Mismatch in higher education: prevalence, drivers and outcomes

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1   Executive summary

Overview

We consider the extent of mismatch, students attending courses that are less or more selective than might be expected given their academic attainment, in UK higher education (HE) for the first time. There is significant under- and over-match in the UK, with 15% (23%) of students under- and over-matching when we measure course quality[1] based on course-level attainment (future graduate earnings). There are substantial socio-economic status (SES) and gender gaps in mismatch, with low SES students and women attending lower quality courses than their attainment might otherwise suggest. This has important implications for social mobility and the gender pay gap. While subject choice at university is a key driver of the gender gap, the SES gap can largely be explained by the secondary school attended. There is also an interesting geographical dimension with low SES students who travel to attend university increasingly likely to match in the same way that high SES students do, but for students who stay close to home, the SES gaps are striking. There are penalties to undermatching in terms of degree outcomes, and in the labour market, with those students who undermatch less likely to achieve a first or a 2:1, and likely to earn less 3.5 years after graduation. Conversely, those who overmatch achieve more positive outcomes than similar matched students. This research suggests that there is an important role for information, advice and guidance, and university outreach programmes, to ensure that students are making informed choices.

1.1   Introduction

Increasing enrolment in HE is a preoccupation of governments around the world. As a result, much academic research has been devoted to examining policies intended to increase university participation, particularly to under-represented groups such as those from low SES backgrounds. However, less attention has been given to the types of universities and courses students enrol in once they decide to continue with their education, and in particular the 'match' between the student and their course.

Recent research from the US (Dillon and Smith, 2017, 2019; Black et al, 2015, Smith et al, 2013) has begun to focus on the phenomenon of 'mismatch'. Although there is some variation in the exact definitions, mismatch broadly consists of 'undermatch', where students attend

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[1] We define course quality in two ways, as will be discussed below. These definitions are of course subjective, but are useful for ranking courses.

universities that are less selective than might be expected, given their academic credentials, and 'overmatch', where students attend universities that are more selective than might be expected, given their credentials.

Existing evidence (which is, to date, exclusively from the US) suggests that a significant proportion of students are undermatched, and that undermatch is more common among ethnic minority students and those from low socio-economic (SES) backgrounds (Smith et al, 2013; Dillon and Smith, 2017; Dillon and Smith, 2019). This research also suggests that these students are less likely to overmatch than their more advantaged counterparts, even when similarly qualified. Despite the growing research base in the US, there is a paucity of research on mismatch in the UK context.

Given the well-documented returns to high status universities and subjects (Belfield et al, 2018), understanding the extent to which disadvantaged students are less likely to enrol in high quality courses than more advantaged students of similar academic attainment, is important for equity and social mobility.

Issues regarding the university admissions process and its impact on disadvantaged students are at the forefront of the current HE policy debate. Universities UK has launched a review of the admissions process, whilst the Office for Students (OfS) is to launch a review soon. The Labour Party have announced plans to radically reform HE admissions by scrapping university offers based on predicted grades and implementing a new system of post-qualification admissions (PQA), aiming to make the admissions process fairer. The Conservative Party have issued a statement backing the OfS review, and endorsing the opportunity to consider the pros and cons of potential models of PQA. Our research will help policymakers understand the extent to which the current system is fair in terms of the courses that students from different groups attend – with potential implications for information, advice, and guidance during the admissions process – and hence is highly relevant to this debate.

1.2 Project Aims

First, we aim to understand the extent of mismatch in the UK HE system. We create two measures of student-to-university match. Our first measure matches students to courses based on their academic attainment, and the academic attainment of their fellow students, measuring the extent to which students attend courses that are commensurate with their academic attainment up to that point. Our second measure matches students to courses based on the

average earnings of graduates from that course, measuring the extent to which students attend courses that are likely to generate future earnings commensurate with their position on the academic attainment distribution.

Our second aim is to document the characteristics of mismatched students. We might have reason to believe that low SES students may be more likely to undermatch than their counterparts from richer backgrounds. For example, such students may have less information about the benefits of attending a more academically prestigious institution or an institution associated with higher earnings. Alternatively, they may have less access to social and cultural capital (Britton et al, 2016).

Our third and fourth aims are to evaluate the impact of mismatch on university and labour market outcomes. Overmatch may at first glance appear to be beneficial to the student as they will be attending a higher quality course than expected. However, overmatched students may struggle to keep up with their better prepared peers and the material being taught, potentially resulting in lower graduation rates. Similarly, being undermatched could be equally harmful, as students will be attending HE courses with fewer financial resources and lower prestige, potentially impacting graduation rates and future earnings. On the other hand, such students may benefit from being "big fish in a small pond." (Murphy and Weinhardt, 2018). Thus understanding the consequences of mismatch is an important empirical question.

1.3 Previous Literature

The small body of literature in this area comes exclusively from the US. These papers find a high degree of student to university mismatch, with estimates suggesting that around 25% of students are mismatched in the US (Dillon & Smith, 2017).

Several studies have revealed that disadvantaged students are more likely to undermatch and less likely to overmatch (Hoxby and Avery, 2012; Smith et al, 2013; Dillon & Smith, 2017), and that information, geographical isolation and financial constraints are important drivers of match quality.

A small number of studies have also examined the consequences of mismatch for future outcomes (Arcidiacono & Lovenheim, 2016; Dillon & Smith, 2017), finding some evidence that the fit between the student and the university matters. For example, Dillon and Smith (2017) show that more able students benefit more from being at a matched (i.e. high quality) university in terms of time to degree. There is also some evidence that the university fit matters

for later earnings outcomes. In a causal study of the impacts of overmatch, Arcidiacono et al (2014) focus on the affirmative-action ban in California (Proposition 209). They find that overall graduation rates for minorities in the University of California (UC) system increased by over 4 percentage points after the ban. After the ban, minority students – who were less academically prepared – were "reshuffled" towards less selective universities. Their positive finding implies that these less selective institutions are better at graduating less well-prepared students. However there is a paucity of research on gender gaps in mismatch, and on mismatch in a non-US context.

1.4   Defining and Measuring Mismatch

Our focus is on the cohort of young people who took their General Certificate of Secondary Education (GCSE) exams in 2006 and their Advanced level qualifications (A level) or equivalent exams two years later in 2008, at the end of secondary school, before entering HE either straight away or after one gap year.

- We use individual-level linked administrative data from schools and universities, and aggregate data on graduate earnings from tax records to construct our measures of match, to understand the characteristics of mismatched students, and to evaluate their degree outcomes.

- We use linked survey data on these students' labour market outcomes to understand the consequences of match for employment and earnings.

Figure 1 illustrates how we construct our measures of match.

- We calculate each students' percentile in the national academic attainment distribution (based on their best 3 A levels or equivalents, weighted for subject difficulty[2]). A student at the top of the distribution (e.g. someone with 3 As in Maths, Advanced Maths, and Physics) will be at the 100th percentile on the x-axis of Figure 1. A student at the bottom of the distribution will be at 0 on the x-axis[3].

- We then calculate each course's position on the national course quality distribution (of all university courses – some 1,300), based on either the grades of students taking that course (points-based match) or the earnings of a previous cohort of graduates 5 years

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[2] For more details on subject difficulty weighting, see Section 5.
[3] Note that our data includes every pupil in the state school population, but excludes those at independent schools. Thus each pupil will be ranked in comparison to other state school pupils only.

after graduation (earnings match). Here, low quality courses (courses populated with low-attaining students, or with low associated earnings) are at 0 on the y-axis, and high quality courses (high-attaining students/high graduate earnings) are at 100 on the y-axis.

Figure 1: Measuring mismatch
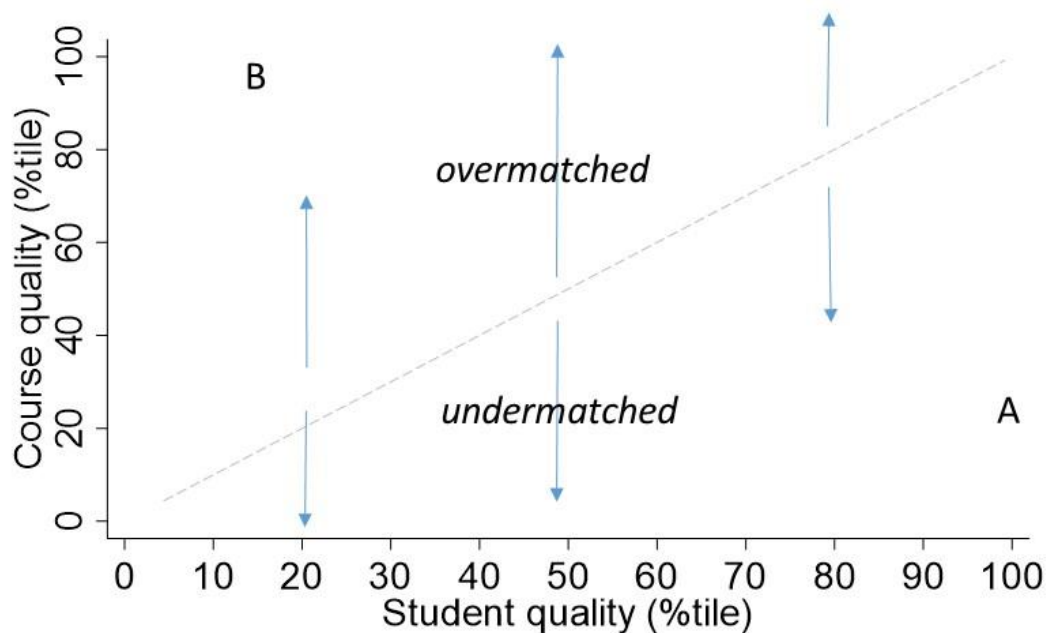
- Mismatch is calculated by comparing each student's position with that of their chosen course, subtracting the individual's percentile from the course percentile. When a student attends a course that is at roughly the same percentile on the course quality distribution as his/her percentile on the attainment distribution, they will be on the 45 degree dotted line (match index of approx. zero).
- Students are defined as undermatched if they attend a course that is at a lower percentile on the course quality distribution than their own percentile on the student quality distribution (a negative match index). In other words, where the student has higher academic attainment than their fellow students on the same course.
- Students are defined as overmatched, meanwhile, if they attend a course that is at a higher percentile on the quality distribution than their own percentile (a positive match index). In other words, where the student is lower attaining than their course peers. While we prefer to measure mismatch as an index, in order to be comparable with the

US, at some points in this report we adopt the binary definition of mismatch from Dillon and Smith, 2017 where mismatch of is +/- 20 percentiles from the matched course.

We also consider the extremes of under and overmatch. For example, a student at point A in Figure 1 is extremely undermatched. He/she is at the top of the student attainment distribution, but is attending a course at around the 20th percentile – a match index of -80. The student at point B is severely overmatched, being at the 20th percentile in the attainment distribution, but is attending a course at around the 90th percentile – a match index of +70. While these extremes are of course rare in reality, we illustrate the full distribution of match in Figure 2, and focus on extremes of match in Section 7.

1.5 Key Findings

We find substantial amounts of both undermatch and overmatch. 15% of students are overmatched and 15% are undermatched using our points-based measure[4]. For our earnings-based measure 23% overmatch and 23% undermatch. Dillon and Smith (2017) find around 25% of students in the US are overmatched and 25% undermatched according to their composite college-input-quality measure. This is most comparable to our points-based measure of match, and while it would problematic to draw strong conclusions from this (as will be discussed in Section 6), the comparison is suggestive that there is more mismatch in the US than in the UK.

There are large social and gender gradients in mismatch.

- We find that students from low SES backgrounds are more likely to undermatch, and less likely to overmatch than their high SES counterparts. This is true for both our measures of match – meaning that low SES students attend courses that are less academically selective, and with lower average earning five years after graduation, than their high SES counterparts, even when they have similar levels of prior attainment. This has important implications for social mobility.

- By contrast, we find that while women and men attend equally academically selective courses, women enrol in courses with substantially lower average earnings than men, even when they have similar prior attainment. This is potentially important for understanding the gender pay gap.

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[4] Where students are defined as undermatched if they are ranked 20 percentiles below their course, and undermatched if they are ranked 20 percentiles above.

- While gender gaps in mismatch are largely explained by subject studied at university, SES gaps are driven by secondary school attended. In addition, low SES students who travel to attend university look increasingly similar in terms of match to high SES students, but large SES gaps remain between students who study at universities close to home.

We also find that White students are more likely to undermatch relative to ethnic minority students, and that students who prefer to live closer to home, who are less certain about whether they will go to university or not by age 16, and students who do not get into university with their first choice of subject, are all more likely to undermatch.

Moreover, we find that mismatch matters for later outcomes. There are economic penalties associated with undermatching for both university performance and labour market outcomes; students undermatched on points are more likely to drop out of university, and to get a lower class degree (less than a 2.1)[5], and go on to earn less in the labour market than similarly qualified but matched students. Those who overmatch on points, meanwhile, are less likely to get a lower class degree, and go on to earn more in the labour market.

These economic penalties for undermatched students, coupled with the social and gender gradients in mismatch, imply that undermatch impedes social mobility and gender equality, and has implications for the gender pay gap.

As described, our results refer to the group of students who entered university in 2008. Since then, the proportion of students going to university has increased, and there has been increased activity devoted to widening participation. However, the gap between rich and poor students has remained relatively stable since 2008, suggesting our findings are reasonably representative of the current situation.

1.6   Who are the mismatched?

We find students from lower socio-economic groups (where we measure SES using a composite measure based on free school meals status, plus area-based measures of deprivation) are more likely to undermatch, and less likely to overmatch throughout the attainment distribution.

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[5] We choose this particular outcome as it is widely accepted in the UK labour market that achievement at the level of 2.1 or above is a key differentiator for employers. Indeed, graduates with a first or 2.1 have been shown to earn around 8% more than those with lower class degrees (Feng & Graetz, 2015; Naylor et al 2015; Walker & Zhu, 2013). This is also often the minimum requirement for entry to graduate programmes.

In addition we highlight a significant gender gap in match. While women and men attend equally academically selective courses, women enrol in courses with substantially lower expected earnings, conditional on prior attainment. These socio-economic and gender inequalities become even starker among the extremely undermatched. High-attaining White, Black Carribean and Black students from other backgrounds also undermatch to a greater extent than students from all other ethnic minorities.

These gaps are particularly pronounced for our earnings-based measure of match, where ethnic minority students overmatch more and undermatch less (again with the exception of Black Caribbean and Black students from other backgrounds) than White students.

1.7   Drivers of mismatch

Accounting for the subject of degree does not reduce the socio-economic gap in match. In other words, when students are of similar attainment and studying the same subject, low SES students study at lower quality institutions. Thus, we can conclude that a key driver of SES inequalities in match is the institution attended.

However, subject choice does account for most of the gender gap in earnings match; the fact that women attend courses with lower earnings potential than men is largely driven by the subjects that women choose, rather than the institution. But a gap remains for high-attaining women, implying that regardless of subject of study, these women attend universities with lower associated earnings. This implies that it may be important to provide women in particular with information about the economic returns associated with different subjects.

While we do not find any evidence that geography plays a role in driving the SES gap in match, we find interesting differences by distance travelled to university.

- High-attaining, low SES students are more likely to attend universities close to home, but those who do so are worse matched than high SES students who attend universities close to home. High-attaining low SES students going to universities near home tend to choose a post-1992 institution, whereas high-attaining high SES students staying near home tend to choose a nearby Russell Group university.
- The fact that low SES students attend universities closer to home could be driven by information constraints, or fear of not fitting in at universities typically attended by more advantaged students.

- Interestingly, meanwhile, those low SES students who move away to attend university face no match penalty.

Further, there is a role for students' preferences, and forward planning in mismatch. Students who are more certain about whether they will go to university or not by age 16, and who have some idea of university prestige and its importance, are better matched suggesting that students who are on the path towards university, and who have undertaken some research, or have useful networks of people offering advice and guidance, are more likely to find a good match. Meanwhile, as described above, those who may be influenced by the location of a university (rather than its prestige) tend to be worse matched.

Students who do not get their first choice of subject are also more likely to undermatch in terms of the earnings measure of match. Students who reported (in survey data) that the subject they are currently studying at university was not their first choice, were found to be more likely to be undermatched on earnings. These students were rejected by their first choice of course, though we are unable to observe whether the first choice was a better match.

Note that we are unable to observe or take into account other elements of the university admissions process which may affect the process by which a student under or overmatches – such as where they apply, the use of their personal statements, or their performance at interviews. For example, students may be undermatched according to their grades, but a) may have not applied to a matched course, b) may have applied but had a very poor personal statement or poor interview performance, resulting in them ending up in a course below their apparent attainment level, c) applied and were offered a lower grade, or d) any other permutation of the admissions process.

Equally, a growing proportion of universities are allowing students from low SES backgrounds to enter with lower grades than required due to the use of contextual admissions (Boliver et al, 2017). Such students would be overmatched by our definition, but again we are unable to observe the extent to which contextual admissions may be important drivers here.

1.8 Outcomes of mismatch

Overmatched students typically have similar or more positive outcomes than matched students at university and beyond, while undermatched students typically have more negative outcomes than matched students. These differences are significant enough in magnitude to be economically important.

There is a penalty associated with being undermatched. After taking account of demographics, school factors and broad university group (Russell Group v non), students that are undermatched on our attainment measure are 4 percentage points more likely to get a lower-class degree than those that are well matched. While we cannot say why these negative effects occur, this supports the hypothesis that students who attend courses at less selective universities than they could have, pay the price in terms of having lower attaining peers and attending courses which have fewer resources. While being undermatched on our attainment measure is not associated with poorer labour market outcomes, being undermatched on earnings – essentially attending a course with lower future earnings than expected – does appear correlated with individual-level lower earnings (around 15% lower than a matched student) 3.5 years after graduation.

Conversely, there are positive associations with being overmatched. Students overmatched on our attainment measure are less likely to get a lower class degree, by around 3 percentage points, after conditioning on observable differences between matched and overmatched students. This suggests that students who enter courses with higher attaining peers do not appear to struggle academically. Being overmatched also appears to bear fruit in the labour market. Being overmatched, in terms of attainment and future earnings, is correlated with individual-level earnings around 6% higher than matched students 3.5 years after graduation.

1.9 Recommendations

Our findings have important implications for policy and society. Our finding that low SES students are attending courses with lower academic prestige, and lower associated earnings, regardless of prior attainment, has important implications for their future earnings. It is unlikely that credit constraints can explain these SES gaps – the vast majority of courses in the UK system charge the same fees, and students are all able to access loans for the full fee amount, and for support whilst they are at university. A more likely explanation is that low SES students have less (or lower quality) information available to them when making choices (or do not access information that is available to them). However, there are a number of processes at play in the UK's university application system, which could be responsible for the greater degree of undermatch among low SES students, such as the use of predicted grades in university applications.

Our finding that females attend courses with lower associated earnings than men on average has relevance for the much documented gender pay gap. Even among high attainers, we show that women are just as likely to enter academically competitive degree subjects as men, but appear to do so at less financially rewarding institutions. This suggests that research into the gender pay gap needs to focus on where women decide to study as well as what.

Our outcomes analysis offers suggestive evidence that undermatching has negative consequences in terms of university and labour market outcomes. Coupled with the characteristics of those who are more likely to undermatch, this has worrying implications for social mobility and highlights the importance of efforts to improve the quality of match of students to universities, rather than focusing on just getting students to attend.

Information, Advice and Guidance

The most obvious policy solution would be to improve the level and quality of information available to undermatched students. For example, students could be provided with information on the entry requirements and labour market returns to different courses at key decision-making ages (Belfield et al, 2018).

However, simply offering information (e.g. on the different returns associated with different institutions) may not be enough to resolve these issues. Studies have shown that those who gain the most from this type of information may be the least likely to consume it, and, to be effective, information has to be carefully targeted (McNally, 2016, Dynarski et al., 2018, Sanders et al., 2018, Sanders et al., 2017).

The UK Applications System

Given the characteristics of those who undermatch, it could be that our current applications system is creating some of the mismatch, as students apply to universities based on their predicted rather than actual grades. Wyness (2016) shows that high achieving low SES students are more likely to have predicted grades that *understate* their actual results.

Clearing may also play a role in mismatch. There is evidence that the number of students going through clearing is increasing, and also it is likely that students from different families may approach clearing differently (O'Kelly, 2019). The clearing system could reduce mismatch, since those who do go through clearing are applying to universities on the basis of their actual grades rather than their predicted grades. On the other hand, if capacity constraints mean that students within clearing have more limited options available, relative to waiting to apply the

following year, then this could lead to more mismatch. Unfortunately our data does not allow us to observe whether or not students went through clearing so we are unable to isolate its role.

Low SES students are also typically more risk averse (Schurer, 2015), meaning that they are more likely to apply to courses that are easier to access in terms of grade requirements, rather than taking a risk on courses that may be harder to get in to. Both of these market failures (i.e. risk aversion and information failures) are potential routes for mismatch to occur.

A policy solution to minimise these issues would be to introduce PQA. As discussed, the Labour Party have announced that they would move to such a system should they gain power (Labour Party, 2019). Creating an admissions system based on observed rather than predicted grades at A level would eliminate the issue of under-predicting for low SES students and reduce risk aversion issues, as the decision would be based on real information. This would enable all students to match more effectively to courses.

Suggested intervention

Building on these policy solutions, we propose an intervention providing targeted information within the UCAS admissions system.

- Based on the idea of targeted advertising, we propose a new system which offers students course suggestions based on their A level (or equivalent) subjects and grades. This could either be the students' grade predictions, or preferably, if policy changes, their actual grades.

- This system could offer a range of filters such as degree subject preference (where students would pick their preferred subject, and would be offered suggested related matched courses), and location preference (where students would be offered suggested matched courses in the area of their choice).

This intervention would provide targeted IAG and, if coupled with PQA, could improve the quality of student to course match for those most at risk of mismatch.

A key benefit of this intervention is that, by working through the UCAS system, the vast majority of students would be reached. Whilst other information based interventions, such as current DfE projects (see https://www.gov.uk/government/news/winners-announced-for-new-student-apps) are offering innovative ways for students to access information during the decision-making process, these are likely to be opt-in only. As previous research has highlighted (McGuigan et al, 2016), the students most likely to use such as are those who are already well informed.