

# Effective learning techniques at university

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# Students' investments in learning new skills

- Going to university is an important transition for secondary school students
- Much more independence
  - In particular: on how to study
- Students need to decide how to spend their time in a new challenging environment
- Which learning techniques are effective for acquiring new skills that will make students ready for the labour market?





# Students' investments in learning new skills

- We use the BOOST2018 study to precisely measure **students' learning investments** during their first year at university
- We also use measures of:
  - **Cognitive ability**
  - **Non-cognitive ability**
  - **Past educational performance**
- We assess the effects of all those investments and characteristics in achieving **good marks**



# Students' learning investments



- Time spent **attending lectures and classes**
- Time spent on private study using **active** learning methods



- Active learning (such as testing yourselves on practice test) forces retrieval in the long-term memory and creates new encoding

- Time spent on private study using **passive** learning methods



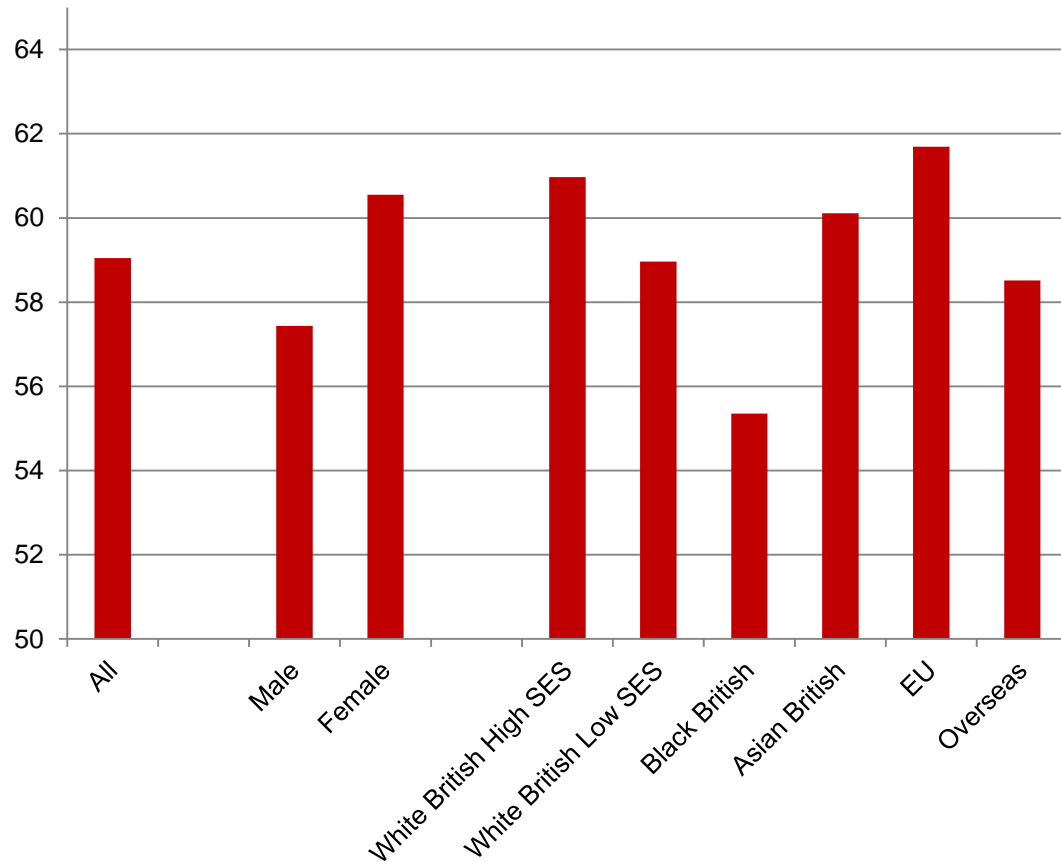
- Passive learning is less demanding on the brain (Reading, highlighting)



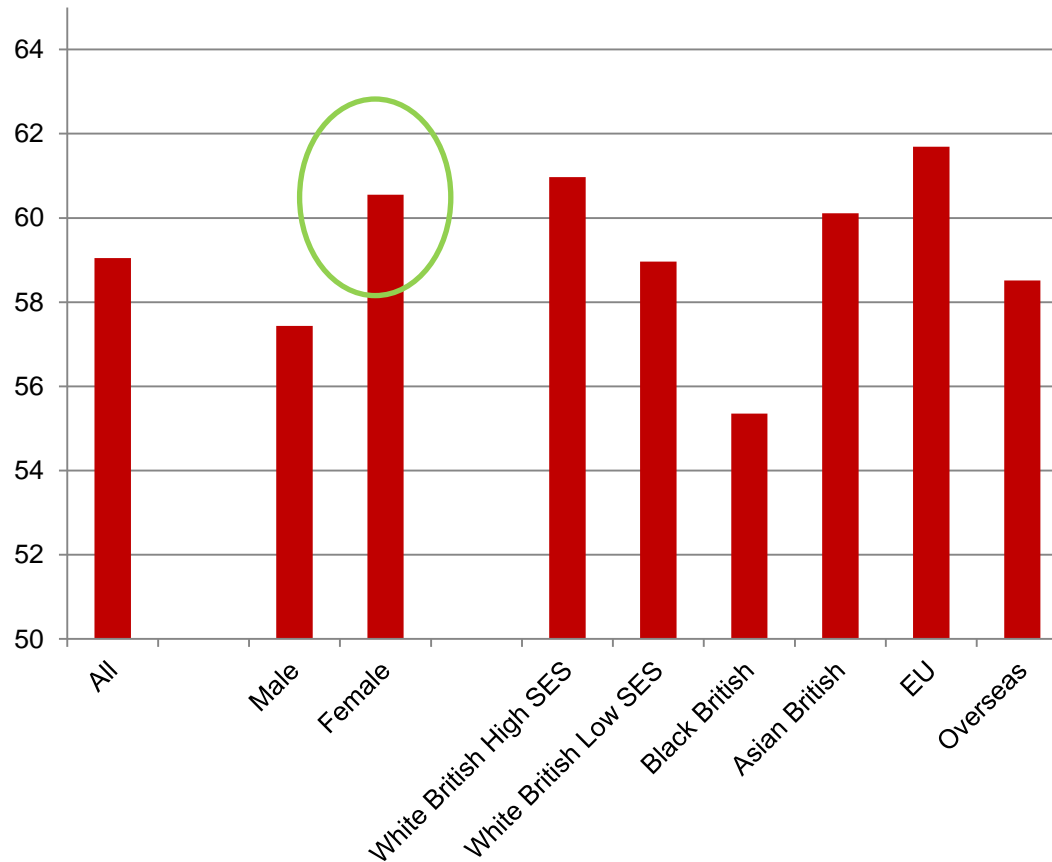
# Measurements

- Very few studies have as detailed data on what students do, their characteristics and their outcomes
- How do we measure all these?

# Outcome: first year mark

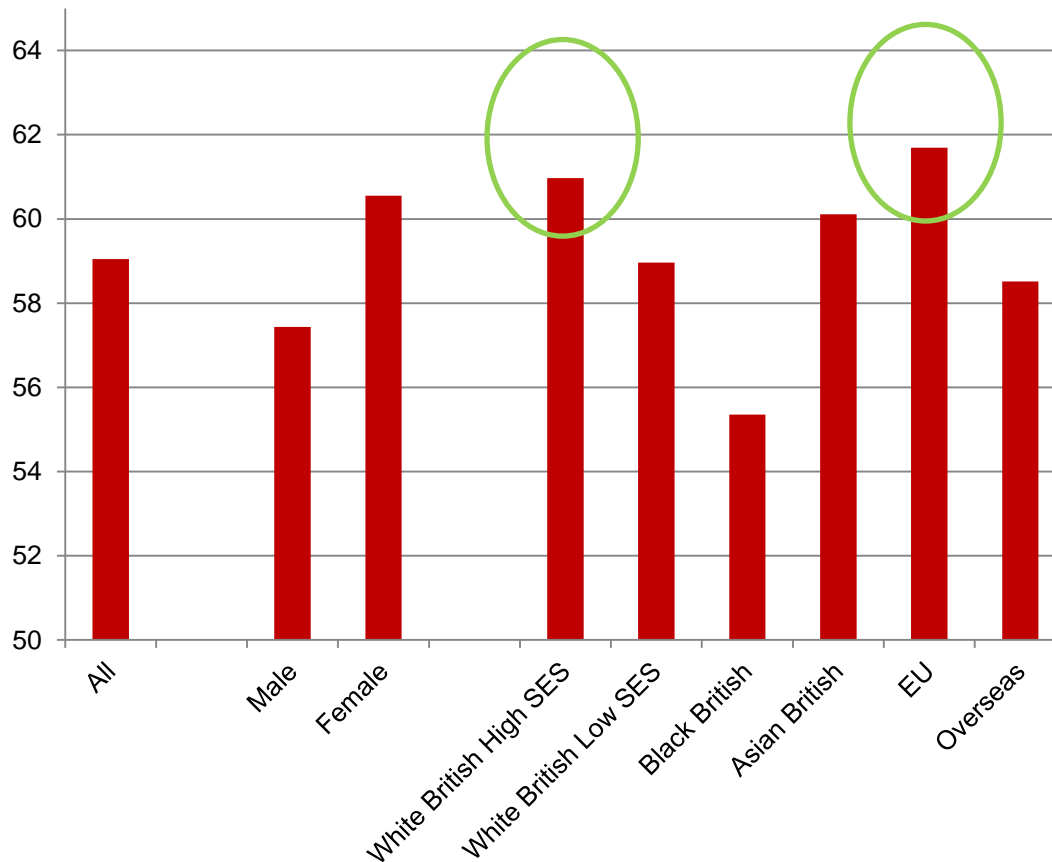


# Outcome: first year mark



Females do better than males

# Outcome: first year mark



High SES  
white British  
and EU  
students do  
better

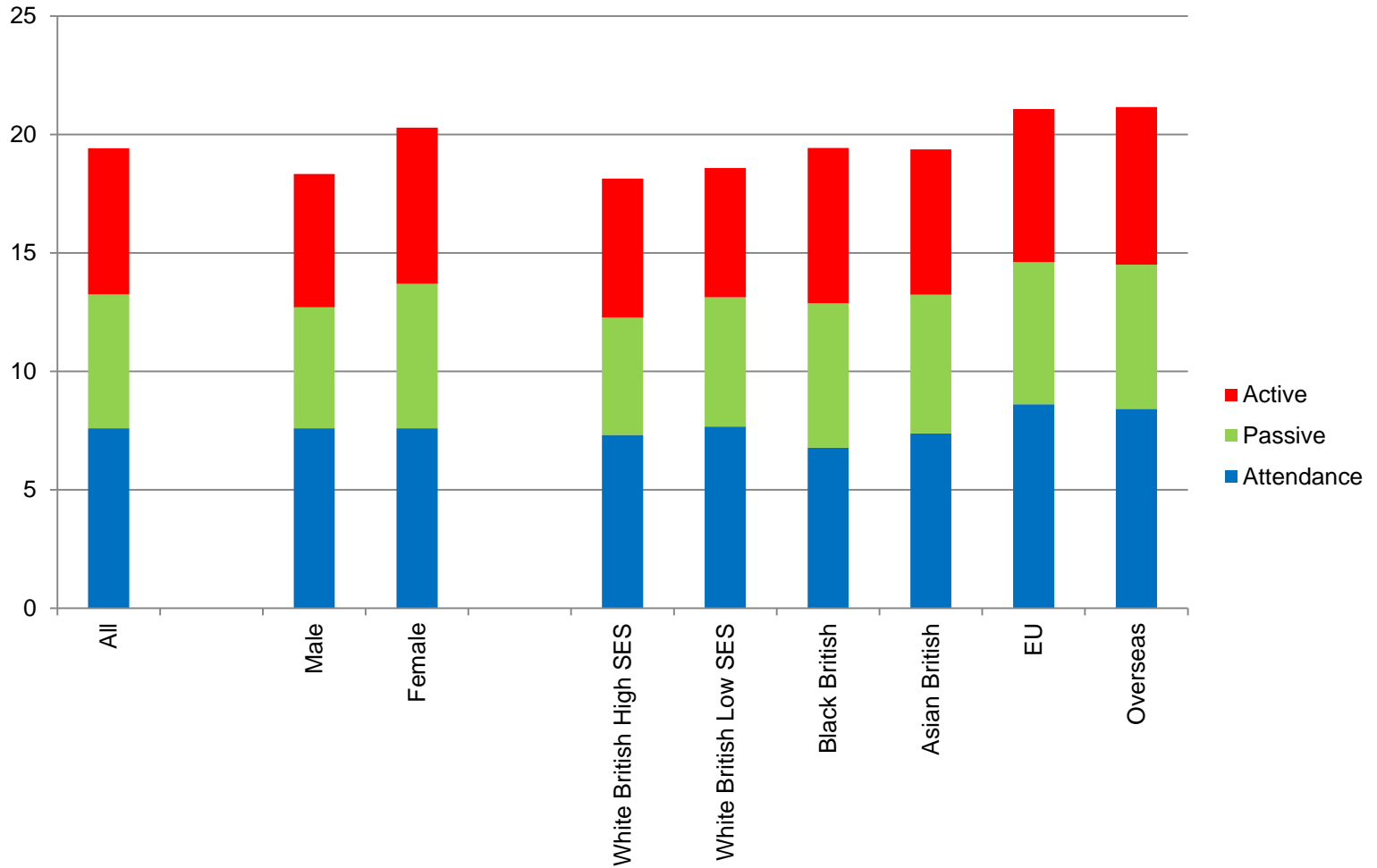




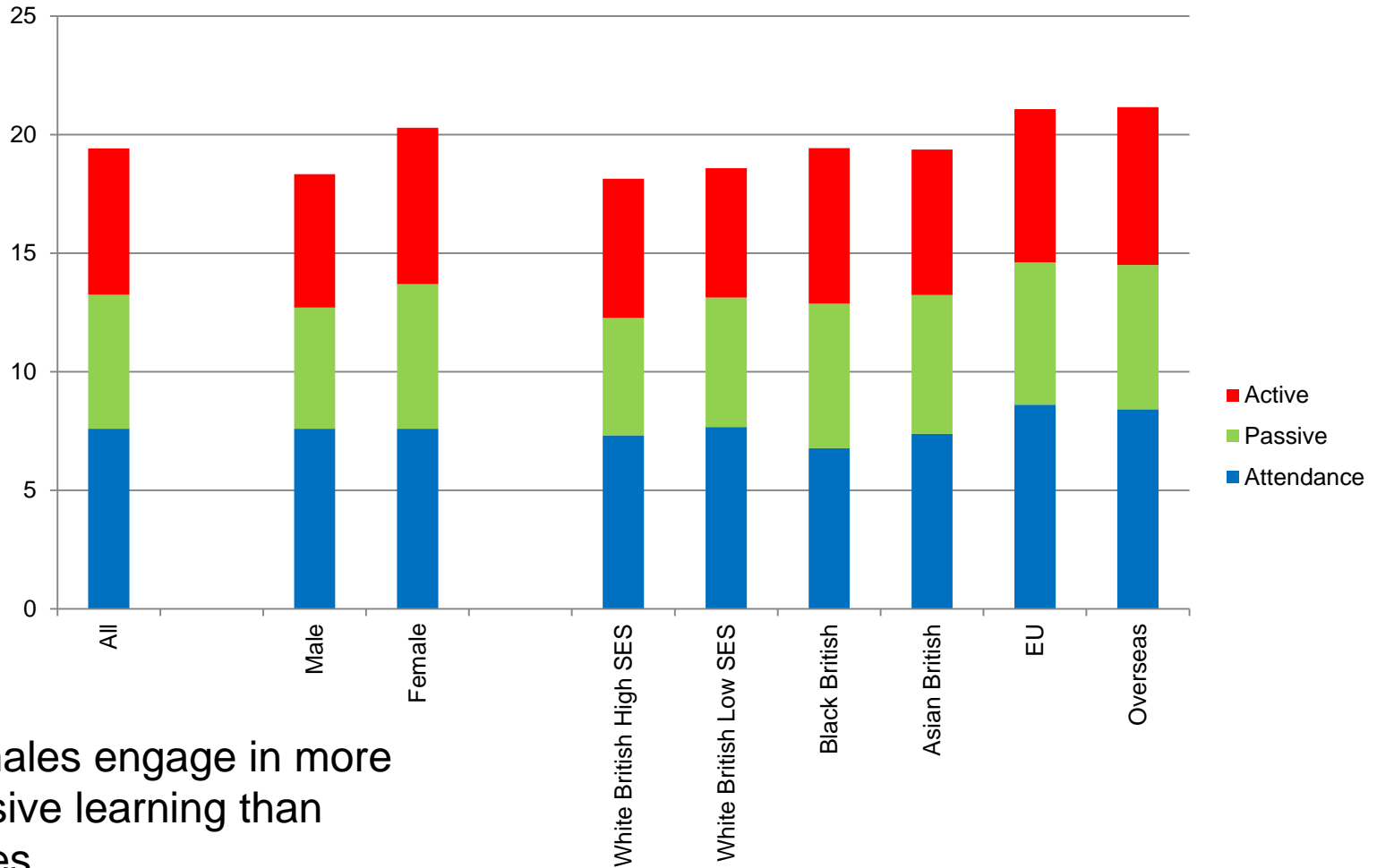
# Learning investments

- **Attendance:** administrative data (students swipe card at entrance to classroom): 7.6 hours a week
- **Study hours:** self-reported
  - Active learning (compulsory homework, testing): 6.2 hours a week
  - Passive learning (reading, re-reading, paraphrasing): 5.6 hours a week

# Overall investments

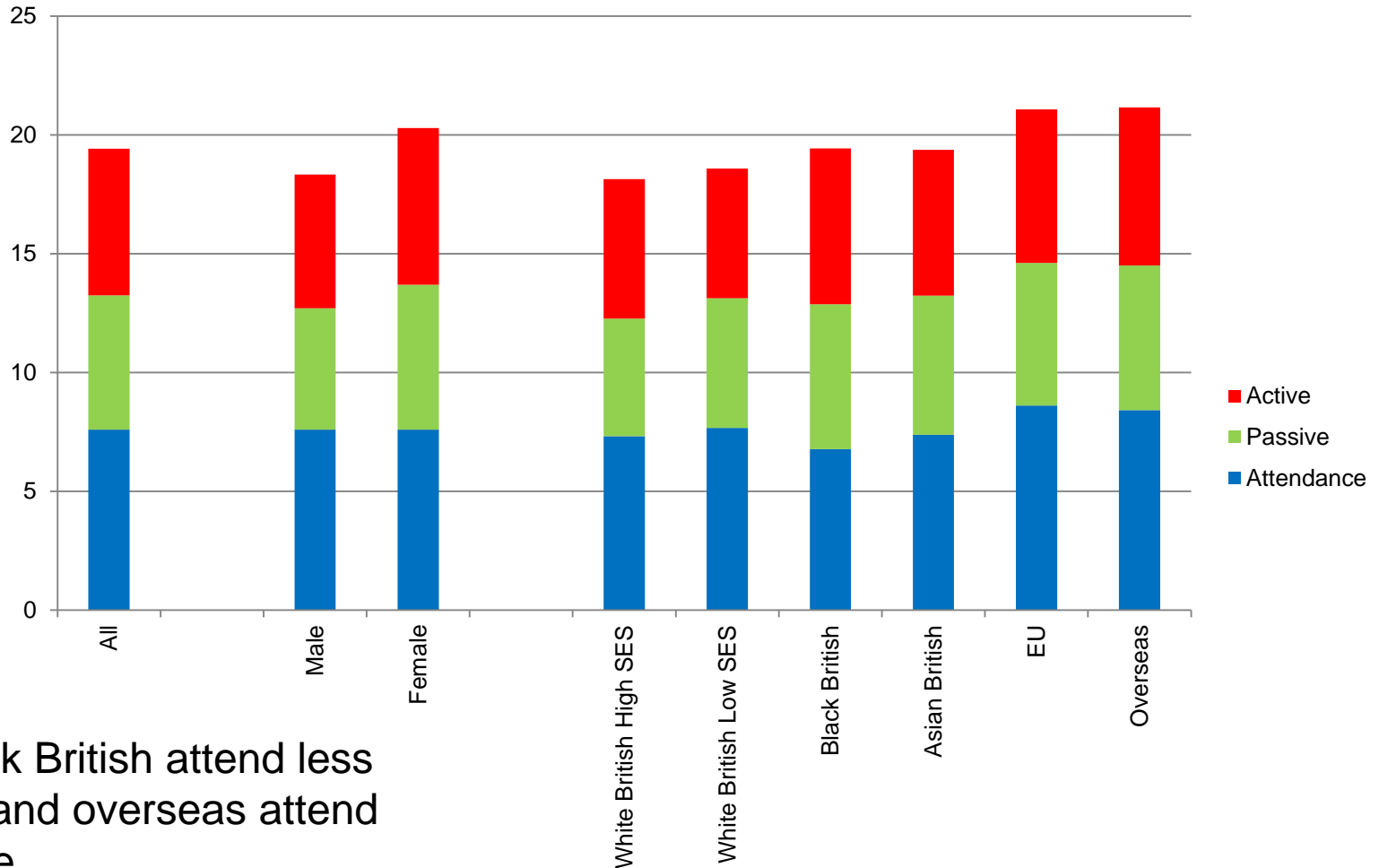


# Overall investments



Females engage in more passive learning than males

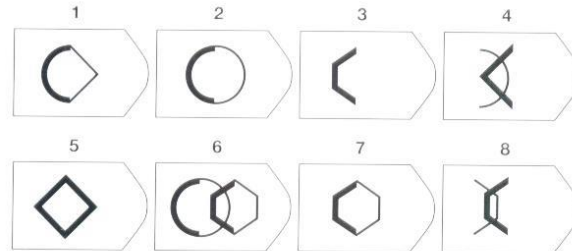
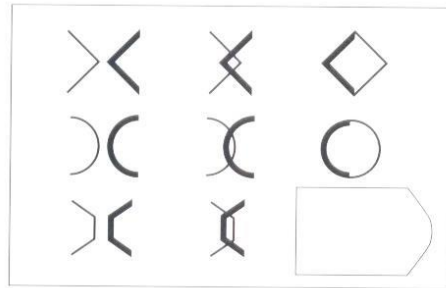
# Overall investments



Black British attend less  
EU and overseas attend more

- ● ● | Other “inputs” relevant for marks

- **Cognitive reasoning**: graduate-level ‘Raven’ non-verbal reasoning test with financial incentive in the lab





# Other “inputs” relevant for marks

**Non-cognitive ability:** Factor derived from factor analysis using:

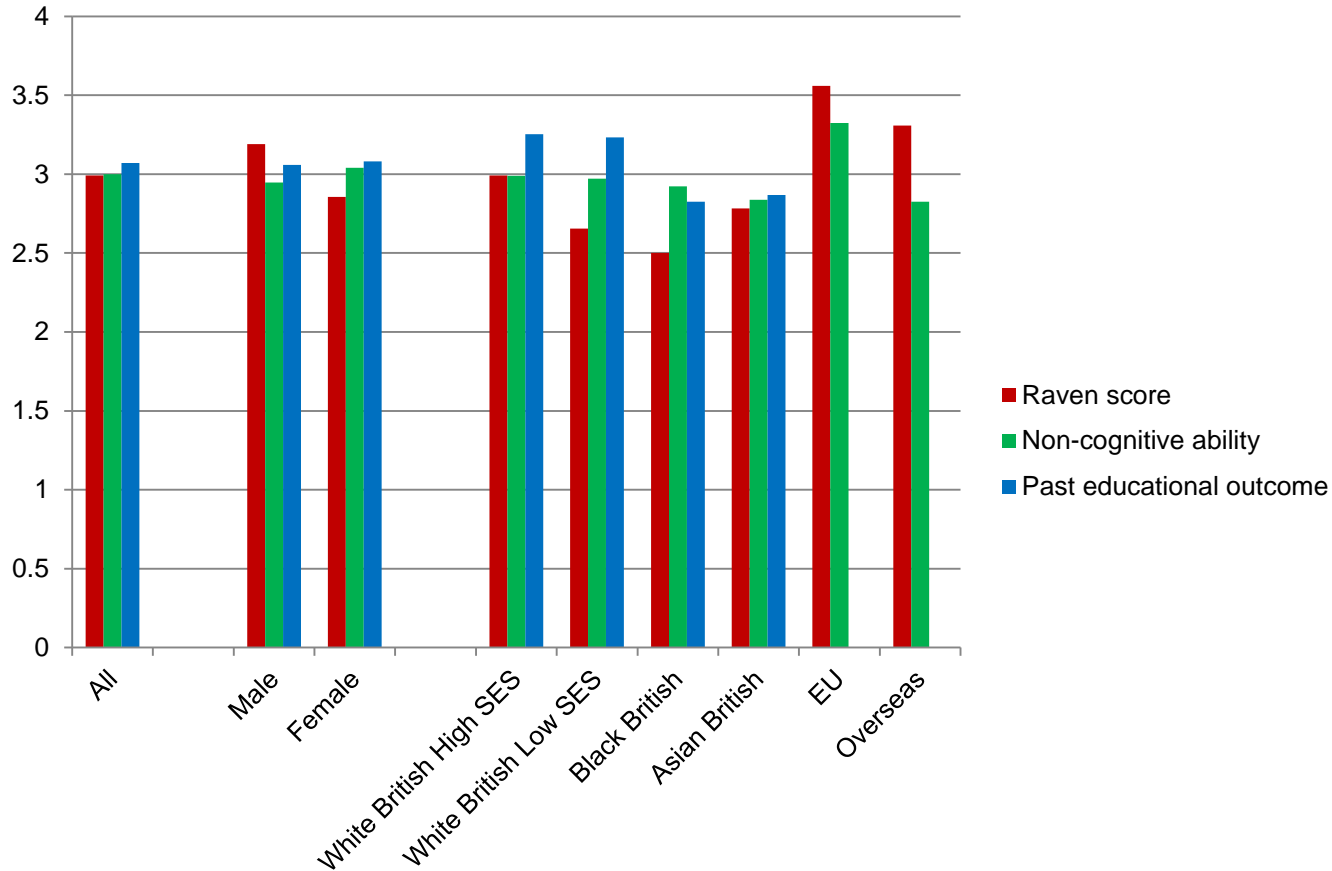
- **Big 5 personality traits** (extraversion, agreeableness, openness, conscientiousness and neuroticism)
- **Grit** The ability to strive for long-term goals and respond positively to setbacks.
- **Need for cognition:** The extent to which the individual is motivated by challenges and effortful activities
- **Planning Efficacy:** The ability to and effectiveness at planning ahead
- **Goal performance:** Motivation for ‘learning’ as opposed to ‘grades’



# Other “inputs” relevant for marks

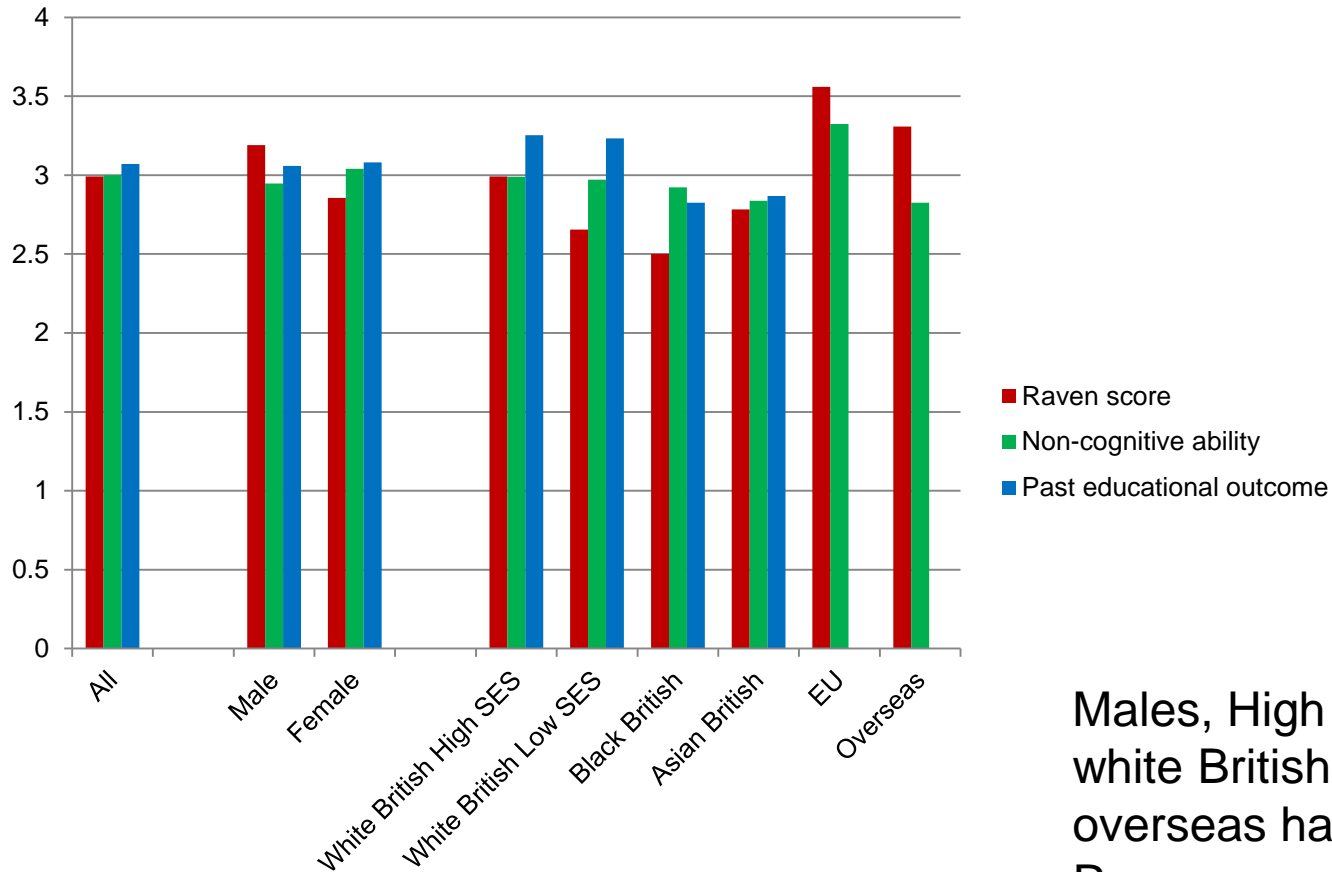
- **Past educational outcomes:** from application form (UK students only)

# Other inputs (rescaled)



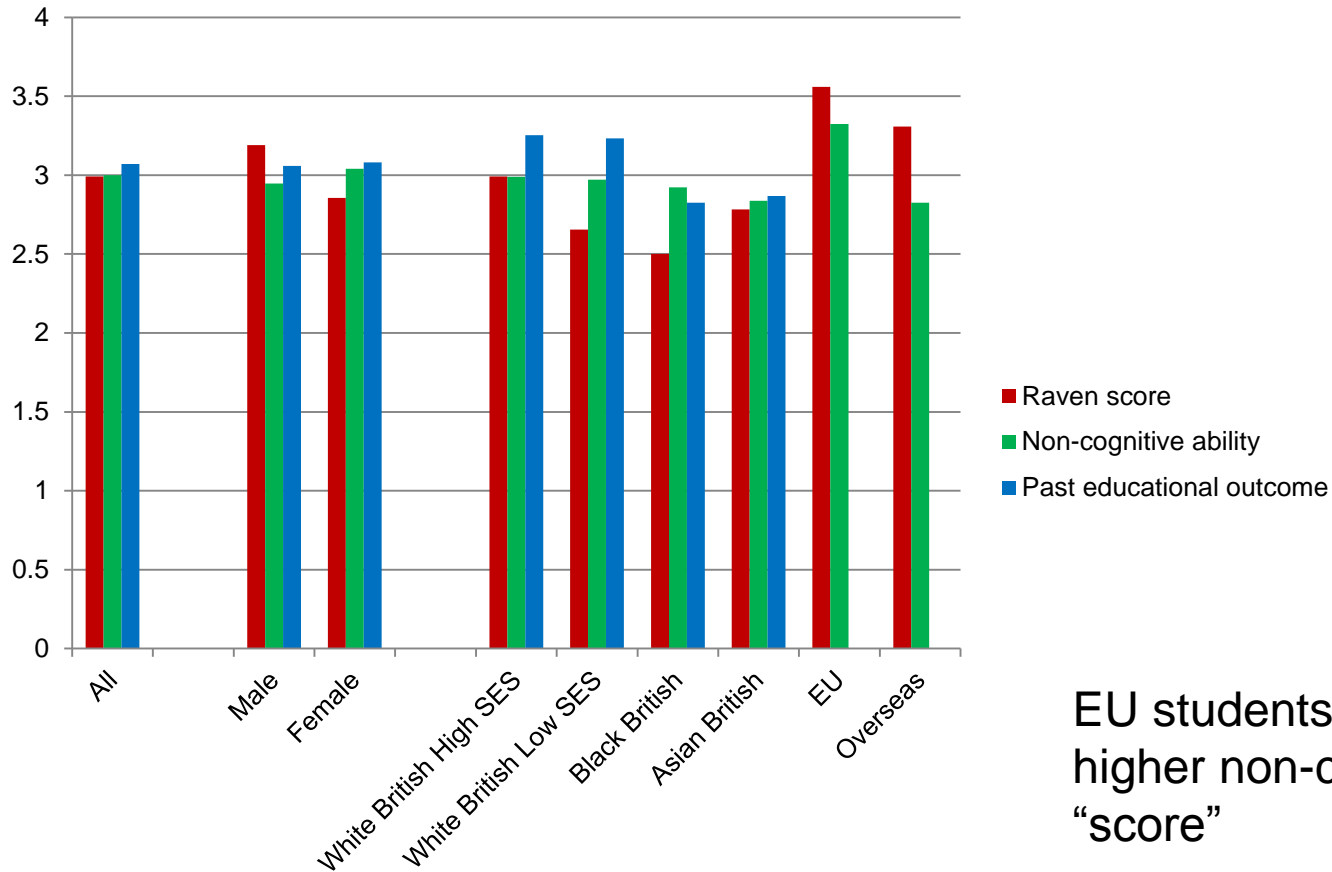


# Other inputs (rescaled)



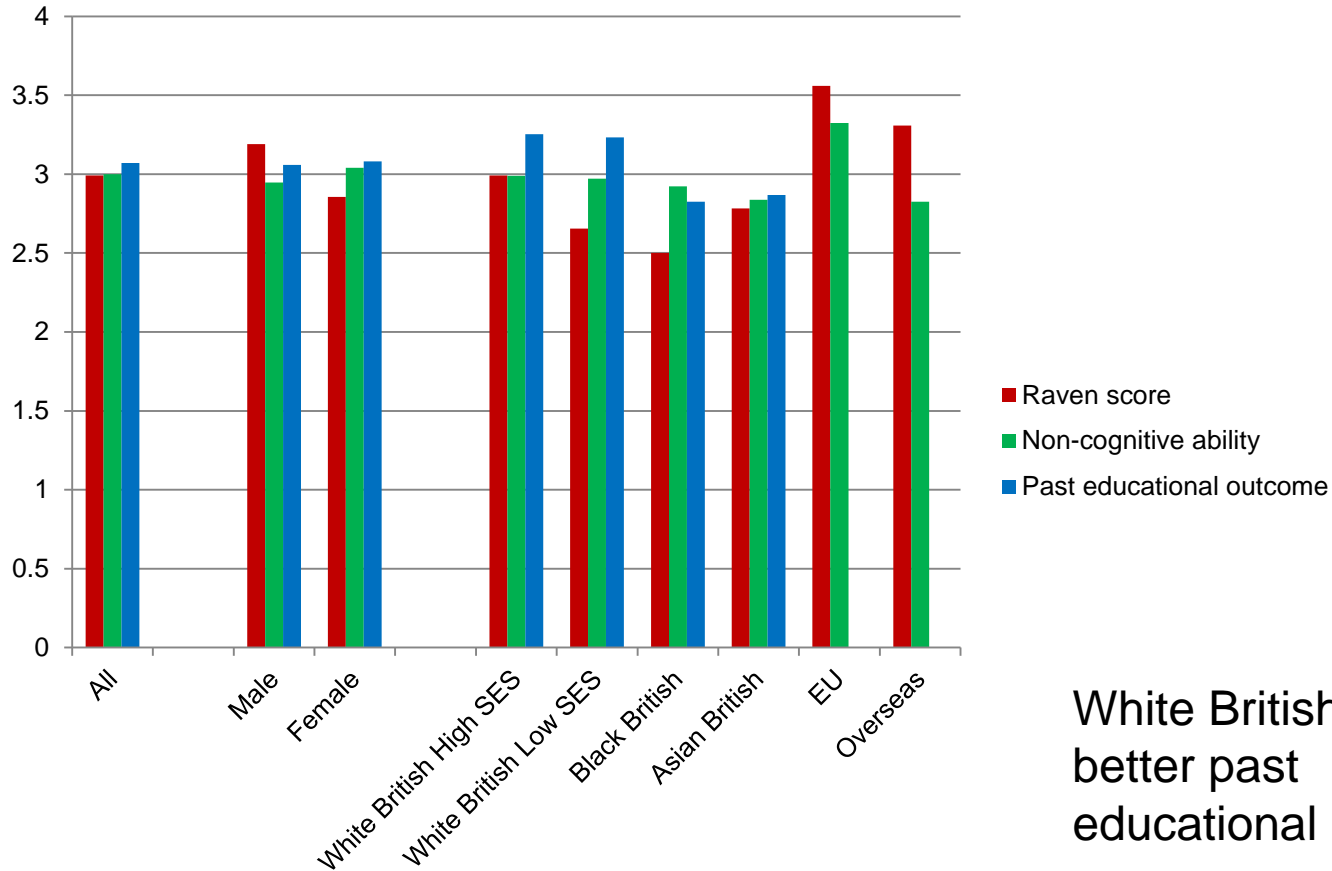
Males, High SES  
white British, EU and  
overseas have higher  
Raven score

# Other inputs (rescaled)

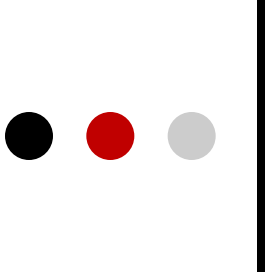


EU students have higher non-cognitive “score”

# Other inputs (rescaled)



White British have better past educational outcomes



# What are effective learning techniques?

- We evaluate **which investments** lead to higher marks and **when** these investments should be made
- We take into consideration the role of investments and characteristics and how they interact
- Important methodological issue: student with (say) high self-confidence might be more likely to invest in their learning and achieve better mark
  - We use econometrics technique to recover a causal effect



# Which learning techniques affect final marks?

|                  | Autumn | Spring |
|------------------|--------|--------|
| Attendance       |        | ++     |
| Passive learning | +      | --     |
| Active learning  |        | ++     |



# Which learning techniques affect final marks?

- Passive learning has a positive impact in the Autumn term
  - Students need to learn the new material

| <b>Autumn Passive learning</b>               | <b>→</b> | <b>Marks</b>           |
|--|----------|------------------------|
| <b>10% increase in passive private study</b> | <b>→</b> | 0.4% increase in marks |
| <b>~37 mins per week</b>                     | <b>→</b> | ~ 0.24 marks           |
| <b>0.38 marks per hour per week</b>          |          |                        |



# Which learning techniques affect final marks?

- Active learning has a positive impact in the Spring term

|   |   |                        |
|---|---|------------------------|
| <b>Spring Active learning</b>               | → | <b>Marks</b>           |
| <b>10% increase in active private study</b> | → | 2.3% increase in marks |
| <b>~35 mins per week</b>                    | → | ~ 1.5 marks            |
| <b>2.57 marks per hour per week</b>         |   |                        |



# Which learning techniques affect final marks?

- o Attendance has a positive impact in the Spring term

| <b>Spring Attendance</b>              | <b>→</b> | <b>Marks</b>           |
|---------------------------------------|----------|------------------------|
| <b>10% increase in attended hours</b> | →        | 2.4% increase in marks |
| <b>~45 mins per week</b>              | →        | ~1.44 marks            |
| <b>1.92 marks per hour per week</b>   |          |                        |



# Which learning techniques affect final marks?

- Passive learning has a **negative** impact in the Spring term
  - May be too late
  - May displace other important inputs like sleep

| Spring Passive study                  | → | Marks                  |
|---------------------------------------|---|------------------------|
| 10% increase in passive private study | → | 1.7% decrease in marks |
| ~32 mins per week                     | → | ~ -1 mark              |
| <b>-1.91 marks per hour per week</b>  |   |                        |



# Conclusions

- Attending lectures and classes is productive (especially in the spring term)
  - Students should go/be encouraged to go more
- All types of private study time are not equally productive
  - Passive learning is productive early on but actually detrimental in the spring term
  - Students should spend more time on active learning techniques once they have learned the material (and could be taught so)
  - Lecturers could give more assignments