Why do so few women study economics? Evidence from England

Claire Crawford[13], Neil M Davies[2] and Sarah Smith[23]

[1] University of Warwick
[2] University of Bristol
3 Institute for Fiscal Studies

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Summary

The under-representation of women in undergraduate economics in the US has been well-documented (see Goldin, 2013). The situation in the UK is very similar. Women make up 57 per cent of all undergraduate students in the UK but only 33 per cent of those studying economics, including economics with other subjects. Focusing on English-domiciled students studying pure economics, the figure is even lower at 27 per cent. This is a lower share than the proportion of female students in the UK in business (46 per cent) and STEM subjects (52 per cent).[1]

The under-representation of women in economics matters for at least two reasons. First, women may unknowingly miss out on the future returns to a high-paying subject. Britton et al (2016) show that the median earnings of (male and female) economics graduates in the UK are second only to those studying medicine, while, at the 90th percentile, economics graduates are the highest earning. At least some of the missing women are likely to earn less than they otherwise would if they studied economics. Second, the under-representation of females in economics has wider, social implications. Economists work in central banks and government and, through these roles, have a direct influence on policy outcomes. Diverse groups have been shown to deliver different – and better – outcomes in business and policy-making (Hoogendoorn et al, 2013; Clots-Figueras, 2012). Survey evidence also shows that male and female economists have different views particularly on the appropriate degree of government intervention – women are more favourable to minimum wages, for example (May et al, 2014).

What are the reasons why women are less likely than men to study economics? US studies have found a small role for aptitude in math and economics, and a greater sensitivity of women to their grades in introductory economics courses. There is mixed evidence on the importance of role models. However, there remains a pronounced gender gap taking

[1] Figures from HESA data, 2015-16. Looking within STEM subjects, fewer women study economics (27%) than study maths (37%), statistics (42%), chemistry (42%), medicine (55%) and biology (60%), although even fewer women study physics (21%), engineering (18%) and computer science (14%).

account of all observable factors (see discussion in Bayer and Rouse, 2016, and studies by, inter alia, Dynan and Rouse, 1997; Calkins and Welki, 2006; Rask and Tiefenthaler, 2008; Emerson et al, 2012).

Tonin and Wahba (2015) show that there is also a gender gap in undergraduate economics in the UK that cannot be explained by a difference in maths background. Our analysis builds on their work, using rich administrative data on actual university and subject choices to document differences by gender, ethnicity, socio-economic status and school type. We include a more comprehensive set of controls for prior educational attainment and confirm that academic background can only account for a small difference in the proportion of men and women studying economics; most of the gap is left unexplained. We also exploit rich survey data on the expectations and beliefs of students before they apply to university. Females believe the financial returns to studying business and economics are lower than do males, but the difference is small and the relative ranking of different subjects by males and females is similar. Females are also less likely to report being motivated by financial returns when choosing a degree subject. This does affect the choice of economics and maths at A level, but it does not completely close the gender gap in the decision to study economics.

In sum, educational background and measures of expected financial returns cannot account for the gender gap in the take-up of economics. This points to a likely explanation being that many women have less interest in the subject than men and choose instead to study other subjects, including medicine (among women mathematical background) and law (among women who study economics at A level).

If the answer is that "women are not interested in economics" is there a case for intervention? An economic case for intervention is typically made on the grounds of market and information failures – and there is evidence of these failures when it comes to university subject choices. We show below that girls are less likely to be offered economics as a subject at school than boys, so they may not even consider it as an option. Secondly, many school students making choices about what to study at university may have an overly narrow perception of what the economics is about – with many thinking that economics is about money (as shown in the figure below). Third, the presentation of economics is often overwhelmingly male which may leave some women mistakenly thinking it is not for them. Stevenson and Zlotnick (2018) show that economics textbooks over-represent men (compared to the relevant population) among examples of contemporary policy-makers and business-leaders, and even among fictional people making economic decisions. Taken together, this suggests that there is a case for intervention to encourage women to consider economics, particularly reaching out and offering a broader and more diverse representation of the subject.

What three words would you use to describe what economics is about?

(110 Year 11 & 12 students at a school's event in Bristol, November 2017)

Data and descriptive statistics

We draw on linked administrative datasets – the National Pupil Database (NPD) from 2001-02 to 2011-12, which covers all pupils attending state and private schools in England, and data from the Higher Education Statistic Authority (HESA) on all students attending UK universities from 2004-05 to 2013-14. Together, these data allow us to consider the population of pupils in England who sat their GCSEs (high stakes exams at age 16) between 2001-02 and 2009-10 and to track them into university anywhere in the UK at either age 18 or 19, including observing which subject they study, and at which institution. For the earliest cohorts, it also enables us to track them through university, observing information on drop out, degree completion, degree classification, and postgraduate study decisions. In total, the data provide information on 6 million individuals.

The dataset contains a limited set of background characteristics for all pupils, including gender and month of birth, and a slightly more detailed set for state school students only, including ethnicity, free school meal eligibility, and home postcode. We use postcode to merge in local area information in order to create a continuous index of socio-economic position. For both state and private school students, the data also contain a rich set of information on national exam results, including GCSEs and A-levels and equivalent qualifications, that students achieved in specific subjects and at which grades. For state school students only, the data also contain information on earlier national test scores taken at age 11.

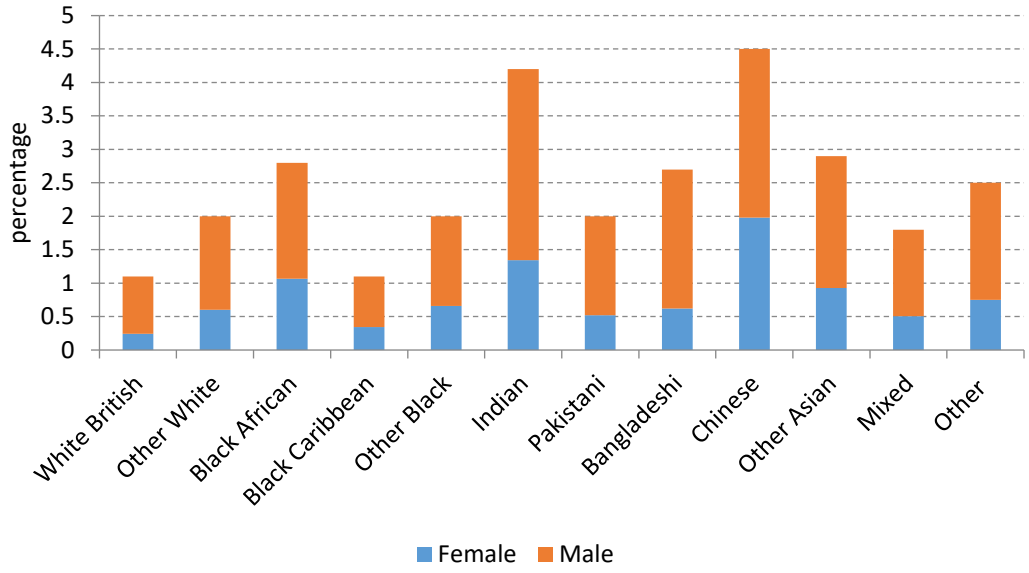
In our sample, just under 27 per cent of English domiciled students studying economics at UK universities were female. This proportion remained relatively stable across the cohorts included in the NPD-HESA data used for this analysis; between 25 – 28 per cent of economics students are female in any given year with no clear pattern over time. There is more variation in the gender gap across institutions; the percentage of females studying economics at institutions ranked in the Complete University Guide 2016 (on programmes catering for at least 20 students per year) ranges from 15 per cent to 36 per cent. There is a positive correlation of around 0.3 between the 2016 Complete University Guide ranking and the percentage of females attending the course. Related to this, the proportion of females is also higher on courses which require maths A-level: girls make up 30 per cent of the cohort on these courses compared to 26 per cent on those which do not require maths A-level.[2]

There is considerable variation across ethnic groups in the proportion studying economics, and in the female share, shown in the figure below. White British students are the least likely to choose straight economics, and the percentage of White British students who are female is the lowest of any ethnic group: just 22 per cent of White British students studying economics are female, compared with 38 per cent of Black African students and 44 per cent of Chinese students, suggesting that there might be a particular problem attracting White British women to study economics.

There are also differences in whether people choose to study economics by socio-economic background. We use postcode to merge in local area information and combine this with free school meal eligibility in order to create a continuous index of socio-economic position. The figure below shows that students from higher socio-economic backgrounds are more likely to study straight economics at university, but the income gradient is much steeper for males than for females and the gender gap is greatest among those with higher socio-economic backgrounds. These differences by ethnicity and socio-economic background persist if we control for other characteristics that might be associated with studying economics.

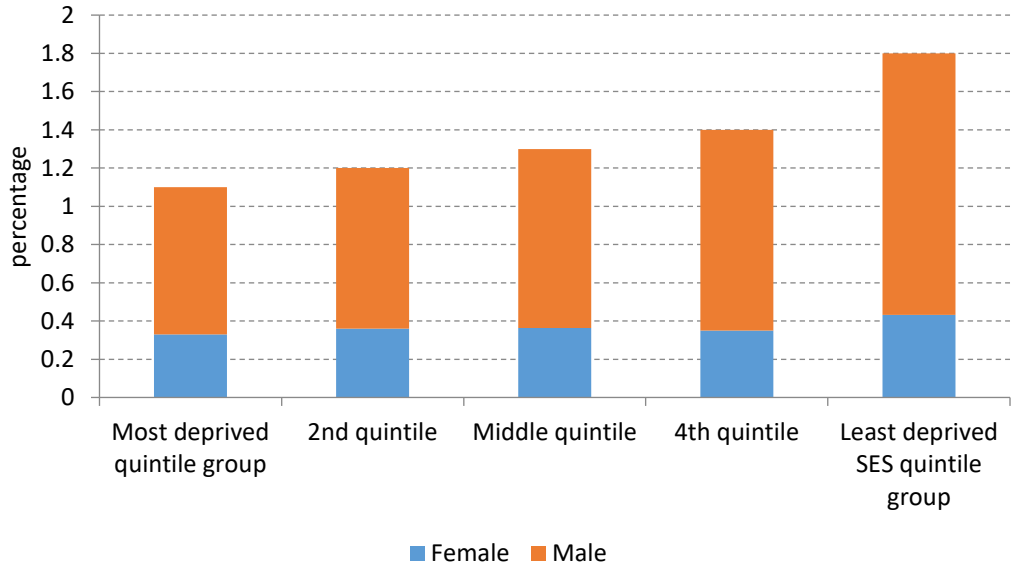
[2] We have inferred whether or not a course requires A-level maths on the basis of the percentage of the cohort who took A-level maths. Courses in which at least 89 per cent of English domiciled students took A-level maths are deemed to require it. This applied to 22 per cent of economics departments ranked in the Complete University Guide 2016 (and catering for at least 20 students per year), rising from 16 per cent to 29 per cent over the period covered by our data.

Percentage of university students studying economics, by ethnicity and gender



Notes: State school students only. Data from NPD-HESA for state school students first entering university at age 18 or 19 between 2004-05 and 2013-14. Sample size=1,790,799.

Percentage of university students studying economics, by socio-economic background and gender



Notes: State school students only. Data from NPD-HESA for state school students first entering university at age 18 or 19 between 2004-05 and 2013-14. Sample size=1,721,149.

Students who previously studied at private schools and single sex schools are more likely to study economics at university. Some of this is likely to reflect differences in exposure to economics across school. Economics is not offered as an A level subject by all schools and is more likely to be offered by private and single-sex schools. It is also more likely to be

offered to boys. 58 per cent of girls attend a school that offers A-level economics, compared to 61 per cent of boys. Girls are less likely to be exposed to economics at all school types, but the differences are exacerbated by the fact that private schools are more likely to offer A-level economics than state schools (and girls are less likely than boys to attend a private school at this level), and because single sex girls schools are much less likely to offer A-level economics than single sex boys schools, particularly in the state sector.

Percentage of students being offered and taking up economics by school type at age 18

	Private mixed		Private single sex		State mixed		State single sex		FE college		Overall	
	Boys	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**
Offered economics A level	81.1%	73.4%	93.5%	80.0%	47.3%	46.3%	80.5%	55.1%	66.0%	65.4%	61.3%	57.7%
Studied A level if offered by the school	21.6%	9.5%	26.0%	13.5%	12.3%	4.2%	14.6%	7.7%	6.0%	2.0%	11.5%	4.3%
Studied **straight economics** at uni	4.2%	1.2%	5.9%	2.3%	1.8%	0.5%	3.4%	1.2%	1.1%	0.3%	2.0%	0.6%
Studied **straight economics** at uni if A-level economics offered by the school	4.7%	1.5%	6.2%	2.6%	2.9%	0.8%	3.9%	1.8%	1.6%	0.5%	2.8%	0.9%
Studied **straight economics** at uni if took economics A level	19.3%	12.9%	21.7%	17.1%	19.6%	14.9%	23.0%	18.6%	19.6%	16.4%	20.3%	16.0%
Studied **any economics** at uni	6.8%	2.2%	9.8%	4.0%	2.7%	0.8%	5.1%	2.0%	1.7%	0.6%	3.0%	1.0%
Studied **any economics** at uni if A-level economics offered by the school	7.5%	2.6%	10.2%	4.6%	4.3%	1.3%	5.9%	3.0%	2.4%	0.8%	4.3%	1.5%
Studied **any economics** at uni if took economics A level	29.2%	21.4%	34.0%	27.8%	27.8%	22.8%	32.6%	29.6%	27.7%	25.3%	29.3%	25.2%
Share of population	7.8%	4.7%	2.6%	3.8%	42.0%	39.5%	9.0%	10.4%	38.6%	41.6%	100%	100%

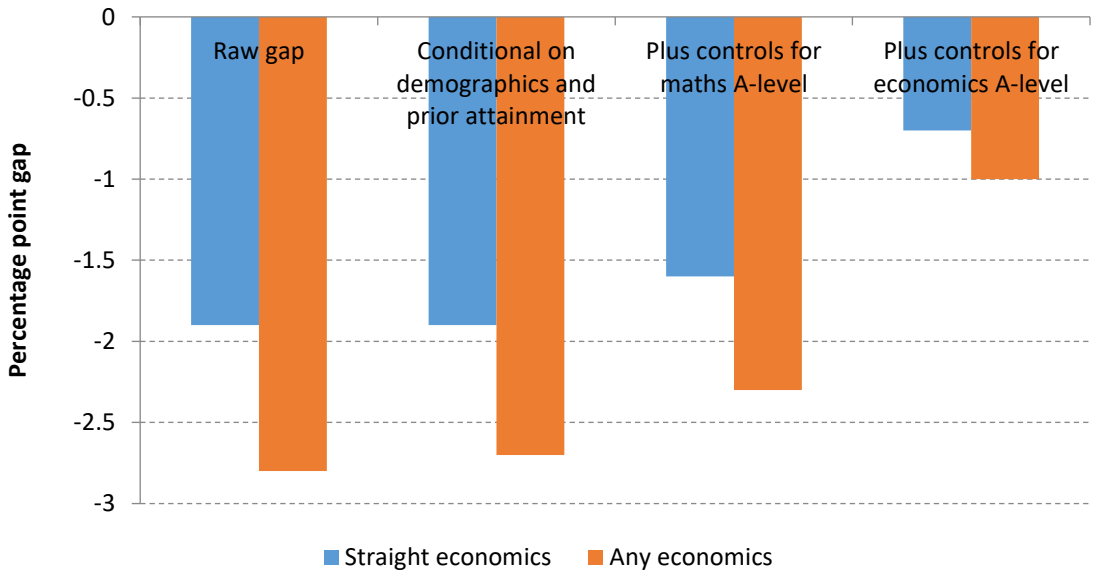
Notes: Data from NPD-HESA for all individuals who take Key Stage 5 qualifications between 2003-04 and 2011-12. Sample size=2,630,299.

Closing the gap?

How much of the gender gap in the take-up of undergraduate economics can be explained by measures of attainment observed before university entry, as well as access to and previous interest in economics?

The graph below shows the raw gender gap (in percentage points) in enrolment in straight economics (blue bars) at university and those taking any economics, i.e. both straight economics and economics combined with any other subject (red bars). Women are 1.9 percentage points less likely than men to study straight economics – just 0.8 per cent of English-domiciled undergraduate students study straight economics compared to 2.7 per cent of men – and 2.8 percentage points less likely to study any economics (1.4 per cent vs. 4.2 per cent).

Percentage point gender gap in economics at university, before/after controls



Notes: Data from NPD-HESA. Sample size=2,015,891. Marginal effects from a linear probability model run on all students going to university at age 18 or 19 between 2004-05 and 2013-14, showing how much less likely girls are to study straight economics or any economics. The second set of bars includes controls for month of birth, socio-economic status, ethnicity, region, a broad range of grades, qualifications, and subjects at age 16 and age 18. The third set of bars additionally controls for whether the individual took maths A-level and whether they got a grade A in their maths A-level; the final set of bars adds the same indicators for A-level economics. Full results for straight economics can be found in the appendix. The results for any economics are very similar and are available on request.

The second set of bars show what happen when we account for everything we observe about individuals prior to entering university, excluding any decision to take maths or economics at A-level. The regression is estimated using a linear probability model in which the dependent variable is equal to one if the student took undergraduate economics (vs. any other subject). Controls include socioeconomic position, month of birth, region and a rich set of measures of attainment in English, maths, and science at age 11 and a broad range of grades, qualifications and subjects at age 16 and age 18. Including these factors reduces the gap marginally for the likelihood of taking any economics, but not for the likelihood of taking straight economics.

Maths is a qualifying subject for a number of economics programmes. Women are less likely to take maths at A-level than males (12 per cent of girls who do A levels take maths, compared to 21 per cent of boys) and, as shown in the third set of bars, this explains some, but not all, the gender gap at university.

A much bigger factor in closing the gap is prior interest in the subject, i.e. taking (and performing well in) economics A level. This is shown by the final, right hand side bars. Although not a qualifying subject, economics is the most common A-level subject among students studying economics at university. 71 per cent of English-domiciled undergraduate students studying straight economics took economics at A-level, compared to 66 per cent who studied Maths at A-level. The proportion taking A-level economics has risen over time, from around 65 per cent amongst the cohort who sat their A-levels in 2004, to a high of around 77 per cent amongst those who sat their A-levels in 2010, before falling back to around 74 per cent amongst those who sat their A-levels in 2012.

As the figure shows, a key factor in accounting for the gender gap is that girls are less likely to take the subject at A level. The gender gap at A-level is similar to the gender gap at university – 7.0 per cent of males doing A levels study economics and only 2.5 per cent of females. As with university study, further analysis shows that background characteristics and prior attainment explain little of the A level gap. Thus, while A level choices account for much of the gap, they offer little by way of explanation – merely that women are not interested in studying economics at university, because they are not interested in studying it at A level.

Full regression results of the probability of studying straight economics on background characteristics and prior attainment are reported in an Appendix at the end of this paper.[3]

[3] Results for the likelihood of studying any economics are similar and available from the authors on request.

These offer a number of interesting insights into differences in the probability of studying economics.

- The probability of studying economics at university is generally increasing in academic performance. This is true of Maths and English (but not science) at key stage 2, GCSE grades in facilitating subjects (science, maths, humanities and language) and total points scored in GCSEs and equivalent qualifications. However, taking and achieving highly in facilitating subjects at A-level (in which economics is not included) is associated with a lower probability of studying economics at university, even after accounting for an individual's likelihood of taking and performing well in economics A-level. This suggests that individuals who choose (and are successful) in facilitating subjects at A-level are less likely to opt for economics than for other subjects at university, conditional on all other measures of achievement. This may be because A-levels in certain facilitating subjects are often required for particular degree courses (e.g. medicine), suggesting, perhaps, that individuals who hold a greater number of higher grades in these subjects may already be on a career path that does not lead to economics as a natural choice of degree subject.

- The observed differences by ethnic group and socio-economic background persist when measures are included for educational background, including choice of A level economics. The differences are greatest for Back African, Indian, Bangladeshi and Chinese students (compared to White British).

- The regression results confirm that school type matters – although the positive effect of attending a private school or a single sex school is reversed once A level economics is included, indicating that the main channel of influence is through increasing the probability of studying economics at A level.

Financial returns?

We have seen that prior educational attainment explains little of the gender gap in the likelihood of studying economics. We conclude our analysis by considering whether gender differences in beliefs and expectations about future earnings from studying different subjects can help to explain these gaps.

The data used for this analysis was collected from 5,593 15 to 16 year old students attending 46 secondary schools who took part in the randomised control trial "The effect of graduate earnings on 16-year-olds' subject choices" funded by the Nuffield Trust. This trial provided students in the treatment group with information about the earnings of graduates of different subjects. All the data used in this paper come from the baseline survey that was completed before the students were provided with any information. As part of the trial we asked the students what they expected graduates of different university subjects to earn on average, and the wages they personally expected to earn if they chose different degree subjects. We collected information about their actual A-level choices and linked their data to the NPD, which provides rich information about their prior attainment (as described above).

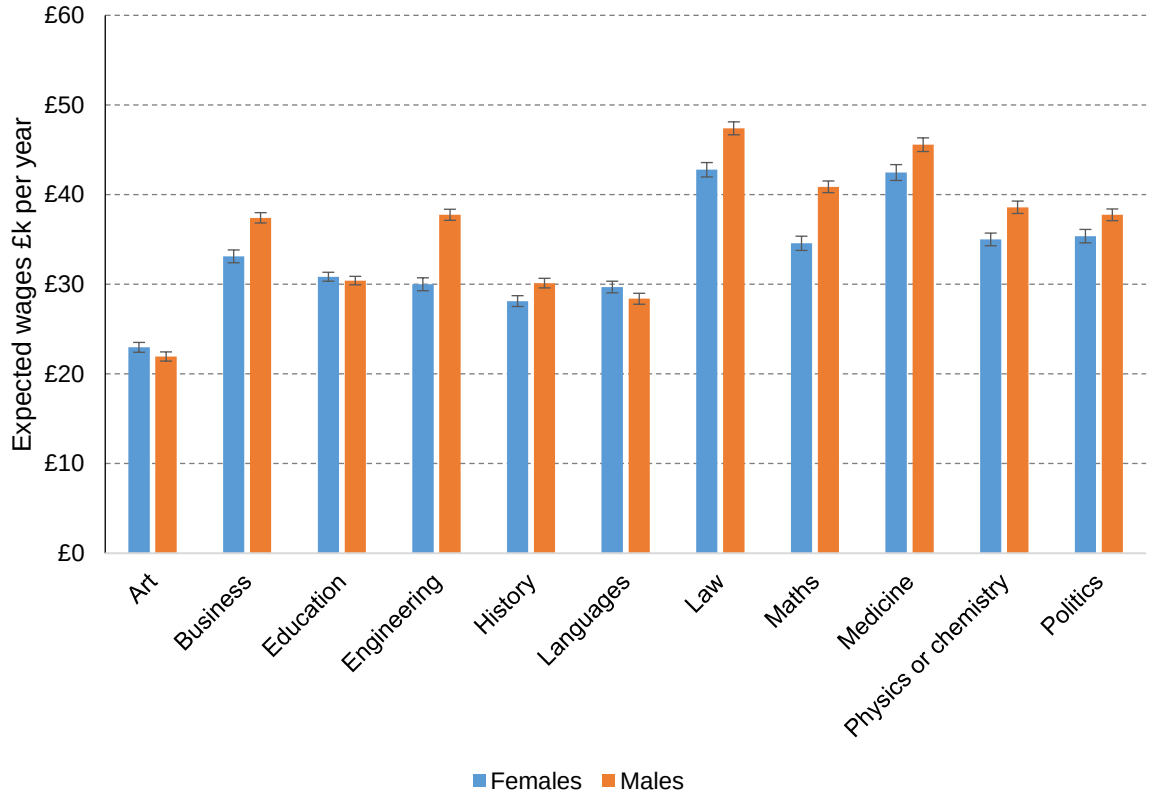
The schools were randomly chosen from a list of schools that met the eligibility criteria for the randomized trial. The schools were from a large, but geographically delimited area of the UK. The survey did not ask students about their intentions toward studying economics, or their beliefs about the wages of economics graduates. This means we cannot estimate the association of these intentions and beliefs and whether they chose economics. However, the schools were asked to provide student level data about their choice of subjects including economics. This means we can test whether males and females have different motivations for choosing subjects in general and whether these differences explain the observed gender gap in economics.

We surveyed the students using a questionnaire about the type of occupation to which they aspired; and their parents' occupation (both coded A/B/C1/C2/D/E). We asked the students to rank possible motivations for choosing their subjects from 1 (low) to 6 (high). The options included higher salary, job status, technical knowledge, prestige, making a difference to society. We asked them to rank the factors that were important in their choice of subject to study at university. The options included: higher salary, job status, expert knowledge, enjoyment, friendship, and cultural awareness. Again these options were ranked from 1 (low) to 6 (high).

Girls expect lower earnings from studying business (including economics) than boys

In the survey, we asked the students what they expected to earn if they took a specific degree subject. The figure below shows gender differences in earnings expectations, by degree subject, among our survey sample. Note the survey did not ask specifically about economics, only about business (which included economics). Girls had higher expectations of average graduate wages than boys for art, education, history, and languages, while boys expected higher graduate salaries for business, engineering, law, politics, and maths (all p-values for difference across genders <0.1). However, whilst these differences in expectations were statistically detectable, they are not large in size. The biggest difference was for engineering, where boys' expectations of engineering graduates' wages was £2,640 per year (95% CI: £2,120, £3,160) higher than girls' expectations. Also, the relative ranking of subjects is very similar. Both boys and girls rank law first and medicine second, followed by business (for girls) and engineering and business (for boys).

Expected own graduate wages (£k per year) by degree subject and gender



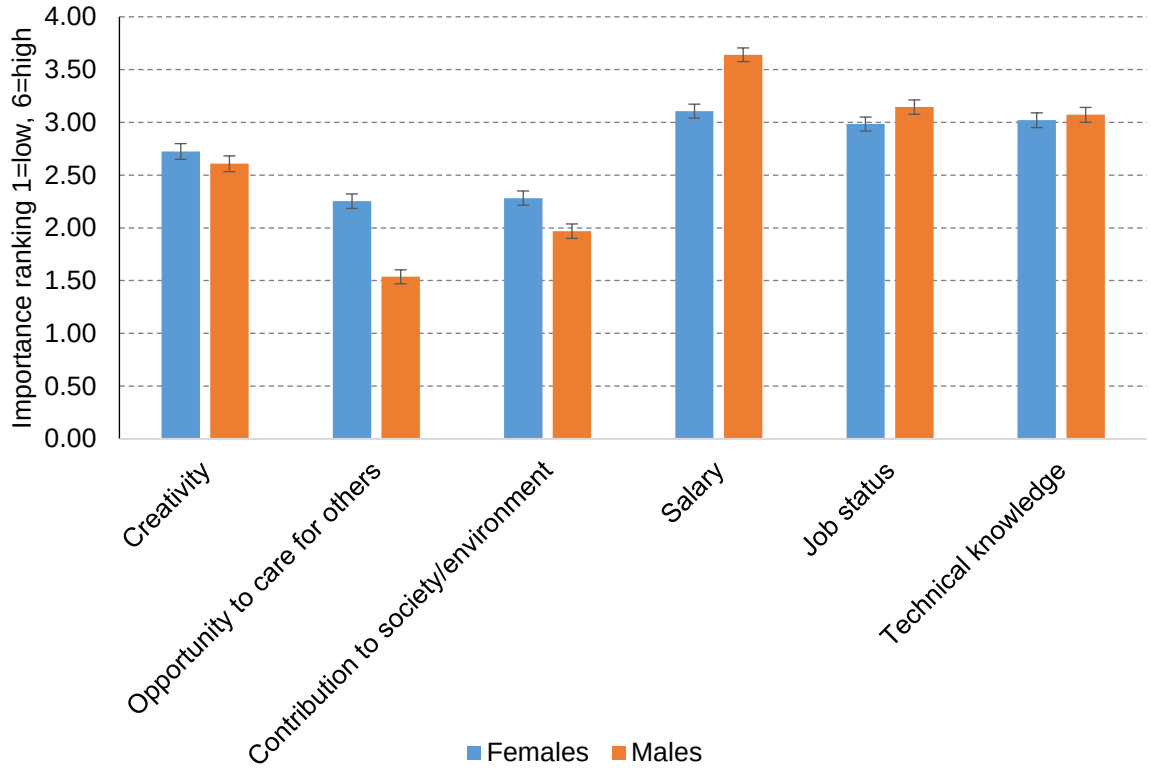
Notes: Data source Nuffield project data. Sample size average salaries=3,632.

Girls put less weight than boys on future earnings in their motivation for choosing a degree subject

Boys and girls have different motivations for choosing particular subjects to study. As shown below, boys are more likely to rank a higher salary as most important whereas girls gave a similar average rank to a higher salary, job status and technical knowledge. On average girls

also gave higher ranks creativity, making a contribution to society or the environment, and the opportunity to care for others.

Reasons for choosing a specific degree subject by gender



Notes: Data source Nuffield project data. Sample size=2,887.

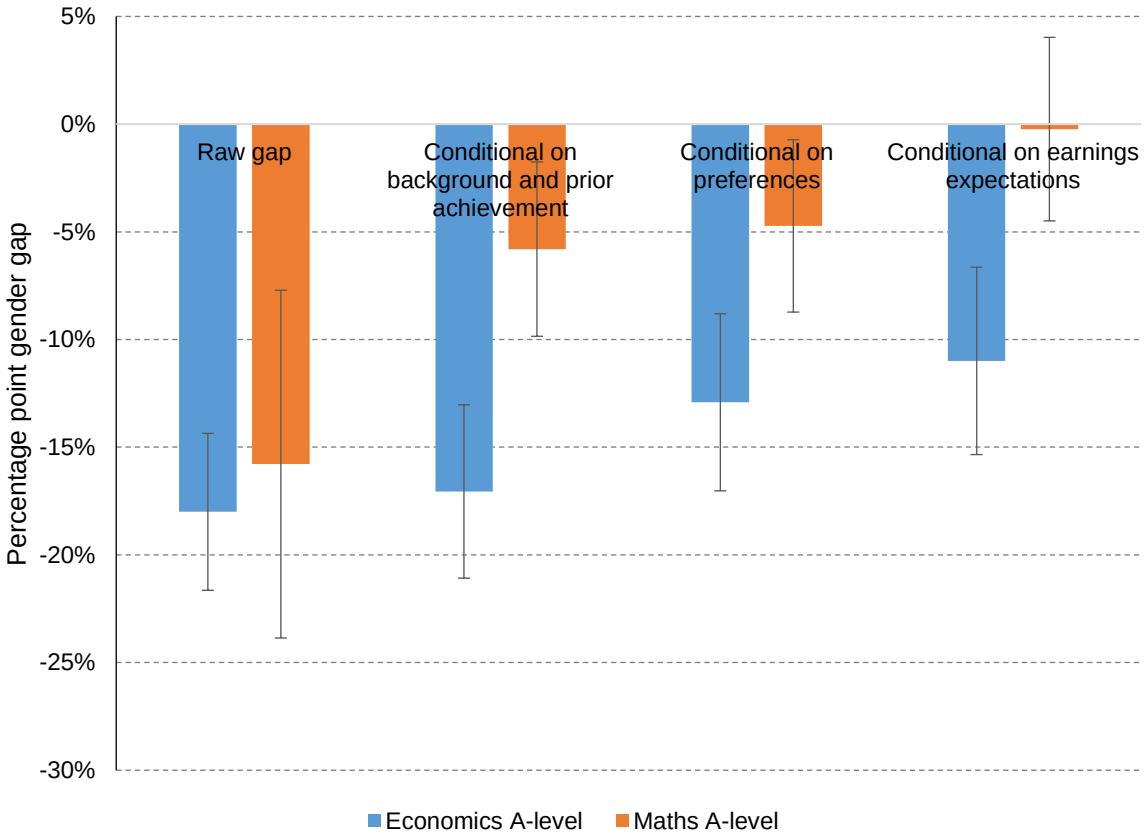
The fact that boys put more weight on financial returns, combined with the fact that they perceive high returns from studying business does explain some of the gender gap in the choice to study economics at A level. We cannot test directly for university subject choice but, as A level and university choices are closely related, it seems reasonable to assume that the findings are likely to hold for university subject choice as well.

Without including any controls we find that boys were 18.0 percentage points (95%CI: 14.4, 21.6) more likely to study A-level economics than girls.[4] After adjusting for the full range of covariates at our disposal, this difference fell to 11.0 percentage points (95%CI: 6.6, 15.3). The characteristics which explained the highest proportion of the gap were motivation for choosing degree subject: "the opportunity to care for others", expectations of the wages of business graduates, whether a higher salary was their motivation for choosing their subject, and attainment in maths at age 14. These results for economics are in contrast to

[4] The survey sampled schools with relatively large sixth forms, and over sampled private schools. This means that the proportion of students taking economics A-level is considerably higher than in the population data described above. Of the students sampled 32% of males took economics, and 13% of females.

mathematics, where background, prior achievement, preferences and earnings expectations can explain the raw gender gap.

Percentage point gender gap in economics and maths A-levels, before/after controls



Notes: Data source Nuffield project data. Sample size=3,723. The table reports the risk difference from a linear probability model in which the dependent variable was: chose A-level economics or maths (=1) or not (=0). The exposure is gender (male=1, female=0). Robust 95% confidence intervals clustered at the school level, restricted to schools that offer economics. The first column reports the raw gender difference. The second column adjusts for eligibility for free school meals, ethnicity, mother or father has a professional job, aspires to a professional job, mother or father attended university, definitely want to attend university and prior achievement (English, Math and Science levels at KS2 and KS3) and GCSE points score. The third column additionally controls for motivations for attending university, and motivations for choosing degree subject. The fourth column additionally controls for expectations of average and own wages for all subjects.

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Appendix

Closing the gap? OLS regression results

Dependent variable = studying straight economics (0/1)

	Raw	Main controls	Plus maths A-level	Plus economics A-level
Female	-0.019***	-0.019***	-0.016***	-0.007***
	(0.000)	(0.000)	(0.000)	(0.000)
2003 cohort		-0.001***	-0.001**	-0.001**
		(0.000)	(0.000)	(0.000)
2004 cohort		-0.002***	-0.002***	-0.001**
		(0.000)	(0.000)	(0.000)
2005 cohort		-0.001**	-0.001*	-0.000
		(0.000)	(0.000)	(0.000)
2006 cohort		-0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)
2007 cohort		-0.000	-0.000	-0.001**
		(0.000)	(0.000)	(0.000)
2008 cohort		0.000	0.001	-0.003***
		(0.000)	(0.000)	(0.000)
2009 cohort		0.001	0.001*	-0.002***
		(0.000)	(0.000)	(0.000)
2010 cohort		0.002***	0.002***	-0.002***
		(0.000)	(0.000)	(0.000)
Born in February		-0.000	-0.000	-0.000
		(0.000)	(0.000)	(0.000)
Born in March		-0.000	-0.000	-0.000
		(0.000)	(0.000)	(0.000)
Born in April		0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)
Born in May		-0.000	-0.000	-0.000
		(0.000)	(0.000)	(0.000)
Born in June		0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)
Born in July		0.000	-0.000	0.000
		(0.000)	(0.000)	(0.000)
Born in August		0.000	0.000	0.001
		(0.000)	(0.000)	(0.000)
Born in September		0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)
Born in October		-0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)
Born in November		0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)
Born in December		-0.000	-0.000	-0.000
		(0.000)	(0.000)	(0.000)
Went to school in the North West		-0.000	-0.000	0.002***
		(0.001)	(0.000)	(0.000)

Went to school in Yorkshire & The Humber		0.000	0.000	0.001*
		(0.001)	(0.001)	(0.000)
Went to school in the East Midlands		0.001	0.000	0.001*
		(0.001)	(0.001)	(0.001)
Went to school in the West Midlands		-0.001	-0.001	0.001
		(0.001)	(0.001)	(0.000)
Went to school in the East of England		0.007***	0.007***	0.004***
		(0.001)	(0.001)	(0.000)
Went to school in London		0.011***	0.011***	0.006***
		(0.001)	(0.001)	(0.000)
Went to school in the South East		0.005***	0.005***	0.003***
		(0.000)	(0.000)	(0.000)
Went to school in the South West		0.000	0.000	0.003***
		(0.001)	(0.001)	(0.000)
Other White		0.006***	0.008***	0.005***
		(0.001)	(0.001)	(0.001)
Black African		0.019***	0.018***	0.012***
		(0.001)	(0.001)	(0.001)
Black Caribbean		0.006***	0.005***	0.003***
		(0.001)	(0.001)	(0.001)
Other Black		0.013***	0.012***	0.008***
		(0.001)	(0.001)	(0.001)
Indian		0.030***	0.027***	0.014***
		(0.000)	(0.000)	(0.000)
Pakistani		0.015***	0.015***	0.009***
		(0.001)	(0.001)	(0.001)
Bangladeshi		0.018***	0.017***	0.012***
		(0.001)	(0.001)	(0.001)
Chinese		0.028***	0.022***	0.011***
		(0.001)	(0.001)	(0.001)
Other Asian		0.014***	0.011***	0.005***
		(0.001)	(0.001)	(0.001)
Mixed		0.007***	0.006***	0.004***
		(0.001)	(0.001)	(0.001)
Other		0.012***	0.011***	0.007***
		(0.001)	(0.001)	(0.001)
2nd deprivation quintile		-0.001*	-0.001	-0.000
		(0.000)	(0.000)	(0.000)
3rd deprivation quintile		-0.001	-0.001	0.000
		(0.000)	(0.000)	(0.000)
4th deprivation quintile		-0.001*	-0.001	0.000
		(0.000)	(0.000)	(0.000)
Least deprived quintile		0.001***	0.002***	0.001**
		(0.000)	(0.000)	(0.000)
Attended a private school at Key Stage 5		0.004***	0.005***	-0.006***
		(0.000)	(0.000)	(0.000)
Attended a FE college at Key Stage 5		-0.001***	-0.002***	-0.001***
		(0.000)	(0.000)	(0.000)
Attended a special school at Key Stage 5		-0.001	-0.001	-0.001
		(0.005)	(0.005)	(0.005)

Attended a single sex school at Key Stage 5		0.002*** (0.000)	0.002*** (0.000)	-0.001*** (0.000)
2nd quintile in English at Key Stage 2		0.003*** (0.001)	0.002*** (0.001)	0.001 (0.000)
3rd quintile in English at Key Stage 2		0.005*** (0.001)	0.003*** (0.001)	0.001* (0.001)
4th quintile in English at Key Stage 2		0.005*** (0.001)	0.004*** (0.001)	0.002*** (0.001)
Highest quintile in English at Key Stage 2		0.002** (0.001)	0.003*** (0.001)	0.002*** (0.001)
2nd quintile in maths at Key Stage 2		-0.002*** (0.001)	0.001 (0.001)	0.001* (0.000)
3rd quintile in maths at Key Stage 2		-0.002*** (0.001)	0.001 (0.001)	0.001** (0.000)
4th quintile in maths at Key Stage 2		-0.001* (0.001)	0.002** (0.001)	0.001** (0.001)
5th quintile in maths at Key Stage 2		0.006*** (0.001)	0.004*** (0.001)	0.002** (0.001)
2nd quintile in science at Key Stage 2		0.000 (0.001)	0.001 (0.000)	0.000 (0.000)
3rd quintile in science at Key Stage 2		-0.000 (0.001)	0.000 (0.001)	0.000 (0.000)
4th quintile in science at Key Stage 2		-0.001** (0.001)	-0.001 (0.001)	-0.000 (0.000)
5th quintile in science at Key Stage 2		-0.004*** (0.001)	-0.003*** (0.001)	-0.001** (0.001)
Grade in English at KS4 (higher=better)		-0.003*** (0.000)	0.000 (0.000)	0.000** (0.000)
Grade in maths at KS4 (higher=better)		0.006*** (0.000)	0.001*** (0.000)	0.000 (0.000)
Number of GNVQs at grades A-A*		-0.000 (0.000)	-0.001 (0.000)	-0.000 (0.000)
Number of GNVQs at grade B		-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Number of GNVQs at grade C		-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Number of GNVQs at grades D-G		0.000 (0.001)	0.000 (0.001)	-0.000 (0.001)
Number of GCSEs at grade A* in science, maths, humanities, languages		0.004*** (0.000)	0.006*** (0.000)	0.002*** (0.000)
Number of GCSEs at grade A in science, maths, humanities, languages		0.002*** (0.000)	0.003*** (0.000)	0.000*** (0.000)
Number of GCSEs at grade B in science, maths, humanities, languages		-0.000 (0.000)	0.001*** (0.000)	0.000 (0.000)
Number of GCSEs at grade C in science, maths, humanities, languages		-0.000 (0.000)	0.000* (0.000)	-0.000 (0.000)
Number of GCSEs at grades D-G in science, maths, humanities, languages		0.001*** (0.000)	0.001*** (0.000)	-0.000 (0.000)

No. of GCSEs at grade A* in other subjects		-0.000* (0.000)	-0.001*** (0.000)	-0.000 (0.000)
No. of GCSEs at grade A in other subjects		-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
No. of GCSEs at grade B in other subjects		-0.001*** (0.000)	-0.001*** (0.000)	-0.000*** (0.000)
No. of GCSEs at grade C in other subjects		-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
No. of GCSEs at grades D-G in other subjects		-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Achieved Level 2 qualification (equivalent to 5 A*-C grades at GCSE) by age 18		0.000 (0.001)	0.001 (0.001)	0.001 (0.001)
Did not achieve Level 2 by academic route		-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)
2nd quintile of Level 2 points		0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
3rd quintile of Level 2 points		0.004*** (0.001)	0.004*** (0.001)	0.002** (0.001)
4th quintile of Level 2 points		0.005*** (0.001)	0.005*** (0.001)	0.003** (0.001)
Highest quintile of Level 2 points		0.007*** (0.001)	0.006*** (0.001)	0.004*** (0.001)
No. of FE qualifications at Level 2		-0.001 (0.001)	-0.001 (0.001)	-0.002** (0.001)
No. of vocational qualifications at Level 2		-0.001** (0.000)	-0.001** (0.000)	-0.001* (0.000)
Number of A-levels at grade A in science, maths, humanities, languages		-0.005*** (0.000)	-0.021*** (0.000)	-0.013*** (0.000)
Number of A-levels at grade B in science, maths, humanities, languages		-0.004*** (0.000)	-0.012*** (0.000)	-0.007*** (0.000)
Number of A-levels at grade C in science, maths, humanities, languages		-0.004*** (0.000)	-0.011*** (0.000)	-0.007*** (0.000)
Number of A-levels at grade D in science, maths, humanities, languages		-0.004*** (0.000)	-0.010*** (0.000)	-0.007*** (0.000)
Number of A-levels at grade E in science, maths, humanities, languages		-0.005*** (0.000)	-0.011*** (0.000)	-0.008*** (0.000)
No. of A-levels at grade A in other subjects		0.012*** (0.000)	0.014*** (0.000)	-0.003*** (0.000)
No. of A-levels at grade B in other subjects		0.005*** (0.000)	0.005*** (0.000)	-0.000 (0.000)
No. of A-levels at grade C in other subjects		0.002*** (0.000)	0.002*** (0.000)	-0.003*** (0.000)
No. of A-levels at grade D in other subjects		-0.001* (0.000)	-0.000 (0.000)	-0.004*** (0.000)
No. of A-levels at grade E in other subjects		-0.002*** (0.000)	-0.002*** (0.000)	-0.005*** (0.000)
2nd quintile of Key Stage 5 points		0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
3rd quintile of Key Stage 5 points		-0.000 (0.000)	-0.001 (0.000)	0.000 (0.000)

4th quintile of Key Stage 5 points		-0.001*	-0.001*	0.000
		(0.001)	(0.001)	(0.001)
Highest quintile of Key Stage 5 points		-0.003***	-0.002*	-0.000
		(0.001)	(0.001)	(0.001)
Achieved Level 3 qualification (equivalent to A-levels at grade E) by age 18		0.003***	0.002***	0.002***
		(0.001)	(0.001)	(0.001)
Did not achieve Level 3 by academic route		0.001	0.001	-0.001
		(0.001)	(0.001)	(0.001)
2nd quintile of Level 3 points		0.000	0.001	0.003***
		(0.001)	(0.001)	(0.001)
3rd quintile of Level 3 points		0.002**	0.002**	0.003***
		(0.001)	(0.001)	(0.001)
4th quintile of Level 3 points		0.002**	0.001	0.003***
		(0.001)	(0.001)	(0.001)
Highest quintile of Level 3 points		0.003**	0.000	0.005***
		(0.001)	(0.001)	(0.001)
No. of FE qualifications at Level 3		0.003***	0.003***	-0.000
		(0.001)	(0.001)	(0.001)
No. of vocational qualifications at Level 3		-0.002***	-0.002**	-0.002***
		(0.001)	(0.001)	(0.001)
Took maths A-level			0.041***	0.026***
			(0.000)	(0.000)
Achieved grade A in maths A-level			0.030***	0.013***
			(0.001)	(0.001)
Took economics A-level				0.148***
				(0.000)
Achieved grade A in economics A-level				0.125***
				(0.001)
Observations	2,015,891	2,015,891	2,015,891	2,015,891

Notes: reference categories are the 2002 cohort, those born in January, those attending school in the North-East of England, White British individuals, the most deprived quintile, those attending state schools at age 18, and those scoring in the lowest quintiles for English, maths and science at age 11, total points at age 16, and total points and total points achieved via A-levels at age 18. * indicates significance at the 5% level, ** at the 1% level and *** at the 0.1% level.