Fields of study

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Fields of study: Horizontal or vertical differentiation within higher education sectors?

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ABSTRACT

This paper assesses the extent to which fields of study and postsecondary institutional sectors serve as mechanisms to preserve social stratification in Scottish higher education. We develop a hierarchy of fields of study based on their social-class and earnings returns, avoiding problems of circularity that occur when fields of study are ranked by their selectivity. We combine data from representative surveys from six cohorts of Scottish school leavers with data from labor force surveys and higher education statistics to examine associations between social background and field of study within types of Scottish higher education, from the late 1980s to the early 2000s when participation in Scottish higher education was expanding rapidly. The results indicate that, when fields of study are ranked according to their labor market returns, they do not serve as a mechanism of social reproduction. Indeed, within the newer sectors of Scottish postsecondary education we see evidence of persons from less advantaged backgrounds choosing more lucrative fields of study: students from working class origins tend to be overrepresented in high-return fields of study in Scotland's higher education colleges (upgraded to university status as part of the expansion) which, though less prestigious than the old, established universities, are venues in which programs such as engineering, technology, business, and allied health fields – among the more remunerative fields – are concentrated. Although returns to fields of study do not increase inequality by social origins, they *do* magnify gender inequality, as men are overrepresented and women are underrepresented in fields with greater labor market returns.

1. Introduction

Recent writers on social stratification have increasingly regarded fields of study in secondary and postsecondary education as not just a form of horizontal differentiation to which persons are allocated on the basis of diverse interests, but a type of vertical differentiation linked to unequal status origins and tied to unequal labor market outcomes (e.g. Ayalon & Yogev, 2005; Duru-Bellat, Kieffer, & Reimer, 2008; Kim, Tamborini, & Sakamoto, 2015; Reimer & Pollak, 2010; Triventi, 2013a,2013b; Triventi, Vergolini, & Zanini, 2017; van de Werfhorst, Sullivan, & Cheung, 2003; van de Werfhorst & Luijkx, 2010; Zarifa, 2012). To the extent that fields of study bear status distinctions with consequences for labor market trajectories, they may be regarded as a mechanism of "effectively maintained inequality" (Lucas, 2001). In this formulation, returns to fields of study that attract students from high-status origins are greater than returns to fields that attract students from low-status origins, and consequently varied returns to fields of study serve to sustain inequality among persons from different origins, even as those from lower-status origins gain increasing access to postsecondary education.

Rational choice theory, however, offers a contrary perspective. While recognizing the differential returns that may accrue to different fields of study, a rational choice view would expect that, given postsecondary enrollment, individuals from disadvantaged social origins would opt for fields with returns that are high enough to compensate for the "risk" of enrolling in higher education (Breen & Goldthorpe, 1997). These may be fields with specific occupational pathways, or that lead to low risk of unemployment, or that have higher financial returns than status, all conditions that vary across jobs and fields of study. Preferences that reflect such risk-reward calculations may increasingly emerge as education expands and more young persons from disadvantaged origins pursue postsecondary education. If this conception is correct, then students' choices of fields of study with greater or lesser returns may not operate as a clear mechanism of vertical stratification.

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A full understanding of differentiation through returns to fields of study requires an examination of sector differences as well as field differences as students move from secondary to postsecondary education (Duru-Bellat et al., 2008; Reimer & Pollak, 2010; Triventi, 2013a; Triventi et al., 2017). Moreover, to avoid circularity in assessing the stratifying role of returns to fields of study, it is essential to measure these returns by criteria that are independent of the process of selection into fields of study.

This paper uses data on six cohorts of Scottish school leavers to examine the extent to which returns to fields of study and institutional sectors serve as dimensions of stratification in higher education, during a period of higher education expansion (Iannelli, Gamoran, & Paterson, 2011). We create a hierarchy of fields of study based on their social-class and earnings returns to education, and we show how our results would differ if fields of study were ranked on the basis of their selectivity. Our analysis will answer the following questions:

1) Do students from various social classes of origin differ in the extent to which they choose more or less economically rewarding fields of study?
2) Do social class patterns in the take up of different fields of study vary by institutional sectors?
3) Has the expansion of higher education led to any change in the way social class affects students' enrollment in different fields of study and institutions?

2. Vertical and horizontal differentiation in higher education

In a seminal paper on the organizational structure of schooling, Sørensen (1970) distinguished between vertical differentiation, intended to reduce the variation within an instructional unit in students' capacities for learning, and horizontal differentiation, designed to reduce the scope of knowledge that students were expected to master. Sørensen offered age-grading as an example of vertical differentiation and curriculum differentiation as an example of horizontal differentiation. Yet as Sørensen suspected and others have long since confirmed, horizontal differentiation at the secondary school level is also a form of vertical differentiation, in that assignment of students to different curricular tracks is commonly linked to students' prior academic performance, and curricular tracks carry status designations that stratify students and condition their schooling outcomes (e.g. Gamoran, 1987; Gamoran & Mare, 1989). Later scholars have argued that the same pattern may apply at the postsecondary level (Lucas, 2001; van de Werfhorst et al., 2003).

2.1. Postsecondary fields of study

Using data from Israel, Ayalon and Yogev (2005) showed that students from disadvantaged origins are less likely to enroll in selective fields, compared to their more advantaged counterparts. van de Werfhorst et al. (2003) reported similar findings for Britain. Building on these findings with data from the Netherlands, van de Werfhorst and Luijkx (2010) argued that fields of study constrain intergenerational mobility because young persons tend to select fields of study that are linked to the class positions of their parents. Similarly, Kraaykamp, Tolsma, and Wolbers (2013) showed that field of study choice was linked to parents' education levels. According to these perspectives, fields of study may preserve inequality across generations because students' social backgrounds influence their choices of what to study at the postsecondary level, and this limits opportunities in the labor market because returns to fields of study vary.

Much of the research on fields of study relies on selectivity to identify the vertical dimensions of this putatively horizontal aspect of differentiation (e.g. Ayalon, 2006; Ayalon & Yogev, 2005; van de Werfhorst et al., 2003). These studies confirm that fields of study may be considered vertical as well as horizontal strata in the sense that persons of lower social origins have less access to the most elite fields. Yet this pattern is in many cases a reflection of the correlation between social origins and the criteria of selection, that is, academic performance. Given that correlation, it is very likely that persons from high-status social origins are overrepresented in high-ranked fields. By contrast, an approach to ranking fields of study that is independent of the characteristics of students enrolled would permit a more open test of the stratifying role of fields of study linked to their labor market returns. Reimer and Pollak (2010), studying Germany, argued that field of study can be described as a dimension of stratification only if there are different rewards to different fields (p. 417). They found that students from high-status families were more likely to choose medicine and law, and that students from low-status families were slightly more likely to choose natural sciences; social sciences and humanities were intermediate in that respect. These social differences were largest among students with the highest school grades. By choosing fields of study with higher labor market rewards, children from higher social origins were able to maintain their advantaged social position.

2.2. Postsecondary differentiation by institutional sector

An important feature of Ayalon and Yogev (2005) analysis was the inclusion of the institutional sector of higher education as an additional dimension of stratification. Their findings revealed that less selective colleges (as opposed to the more prestigious universities) in Israel tended to draw in students from lower-status origins studying in less-selective fields. Thus, higher education sectors played at least as much of a role in stratifying educational opportunities as did fields of study.

Like Ayalon and Yogev (2005), Davies and Guppy (1997) attended to institutional differences, noting that social origins positively predicted enrollment in fields with high-status returns in elite colleges, although this association was mediated by high school academic performance. Once again, it appears that stratification within higher education may have more to do with different types of higher education institutions and less to do with returns to fields of study. Triventi (2013a), too, found that institution type mediated the relationship between social origin and the occupational outcomes that were achieved through higher education, though in Europe the institutional type effects were not as strong as the effects of field of study.

Duru-Bellat et al. (2008) found that effects of family socio-economic status on choice of field of study were smaller in the highly selective elite parts of French higher education than in the rest of French higher education or in Germany: accordingly, these authors described field of study as "a second axis of stratification" (p. 348) after institution. Likewise, Zarifa (2012) found weaker effects of social origin on field of study in the U.S. than in Canada. Explaining the contrasting findings, Zarifa speculated that in the U.S., selection into different institutional types is so strong that there is no remaining stratification by field of study within institutions, whereas in Canada, with a less strongly differentiated structure of institutions, field of study does appear as a secondary dimension of stratification. In the comparative study by Jacob, Klein, and Iannelli (2015), field of study explained more of the social-origin differences in graduates' chances of entering high professional and managerial occupations than institution type, a pattern that was more salient in Germany than in the UK. This makes it important, when analyzing UK data, to be open to the likelihood that there are forms of selection that are strong, as in France, even though not formally institutionalized into different sectors of higher education.

Prior research suggests that institutional differentiation interacts in complex ways with the expansion of higher education. In a cross-national comparative analysis, Arum, Gamoran, and Shavit (2007) showed that inequality of educational attainment tended to be lower in countries with more differentiated systems of higher education compared to those with less differentiated systems. Yet Iannelli et al. (2011) pointed out that in the case of Scotland, whereas a reduction of institutional differentiation reduced inequality of access in the sense of

bringing more persons to enroll in higher education, persons of lower social origins were concentrated in the formerly lower-status sectors of higher education, and in that sense inequality was preserved even during the expansion. Nevertheless, several years into the expansion, inequality between sectors was reduced again at a much higher level of overall participation.

2.3. Ranking fields of study by labor market returns

Although many of the authors above noted the ways in which fields might be ranked (such as by prestige or by economic returns to the individual graduate), few incorporated such measures into their modelling. Davies and Guppy (1997) did include a measure of the status of fields into their study of U.S. higher education. They used field-specific financial returns to education as a measure of ranking: fields were rated high if they led to high levels of income, and low if they did not. In their analysis, returns to fields of study did *not* stratify students according to social origin; in some cases, students from low-status origins were more likely than their high-status peers to select fields of study with high income returns, a finding replicated by Goyette and Mullen (2006). Whereas returns to fields of study compounded gender inequality – men tended to enroll in more remunerative fields (see also Jacobs, 1995; Jonsson, 1999; Katz-Gerro & Yaish, 2003; Zarifa, 2012) – they did not serve as a mechanism for inequality by social origins.

Yet the shift from selectivity-based to labor market-based indicators has not yielded entirely uniform results. Hällsten (2010) found that in Sweden individuals from lower social classes do tend to choose subjects that lead to labor market outcomes that yield higher earnings on average. But lower-class people also choose subjects that lead to lower risk, for example of unemployment. Because some occupational categories with a high risk of low earnings also have a high risk of high earnings, there was also, in Sweden, a tendency at the top of the earnings and risk distribution for low-class people to prefer subjects that lead to relatively low average earnings because they lead also to lower relative risk. Moreover, people from manual social classes tend in Sweden to choose shorter programs closer to their homes, which ultimately also lead to lower labor market returns.

3. Higher education decisions

Decisions to enter a field of study can be driven by a number of factors. Kraaykamp et al. (2013) evoke a neo-Weberian perspective to explain that individuals compete for status in a context of scarcity, and families mobilize their resources to elevate the chances of their children to achieve the greatest success in the status competition. By this account, social inequalities in individuals' educational decisions are largely due to differences in family resources, while limited social, cultural and economic family resources constrain the choices individuals can make. Thus, educational decisions are more the result of inherited family advantages and disadvantages than the result of true choices. With respect to postsecondary field of study, both prior academic preparation and cultural orientation are likely to condition decisions. People from lower social classes tend to have weaker academic achievements prior to entering higher education and this may constraint their choice of field of study and institution.

A rational choice perspective emphasizes the role played by individuals' rational evaluation of different alternatives (Breen & Goldthorpe, 1997). In this view, social class differences emerge because the costs and benefits associated with various educational choices differ among social classes, as do perceived risk of social demotion and individuals' expectation of success (Breen & Goldthorpe, 1997). From this standpoint, family and institutional constraints are considered as part of the evaluation process in which individuals make their educational decisions.

Even though these theories are often contrasted, they can be reconciled (van de Werfhorst et al., 2003). Limited family resources may lead people from lower social classes to have more restricted choices (as the status competition perspective would argue), but within the range of possible choices, they may select fields that minimize risk and maximize economic returns (as specified by the rational choice perspective): for example, programs that are shorter, hold a lower risk of failure and lead to less uncertain labor market outcomes and higher earnings. Without discarding the idea that similar economic (but less constrained) considerations also influence middle-class children's decisions (as rational choice theories would argue), one may hypothesize that people from more advantaged social classes can afford to make decisions that are less based on instrumental economic reasoning and more on their personal interests or on a family-transmitted appreciation for certain subjects, such as art and humanities, traditionally considered *elite* subjects in reproductionist theories (e.g. Bourdieu, 1984). In particular, people from advantaged classes can afford to rate status rewards higher than financial rewards, whereas people from disadvantaged classes would be constrained – through risk-avoidance – to prioritize financial rewards. Ayalon and and Yuchtman-Yaar (1989) demonstrated a pattern consistent with this reasoning at the secondary level, showing that whereas academic-track students aspired to occupations that bore high status but not necessarily high income, vocational-track students aspired to occupations that brought high levels of income without requiring high levels of education. Empirically, these motives might appear as working-class students being more instrumental than middle-class students, but a stricter consideration of motives would suggest that the differences lies in how instrumentalism is defined – as gaining income or class status (to compensate for risk) or as gaining intrinsically rewarding careers (because family resources minimize economic risks).

Another reconciliation of status competition and rational choice perspectives is evident in the theory of effectively maintained inequality (EMI: Lucas, 2001), developed to understand the persistence of educational inequality despite expansion. Lucas demonstrated that when a level of education approaches saturation (e.g. virtually all middle class youth graduate from high school), qualitative differences *within* levels emerge that introduce new axes of differentiation and stratification, such as curricular tracks in high school and institutional differences such as community colleges versus universities at the postsecondary level. Thus, inequality is preserved as education expands because privileged groups structure opportunities such that rational decisions within all social classes result in a persistent system of stratification.

These considerations also show that the social status or financial returns to fields of study are, in principle, distinct from the educational content or selectivity of the fields. There is undoubtedly a link, insofar as, over time, the kinds of knowledge that a society values will, through the labor market, be rewarded by prestige and income. Likewise, the fields that are valued will tend to attract most interest from prospective students, and thus selectivity will tend to increase because prior attainment is used as a quasi-currency in the competition for a limited number of places on courses. But need not make any assumptions about the nature of any connection between content and rewards for an analysis by social rewards to be sociologically meaningful, and it is an open empirical question whether any stratification will emerge through the prior competition for entry (the selectivity) or the prospective rewards in status or income, or both. Our interest is in these social rewards, and we make no comment on the intrinsic educational or cultural value of particular types of study. For example, we do not attempt to categorize the cultural significance nor the cognitive demands of particular fields, even though we rank them by selectivity in one part of our analysis. Our analysis focuses on returns to field of study, not directly on any intrinsic characteristics of fields.

4. Field of study and institutional sector in Scotland

The empirical focus of our study is Scotland, chosen partly because of the quality of data available (as described in the Data and Methods

section), and partly because higher education there went through a particularly clear and swift reform in the early 1990s from a binary system to a diversified system (Arum et al., 2007). The high-status side of the binary system had been stabilized in its modern form in the 1960s, by the end of which decade there were eight universities in two historically defined sectors:

- **Ancient universities**: the four oldest universities in Scotland (St Andrews, Glasgow, Aberdeen and Edinburgh), founded in the fifteenth and sixteenth centuries.
- **Old universities**: the four universities created in the 1960 s, two of which were formed by the upgrading of former technological colleges (Strathclyde and Heriot Watt), one of which (Dundee) was formed by separating a college from St Andrews University, and only one of which (Stirling) was wholly new.

We retain the distinction between these two groups in the statistical modelling. Alongside this, from the 1960 s were the main part of the lower-status side of the binary divide:

- **Higher education colleges**: technological, teacher-education and creative-arts colleges that were upgraded to university-level status in 1992–3.

This group forms our third category of institution. From the 1970s onwards, moreover, a fourth sector of higher education grew in the further education colleges, which mainly provide non-advanced technical training. These are the fourth category of our institutional variable:

- **Further education colleges**: technical colleges that had not been upgraded institutionally in 1992–3, but which offered some higher-education courses, almost entirely at sub-degree level equivalent to ISCED level 5 (short-cycle tertiary education).[1]

Throughout the period we study here (from the late-1980s till the early 2000s), over nine out of ten school leavers from Scotland who entered higher education did so in one of these four sectors. The remaining entrants attended a diverse group of universities outside Scotland, which we group together into one heterogeneous category:

- **Universities outside Scotland**: these have been retained as a separate category since they cannot be readily fitted into the other four categories because the history and current structure of higher education in Scotland are different from the rest of the UK (and since sub-dividing this category would not be reliable because of sample size).[2]

[1] The Higher National Certificates (HNC) and Higher National Diplomas (HND) are sub-degree programmes at ISCED level 5 mainly offered by Further Education Colleges (for a brief description of these qualifications and their ISCED level see https://beta.gov.scot/publications/scottish-qualifications-unesco-isced-levels/). These qualifications also allow students to progress to degree programmes at ISCED level 6.

[2] For example, the four ancient Scottish universities were all essentially urban foundations, in contrast to the two ancient universities in England, Oxford and Cambridge. There are no Scottish counterparts to the many urban universities founded in England, Wales and Northern Ireland in the nineteenth century and the early twentieth century (partly because of these much older Scottish urban foundations). Of the four Scottish universities founded in the 1960s (the category 'old university' here), two grew out of technological colleges that had no parallels in England, one was a college of an ancient university (thus with no parallel in any English university of the 1960s), and only one was wholly new. The colleges in Scotland that became universities after 1992 were more firmly technological than the former polytechnics in England, most of which had developed social science or humanities programmes in the 1980s.

The theoretical rationale for categorizing universities and colleges in this way is based on the idea that institutions may be said to embody cultural capital just as do other social groups, and that the resulting hierarchies of prestige are stable (Raffe & Croxford, 2015; Strathdee, 2009). Earlier research (Iannelli et al., 2011) found that, during the expansion, inequalities of entry to higher education first widened and then narrowed. The widening of inequality was particularly evident for entry to the ancient universities, and so the initial expansion in the mid-1990s could be described as a process of diversion, through which low-status students did gain new opportunities but mainly in low-status institutions.

For all but a couple of years at the end of the 1990s, students from Scotland attending higher-education courses in Scotland were not charged fees before entry (Hunter-Blackburn, 2015). The main financial cost of attending higher education is for living expenses, for which state-subsidized loans have been available. In this respect, the situation in Scotland is similar to that in Sweden as studied by Hällsten (2010), noted above. Thus in Scotland, as in Sweden, although direct financial costs might still be some deterrent to entry, they are unlikely to have been an immediate influence. More plausible is that some students might see the prospect of having to re-pay loans as a deterrent, even if the repayment is in effect a form of graduate income tax (paid as a percentage of income). The perception of such a tax might contribute to the assessment of financial rewards associated with fields of study, and might be especially influential on students from disadvantaged origins who could not fall back on family resources to help pay the tax.

The Scottish experience may be of particular interest internationally because it has a unique combination of features. Like the rest of the UK and the U.S., it now has relatively high levels of participation in higher education, in contrast to, for example, Germany. Our data cover the period from the late 1980s to the middle of the first decade of the new century when expansion happened most rapidly, and so we can study the effects on differentiation by field of study and by institution during a transition from a moderate to a high level of participation. Unlike France, Scotland has no formal differentiation among sectors of higher education, but nonetheless, the informal distinctions among sectors that we have summarized are a source of differential selection. So Scotland allows us to ask the questions: does the hierarchy of fields of study according to their labor market returns have a stratifying effect where participation in tertiary education is high, and does informal differentiation among institutions at the tertiary level outweigh any stratifying effect of returns to field of study?

5. Data and methods

Three sources of data are used in the paper. The main analysis is of the Scottish School Leavers' Survey of people who left high school in 1987, 1989, 1991, 1993, 1999 and 2001.[3] The dependent variables are derived from the other two sources – the UK Labor Force Survey in 1993, 1996 and 2000, for measures of the social status and average earnings of the occupations entered by graduates in each field of study; and administrative data from the UK Higher Education Statistics Agency, for the selectivity of each field of study, as recorded for entrants to higher education in 2002.

5.1. Scottish school leavers' survey (SSLS)

The data on which the main modelling is based come from the Scottish School Leavers' Survey, constructed as a time series by the project Education and Youth Transitions in England, Wales and

[3] Respondents from more recent Scottish School Leavers' Surveys were interviewed another time at ages 21–22 and 23–24. The attrition rate of these follow-up surveys was particularly high and did not allow us to use these data to directly measure the labor market returns of young people in our study.

Scotland 1984–2002 (Croxford, Iannelli, & Shapira, 2007). The SSLS was a nationally representative survey of young people attending all categories of high school except special schools. Six time points cover entry into higher education during the period between the end of the 1980s and the beginning of 2000. The data used here refer to the follow-up surveys carried out two years after the respondent had left compulsory schooling, at which point the net response rates were: 1987, 50%; 1989, 52%; 1991, 50%; 1993, 43%; 1999, 39%; 2001, 42%.[4] Our measure of "higher education entrant" refers to young people who, after leaving school, directly entered full-time higher education (aged approximately 18), aiming to acquire a degree or a sub-degree qualification.

Following several other researchers on the topic of stratification by field of study (such as Reimer & Pollak, 2010; Zarifa, 2012), we restrict analysis to entrants, with resulting sample sizes ranging from 893 to 2197. Not restricting in this way would potentially confuse two aspects of selection – into higher education, and within higher education. Selection into higher education in Scotland has been studied elsewhere (Iannelli et al., 2011). By limiting the sample to entrants, we are unable to say whether the conclusions we reach would be applicable to students who did not enter higher education but who might have done if, for example, more places had been made available. Moreover, the paper only examines the point of entry to higher education, using the field of study which students report at that point. We do not have data to model systematically the extent to which students transfer between fields of study or institutions, or leave higher education altogether, and there has been no recent published research on these questions in Scotland. However, for one cohort, we were able to estimate the extent of changing field for people who entered degree programmes and we found a high degree of stability (79.2% of cases remained in the same field of study).[5]

The variables used are cohort, gender, social class of origin, parental education and respondents' educational attainment prior to entry into higher education. Cohort was grouped into three categories to achieve larger sample sizes: 1987–1991 (the reference category); 1993; and 1999–2001; the rationale for the grouping is described below, relating to the institutional reforms that took place in the 1990s. Gender is coded as a dummy variable where male is the reference category.

Social class of origin is measured by the higher of the occupational statuses of mother and father or, when one parent was unemployed or economically inactive, by the status of the employed parent. This information was collected when respondents were aged 16. Social class of origin was coded (from the UK National Statistics Socio-Economic Classification) as a categorical variable in which three social classes have been distinguished: managerial and professional class (the reference category), intermediate class and working class. Even though a more detailed classification of social classes may have been desirable, using only three classes from the full classification has allowed us to increase the statistical power in our analysis given the relatively small sample sizes. This three-class simplification of the full classification is consistent with the conceptual basis of the classification (Office of National Statistics, 2005, p. 15). It is also consistent with well-validated practice using the Goldthorpe class scheme on which the National Statistics scheme is based: Evans and Mills (1998) found that a four-class version of the Goldthorpe scheme had high content validity when judged by criteria such as earnings, probability of unemployment, and class identity. We have combined their third and fourth class categories into our 'working class', since their third category of 'supervisors of manual workers' had on average only 50 sample members entering higher education in each cohort, and so would have given unreliable estimates. We include an "unclassified" category in the models to analyze also those cases for which the information on social class of origin was not available while the information on the other variables was available. We refer to this variable throughout the paper as 'social class'.

Parental education is measured by the age at which parents left school. We distinguished six categories: both parents left school at age 17 or later (the reference category), one parent left at 17 or later, both parents left at 16, one parent left at 16, both parents left at 15, and the unclassified. Information on educational qualifications of parents was not available in the data; however, these categories mark important boundaries in the Scottish system of secondary schooling through which the parents would have passed, corresponding to the distinction between parents who had only elementary education (left school at 15), parents who had some secondary education (left school at 16) and parents who had achieved some upper-secondary education or above (left school at 17 or later). The measure has been used successfully in much previous research on Scottish higher education (summarized by Iannelli et al., 2011). We originally included this variable as well as the social-class variable in order to test whether there would be any additional statistical effect of parental education, but in practice there turns out not to be much evidence of an effect.[6]

Respondents' educational attainment is the highest attainment gained at the time they were aged 18-19. This information was coded as a continuous variable, which we refer to as the "UCAS point score" after the tariff defined by the central organisation in the UK that processes applications for entering undergraduate courses (Croxford et al., 2007, p. 67). The score as defined in this data set is composed only of attainment in the school-leaving examinations and thus has fairly stable validity over time: there is no contribution from low-level vocational qualifications, and so it has not been affected by any widening of the criteria by which applicants are selected for entry.[7] In Scotland (as in the rest of the UK) each higher education institution sets its own entry requirements and admissions policies. Institutions specify a minimum requirement for each course (based on UCAS Tariff points and specific

[4] Survey non-response in the leavers' surveys has been found to be associated with attainment in school-leaving examinations, the decision to remain in full-time education beyond the minimum leaving age, sex and the socio-economic circumstances of students' households (Croxford, 2009, pp. 8–10; Dobbie, 2006, pp. 9–10). Because we confine attention only to people who stayed on well beyond the leaving age, and because these other variables are included in our models, these models largely control for non-response bias.

[5] The cohort which in our data is referred to as '2001', when the members were aged about 19, was followed up at age 22. Of those who were studying for an undergraduate degree at both time points, 79.2% were studying in the same field on each occasion. That high degree of stability over three years suggests that initial field remains an important predictor of eventual field. Moreover, although the question of changing field would merit much further investigation, its neglect here does not invalidate the question we are asking, which is whether the decision at the point of entry is associated with the social status or economic returns of fields of study.

[6] The only consistent statistical effect with respect to parental education in the models is that the category 'one parent left school at age 17' shows higher values than the reference category of 'both parents left school at age 17' on the first two dependent variables. We interpret this parental-education category as adjusting the category of 'professional class' in the social-class variable to the average level of parental educational attainment within that class. So, when we present results in terms of social class as comparisons with the category 'professional and managerial', we are in effect showing a comparison with people whose parents have average educational attainment within that class.

[7] The public body responsible for the school-leaving examinations in Scotland, the Scottish Qualifications Authority (and its predecessor, the Scottish Examination Board), carries out regular quality-control checks on standards of assessment, so that over the fairly short period of time with which we are concerned here standards are like to have been constant. Moreover, for the purposes of entry to higher education (and the UCAS tariff score), Scottish qualifications are regularly compared with those from the rest of the UK with the aim of achieving comparable standards. See, for example, Coe, Searle, Barmby, Jones, and Higgins, 2008; Devine, Hall, Mapp, and Musselbrook, 1996; Johnson and Hayward (2008); Kingdon (2009), and Tomlinson (2002).

Table 1
Field of degree, by institutional sector (% in columns).

Field of degree	Ancient university	Old university	Higher education college	Further education college	University outside Scotland
Medicine	8.1	0.9	0.1	0.1	1.4
Allied health	6.1	8.5	13.2	7.7	5.5
Biological Science	9.1	5.5	3.9	1.8	3.2
Physical Science	10.5	8.0	3.0	1.1	9.2
Agricultural Science	3.9	.4	1.7	1.8	4.8
Mathematics and Computing	9.3	9.6	6.7	8.8	6.0
Engineering and Technology	7.3	15.2	13.1	8.7	8.3
Architecture and Building	.5	4.5	2.5	2.8	1.6
Social Science	17.8	13.5	7.0	9.2	14.4
Business and Law	6.8	18.6	28.5	35.9	11.7
Information Studies and Mass Communication	0.2	0.7	2.4	4.4	2.8
Languages and Literature	10.4	5.1	1.3	1.0	8.9
Humanities	5.3	3.4	.2	.5	6.0
Creative Arts	2.1	3.6	6.9	10.4	11.9
Education	2.5	2.5	9.5	5.8	4.4

Source: Scottish School Leavers' Survey

grades achieved in exam results) but, given the high numbers of applications, the majority of courses make offers at a higher level than the minimum requirements. Thus, based on the courses' entry requirements and their academic achievement at the school-leaving examinations potential students decide the course they would like to study and which institution to enter. We standardized this variable to have mean 0 and standard deviation 1 over the whole data set, combining cohorts. The advantage of doing this, rather than standardizing separately within cohorts, is that it allows us to estimate any change over time in the statistical effects of the variable.

We grouped the sector of higher education into five categories, based essentially on the histories of the institutions, as described more fully above: ancient universities (the reference category), old universities, higher education colleges, further education colleges, and institutions outside Scotland. Since the higher education colleges were mostly upgraded the university status in 1992–3, the categories of the grouped cohort variable correspond to the pre-reform period (1987–1991), the period of reform (1993) and the aftermath of reform (1999–2001).

From Table 1 we can see that, with two exceptions, all fields of study are represented in all of the institutional sectors. The exceptions are medicine, which is concentrated in the ancient universities and the universities outside Scotland, and humanities, which do not have a strong presence in the new universities (formerly higher education colleges) or in the further education colleges. This generally wide presence of each field suggests that it is unlikely that the social prestige or economic returns to each field is strongly driven by its being associated with particular kinds of institution. That hypothesis was confirmed by re-running our analytic models while excluding the fields that have less than 1% of entrants in the higher-education colleges and the further-education colleges, namely medicine and humanities. Since these fields are the two most selective fields (as seen in Table 2), only the model with control for school attainment can provide a valid comparison. The new estimates do not substantially differ from the estimates of the model which includes medicine and humanities. The coefficients estimated from this re-run model had a correlation of 0.86 with the corresponding coefficients in the full model. This close agreement further confirms that the differential presence of fields of study in the different sectors is unlikely to have seriously biased the results.

5.2. Labor force survey (LFS)

The LFS is run by the UK Office of National Statistics (www.statistics.gov.uk). In this period, it has been conducted every quarter, with a sample size of approximately 60,000 individuals. Data on the field of study of people who have a higher-education qualification[8] were recorded from 1992, and earnings from 1993. We use the first full-quarter surveys of 1993 (January–March), 1996 (March–May), and 2000 (March–May) to cover the period when the people in the Leavers' Survey were entering higher education. The sample selection in this period mostly used the Postcode Address File to select an unclustered sample for face-to-face interviewing (the exception being the sparsely populated areas of the north-west of Scotland, where random telephone interviewing was used). The response rate of the LFS was over 75%, and weights are used to compensate for non-response. Data for people aged between 18 and 74 and for the whole of the UK have been used, to give good sample sizes of graduates. It is unlikely that status differences among subject areas would differ much between Scotland and the UK as a whole; in any case, the graduate labor market is UK-wide in the manner in which it operates. The wide age range chosen allows us to consider labor market benefits which can derive from having studied certain subjects on a long-term perspective. As a sensitivity check we re-calculated the means shown in the social-class and earnings columns of Table 2 for the age range 20–35. The results gave values that correlated (at the level of subject groups) very highly with those shown there: 0.98 for the social-class measure, and 0.94 for the earnings measure.

Field of study has been grouped as shown in Table 2. It was possible to allocate a field of study to 76.1% of graduates in 1993, 94.3% in 1996 and 99.6% in 2000; the total number of graduates in the LFS sample was respectively 12,205 in 1993, 10,113 in 1996 and 10,683 in 2000. Two measures are derived from the LFS to act as dependent variables in the main analysis. The first relates to the social class of graduates in each field, defined as the average over the three years of the proportion in high-status professions. High-status professions are defined to mean Socio-Economic Groups 1, 3 and 4:

1 Employers and managers in central and local government, industry, commerce, etc. – large establishments.
2 Professional workers – self-employed
3 Professional workers – employees

At the level of the 15 categories of field of study, the correlation of this measure in pairs of these three years was high (each pair over 0.96). This measure is shown in first column of Table 2.

The second measure is defined similarly, based on the average earnings in the respondent's main job, before tax and other deductions,

[8] The field of study refers to the highest qualification achieved at the time of the survey. In our sample of graduates, it can relate to either a graduate or postgraduate qualification depending on whether the person in the sample has gained any postgraduate qualification.

Table 2
Coding of status of field of degree.

Field of degree	High status occupations[1] (%)	Earnings[2] (£)	Selectivity[3] (%)
Medicine	83.2	574	89.4
Allied health	55.2	423	38.3
Biological science	49.7	410	38.9
Physical science	58.5	486	
Agricultural science	51.3	380	24.6
Mathematics, computing	50.0	509	32.0
Engineering and Technology	69.2	536	36.5
Architecture, building	66.4	436	28.9
Social science	43.7	451	41.9
Business, law	62.1	531	27.2
Information studies, mass communication	33.5	309	
Languages and literature	34.5	400	48.7
Humanities	37.2	432	
Creative arts	20.2	331	19.6
Education	29.5	395	21.3
All[4]	49.6	440	36.8

[1]Average over the labour Force Surveys in 1993 (January–March), 1996 (March–May) and 2000 (March–May) of the proportion in Socio-Economic Groups 1, 3 and 4 among people in the UK labour market who have a degree in the field.
[2]Average over the labour Force Surveys in 1993 (January–March), 1996 (March–May) and 2000 (March–May) of the average gross weekly earnings (in pounds) among people in the UK labour market who have a degree in the field.
[3]Proportion of entrants to the field in 2002–3 who had a score on the UCAS tariff scale of 321 or higher, as derived from administrative data from the Higher Education Statistics Agency. Note that this is based on only 12 distinct fields, grouping as shown.
[4]All with degree for the measures of status and of earnings, and all entrants for the measure of selectivity.
Sources: High status professions and earnings: Labour Force Surveys in 1993 (January–March), 1996 (March–May) and 2000 (March–May). Percentages weighted. Selectivity: Table B3 from 'Young entrants to full-time first degree courses by field and entry qualifications 2002–3′, from web site of Higher Education Statistics Agency (in the section 'PIs: Widening participation of under-represented groups' under 'more statistics' at http://www.hesa.ac.uk/index.php).

for graduates in full-time or part-time work. The earnings information was asked of a random one fifth of respondents in 1993 and 1996, and a random two fifths in 2000; among them the sample size and response rate were: in 1993, 1448 graduates (63%); in 1996, 1363 graduates (69%); in 2000, 2521 graduates (62%). Correlations at the level of the 15 categories of field of study were lower than for occupational status: 0.71 for 1993 and 1996, 0.83 for 1996 and 2000 but only 0.56 for 1993 and 2000. The average of this measure across years is thus more reliable than its value for individual years. It is shown in the second column of Table 2.

5.3. Higher education statistics agency (HESA)

Since 2002, the HESA has published information on its web site which summarizes the qualifications of people entering each field of study in degree-level courses using the same scale as is available in the Leavers' Survey (described above). The information for entry in 2002 is shown in the third column of Table 2. The data come from administrative sources, derived from the process by which students apply for and are selected into higher-education courses. The calculation is based only on entrants to each field who have A-levels, Higher Grades, or General National Vocational Qualifications (70% of all entrants in 2002–3), because these will have been mostly entrants directly from high school and thus will be similar to the respondents in the Leavers' Survey.

One of the main weaknesses of each of these measures is that they do not distinguish among the sectors of higher education. Thus the Labor Force Survey cannot tell us whether a degree in a particular subject from a higher education college is worth the same as a degree in that same subject from an ancient university. However, other research suggests that the effect of this omission will be minor. Sector differences in earnings in the UK, controlling for entrance qualifications and field of study (as well as other potential confounding factors such as gender and social class of origin), have been found to be small (at most 6–7%) for the period which our data cover (between the late-1980s and the early 2000s) (Chevalier & Conlon, 2003; Chevalier, 2014; Hussain, McNally, & Telhaj, 2009). Indeed, research in the U.S. by Dale and Krueger (2002) suggests that apparent sector differences are due to characteristics of graduates that are not captured by measures such as entrance qualifications, gender or social class. Thus, there is reason to believe that the measures shown in Table 2 are not concealing important variation in the effects of different kinds of institution. Moreover, all our models control for the type of institution that students enter. For example, our models allow us to assess whether students entering older universities tend to enter fields of study that have higher or lower average returns than students entering newer universities. These controls remove bias due to selection into different types of institutions when assessing associations with returns to field of study of other variables, such as students' social class of origin.

We treat the indices of fields of study as independent of the process

Table 3
Field of degree, by cohort (% in columns).

Field of degree	1987, 1989, 1991	1993	1999, 2001
Medicine	3.7	2.7	1.7
Allied health	5.6	9.0	11.9
Biological Science	4.9	5.2	5.7
Physical Science	6.2	6.6	5.9
Agricultural Science	2.3	2.8	2.1
Mathematics and Computing	8.2	6.6	9.0
Engineering and Technology	13.9	12.5	7.5
Architecture and Building	1.9	1.2	3.0
Social Science	12.5	12.8	11.6
Business and Law	20.9	21.8	19.9
Information Studies and Mass Communication	1.0	.7	2.9
Languages and Literature	5.5	5.3	4.5
Humanities	2.4	2.8	2.9
Creative Arts	5.8	5.4	5.9
Education	5.3	4.6	5.4

Source: Scottish School Leavers' Survey.

of higher-education expansion that is embodied in the explanatory variables. There is some risk of endogeneity here. For example, a field might become more lucrative because high-status graduates enter it, rather than the causal direction being the other way around. We cannot completely control for this possibility. However, we do account for changing rewards to particular fields by using the average status of the fields over the whole period of our data. There cannot be any correlation over time between the change in social status of people entering a field and the reward associated with that field if the reward is postulated to be constant. Of course, by doing this we also lose the possibility of investigating any link between changing rewards and changing social status, and are confined to analyzing the link between a constant level of reward and a constant level of status.

Also implicit in these measures are that the status or financial rewards to a field of study are perceived by prospective entrants to higher education as homogeneous, undifferentiated by such factors as age or gender. This follows the approach of other authors, for example Davies and Guppy (1997), who argued that aggregate returns of this kind will capture a stable component of the status of a field of study which smooths out, for example, changing differentials by gender or the heterogeneity of returns among women or among men. For example, as the proportion of women entering medicine and law has increased (as we observe empirically below) it would not be obvious whether, for these professions, the historical rate of return for women or the overall rate of return for both sexes would be the more relevant for our purposes. Only a study that collected students' actual perceptions of returns could resolve this issue. Nevertheless, even in the absence of that, it is important to ask whether the aggregate returns to a field of study are associated with decisions to enter a field.

Participants in the Scottish School Leavers Surveys were distributed fairly similarly across fields of study over time, as exhibited in Table 3. The exceptions are allied health, mathematics and computing, and information studies, which experienced relative growth, and medicine, engineering and technology, which experienced relative declines. Comparison of Tables 2 and 3 shows that the expanding fields were of comparatively low status and the contracting fields were of comparatively high status.

5.4. Methods of analysis

The models are linear regressions, using the package "lm" in R. For the dependent variable, each respondent is given the standardized value of the measure of return (shown in Table 2) corresponding to the field of study of the course which they entered. Cohort, gender, social class and parental education are entered as categorical explanatory variables, and entrance qualification as a continuous explanatory variable standardized to have mean 0 and standard deviation 1 in the sample. Models without entrance qualification are shown as Model 1 in Tables 4–8 , and those controlling for entrance qualification are shown as Model 2.

Institutional sector is treated as a categorical explanatory variable (again without and with control for entrance qualifications). That is, for the main effect of that variable we are asking (for example) whether the occupational status of the fields entered tends to be higher in ancient universities than in newer universities. We use interactive effects to include in the models the other theoretical topics which we have

Table 4
Average marginal effect of 'intermediate class' and 'working class' compared to 'managerial & professional class', by sector of higher-education institution, on field of study defined as proportion in high-status occupations.

Dependent variable is proportion in high-status occupations	Model 1 (no control for attainment at secondary school)		Model 2 (control for attainment at secondary school)	
Sector (ref. Ancient universities)	AME	Standard error of AME	AME	Standard error of AME
Old universities	0.14*	0.06	0.22**	0.06
HE colleges	0.16**	0.05	0.28**	0.06
FE colleges	0.13*	0.06	0.083	0.08
Outside Scotland	−0.30**	0.10	−0.16	0.10
Parental social class (ref. Managerial and Professional)				
Intermediate class				
Ancient universities	−0.10*	0.05	−0.067	0.05
Old universities	0.010	0.06	0.0069	0.06
HE colleges	0.062	0.05	0.051	0.05
FE colleges	0.065	0.07	0.046	0.06
Outside Scotland	0.087	0.12	0.18	0.12
Working class				
Ancient universities	−0.16	0.09	−0.10	0.09
Old universities	−0.013	0.10	0.00089	0.09
HE colleges	0.14*	0.06	0.13*	0.06
FE colleges	0.22**	0.07	0.18*	0.07
Outside Scotland	0.21	0.20	0.29	0.20

The average marginal effects are calculated from the coefficients presented in Table A.1 in the on-line supplementary material (effects of other variables in the models are not shown here). Units are standard deviations of the dependent variable. The average change in the dependent variable over this period was about one tenth of a standard deviation.
**p < 0.01, *p < 0.05.

Table 5
Average marginal effect of 'Standardised UCAS points score' by sector of higher-education institution on field of study defined as proportion in high-status occupations.

Dependent variable is proportion in high-status occupations	Model 2 (control for attainment at secondary school)	
	AME	Standard error of AME
Ancient universities	0.26**	0.03
Old universities	0.18**	0.04
HE colleges	−0.064*	0.03
FE colleges	−0.16**	0.04
Outside Scotland	0.12**	0.04

The average marginal effects are calculated from the coefficients presented in Table A.1 in the on-line supplementary material (effects of other variables in the model are not shown here). Units are standard deviations of the dependent variable. The average change in the dependent variable over this period was about one tenth of a standard deviation.
**p < 0.01, *p < 0.05.

Table 6
Average marginal effect of 'intermediate class' and 'working class' compared to 'managerial & professional class', by sector of higher-education institution, on field of study defined as selectivity.

Dependent variable is selectivity	Model 1 (no control for attainment at secondary school)		Model 2 (control for attainment at secondary school)	
Intermediate class	AME	Standard error of AME	AME	Standard error of AME
Ancient universities	−0.31**	0.05	−0.27**	0.05
Old universities	0.0015	0.06	−0.0060	0.05
HE colleges	0.028	0.05	0.018	0.04
FE colleges	0.054	0.06	0.044	0.06
Outside Scotland	−0.35**	0.11	−0.18	0.11
Working class				
Ancient universities	−0.40**	0.08	−0.34**	0.08
Old universities	−0.067	0.09	−0.072	0.09
HE colleges	0.060	0.06	0.043	0.06
FE colleges	0.12	0.07	0.096	0.07
Outside Scotland	−0.16	0.18	−0.011	0.18

The average marginal effects are calculated from the coefficients presented in Table A.3 in the on-line supplementary material (effects of other variables in the models are not shown here). Units are standard deviations of the dependent variable. The average change in the dependent variable over this period was about one tenth of a standard deviation.
**$p < 0.01$.

discussed above. For the interactive effect of sector and other variables we are asking, for example: does the gender or parental-education difference in the occupational returns of the fields entered vary across institutional sectors? Our treatment of institutional sector is similar to the approach of Triventi (2013a) and Zarifa (2012). Treating institutional sector as an explanatory variable does not presuppose any temporal ordering of students' decisions – that is, it does not presuppose that they choose institution first and then field of study. Controlling for sector in this way does no more than refine the scope of the comparison of the association of the dependent variable with the other explanatory variables.

Although interactions were a central interest, both parsimony and computational efficiency led us to undertake an exploratory process to identify a subset of all possible interactions to include in our final models. We focused on those interactive effects which correspond to questions of theoretical interest. We used F-tests to determine which two-way interactive effects to include, assessing for inclusion the possible interactive effects of cohort and gender, social class, parental education, and UCAS score, of institutional sector and these same variables, and of cohort and institutional sector. Interactive effects were included only if the corresponding F test was significant at the 10% level or lower. For the sake of comparability, an interactive effect that was included for one dependent variable was included for all dependent variables. Our models thus include interactive effects for cohort by gender, UCAS score, and institutional sector; and for institutional sector by gender, social class, and UCAS score.

Interpretation of interaction terms can be complex, but an effective way of presenting them is by means of average marginal effects. The average marginal effect of an explanatory variable may be thought of as the effect of that variable, conditional on the other explanatory variables in the model, averaged over the values of the explanatory variable (Brambor, Clark, & Golder, 2006). This averaging is necessary where there are interactive effects since the effect of one explanatory variable is then different at different values of the other explanatory variable involved in the interaction. Because of the averaging, the effect of the variable in question may be interpreted as its average effect across all the levels of those variables with which it also has an interactive effect.

Table 7
Average marginal effect of 'Standardised UCAS points score', by sector of higher-education institution, on field of study defined as selectivity.

Dependent variable is selectivity	Model 2 (control for attainment at secondary school)	
	AME	Standard error of AME
Ancient universities	0.30**	0.03
Old universities	0.078*	0.04
HE colleges	−0.014	0.03
FE colleges	−0.037	0.04
Outside Scotland	0.23**	0.04

The average marginal effects are calculated from the coefficients presented in Table A.3 in the on-line supplementary material (effects of other variables in the model are not shown here). Units are standard deviations of the dependent variable. The average change in the dependent variable over this period was about one tenth of a standard deviation.
**$p < 0.01$. *$p < 0.05$.

This is explained further when the first results of this kind are presented below (in connection with the upper panel of Table 4). The calculations were performed using the package 'margins' in R (Leeper, 2017). Average marginal effects are the main means by which we present the results of interactive effects below. The full models are available in the on-line supplementary material.[9]

Our main attention is to statistical significance, examining the strength of evidence that there is an association between students' characteristics and various measures of return. However, it is also useful to be able to say how substantively important any such association is (Bernardi, Chakhaia, & Leopold, 2017). Because we are using standardized versions of each of the dependent variables that are recorded in Table 2, the most convenient metric for assessing substantive significance is units of standard deviation. All average marginal effects may be thought of in that way. As a benchmark to judge the substantive importance of the effects we discern, we note the average change in each dependent variable over the time period which our data cover: −0.12 for the social-class measure, −0.20 for the earnings measure, and −0.10 for the selectivity measure. In other words, the class and selectivity measures fell by about one tenth of a standard deviation over this period, and the earnings measure fell by two tenths of a standard deviation. As a standard of comparison, we consider whether the effects of social origins on field of study are large enough to compensate for these declines over time.

Our data do not allow us to make causal inferences or examine the direct and indirect effects of social-class origins on social-class destinations because we do not observe the actual individual returns to fields of study. Nevertheless, even with this limitation, it is valuable to learn whether returns to field of study serve as the mode through which reproduction occurs.

6. Results

We discuss first the results for the dependent variable defined by social class, and then compare these with the results for the metrics based on earnings and on selectivity.

Starting from the main effect of sector, the upper panel of Table 4 shows the average marginal effects of each sector compared to the reference sector (i.e. ancient universities; the full models from which the average marginal effects are computed are displayed in Table A.1 in the on-line supplementary material). The technique of average marginal

[9] We refer to 'marginal effects' rather than 'partial effects' to be consistent with the terminology used in the package 'margins', where Leeper (2017) uses the term to distinguish it from the partial derivatives which are the basis of the software.

Table 8
Average marginal effect of 'Female' compared to 'Male', by cohort, under three specifications of the dependent variable.

	Field of Study coded by:											
	Proportion in high-status occupations				*Average earnings*				*Selectivity*			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	AME	s.e. of AME	AME	s.e. of AME	AME	s.e. of AME	AME	s.e. of AME	AME	s.e. of AME	AME	s.e. of AME
Cohort 1 (1987, 1989, 1991)	−0.40**	0.04	−0.38**	0.04	−0.36**	0.04	−0.35**	0.04	−0.06	0.04	−0.04	0.04
Cohort 2 (1993)	−0.40**	0.06	−0.40**	0.06	−0.39**	0.06	−0.38**	0.06	0.12*	0.06	0.13*	0.06
Cohort 3 (1999, 2001)	−0.30**	0.04	−0.29**	0.04	−0.39**	0.04	−0.37**	0.04	0.09**	0.04	0.10**	0.03

's.e.' refers to the standard error.
The average marginal effects are calculated from the coefficients presented in Tables A.1- A.3 in the on-line supplementary material (effects of other variables in the models are not shown here).
Model 1 does not include a control for attainment at secondary school; Model 2 does. Units are standard deviations of the dependent variable. The average change in the dependent variable over this period was about one tenth of a standard deviation for the first status and selectivity measures, and about one fifth of a standard deviation for the earnings measure.
**$p < 0.01$. *$p < 0.05$.

effects means that these effects are averaged across all the values of the variables with which the sector term has an interactive effect in the model (Leeper, 2017, pp. 16 and 21–25). The upper panel of Table 4 thus shows that there is a tendency for ancient universities (the omitted reference category) and universities outside Scotland to be associated with fields that have lower-status returns. This is because the humanities and social sciences make up a larger share of courses in these universities than they do in the newer institutions (Table 1), and because, as is seen in Table 2, these fields are less likely to lead to higher social classes than most other fields.

Comparing Models 1 and 2 in the upper panel of Table 4, we can see that the sector differences are not explained by secondary-school attainment. If anything, the sector differences between ancient universities and both old universities and higher education colleges become larger, as do differences between old universities and further education colleges. Thus the differences between sectors are probably related to cultural prestige. We return to this point below, when we discuss the results based on selectivity of field.

6.1. Social class background and field of study choice

Our central interest is in the patterns of field choice among students from different class backgrounds, in different types of institutions, and over time. Contrary to status competition predictions, we find no evidence that students from more advantaged social origins pursue fields of study linked to higher social-class returns. On the contrary, the results summarized in the lower panel of Table 4, Model 2, show that in the ancient and old universities there are no significant differences among students from different social classes of origins in the choice of fields of study leading to high social classes of destinations. The results show also that in higher education colleges and further education colleges (the lower-status ranks of Scottish postsecondary institutions), students from working-class pursued higher-ranked fields of study compared to their counterparts whose parents held managerial and professional jobs.

Because we are using standardized versions of each of the dependent variables, the average marginal effects should be interpreted as changes in units of standard deviation in the dependent variable. Thus, for example in Model 2, which controls for secondary qualifications, the average marginal effect for working class students in higher education colleges is about 0.13 standard deviations higher than for students of the managerial or professional class in the same type of institution, and for working class students in further education the effect is 0.18 of a standard deviation higher. Using the benchmarks noted in the 'methods of analysis' section, this difference in the higher education colleges of just over one tenth of a standard deviation is approximately equivalent to the average fall in status for the whole sample over the period covered by the surveys (1987–2001). In that sense, the students from working-class backgrounds could compensate for that average fall by entering higher-education colleges. They could do even better than that by entering the further-education colleges. Hence the effects appear to bear substantive as well as statistical significance.

Thus in the higher education colleges and the further education colleges, the lower the class of origin, the higher the social-class return of the field entered (even after control for secondary-school attainment). In other words, working-class students use the newer sectors (created by the expansion of higher education) to enter fields that are more likely to lead to higher social-class destinations. This is because students from these social classes tend to study subjects such as engineering, technology and business which are mainly provided by these types of institutions (as shown in Table 1), which do not require high attainment at entry and which lead to high returns in the labor market. Although these patterns were enabled by the expansion of higher education which elevated the higher education college sector and enlarged the further education sector, tests for differences in the effects over time were non-significant (F-value for the three-way interactive effect of cohort by sector by class = 0.9, p = 0.60; full ANOVA table shown in Table A.1a in the on-line supplementary material).

6.2. Effects within institutional sectors

The positive association between secondary-school attainment and the social-class returns to the field of study is stronger in the ancient and old universities and in the universities outside Scotland than in the other two sectors. For example, Table 5 shows average marginal effects of 0.26 and 0.18 for ancient and old universities, respectively. Compared to the benchmark proposed in the 'methods of analysis' section, these correspond to around twice the average decline in the social-status destination of graduates in the period covered by the data, thus indicating that a gap of half a standard deviation in the measure of prior attainment approximately compensates for that average decline. In contrast, the slopes on prior attainment in the higher education and further education colleges are -0.064 and -0.16, respectively. This finding shows that students with higher prior attainment tend to choose fields with lower social status of outcome than students with lower prior attainment in the same sector. For example (from Table 2), they would tend to choose fields such as mathematics rather than fields such as engineering, whereas in the other sectors they tend to choose fields that lead to higher-status occupations.

6.3. Alternative indicators of returns to field of study

We now turn more briefly to the other two dependent variables, based on earnings and on selectivity. While for earnings the patterns are similar to those for the metric that uses high-status employment (see Table A.2 in the on-line supplementary material), the pattern for the metric based on selectivity is very different, so we display those results in Tables 6 and 7 (full models are presented in Table A.3 in the on-line supplementary material). Our findings show that entering more selective courses is associated with higher social class background and higher secondary-school attainment. In the ancient universities and in the universities outside Scotland, lower-class students are less likely to enter the more selective fields than higher-class students (Table 6). This pattern was far less evident when field of study was coded by occupational status (see Table 4; results for earnings are similar to those in Table 4). For example, whereas the average marginal effect of working class origins on field of study coded as occupational returns in ancient universities was -0.16 (Table 4, Model 1), it was -0.40 when field of study was coded by selectivity (Table 6, Model 1). Similar differences are evident when secondary school attainment is taken into account (Model 2, Tables 4 and 6). Part of what appears to be an effect of social origins on field of study as measured by selectivity turns out to be a reflection of the composition of those enrolled, simply because those enrolled are more highly selected. This sort of circularity reinforces our preference for ranking field of study based on labor market returns, as in Table 4.

Table 7 displays an analogous point for the association between selectivity and secondary-school attainment. When returns to field of study are measured by selectivity of the student body, secondary qualifications do not predict entry in selective fields of study in the higher education colleges and further education colleges (compare Tables 5 and 7). This finding on the statistical effect of prior attainment in these two sectors shows that prior attainment does not differentiate between fields of study in these two sectors, whereas it does seem to shape the choice of field by students in the other sectors.[10]

One interpretation of the results for selectivity as contrasted with social-class and earnings returns is that middle-class students can afford to enter fields that lead to lower labor market returns, presumably choosing these fields (such as the humanities and social sciences) on the basis of intrinsic interest rather than instrumentally (though they might choose them instrumentally on the basis of cultural prestige that is not reflected in monetary reward in the labor market). These same fields, as is evident from Table 2, are the most selective, and thus in a cultural sense probably of the highest prestige. However, these points apply only to the ancient universities and to universities outside Scotland. The newer sectors do not have many courses in the humanities, languages and literature and social sciences. In applied fields, by contrast, there is not a strong class or sector effect. Therefore, although the newer sectors (higher and further education) are likely to be enabling lower-class students to enter selective fields on the same terms as higher-class students, nevertheless lower-class students are not gaining equal access to fields of study in the oldest universities that have the highest cultural prestige.

6.4. Gender and field of study choice

One of the main points of contrast in the field of study choice occurs in relation to gender, so we compare the gender average marginal effects for different specifications of field of study side-by-side in Table 8. When field of study is defined by proportion in high-status occupations, or by average earnings, gender exhibits strong negative average marginal effects in each cohort. That is, women tend to enroll in fields with lower payoff, in occupational status or earnings, compared to men. By contrast, the negative average marginal effects largely disappear when field of study is coded by selectivity. This also illustrates that coding of field of study by selectivity can obscure aspects of social reproduction: because women tend to have higher academic performance than men, the selectivity coding makes it appear that women enter fields of study with equal or even higher status than men. However when field of selectivity is coded by returns, gender stratification is revealed, as women consistently enroll in fields with lower economic yields than men.

A more subtle difference revealed in Table 8 is that whereas the gender average marginal effect diminishes by about one fourth in the youngest cohort when coded by occupational status, no such shrinkage is evident when field of study is coded by average earnings. This pattern is consistent with other research on gender: women in Scotland are entering many traditionally male spheres of professional employment, but their average earnings continue to lag behind those of men (Paterson, Bechhofer, & McCrone, 2004, pp. 64–6 and p. 88).

7. Conclusions

This study challenges notions that fields of study serve as markers of vertical differentiation within postsecondary institutions. Our findings indicate that, when fields of study are ranked according their labor market returns, they do not magnify class stratification. This is revealed when returns to field of study are measured in terms of social class or earnings. By contrast, rating field of study according to selectivity obscures the lack of social reproduction. The association between social origin and selectivity of field of study is mainly, though not entirely, a simple reflection of the correlation between social origins and achievement and thus mainly reflects the descriptive fact that some fields are selective and that the mechanism of selection is positively correlated with students' social class of origin. Our findings thus replicate work on the U.S. by Davies and Guppy (1997), Goyette and Mullen (2006) and Zarifa (2012), and on France (Duru-Bellat et al., 2008), and contrast in some respects with findings for Sweden (Hällsten, 2010) and other European countries (Triventi, 2013b; Triventi et al., 2017) as well as Canada (Zarifa, 2012), where returns to field of study were more clearly a dimension of stratification. One caution about our analysis might be that our sample sizes allowed us to use only a three-class scheme of measuring social origin. It is possible, for example, that reproduction of finer class distinctions might be seen with a more detailed differentiation of origins. Nevertheless, the work of Evans and Mills (1998) on the validity of the Goldthorpe class scheme concluded that using classes similar to the ones which we have used did not lose very much validity when compared to fuller schemes of classification.

Importantly, the patterns we uncovered differed by institutional setting. Our results indicated that the reason returns to field of study do not serve as a dimension of social reproduction in the Scottish case is that persons from disadvantaged origins are overrepresented in the fields with higher labor market returns in the less prestigious, newer universities and colleges. To understand how opportunities are widened or restricted, it is essential to examine returns to fields of study in an institutional context. This, too, is a point made by several authors who analyzed other countries, such as Triventi (2013b) on eleven European countries, Duru-Bellat et al. (2008) on Germany and France, Reimer and Pollak (2010) on Germany, and Zarifa (2012) on the U.S. and Canada. A clue to the explanation of our finding on institutional differentiation is provided by the conclusion reached by Triventi et al. (2017) that, although there was differentiation by field of study in Italy, there is no analogous differentiation by institutional type. They comment (p. 30) that the relative prestige of Italian universities is not a strong influence on students' choices, which is a contrast to Scotland (and the rest of the UK).

[10] As with the first dependent variable, we re-ran these models excluding medicine and humanities. Again, the coefficients estimated from this re-run model had high correlations with the corresponding coefficients in the full models: 0.90 in the case of the earnings dependent variable, and 0.82 in the case of selectivity.

Scotland thus shows that the absence of social reproduction by returns to field of study is consistent with a less selective system than the French Grandes Ecoles, and a less institutionally stratified system than in the U.S. Why Scotland stands out in these international comparisons will require further investigation, but one reason may be its unusual combination of high participation and institutions that are informally differentiated by the market for student places rather than formally. In such circumstances, students may choose in relatively unconstrained ways among fields of study, and the social constraints on choice operate through the more visible status distinctions among institutions.

In contrast to the findings for class stratification, and also consistent with U.S. research (Zarifa, 2012), returns to field of study in Scotland are a mechanism of gender inequality. We extend past research by exploring this pattern over time, finding that the link between gender and returns to field of study has receded with respect to occupational returns but not for earnings. Thus, our paper shows that it is important to distinguish between earningsreturns and returns in terms of social-class prestige: the patterns, though similar, are not identical, and there is a particularly important distinction with respect to gender. The expansion was associated with women making relative gains in terms of social-class prestige (and also selectivity), but not with respect to any change in their relative earnings.

Our paper also contributes to fields of study research by examining change during a period of great expansion. The most striking aspect of our cohort comparisons is stability in enrollment patterns despite expansion; the weakening gender effect on social-class prestige is the only major change in predictors across cohorts. Our results also show that as the pool of students increases through expansion, selective fields of study that maintain high standards tend to reduce their relative enrollment shares. For example, medicine drops by more than half, while allied health fields more than double. This seems likely to reflect a change in the student population composition.

Our data did not provide direct evidence on students' motivations, so there remains an element of speculation about the explanation for the patterns we have found. As we noted earlier, we measure the returns to fields of study by historical patterns, not by prospective students' own estimation of their own likely returns. It remains possible that students are responding to an intermediate variable that is correlated with returns and with field. However, we have been able to exclude some of these possibilities by our choice of variables and our strategy of modelling. By analyzing selectivity separately, we have been able to suggest explanations of some of the findings, such as that middle-class students can afford to enter fields that are not lucrative. By controlling for attainment in secondary school, we have controlled for the possibility that potential students use their own attainment as a predictor of their own future earning capacity, which might in principle have been an explanation of why fields that are very selective lead to higher earnings.

Our results tend to support a particular version of rational choice theory, in which young persons from lower-status origins choose more remunerative fields of study within the less prestigious institutional types. Thus, returns to fields of study do *not* constitute mechanisms of effectively maintained inequality; they represent a dimension of *horizontal* differentiation but not *vertical* differentiation. Though returns to fields of study preserve and magnify gender differences, in Scotland they do not play this role for differences in social rewards, whether we measure differentiation in terms of social class or earnings. Indeed, the newer, though less prestigious, sectors of higher education provide increased opportunities for young persons to pursue highly remunerative fields. Though qualitative differences between sectors may help preserve social inequality (Iannelli et al., 2011), fields of study do not.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi: https://doi.org/10.1016/j.rssm.2018.06.004.

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