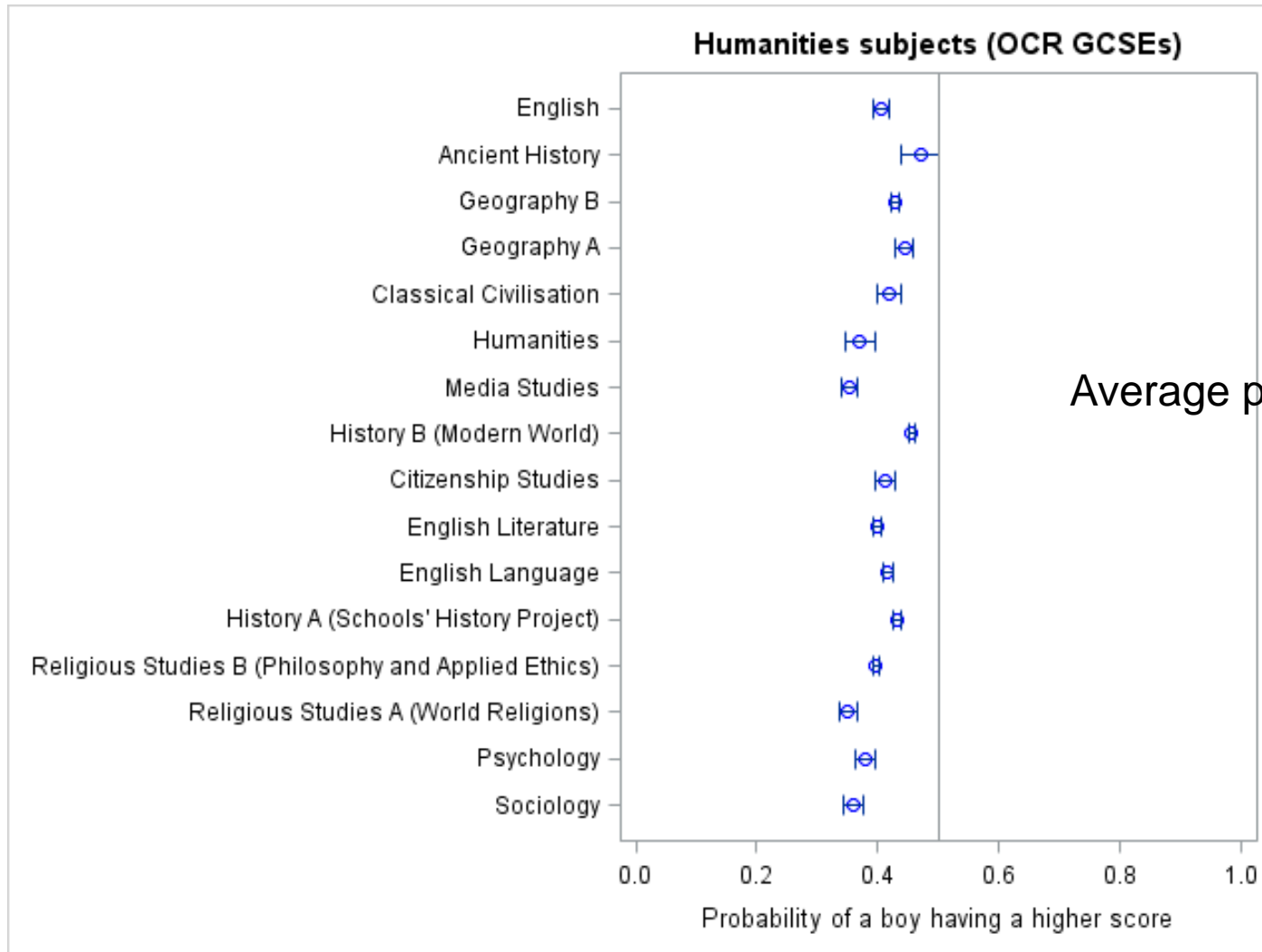
- The probability that a randomly sampled boy would have a higher score than a randomly sampled girl

Scale-free metric, uses all the data

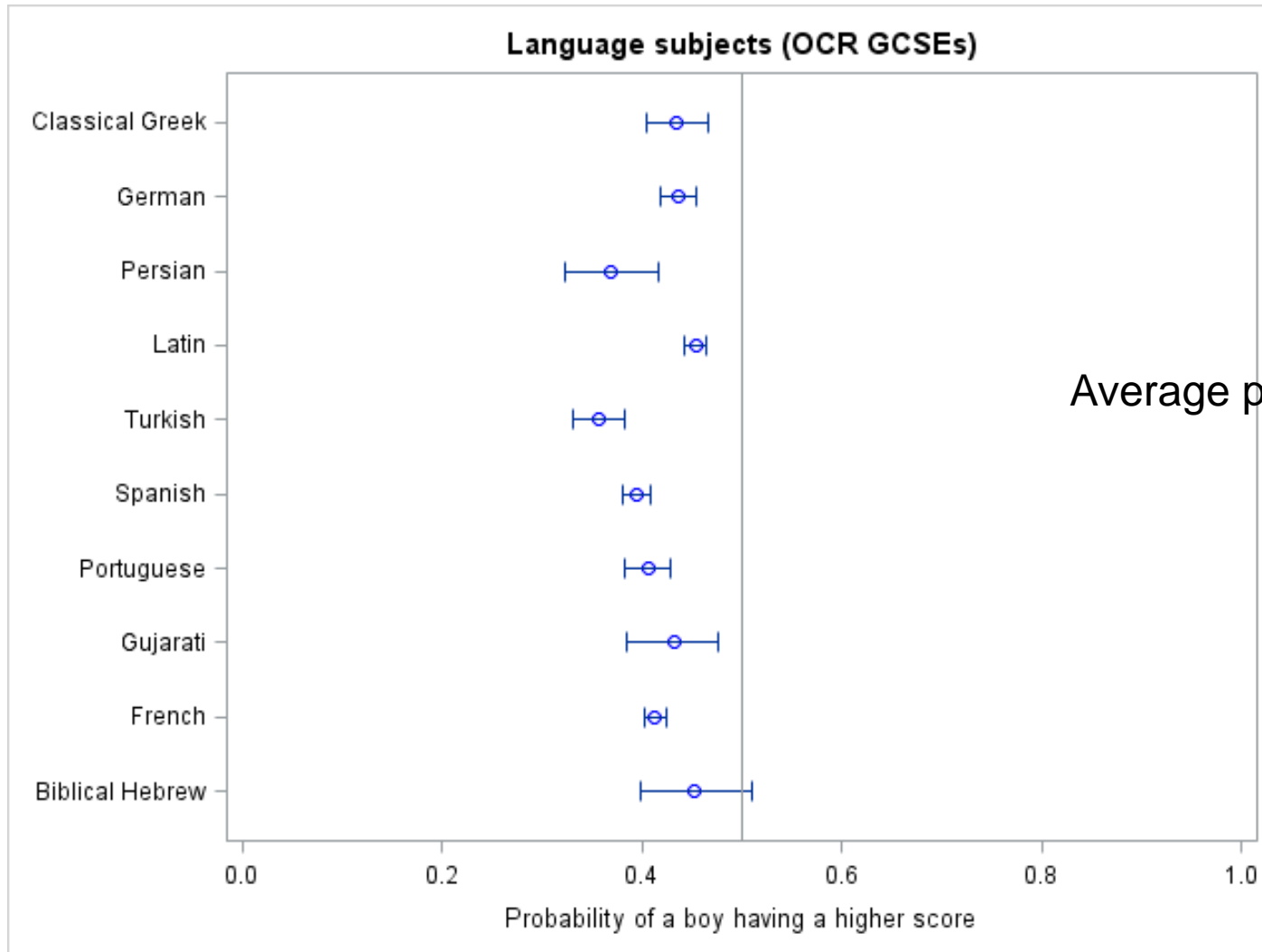
P(sup) GCSE June 2014



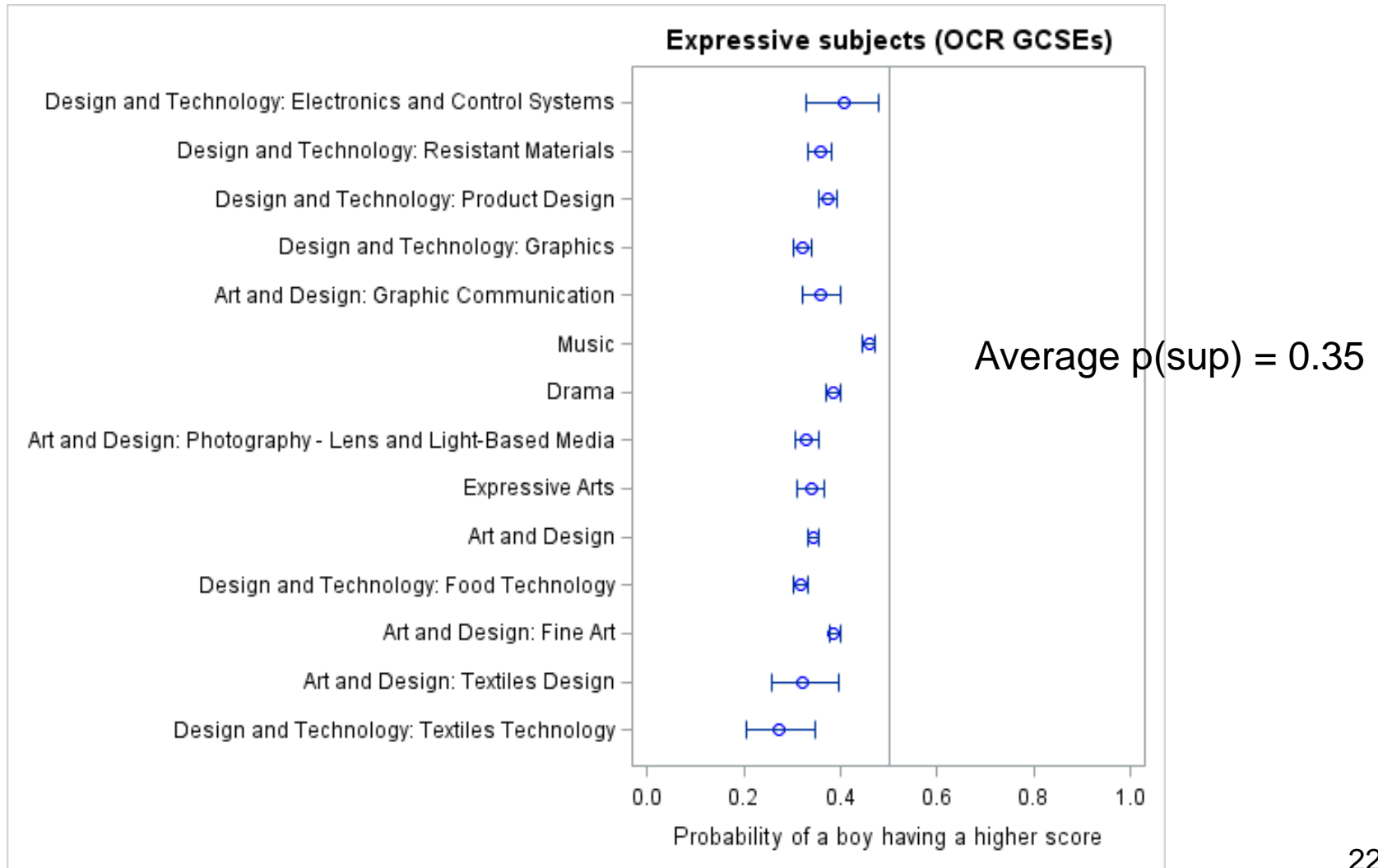
P(sup) GCSE June 2014



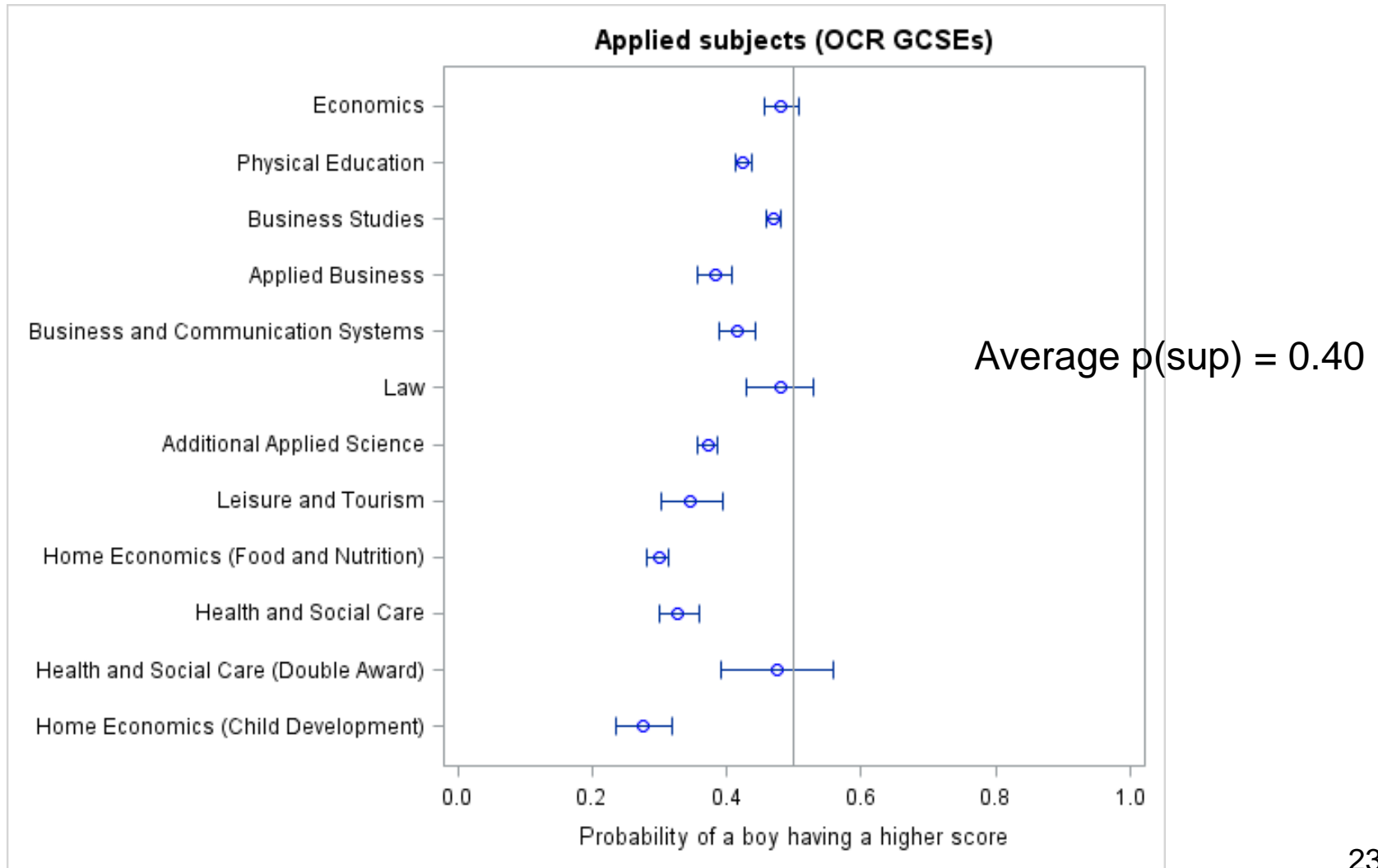
P(sup) GCSE June 2014



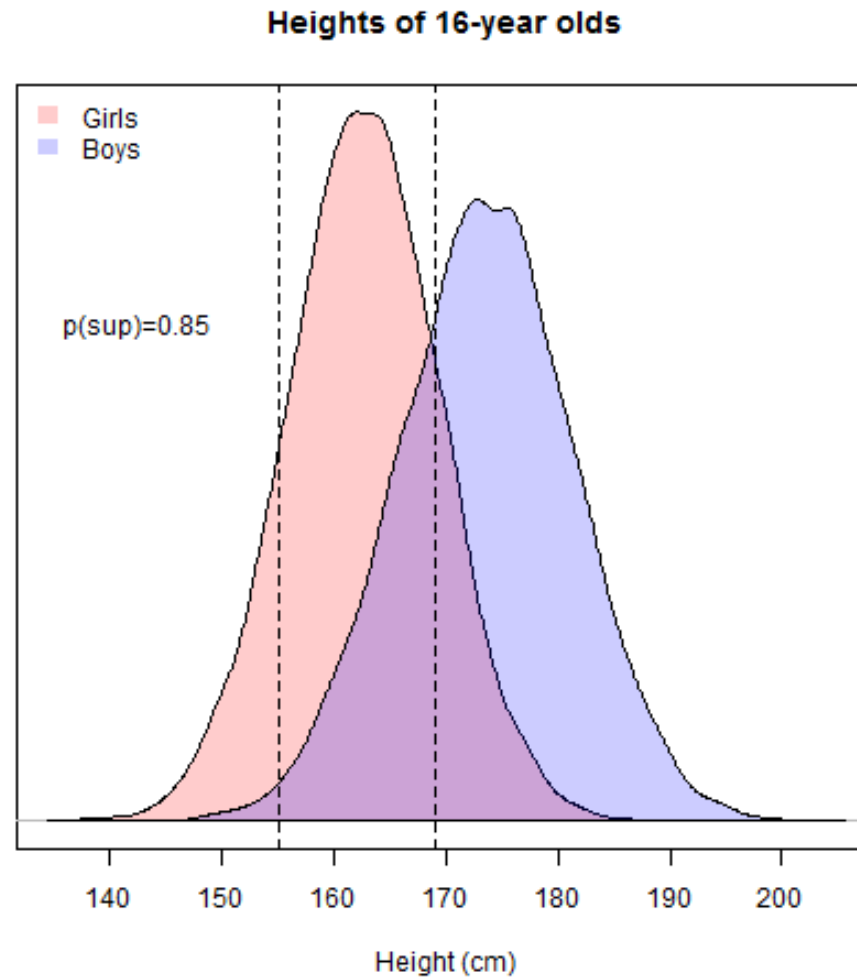
P(sup) GCSE June 2014



P(sup) GCSE June 2014

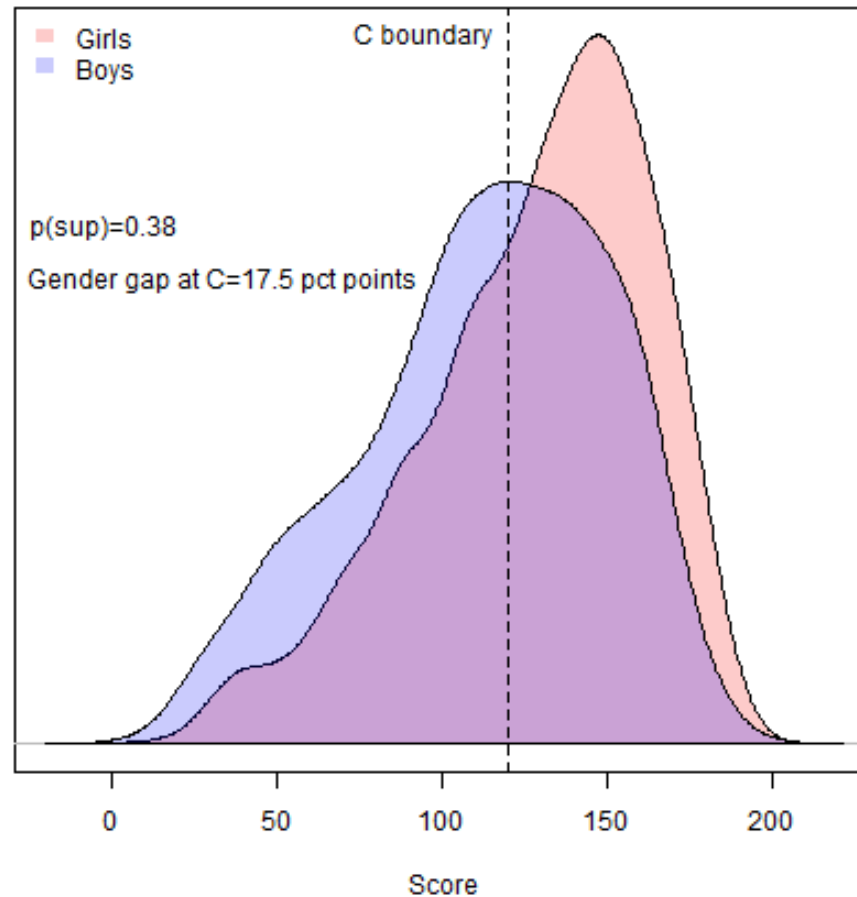


Effect size comparison



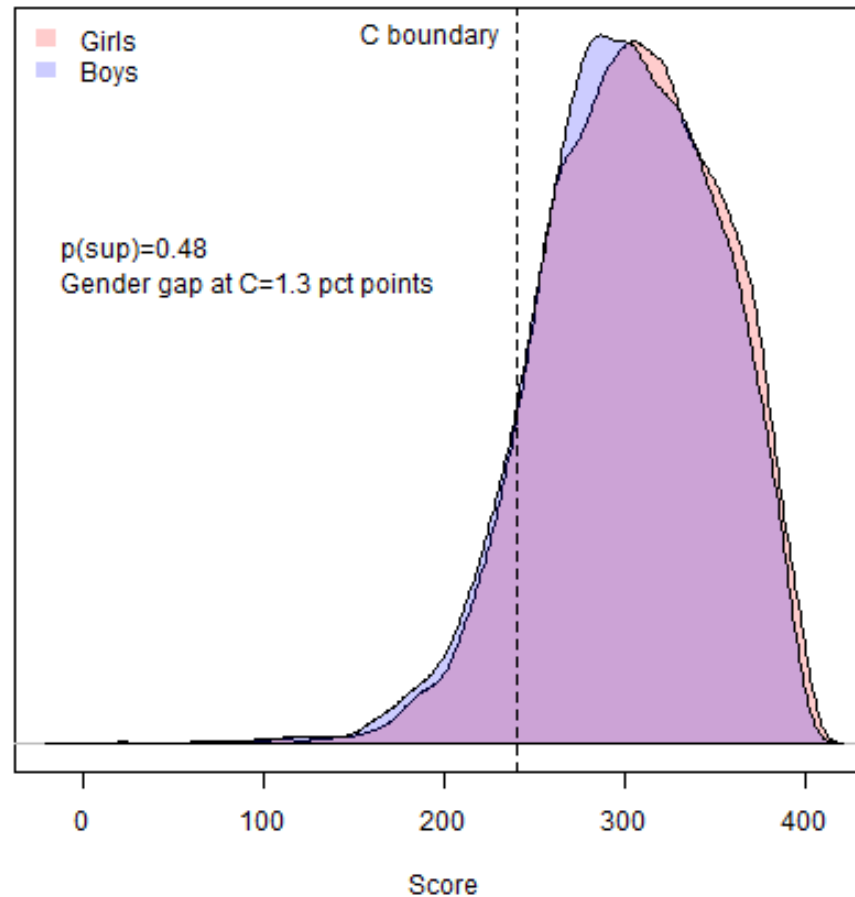
Effect size comparison

OCR GCSE Psychology June 2014



Effect size comparison

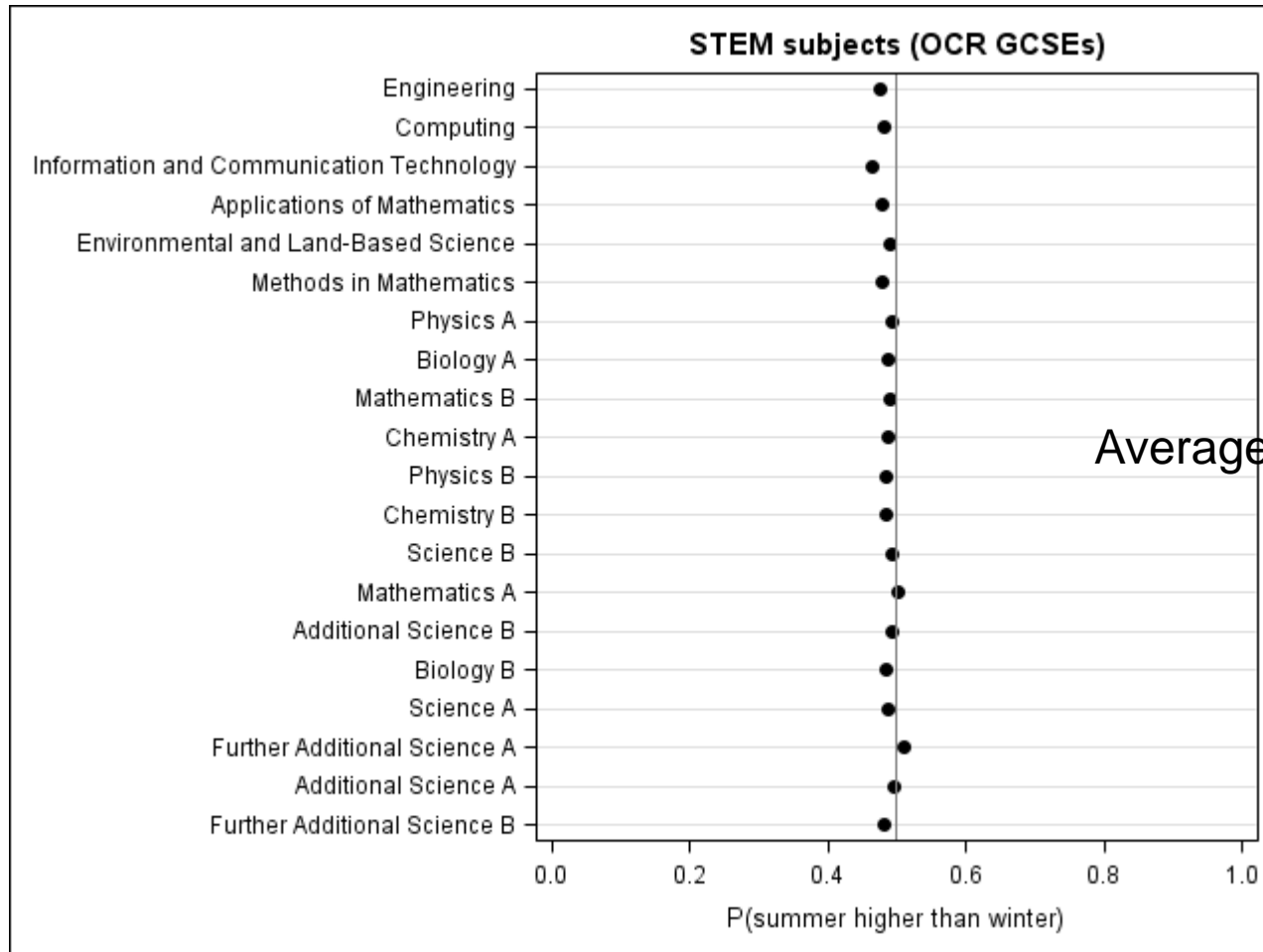
OCR GCSE Physics A June 2014



Month of birth



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Average $p(\text{sup}) = 0.48$

Summary of effect sizes

Average height difference between 16 year old (Year 11) boys and girls (around 11cm)

→ p(sup) of 0.86

GCSE gender gap → average p(sup) of 0.41

- Corresponds to 2.5cm average height difference in Y11 boys aged 9 months apart

GCSE month of birth gap → average p(sup) of 0.48

- Corresponds to 0.5cm average height difference in Y11 boys aged 2 months apart

Distribution differences

More males at low and high end of distribution?

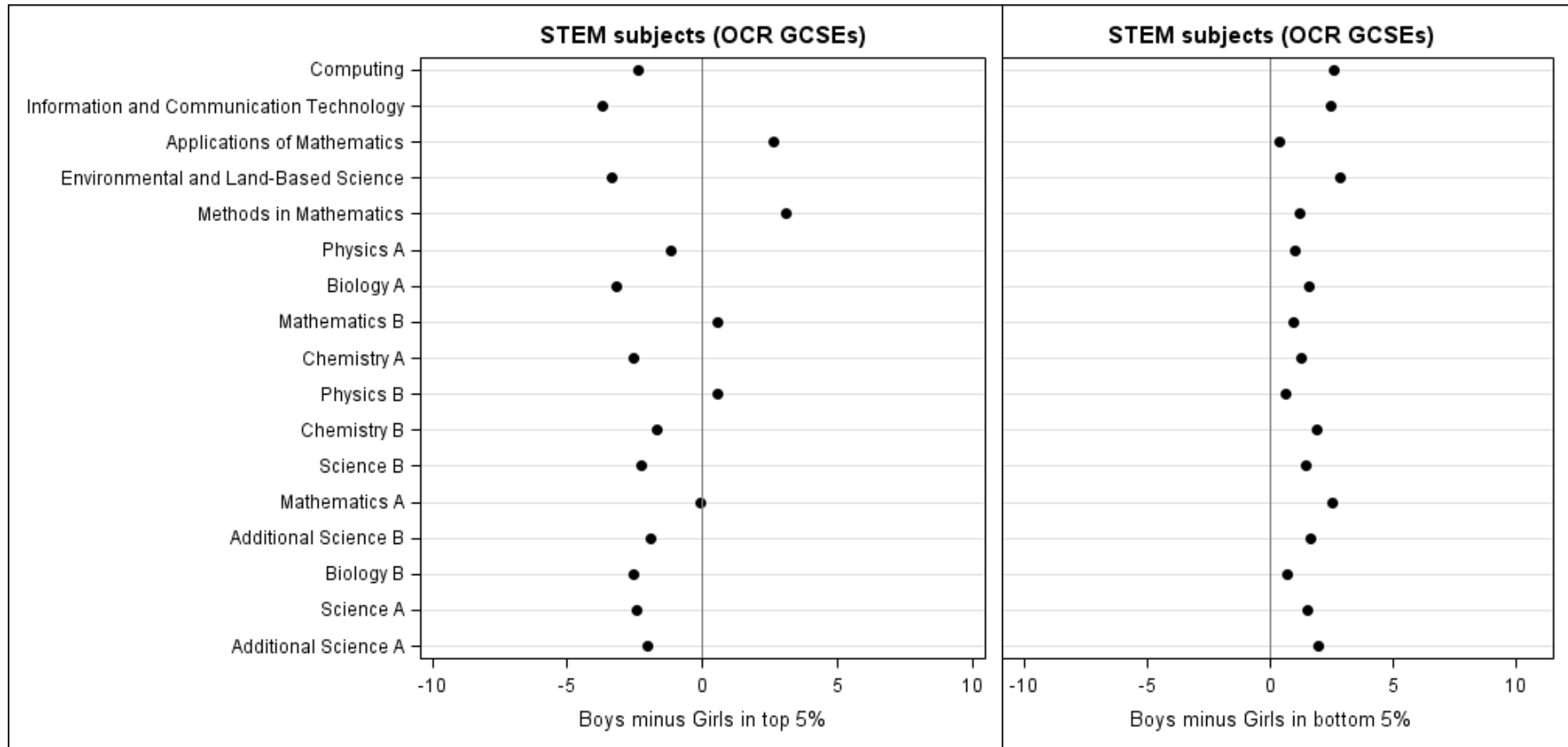
- ‘Mediocrity of women’ hypothesis (Heim, 1970)
- Long running controversy. Difficult to get unbiased data.
- ‘Boys tend to get top marks or fail in exams, says new research’ (Independent, 3rd August 2015)

In the GCSE scores (OCR June 2014):

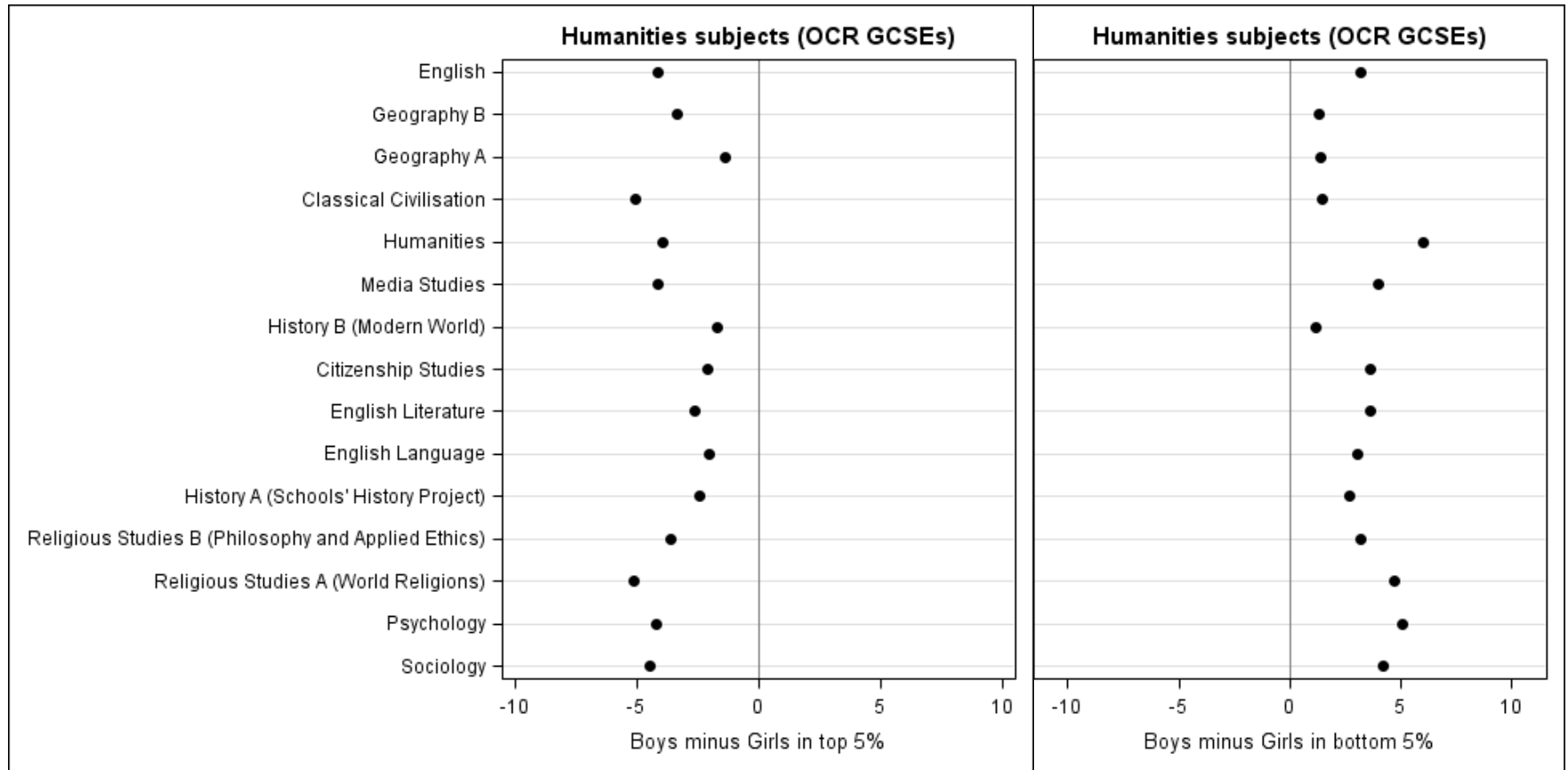
- Girls had a higher mean in 96% of cases
- Boys had a higher standard deviation in 80% of cases
- Girls higher mean AND boys higher SD in 71% of cases

But does this mean more boys at the extremes?

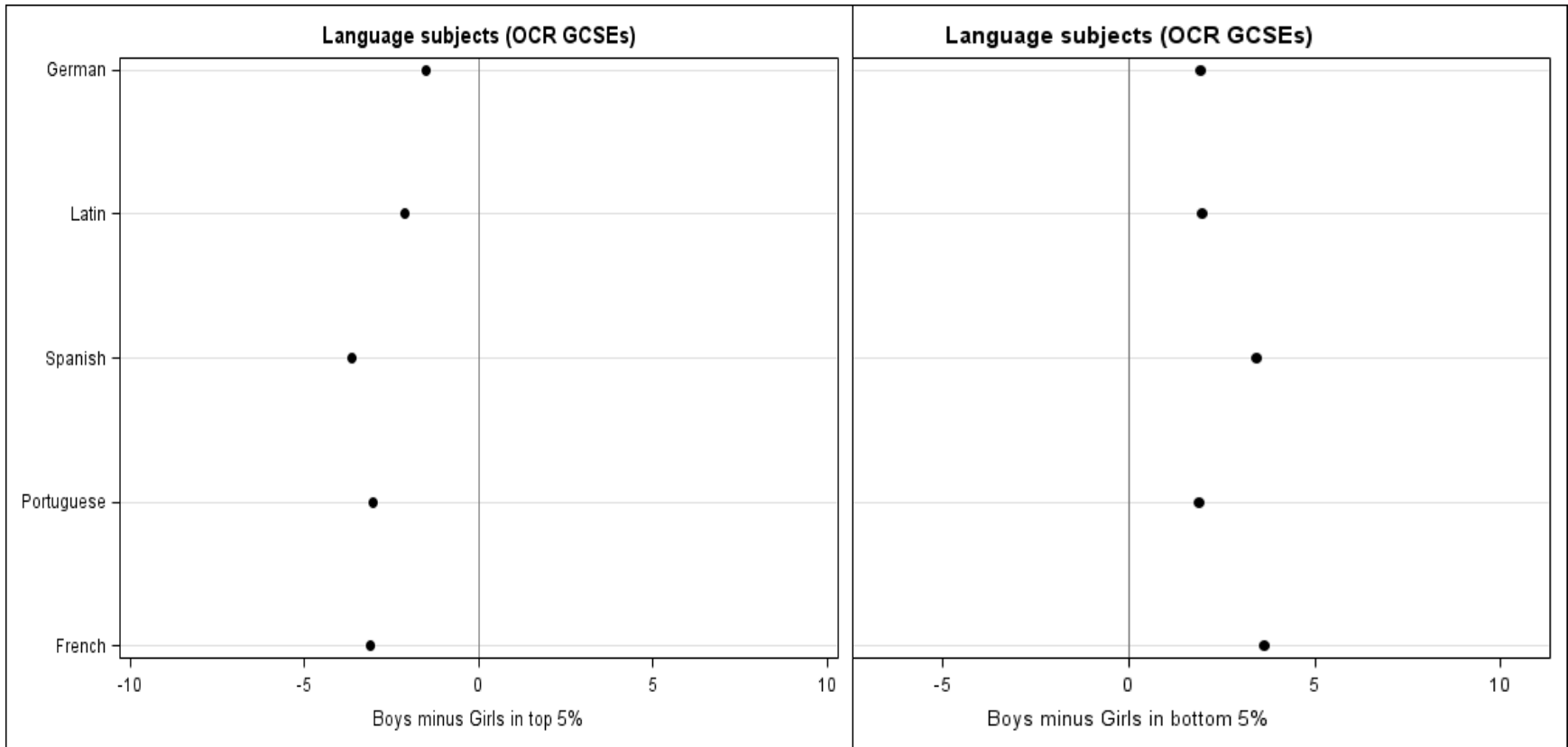
More boys at the extremes?



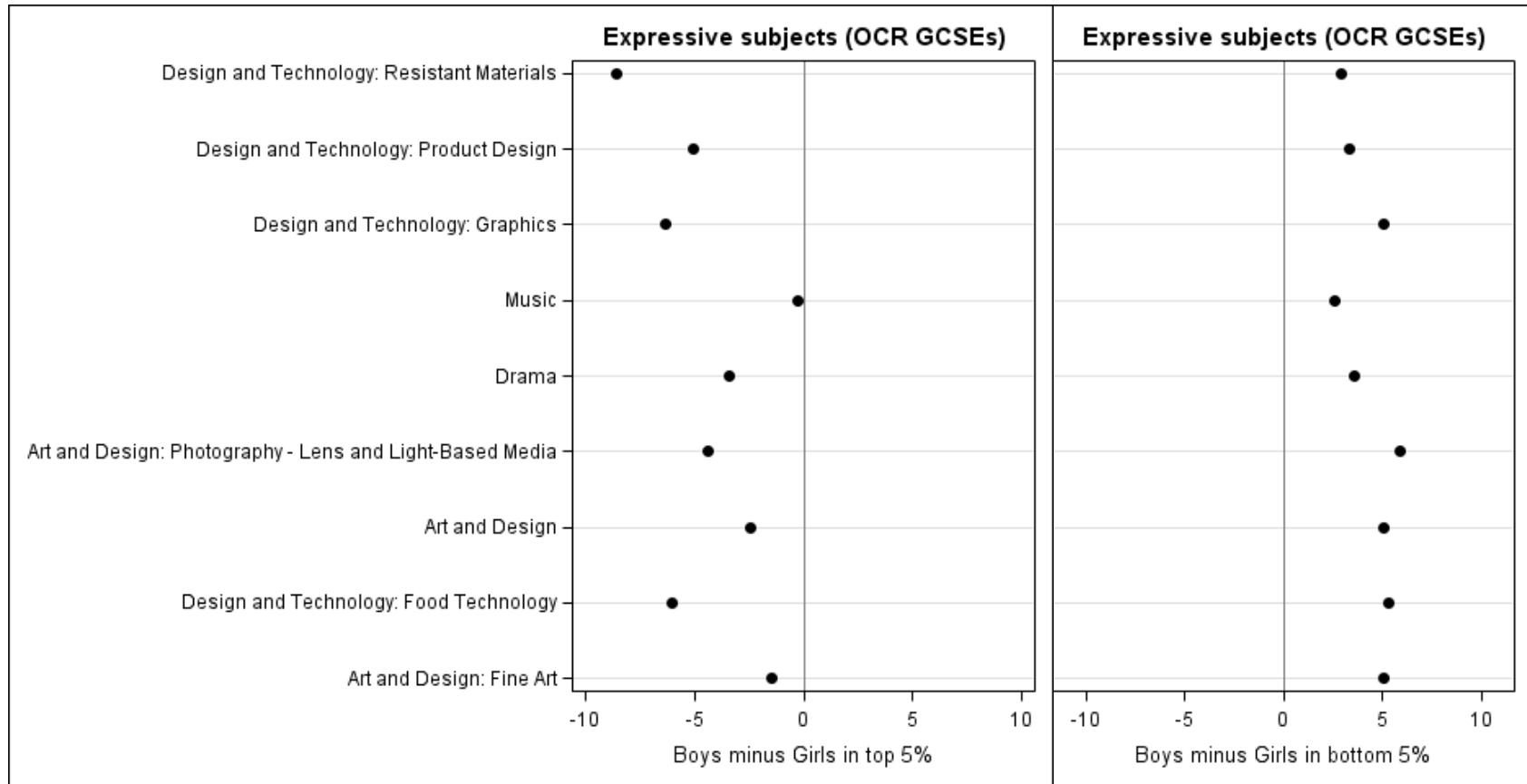
More boys at the extremes?



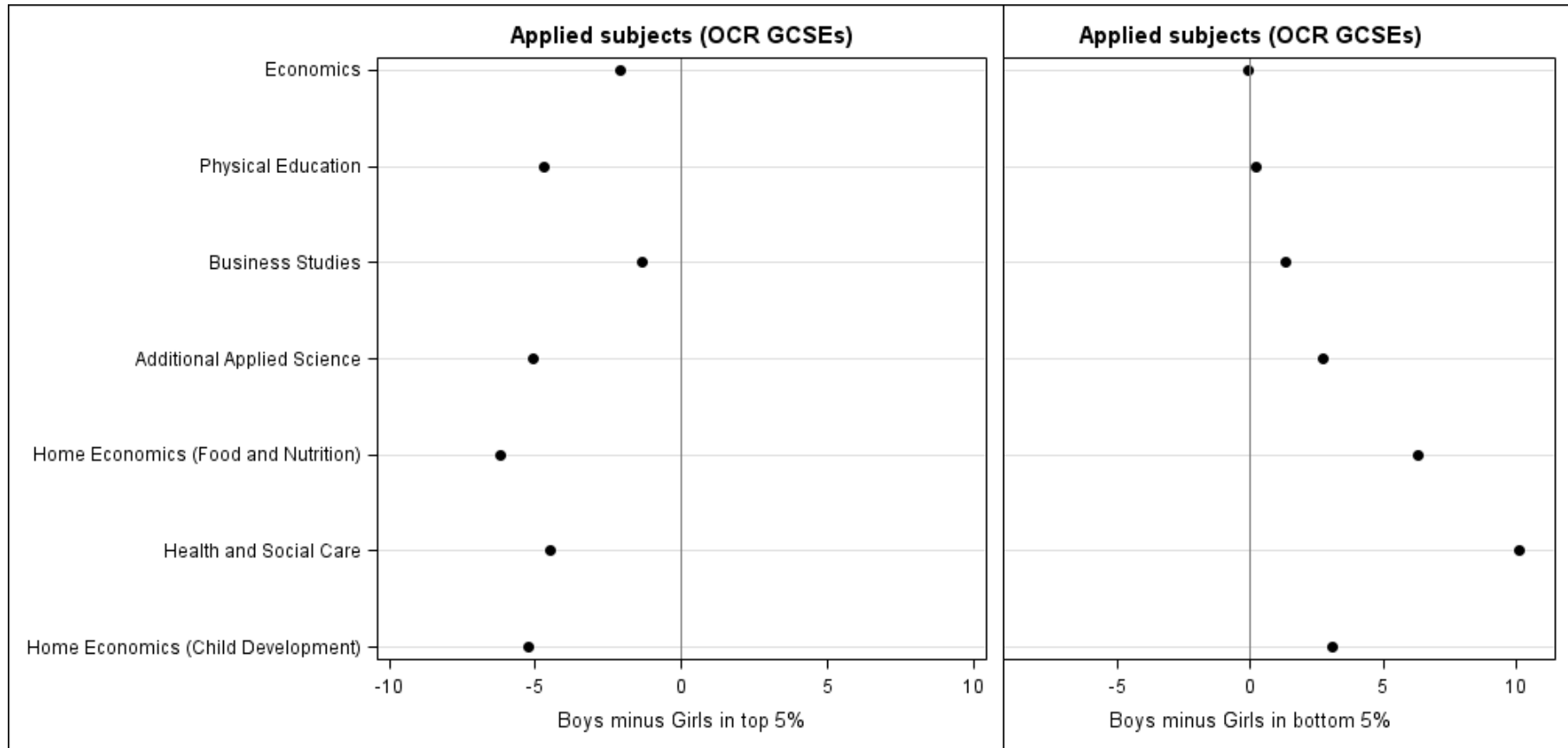
More boys at the extremes?



More boys at the extremes?



More boys at the extremes?



Assessment type

Look at scores on the components rather than the whole assessment

- Written exam papers
- ‘Coursework’ (inc. practicals, portfolios, performances, controlled assessments)

Girls higher mean on 93% of coursework components cf 84% of written components

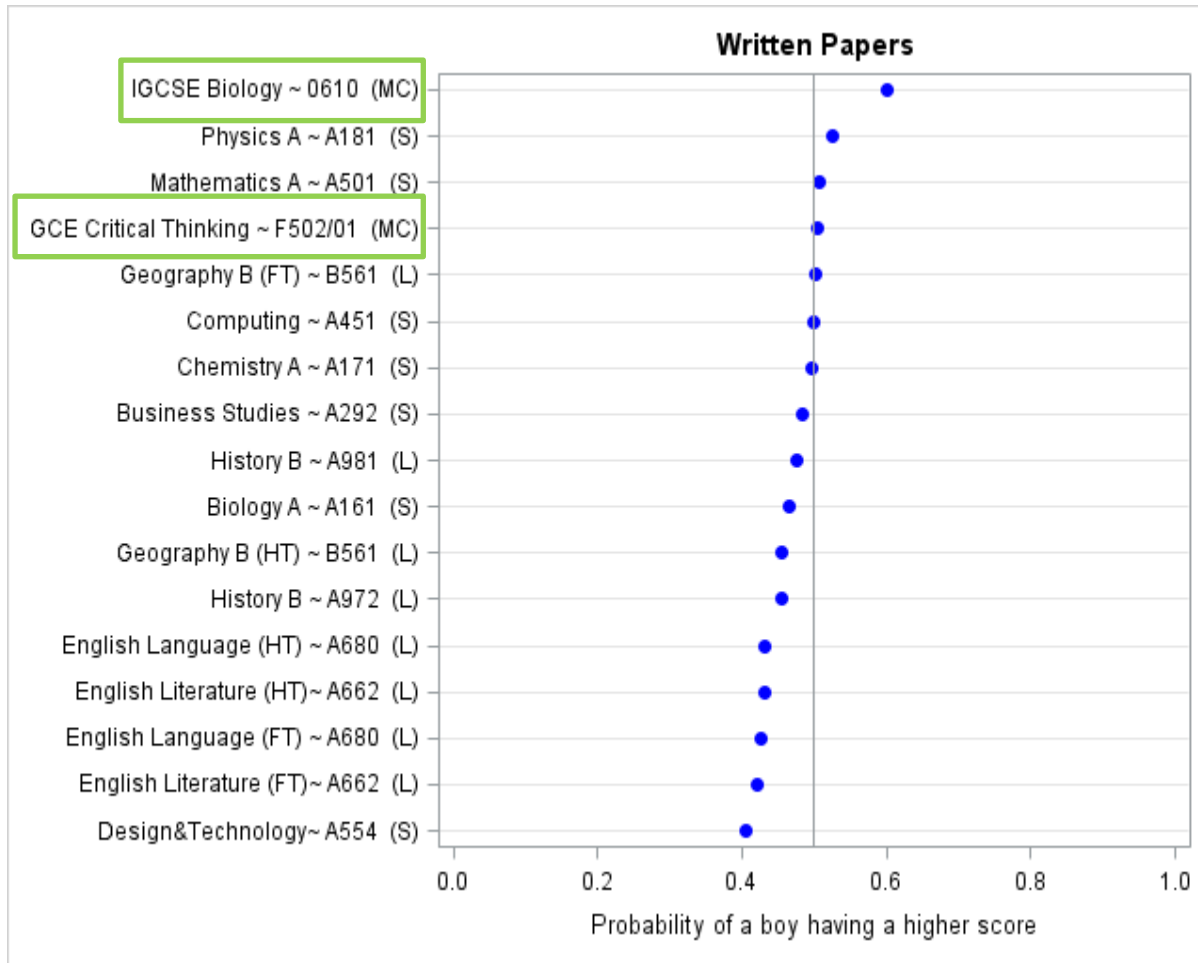
Girls higher mean AND boys higher SD on 74% of coursework and 56% of written components

Item (question) type

Multiple-choice, short answer, extended answer, essay

Interacts strongly with subject – i.e. certain subjects more likely to be assessed with certain item types

Written papers

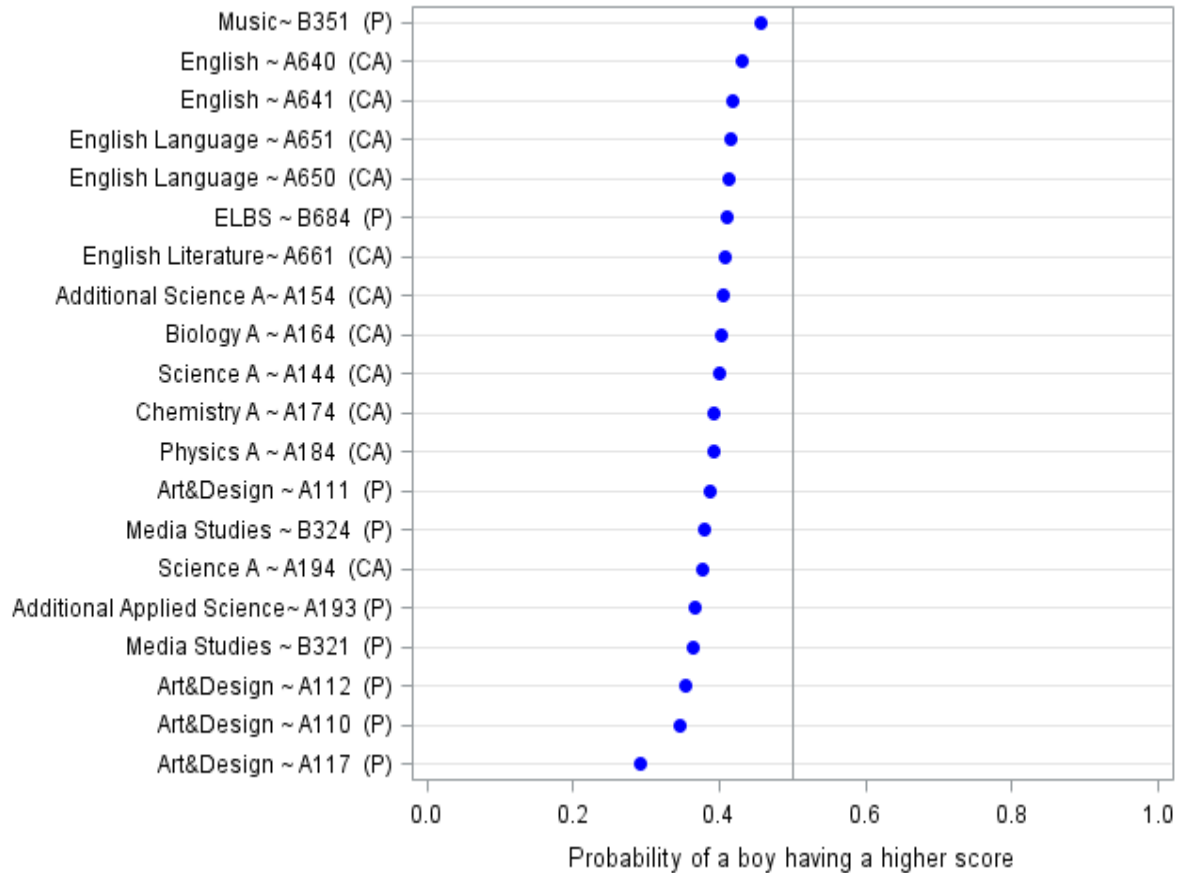


FT – Foundation Tier
HT – Higher Tier

MC – multiple-choice questions
S – short-answer questions
L – long-answer questions

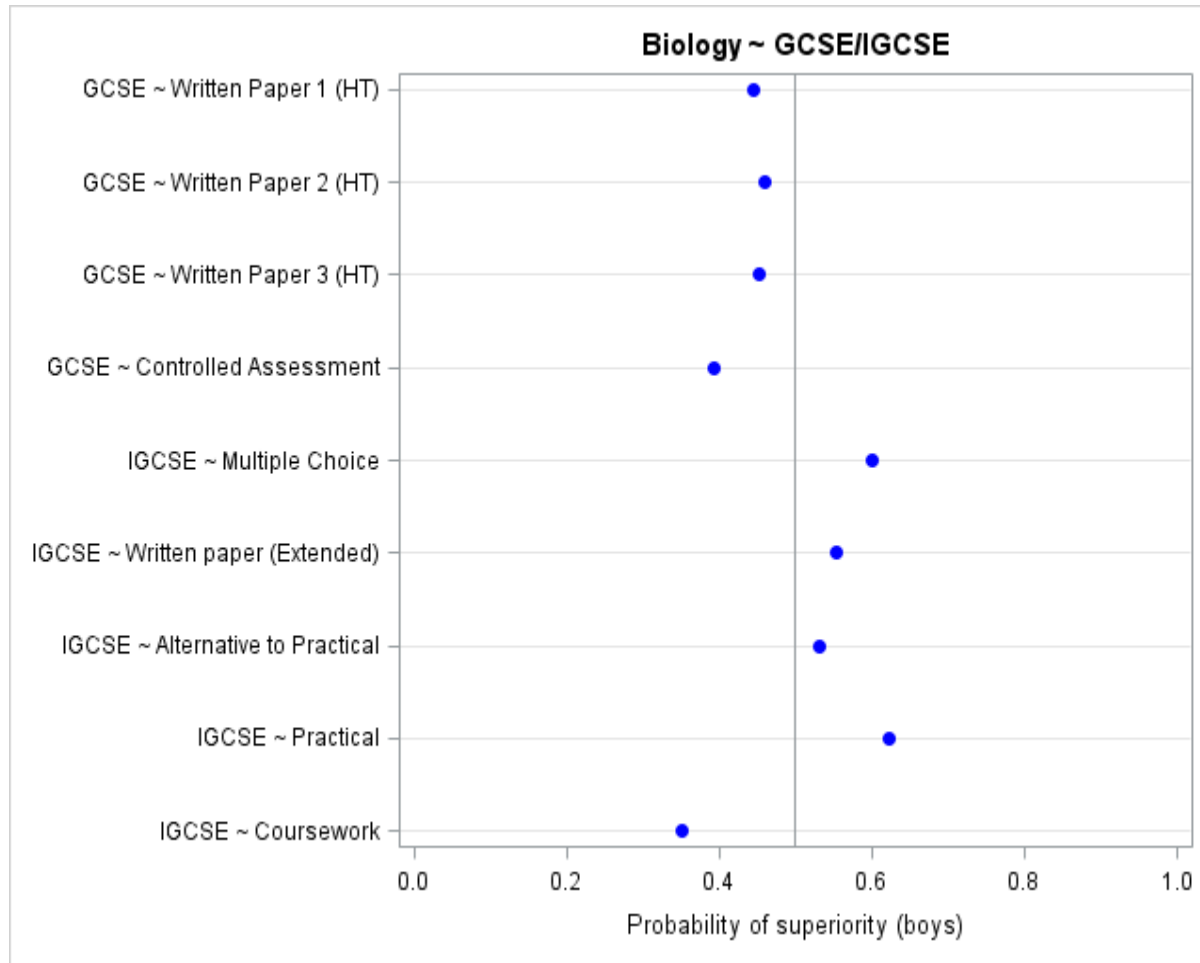
Non-written papers

Other assessment types



CA – Controlled assessment
P – Portfolio

A counter-example



Summary

Differences in subject choice (proportions of boys and girls taking the GCSE) are generally bigger than differences in outcome

Girls do better across all subjects and metrics for comparison

Gender gap narrower in STEM and languages*

Average effect size roughly comparable to 9 months growth in height for 16 year old boys

Some evidence of different effect for different types of assessment