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What Factors Contribute to Successful (Northern Ireland) Student Outcomes in Further Education? An Econometric Analysis

(Based on 2011/12 Performance Data)



Prepared by: Analytical Services, Department for Employment and Learning

Retention and achievement rates have been improving steadily in the further education sector in recent years. However, the Department for Employment and Learning (The Department) is aware of significant variation in the rates of successful outcomes within the sector – across different student types, subject areas and colleges, for example. It is recognised that using raw data alone to compare performance across the sector may not reveal the full picture and an in-depth statistical model has been developed to understand these differences in more detail. This paper reports the results of an investigation of the broad factors which affect the likelihood of success of final year enrolments from the further education sector in Northern Ireland, based on 2011/12 performance data. The results show that, even after adjusting for other characteristics (i.e., comparing students and colleges on a more like-for-like basis); some colleges perform better than others. ‘Subject studied’ matters for successful student outcomes, with core Science, Technology, Engineering and Mathematics (STEM) subjects offering a significantly lower likelihood of success. Also, we find that on an adjusted basis ‘level’ and ‘mode’ (ie full-time vs part-time) of study are important factors in explaining variance in successful outcomes among students. We find that the more affluent the area in which a student lives, the better their chances of success, after controlling for other (measurable) student and institutional characteristics. This is by no means a surprising finding and is found in other areas of education and training. This analysis is intended to assist colleges’ further direct pastoral care and student support; shape curriculum plans; identify and address weaknesses and “risk areas”; and identify/learn from best practice across the sector. While the Department has confidence in the output from this analysis it is recognised that the statistical model remains in development and the Department is keen to work with others including the further education sector to enhance it further.

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1. Background

- 1.1 This project has been commissioned following a recommendation from the Department's 'Quality and Performance: A Baseline Analysis' report (May 2010). The baseline analysis was commissioned by the Department following on from the publication of its strategy for quality improvement, 'Success through Excellence'. It underscores the Department's commitment to raising standards.
- 1.2 The purpose of the 2010 baseline analysis – and subsequent analyses – was to provide a quantitative assessment of DEL funded programmes and provision broken down by work area. It sits alongside and provides context to the many other internal and external mechanisms in place to assess the quality and performance of the Department's programmes and provision.
- 1.3 A key issue identified in the baseline analysis was the extent of variability in successful outcomes across the Department's skills provision. This included a number of high level observations, including some social groups being more likely to gain a qualification successfully than others and that retention and achievement rates vary across education and training providers and across subject areas.
- 1.4 In autumn 2010, the Department tendered for the appointment of an external expert (via Central Procurement Directorate) to work alongside DEL analysts to develop an econometric model capable of explaining further the observed variability in outcomes. Through that process Professor Vani Borooah (Professor of Applied Economics) and Dr. Mark Bailey (Senior Lecturer in Economics) both from the University of Ulster (School of Economics) were appointed.

- 1.5 The Department provided the external experts with the Further Education Leavers Survey (FELS) datasets. The external experts carried out preliminary analysis of the dataset, trained the DEL analysts how to use a particular statistical software package (STATA), proposed a well established methodology for use in this area and provided technical support in the application of that methodology. Professor Vani Borooah has reviewed the output of the econometric model and concluded that, while there is potential for the model to be developed further particularly by improving the coverage of the underpinning data in some areas, overall it forms a sound basis for assessment.
- 1.6 DEL analysts undertook a pilot project to investigate variance in the 2007/08 and 2008/09 FE data under the guidance of the external experts, who provided a quality assurance role on the pilot project and its findings. During 2012 the Department undertook an analysis of the 2010/11 FE outcome data. Whilst the research findings were not published they were shared with FE Governing Bodies and the Education and Training Inspectorate.
- 1.7 This report utilises **2011/12 FE data** as the most up-to-date information on professional and technical qualification outcomes in the FE sector. The Department is publishing this report alongside its annual Quality and Performance Report, following a period of engagement with the sector. Further iterations of the analysis will be conducted as new data become available in future years.
- 1.8 The model has been developed to augment the comprehensive information that is already available on college performance. It recognises that using raw data alone to compare performance across the sector may not reveal the full picture. It may be, for instance, that some colleges would be expected to deliver better outcomes given the nature of the students that they are dealing with. For example, a college may draw a larger proportion of its students from more affluent backgrounds than other colleges. We know

from other analysis that, typically, students from wealthier backgrounds are more likely to succeed. Likewise a college may specialise more in delivering provision in subject areas that typically have higher success rates. For example we know from other evidence that students studying health and care subject areas are more likely to gain a successful outcome (regardless of what college they go to) than those students studying science and mathematics subject areas. The question is, can all of the performance difference between colleges that is found in the raw data be explained by these issues?

1.9 The regression technique used in this paper (and outlined in detail at Section 4) enables the Department to analyse the raw data on a more sophisticated basis to answer this question; by adjusting each college's performance so that it can be compared on a more 'like for like' basis.

1.10 While the Department and the University of Ulster academics have confidence in the output from the regression model it is recognised that the model remains in development and the Department is keen to work with others including the FE sector to enhance it further. This report has been reviewed independently by Professor Neil Gibson (Ulster Business School), John Simpson (independent economic commentator) and Professor Allen Thurston (Queen's University Belfast) who have provided valuable feedback. However any errors or omissions in the report remain the responsibility of the authors.

2. Introduction to the Further Education sector

2.1 The Further Education (FE) sector is the main provider of professional and technical education and training in Northern Ireland. The range of courses provided by the sector spans the Essential Skills of literacy, numeracy and ICT, professional and technical provision particularly at Levels 2 and 3, academic programmes, and Higher Education courses at intermediate level.

2.2 Following a merger in August 2007, the FE sector in Northern Ireland is made of up six colleges which incorporated the previous 16 Further Education colleges. Northern Ireland's six FE colleges are listed below:

- Belfast Metropolitan College;
- Northern Regional College;
- North West Regional College;
- South Eastern Regional College;
- Southern Regional College; and
- South West College.

2.3 In 2011/12, the number of enrolments in FE Professional and Technical courses was 153,075. This represents significant growth over the long term with enrolment numbers having grown by a fifth over the past decade.

2.4 The FE sector continues to engage successfully with those students from more deprived backgrounds. Almost a quarter (22%) of FE participants are drawn from the 20% most deprived regions (according to the Northern Ireland Multiple Deprivation Measure) in 2011/12. This compares with 14% of full time first year Northern Ireland students at Northern Ireland Higher Education Institutions in 2011/12.

2.5 Over the period (2003/04 to 2011/12) the retention rates¹ of FE students averaged 88% and average achievement rates² were 69%. In the 2011/12 academic year retention and achievement rates were 88.5% and 84.2% respectively. This indicates that the FE sector has been able to maintain and improve its performance in recent years, which is very positive given the growing number of enrolments and particularly the increase in the numbers drawn from the more deprived areas in Northern Ireland.

2.6 The Department is responsible for the policy, strategic development and financing of the statutory FE sector. This includes curriculum policy to ensure that colleges' provision is focused on meeting the needs of the Northern Ireland economy. Quality improvement is also a key strategic priority for the Department, an important element of which is monitoring colleges' performance in terms of learner retention, achievement and success.

3. Defining 'Success'

3.1 In this analysis, a successful outcome is defined as an enrolment that enters the final year of their course (including one year courses) and who **fully** or **partially**³ achieves the (professional and technical) qualification they were aiming for. In other words, success is a function of retention (the proportion of final year students who complete their course) and achievement (of those

¹ The proportion of final year students who complete their course. The vast majority of FE enrolments are on courses of one-year or less.

² Of those that complete their course, the proportion who achieve the qualification they were aiming for.

³ Partial achievement is recorded when: the qualification for which a student has enrolled has not been achieved in full, but when either (a) a student achieves a certified component of the intended qualification – for example, a QCF Award instead of a QCF Certificate, or a QCF Certificate instead of a QCF Diploma; or (b) if a student does not achieve a certified component of the intended qualification, but still achieves 50% or more of the intended qualification – for example, 50% or more of the QCF units. It should be noted that 50% or more of QCF qualifications is based on units achieved and not on credits, because even though credits would be a more accurate measure of achievement, credit information is not readily available to colleges from the examination results provided by awarding organisations. 'Partial' achievement represents a small proportion of overall success – around 7% in 21011/12.

that complete their course, the proportion that achieve the qualification they were aiming for), that is:

- **Success Rate = Retention Rate X Achievement Rate**

3.2 In 2011/12, 81% of all FE Professional and Technical enrolments were in the final year on their course.⁴

3.3 Both these attributes – retention and achievement – are identifiable within the FELS dataset, which contains individual data on those enrolments that enter the final year of their course and their level of achievement.

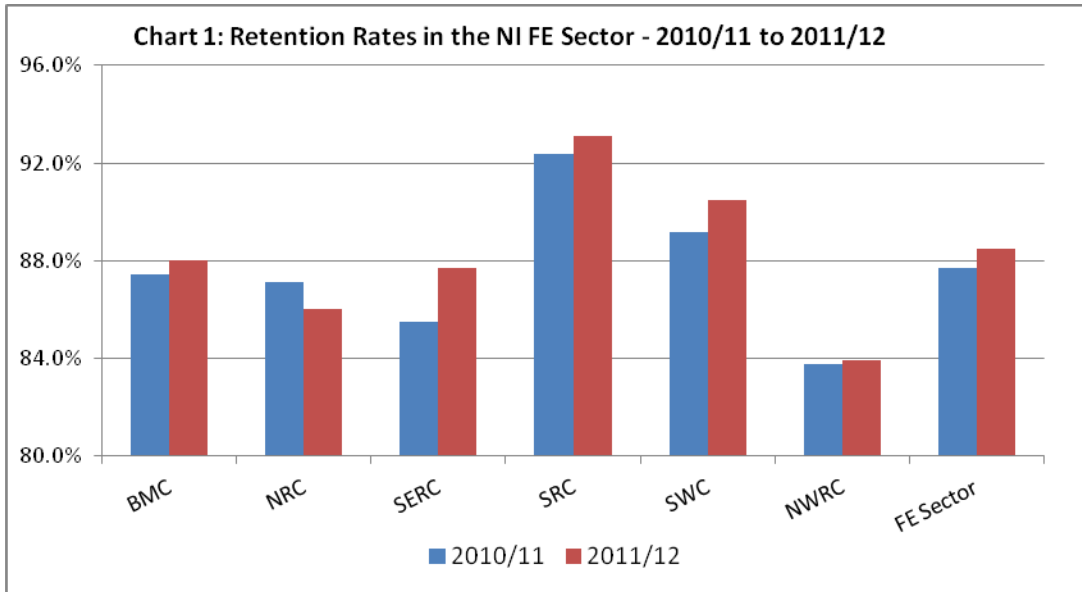
3.4 Having defined success, it is also necessary to define those who did not succeed. The FELS dataset captures a number of different outcome classifications in addition to ‘full’ or ‘partial’ achievement. For the purposes of this project, those who do not succeed are defined as final year enrolments whose outcome was recorded as ‘no achievement’, ‘result not yet known’, ‘study continuing’ or ‘results returned directly to students’. Section 4 provides further detail on the composition of the 124,437 final year enrolments in 2011/12.

3.5 The analysis focuses on the observed difference in success outcomes in the 2011/12 academic year. This represents the most recent data on professional and technical qualification outcomes in the FE sector. The analysis will be updated annually as further FELS datasets become available.

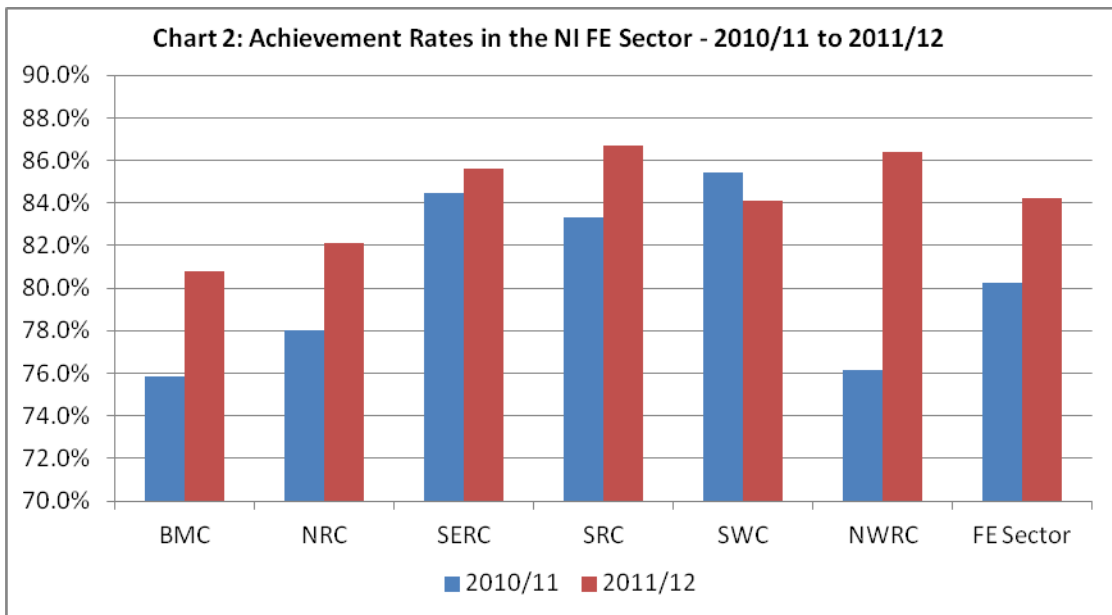
3.6 Chart 1, 2 and 3 show retention, achievement and success rates in the FE sector, by college, over the last two academic years - 2010/11 and 2011/12. The Department only began publishing annual FE retention and

⁴ The vast majority of FE students are on courses that last for one year or less.

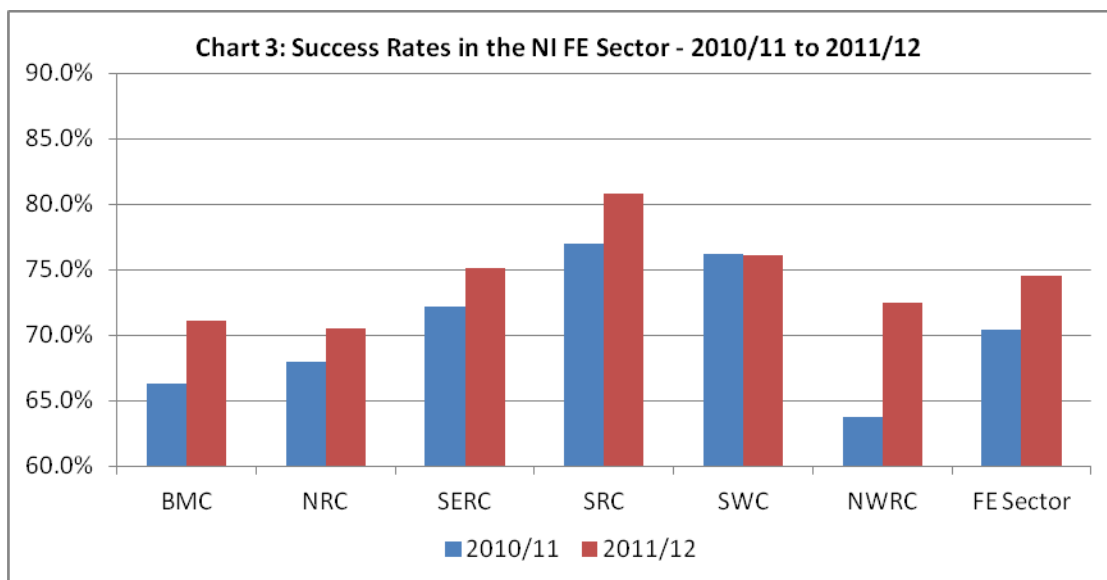
achievement data from the 2010/11 academic year onwards after a period spent working with the Sector to improve data quality and completeness issues.



(Source: Further Education Leavers Survey)



(Source: Further Education Leavers Survey)



(Source: Further Education Leavers Survey)

3.7 In terms of achievement performance **Chart 2** demonstrates that achievement rates have improved significantly over the last two academic years. This improvement is consistently identified across all colleges (with the exception of SWC) and the gap between the highest and lowest performing college is relatively small (5.9 percentage points) and has been decreasing. However, it is evident from **Chart 1** that retention rate performance has been more variable across the sector in recent years. In combination these movements have led to increasing success rates although there remains room for improvement and the Department and the sector are focussed on maintaining strong progress.

3.8 In addition, a performance gap remains between colleges' success rate performance (**Chart 3**). The question is, can this performance gap be explained by the types of student that the colleges recruit and the types of courses they deliver? Establishing how much of this performance gap can be explained by student characteristics is a key objective of the statistical model the Department has developed.

4. The Econometric Model

4.1 An important question for the FE sector and policy makers more generally, is how the probability of a final year student gaining a qualification is influenced by his/her personal characteristics and circumstances, and the institutional characteristics of the college they attend. Understanding, for example, whether a male student is less likely to gain a successful outcome than a female student that is similar in all other respects apart from gender can help focus efforts and pastoral support towards those who need it most. In order to answer such questions a logit model was developed in which the dependent variable $Y_i=1$ if student i had a “successful” outcome (i.e., full or partial achievement) and $Y_i=0$ if he/she did not have a “successful” outcome.⁵

4.2 It is important to note that for an individual to be included in the econometric analysis they must have a complete data profile against each variable i.e., a valid data entry for each variable being modelled. If an individual has a missing data entry for any of the variables included in the model, that enrolment is automatically removed from the analysis. As a consequence two variables have been excluded from the analysis as they would have substantially reduced the sample size of the dataset used to estimate the model. The two variables are ‘social class’ (98% non-response rate) and ‘qualifications on entry’ (30% non response rate). The Department will seek to engage further with the FE sector as this model develops so issues associated with missing data are minimised, that all key explanatory variables are included and to ensure the results of the model are understood fully. It is through this process of engagement that the impact of the model can be maximised. Engagement with the sector and others has already

⁵ The logit equation is $\frac{\Pr(Y_i = 1)}{1 - \Pr(Y_i = 1)} = \exp\left\{\sum_{k=1}^K X_{ik} \beta_k\right\} = \exp\{z_i\}$ for K coefficients, β_k and for observations on K variables where $\Pr(Y_i = 1) = e^{z_i} / (1 + e^{z_i})$

proved helpful. Attached at **Annex 1** is the Department's response to the feedback received from the sector and others.

- 4.3 The Northern Ireland Multiple Deprivation Measure (NIMDM, 2010) score, which is based on super output areas, has been used as a proxy to assess social background. The NIMDM 2010 is the official measure of spatial deprivation in Northern Ireland. It provides relative deprivation ranks for 890 small areas in Northern Ireland with an average population of 2,000 people based on seven types of deprivation, including: *Income; Employment; Health and Disability; Education, Skills and Training; Proximity to Services; Living Environment; and Crime and Disorder.*
- 4.4 The 'Qualifications on entry' variable is an important indicator of 'distance travelled' in the FE sector. The Department has been unable to use 'Qualifications on entry' in its analysis. However, this is an area where it is keen to work with colleges to improve data robustness to ensure it can be reflected in future iterations of the research.

Data Overview

- 4.5 The 2011/12 FELS dataset contains 124,437 final year enrolments of which the number of final year completers is 110,072 – equating to a retention rate of 88.5%. 92,682 achievements (full and partial) equates to an achievement rate of 84.2% so that overall, the success rate for the FE sector is 74.5% ($88.5\% \times 84.2\% = 74.5\%$). The Department published data on retention and achievement for the first time in April 2012. This was followed by a further publication in December 2012 which set out the 2011/12 retention and achievement data, which forms the basis of this report. The data provide

performance analysis by subject area, college, level of study, type of provision, gender and age.⁶

4.6 The variables included in the econometric analysis are assumed to be independent, they are:

- Gender
- Age
- Adult dependents
- Child dependents
- Level of study
- Mode of study
- Ethnicity
- Marital status
- Disability
- Employment status
- Urban/rural domicile
- Social background
- Subject studied

4.7 Reducing the FELS dataset to eliminate incomplete data profiles produces a regression sample of 72,954 cases – more than half the number of final year enrolments (124,437). A full breakdown of how the reduced dataset (72,954 cases) compares to the overall FELS dataset (124,437 cases) is presented at **Annex 3**. In sum, the breakdown shows that the reduced (sample) dataset – on which econometric results are based – is broadly comparable with the larger (population) dataset. As would be expected there is some spread in variable profiles between the two but in general this is minimal and would not be expected to significantly skew the model.

⁶ ‘Professional and Technical Retention and Achievement Data in the Northern Ireland Further Education Sector for 2011/12’ (DEL, 2012)

4.8 Data quality on outcomes has improved significantly in recent years especially given the work of a College/DEL “Retention & Achievement” group and the focus on success within College Development Plans. If the FE outcomes data quality continues to improve each year, as the Department expects, it will improve the volume and quality of data available for econometric modelling. That said, a sample of almost 73,000 cases represents a significant and robust basis for modelling.

4.9 Using the 72,954⁷ sample the econometric model estimates the variables that most affect the probability of successful outcomes. Therefore, it is possible to estimate to what extent a change in a particular characteristic (individual and/or institutional) will affect the probability of success with all other characteristics unchanged. So, for example, it enables us to ask;

- *How does the college an individual attends affect their likelihood of success, after accounting for other potential influences (gender, social background, level of study etc.)?*

4.10 This econometric approach (logistic regression) is used extensively in numerous disciplines, including the medical and social science fields. In the medical field, for example, logistic regression is often used to predict the likelihood that a patient will get a given disease (e.g., diabetes) based on observed characteristics of the patient (age, gender, body mass index, results of various blood tests, etc). In the social sciences, logistic regression is used extensively to predict voting patterns, based on age, income, gender, race, state of residence, votes in previous elections, etc.

⁷ These are students who have fully or partially achieved the intended qualification and for whom there is a complete data profile.

4.11 The results of estimating the logistic equation on data for 72,954 FE students in 2011/12 are shown in **Annex 2**. Annex 2 also outlines in technical detail how results should be interpreted.

5. Results

Success outcomes differ across Colleges

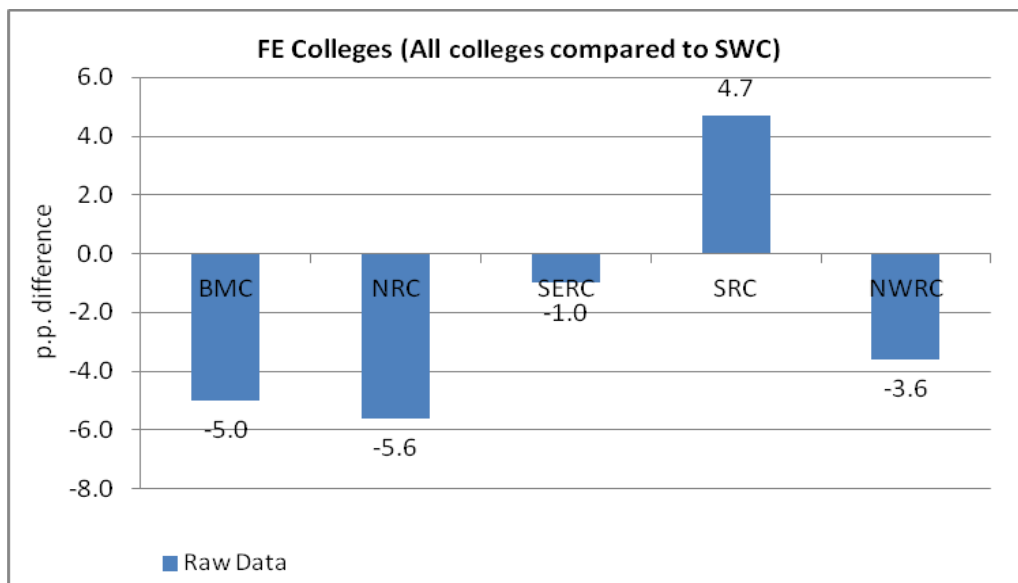
5.1 The raw data presented in Figure 2 (and represented by the blue bars in **Figure 3**) demonstrates that there is considerable variability in success outcomes across the FE sector by College, before any like for like adjustment is made through the logistic regression model. There is a 10.3 percentage point gap between the lowest performing college and the highest performing college, in terms of the rate at which students that had enrolled in those colleges remained on their course and achieved the intended qualification (the success rate). The blue bars show that in terms of the raw data the Southern Regional College success rate is ranked highest in the sector.⁸

5.2 However, using the success rate figures alone to compare performance across the sector may be misleading. It may be, for instance, that some colleges would be expected to deliver better outcomes given the nature of the students that they are dealing with. For example, a college may draw a larger proportion of its students from more affluent backgrounds than other colleges. We know from other analysis that, typically, students from wealthier backgrounds are more likely to succeed. Likewise a college may specialise more in delivering provision in subject areas that typically have higher success rates. For example we know from other evidence that students studying health and care subject areas are more likely to gain a successful outcome (regardless of what college they go to) than those students studying science and mathematics subject areas. The question is, can all of the performance difference between colleges that we find in the raw data be explained by these issues? The logistic regression analysis outlined above allows us to better answer that question by adjusting each college's performance so that it can be compared on a more like for like basis.

⁸ This information is calculated using the DEL statistical publication referenced at paragraph 4.4.

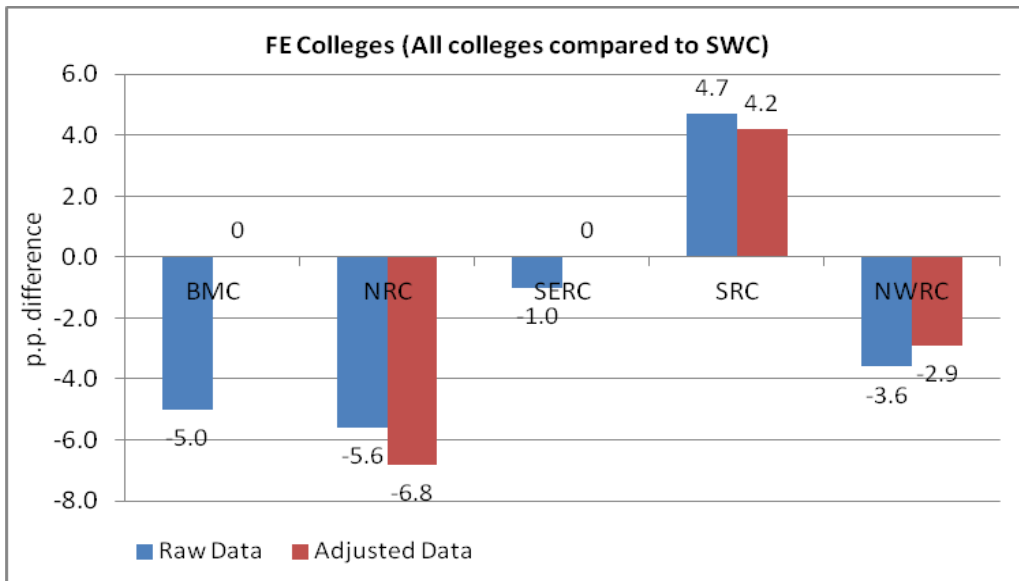
5.3 A residual (reference) category is chosen, in this instance SWC, to mirror the econometric modelling technique employed subsequently. SWC is chosen as the reference point as a mid to high-performing college in the 2011/12 raw data, in terms of successful outcomes - although in reality any college could be used as the reference category.

Figure 2: FE Sector Success Outcomes (2011/12) – Raw Data



5.4 Even after adjusting for other characteristics, some colleges perform better than others. The red bars in **Figure 3** show that applying the logistic regression technique to the final year enrolment raw data – to ensure like for like comparison – actually widens the gap between college success rates, albeit marginally. The performance gap between the highest (SRC) and lowest (NRC) college success rates widens from 10.3 percentage points to 10.9 percentage points. However, the results also show that following adjustment the gap in performance between BMC, SWC and SERC is eliminated such that there is no (statistical) difference in the likelihood of observing a successful outcome between each college.

Figure 3: FE Sector Success Outcomes (2011/12) – Raw Data v. Adjusted Data



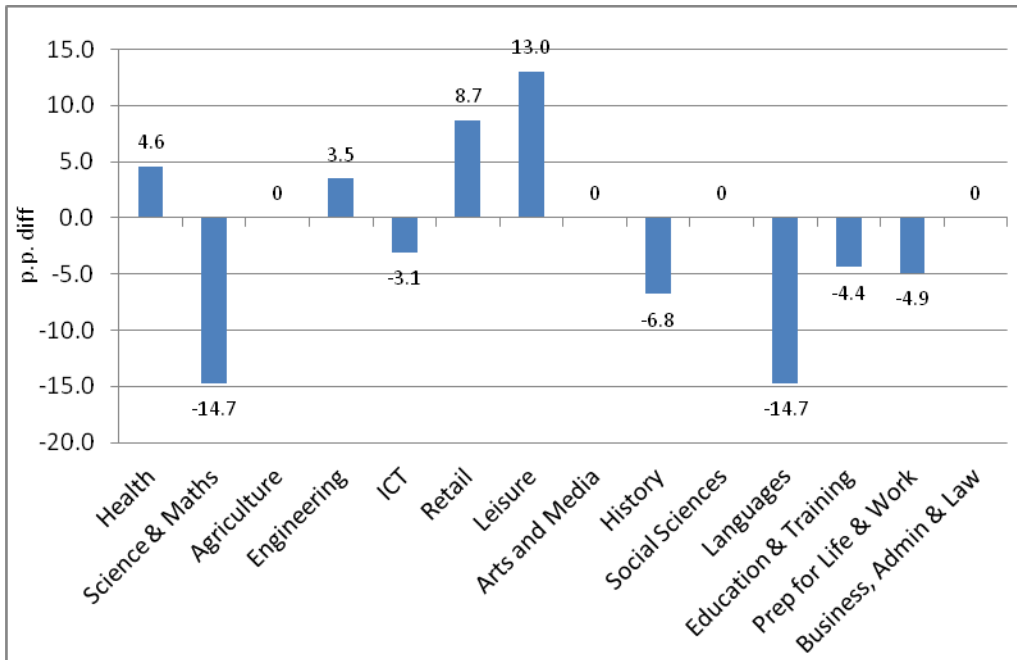
5.5 Overall **Figure 3** suggests that a final year enrolment's chance of gaining a successful outcome is affected by the college they attend. In other words, even after accounting for subject studied, mode of study, student gender and age, employment status, social background, etc, a significant performance gap remains between a number of colleges'. This would suggest that even if colleges had a broadly 'like for like' set of final year enrolments we would continue to observe variance in success outcomes across the sector. In other words, **an enrolment's likelihood of having a successful outcome is affected by the college they attend.**

In response to this work and the wider DEL Quality and Performance report, the Department has published an Action Plan which sets out the measures that the Department and colleges are taking to further improve retention and achievement and to address performance differentials where they exist.

Subject studied matters for successful outcomes

5.6 **Figure 4** illustrates the impact of subject studied on the likelihood of success, controlling for all other factors in the model.

Figure 4: FE Sector – Subject Area (Adjusted data)¹



¹Compared to 'Construction Planning and the Built Environment'

5.7 *Final year enrolments in Leisure, Travel and Tourism ('Leisure'), Retail and Commercial Enterprise ('Retail'), Health, Public Services and Care ('Health') and Engineering and Manufacturing Technologies ('Engineering') subjects are more likely to produce successful outcomes (+13.0pp, +8.7pp, +4.6pp and +3.5pp, respectively) compared to Construction, Planning and the Built Environment ('Construction') subjects, even after controlling for other measurable factors. On the other hand, final year enrolments in Science and Mathematics ('Science'), Languages, Literature and Culture ('Languages') and Information and Communication Technology ('ICT') subjects are significantly less likely to produce successful outcomes, compared to 'Construction' subjects (-14.7pp, -14.7pp and -3.1pp, respectively). Subject areas identified with a '0' in Figure 4 means that these subject areas are not*

(statistically) significant in the analysis. So, for example, the likelihood of observing a successful outcome for a final year enrolment in 'Social Sciences' is no more (or less) likely than that of a final year enrolment in 'Construction'.

[DN. It would be helpful to include reasons for variation in subject level success rates – could this reflect students taking the exam for maths/science or languages at school but also studying the subject in an FE setting to increase their chances of success, for example?]

Level and Mode of Study

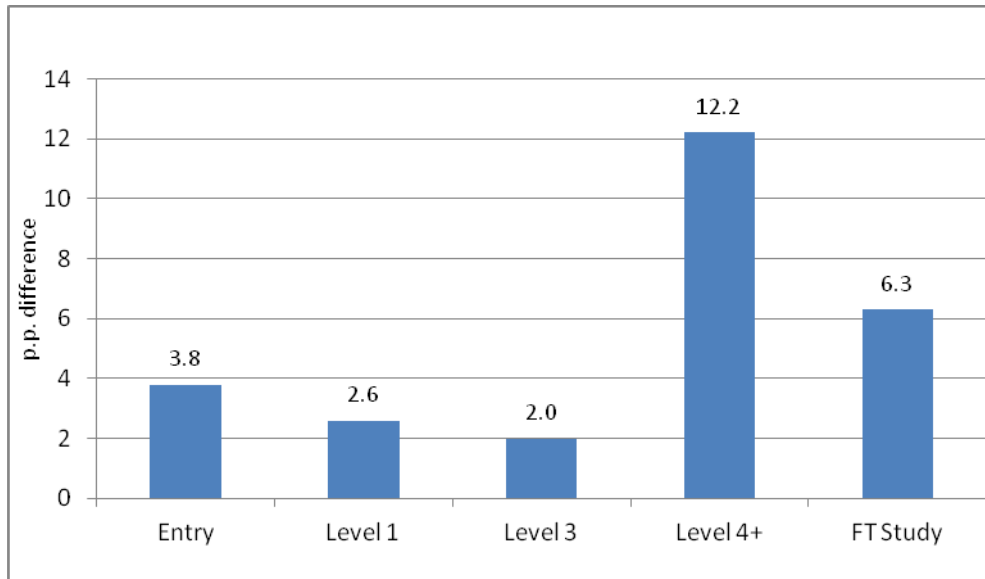
5.8 **Figure 5** illustrates that level and mode of study (*i.e. full time v. part time*) are important factors behind successful outcomes, even after adjustment to allow more *like-for-like* comparison. Final year enrolments at *Entry Level*, *Level 1*, *Level 3* and *Level 4* are associated with a higher likelihood of success, compared to final year enrolments at *Level 2*. Final year enrolments at *Level 4* in particular are 12.2pp more likely to result in a successful outcome. Interestingly, *Entry* level final year enrolments are more likely to result in a successful outcome than *Level 3* final year enrolments.

5.9 While the duration of courses at entry level and level 1 is likely to be less than for courses at level 2 and above, the fact that these produce better success rates for 'like for like' students reflects well on the FE sector's potential to progress learners to higher level courses. The analysis does suggest, however, that further improvement is possible, in particular in both level 2 and level 3 success rates.

5.10 *Full-time* study is associated with an increased likelihood of success; some 6.3pp higher than the reference group – *part-time* study. Age, gender and

disability were not (statistically) significant determinants of success outcomes in the FE sector in 2011/12.

Figure 5: Level² and mode³ of study



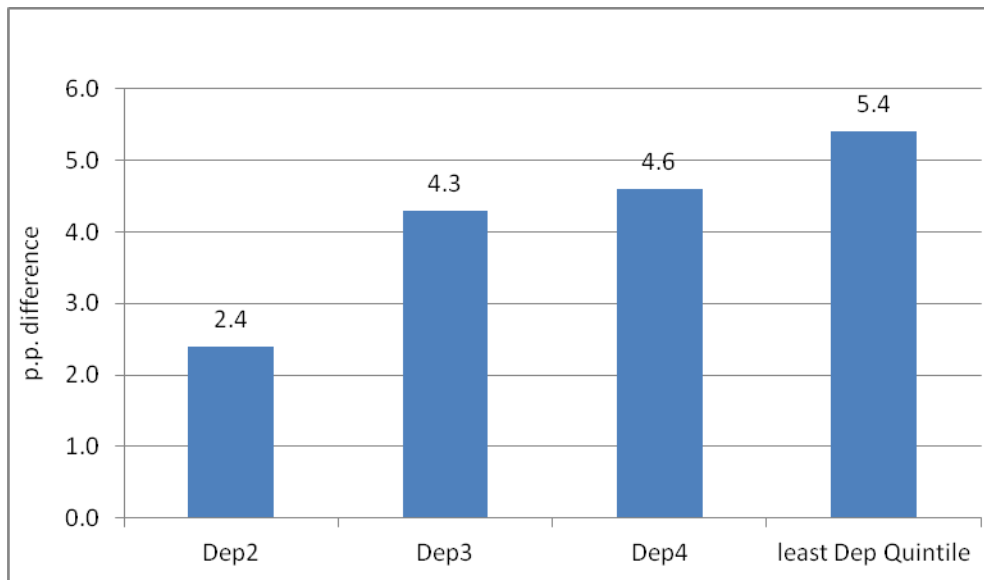
²Compared to Level 2

³Compared to PT Study

Social background

5.11 Based on the Northern Ireland Multiple Deprivation Measure (2010) final year enrolments are categorised - by home postcode - into deprivation quintiles [Dep1 – Dep5] such that Dep1 = most deprived areas and Dep5 = least deprived areas. On that basis, the analysis finds that the more affluent the area in which a final year enrolment lives, the better their chances of success, after controlling for other student and institutional characteristics.

Figure 6: Social Background⁶

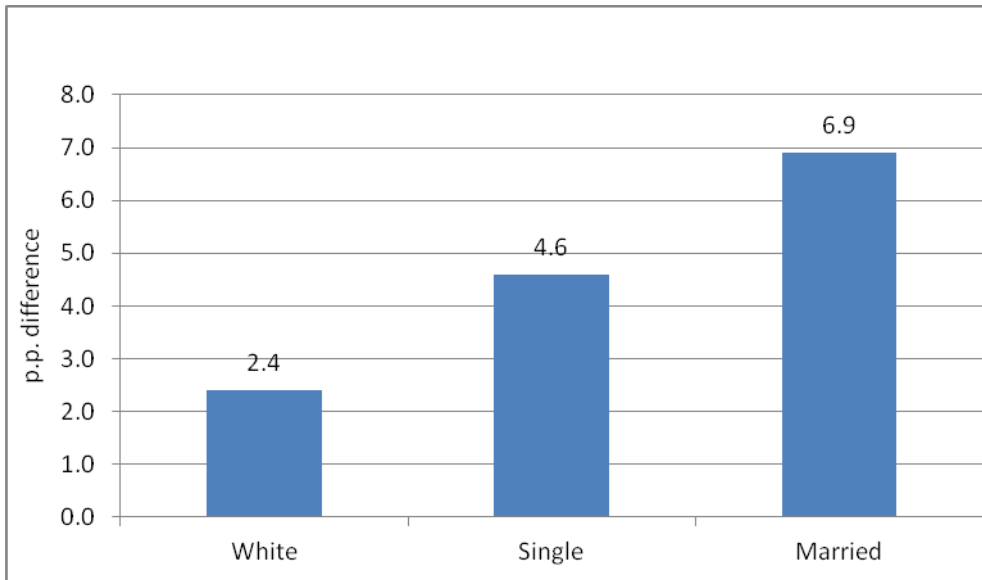


⁴ Compared to 'Most deprived' areas

5.12 **Figure 6** illustrates the relationship between social background and success outcomes; the more affluent a final year enrolment's social background the more likely they will succeed. A final year enrolment from the *least deprived* area is 5.4pp more likely to succeed, compared to an otherwise identical final year enrolment from the *most deprived* area. This is by no means a surprising finding and is found in other areas of education and training. However what is surprising, perhaps, is that the variability between the success rate achieved by students from the most affluent areas is only 5 percentage points greater than those students from the most deprived areas. While clearly there is room for further improvement, the access policies and pastoral care offered within the FE sector appear to be making an impact on keeping the gap between affluent and deprived students success rates at a relatively low level.

Other characteristics affecting success

Figure 7: Ethnicity⁵ and Marital Status⁶



⁵ Compared to 'non-white'

⁶ Compared to 'Divorced/Widowed'

5.13 The econometric model predicts that a final year enrolment of '*white*' ethnicity is 2.4pp more likely to succeed, compared to an otherwise identical final year enrolment of '*non-white*' ethnicity, after adjusting for other factors. Similarly, final year enrolments of '*married*' and '*single*' marital status are more likely to succeed, compared to *divorced/widowed* final year enrolments.

5.14 The employment status of final year enrolments affects the likelihood of success. Compared to an otherwise identical final year enrolment who is unemployed, someone in employment is more likely to have a successful outcome – full time employment (+5.5pp), part time employment (+3.6pp).

5.15 Regression results are presented in full at **Annex 2**, and a detailed comparison between the FELS dataset (124,437 cases) and the reduced

dataset (72,954 cases) is included at **Annex 3**. The Department's response to the feedback already received from the FE sector and others is presented at **Annex 1**.

6. Summary

5.16 The Department has developed an econometric model to analyse variability in successful outcome in the FE sector on a more 'like for like' basis. While the Department has confidence in the output from the regression model it recognises that the model remains in development and it is keen to work with others including the FE sector to enhance its analytical capacity further. The regression model offers a more sophisticated method to scrutinise the raw data, compared to drawing conclusions from the raw data only.

5.17 Based on an analysis of the 2011/12 FELS data this paper has provided an insight into the characteristics most likely to affect success outcomes across the FE sector. Based on the results it can be concluded that a student with the following characteristics will be (statistically) significantly *more* likely to succeed:

- attended Southern Regional College,
- white,
- single,
- married,
- employed (full time or part time),
- living in a less deprived area,
- living in a rural area,
- studying full time,
- studying a level four plus course,
- study a '*Leisure*', '*Retail*' or '*Health*' subject

5.18 A final year enrolment with the following characteristics will be (statistically) significantly *less* likely to succeed.

- attend Northern Regional College,
- non-white,
- widowed or divorced,
- unemployed,
- living in a more deprived area,
- living in an urban area,
- studying part time,
- studying a '*Science and Mathematics*', '*ICT*' or '*Languages*' subject

5.19 It is intended that this analysis will assist colleges to: shape curriculum plans; identify and address weaknesses and “risk areas”; shape student support and pastoral care; and identify/learn from best practice across the sector.

5.20 As indicated at section 2.6 above, quality improvement is a key priority for the Department, across all its funded provision, including in the further education sector. The desire to improve student outcomes further is also at the heart of the FE sector’s mission. The Department works with the FE sector in a number of ways to ensure quality of outcomes is maintained and enhanced. The main components include quarterly health checks and the annual College Development Planning (CDP) process.

5.21 These components of performance monitoring are also informed by data including: actual enrolments against a series of curriculum targets and funding targets; the key quality performance indicators of learner retention, achievement and success; and a range of financial and governance performance indicators. Each college (Chair and Director) has an annual accountability review meeting with the Department’s Permanent Secretary, where all aspects of college performance, governance and accountability arrangements are discussed. Also, each college prepares and submits to the Department an annual self-evaluation report and quality improvement plan.

5.22 As part of the evaluation of these documents, each college has a short inspection by the Education and Training Inspectorate to confirm the accuracy of their own self evaluation report. Finally, each college has an inspection by the Education and Training and Inspectorate every three years, with improvement plans and follow-up inspections being required in respect of areas of provision that are graded as “satisfactory” or worse. An important contributor to the Department’s drive for quality improvement is the work of the Quality Managers’ Forum held on a quarterly basis. The forum was established to share good practice and facilitate collaborative working towards quality improvement. There are separate quality improvement and inspection arrangements for HE in FE provision, which are carried out by the Quality Assurance Agency (QAA) for higher education.

5.23 The Department has shared the findings of this model with colleges and discussed them with Governing Bodies and the Education and Training Inspectorate. The colleges have committed to work with the Department to ensure the model can be developed further in future. There is a shared desire to ensure data coverage is maximised and additional variables (such as the “qualifications on entry” variable) which have the potential to cast further light on performance, are included.

5.24 This econometric model will not replace existing mechanisms for assessing performance but rather is intended to provide a further source of evidence to inform action so that a student’s chances of success are maximised.

**'WHAT FACTORS CONTRIBUTE TO SUCCESSFUL STUDENT OUTCOMES IN FURTHER EDUCATION? AN
ECONOMETRIC ANALYSIS'**

--STAKEHOLDER FEEDBACK / DEL RESPONSE--

Comment	DEL Response
<p>Consider whether the most appropriate model is being used and set out clearly the modelling limitations.</p>	<p>The model used was recommended by the academic community and has been used successfully to consider performance differentials in the schools sector in Ireland and in a number of other fields. The Department will keep the model under review and continue to work with the academic community/other stakeholders to ensure it is the best available for this purpose.</p> <p>The Department accepts that all models have limitations and has sought to highlight any limitations associated with the current model in this report. This report also sets out how the Department will seek to work with others to strengthen the model further.</p>
<p>The use of Northern Ireland postcode to access the social background of students means that all students from ROI are necessarily excluded from the analysis.</p>	<p>Accepted. The analysis only covers NI students. However the Department will work with the FE sector and others to see if alternative robust measures of social background can be used which would allow students that are from outside NI to be included.</p>

<p>Other potentially important variables are not included in the model including the size of the local grammar cohort, retention levels in non-grammar post primary, and the balance between 11-16 and 11-18 age group schools</p>	<p>The analysis is based on FELS data which does not collect this wider information. However, the Department is keen to work with the FE sector, and others, to develop the model and the underlying data driving it.</p>
<p>The likelihood of employment post qualification and levels of remuneration to be gained from employment is a variable (not in the model currently) which could help explain retention and achievement.</p>	<p>The FELS dataset does not currently provide comprehensive 'destination' information from FE. However, the Department is working with the sector to develop a survey similar to that conducted in HE via the Destinations of Leavers from Higher Education (DLHE) Survey to track leavers from the FE and training sectors. This information could potentially be used to develop the FE model further once available.</p>
<p>Compared to the overall student population some colleges are under- represented in the sample used for this analysis and others are over-represented. This could lead to bias.</p>	<p>The modelling technique requires that for each observation there is a complete data profile. NRC has 13.2% of enrolments in the full FELS dataset, this rises to 19.5% in the reduced dataset. This suggests that NRC is better at recording information for their enrolments. The Department is keen to work with the sector to improve data collection.</p>
<p>Is NIMDM (2010) the most effective proxy for social class?</p>	<p>The 'social class' variable in the FELS dataset has a 98% non-response rate. Therefore, the Northern Ireland Multiple</p>

	<p>Deprivation Measures (NIMDM, 2010) score, which is based on super output areas, has been used as a proxy to assess social background. The NIMDM 2010 is the official measure of spatial deprivation in Northern Ireland.</p> <p>NIMDM (2010) provides relative deprivation ranks for 890 small areas in Northern Ireland with an average population of 2,000 people based on seven types of deprivation, including: Income; Employment; Health and Disability; Education, Skills and Training; Proximity to Services; Living Environment; and Crime and Disorder.</p>
<p>How can student 'distance travelled' be measured more effectively in the model?</p>	<p>Value added or 'distance travelled' is an important aspect of what colleges do. The Qualification on entry variable is a key measure of distance travelled. Unfortunately it has not been possible to use this variable in the analysis because of data coverage issues. This is an area where the Department is keen to work with colleges to strengthen the analysis.</p>
<p>The model currently includes data for only one year only (2011/12) and the outcomes may change widely on a year to year basis.</p>	<p>Analysts conducted pilot studies using data from 2008/09 to 2010/11 and that analysis would suggest a broad degree of consistency in the results over time. Going forward the</p>

	<p>Department intends to update the analysis annually as new FE performance data become available. That additional analysis will cast further light on the variability of the results over time.</p>
<p>Colleges are keen to explore how this analysis could be further used to guide their actions.</p>	<p>The Department is keen to work with the FE sector to ensure the results of the model support college actions/decisions and impact is maximised.</p>

Annex 2

Table 1: (Logistic) Regression Analysis – Results (statistically significant variables)

Residual Variable	Variable	dy/dx	Z	P> Z
Compared to SWC				
	NRC***	-6.8	-10.44	0.000
	SRC***	4.2	7.20	0.000
	NWRC***	-2.9	-4.29	0.000
Compared to 14-19 yr old				
	20-24 yr old***	-1.7	-3.27	0.001
Compared to non-white				
	White***	2.4	2.14	0.032
Compared to Widowed & Divorced				
	Single***	4.6	4.98	0.000
	Married***	6.9		
Compared to Unemployed				
	Employed - Full time***	5.5	11.47	0.000
	Employed - Part time***	3.6	8.12	0.000
	Inactive***	2.9	6.90	0.000
Compared to Rural domicile				
	Urban domicile***	-3.4	-8.94	0.000
Compared to Deprivation Quintile 1 (most deprived)				
	Deprivation Quintile 2***	2.4	5.05	0.000
	Deprivation Quintile 3***	4.3	8.83	0.000
	Deprivation Quintile 4 ***	4.6	9.36	0.000
	Deprivation Quintile 5 (least deprived)***	5.4	10.41	0.000
Compared to 'Construction'				
	Health, Public Services & Care***	4.6	4.97	0.000
	Science and Mathematics***	-14.7	-10.48	0.000
	Engineering and Manufacturing***	3.5	3.30	0.001
	Information and Communication***	-3.1	-2.78	0.005
	Retail and Commercial Enterprise***	8.7	10.30	0.000
	Leisure, Travel and Tourism***	13.0	15.13	0.000
	History, Philosophy and Theology***	-6.8	-2.42	0.015
	Languages, Literature and Culture***	-14.7	-10.34	0.000
	Education and Training***	-4.4	-4.53	0.000
	Preparation for Life and Work***	-4.9	-3.97	0.000
Compared to Level 2 Study				
	Entry Level***	3.8	6.64	0.000
	Level 1***	2.6	5.59	0.000
	Level 3**	2.4	4.05	0.000

	Level 4***	12.2	18.36	0.000
Compared to PT Study				
	FT Study***	6.3	12.20	0.000

Key:	
dy/dx	Marginal effect compared to base variable
Z	Statistical significance of variable (see below)
P> Z	Probability of exceeding Z Value
Confidence Level	Critical Z Value
< 90% confidence - ' '	Within ±1.65
90% confidence or higher - '*'	Outside ±1.65
95% confidence or higher - '***'	Outside ±1.96
99% confidence or higher - '****'	Outside ± 2.58

Notes:

Interpretation of results

A positive (or negative) coefficient estimate indicates that the probability of “success” rises (or falls) with an increase in the value of the variable associated with the coefficient. However, the coefficient estimates do not provide a guide to the amount by which the probability of success increases or decreases in consequence of a change in the variable value.

For this reason, the estimation results are discussed in terms of “marginal probabilities” shown in the third column of Table 1 (p.27) as dy/dx. The *marginal probability* of “success”, associated with a determining variable (e.g., gender, age, college) is the change in the probability of “success” consequent upon an unit change in the determining variable, the values of the other variables remaining unchanged (held at their mean values). For discrete variables⁹, the marginal probabilities refer to changes consequent

⁹ A variable that takes values from a finite or countable set, in this case the outcome is success (or not).

upon a move from the *residual (or reference) category*¹⁰ for that variable to the category in question.¹¹

So, for example, compared to an otherwise identical final year enrolment, an urban domiciled enrolment is 3.4 percentage points less likely to have a successful outcome. This result is significant at the 99% level. Significance levels tell us how likely a result is due to chance. In this instance, there is a 99% chance of the result being true and, conversely, only a 1% chance of it not being true. The 90% threshold is generally accepted as the minimum standard in the academic literature.

In this analysis, variables are said to be significant when they are statistically significant at the 10% level or higher, i.e. the z-value is greater than ± 1.65 .

¹⁰ The residual categories for the variables are defined in the notes to Table 1.

¹¹ The marginal probability is defined as $\frac{\partial \Pr(Y_i = 1)}{\partial X_{ik}}$ and reported in Table 1 as **dy/dx**.

Mean value comparison of variables in the full and reduced FELS dataset 2011/12

This annex sets out a full breakdown of how the reduced dataset (72,954 cases) compares to the overall FELS dataset (124,437 cases).

Variable	Full FELS Dataset 2011/12 (Sample Size 124,437)		Reduced Dataset - for modelling (sample size: 72,954)		Difference in means (percentage points)
	No. of Observations	Mean Value	No. of Observations	Mean Value	
No. Final Year Enrolments (A)	124,437	-----	72,954	
No. Final Year Completers (B)	110,072	-----		
Retention Rate (B/A)		88.7%			
No. of Achievements – full & partial (C)	92,684		45,506		
Achievement Rate (C/B)		84.2%			
Success Rate (B/A*C/B)		74.7%		73.7%	1.0pp
Success by FE College:					
BMC	27,679 FYE = 22.2% of full dataset	71.1% (71%)	12,371 = 17.0% of reduced sample	71.1% (71%)	0
NRC	16,451 FYE= 13.2% of full dataset	70.5% (71%)	14,225= 19.5% of reduced sample	70.9% (71%)	0.4pp
SERC	22,069 FYE= 17.7% of full dataset	75.1% (75%)	11,139 = 15.3% of reduced sample	73.3% (73%)	1.8pp

SRC	24,222 FYE= 19.5% of full dataset	80.8% (81%)
SWC	17,187 FYE= 13.8% of full dataset	76.1% (76%)
NWRC	16,829 FYE= 13.5% of full dataset	72.5% (73%)
Sector Total		74.5%

12,452 = 17.1% of reduced sample	78.8% (79%)	2.0pp
12,479 = 17.1% of reduced sample	76.8% (77%)	0.7pp
10,288 = 14.1% of reduced sample	71.5% (72%)	1.0pp
	73.7% (74%)	1.0pp

Female	63,897	51.3%
Male	60,540	48.7%
Sector Total	124,437	100.00%

38,326	52.5%	1.2pp
34,628	47.5%	1.2pp
72,954	100.00%	

Young	63,167	50.8%
Mid	16,364	13.2%
Old	44,848	36.0%
Sector Total	124,437	100.00%

39,071	53.4%	2.6pp
10,159	13.9%	0.7pp
23,703	32.5%	3.5pp
72,954	100.00%	

Adult Dependents	2,596	2.1%
No Adult Dependents	121,841	97.9%
Sector Total	124,437	100.00%

1,778	2.4%	0.3pp
71,176	97.6%	0.3pp
72,954	100.00%	

Child Dependents	8,687	7.0%
No Child Dependents	115,750	93.0%
Sector Total	124,437	100.00%

6,301	8.6%	1.6pp
66,653	91.4%	1.6pp
72,954	100.00%	

Studying level 0 (entry)	13,235	10.6%
Studying level 1	19,033	15.3%
Studying level 2	62,424	50.2%
Studying level 3	23,905	19.2%
Studying level 4 & up	5,840	4.7%
Sector Total	124,437	100.00%

6,948	9.5%	1.1pp
11,397	15.6%	0.3pp
37,006	50.7%	0.5pp
14,214	19.5%	0.3pp
3,389	4.7%	0
72,954	100.00%	

Full time study	16,724	13.4%
Part time study	107,713	86.6%
Sector Total	124,437	100.00%

10,719	14.7%	1.3pp
62,235	85.3%	1.3pp
72,954	100.00%	

White	105,504	97.6%
Non White	2,556	2.4%
Sector Total	124,437*	100.00%

71,458	98.0%	0.4pp
1,496	2.0%	0.4pp
72,954	100.00%	

* 16,377 (13.2%) missing observations

Single	74,318	77.3%
Married	17,776	18.5%
Divorced/Widowed	4,014	4.2%
Sector Total	124,437*	100.00%

57,458	78.8%	1.5pp
12,644	17.3%	1.2pp
2,852	3.9%	0.3pp
72,954	100.00%	

* 2,832 (2.3%) missing observations

Disability	13,575	13.9%
No Disability	84,432	86.2%

9,658	13.2%	0.7pp
63,296	86.8%	0.6pp

Sector Total	124,437*	100.00%
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* 26,430 (21.2%) missing observations

Employed - Full time	16,994	17.2%
Employed - Part time	15,930	16.1%
Unemployed	35,694	36.1%
Economically inactive	30,381	30.7%
Sector Total	124,437*	100.00%

* 25,438 (20.4%) missing observations

Urban domicile	78,183	65.3%
Rural domicile	41,543	34.7%
Sector Total	124,437*	100.00%

* 4,711 (3.8%) missing observations

Deprivation Quintile 1 (Most deprived)	27,127	22.7%
Deprivation Quintile 2	27,709	23.1%
Deprivation Quintile 3	25,542	21.3%
Deprivation Quintile 4	22,096	18.5%
Deprivation Quintile 5 (Least deprived)	17,252	14.4%
Sector Total	124,437*	100.00%

* 4,711 (3.8%) missing observations

Health, Public Services and Care	13,701	11.0%
Science and Mathematics	4,679	3.8%

72,954	100.00%	
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13,014	17.8%	0.6pp
12,934	17.7%	1.6pp
27,201	37.3%	1.2pp
19,805	27.2%	3.5pp
72,954	100.00%	

46,528	63.8%	1.5pp
26,426	36.2%	1.5pp
72,954	100.00%	

16,019	22.0%	0.7pp
17,803	24.4%	1.3pp
15,980	21.9%	0.6pp
13,512	18.5%	0.0pp
9,640	13.2%	1.2pp
72,954	100.00%	

8,064	11.1%	0.1pp
3,235	4.4%	0.6pp

Agriculture, Horticulture & Animal Care	647	0.5%
Engineering & Manufacturing Technologies	7,162	5.8%
Construction, Planning & Built Environment	5,505	4.4%
Information & Communication Technology	10,467	8.4%
Retail and Commercial Enterprise	12,296	9.9%
Leisure, Travel and Tourism	4,310	3.5%
Arts, Media & Publishing	4,911	4.0%
History, Philosophy and Theology	527	0.4%
Social Sciences	2,494	2.0%
Languages, Literature and Culture	7,390	5.9%
Education and Training	32,976	26.5%
Preparation for Life and Work	10,024	8.1%
Business, Administration and Law	7,348	5.9%
Sector Total	124,437	100.00%

403	0.6%	0.1pp
3,748	5.1%	0.7pp
3,544	4.9%	0.5pp
5,679	7.8%	0.6pp
7,335	10.1%	0.2pp
2,613	3.6%	0.1pp
3,002	4.1%	0.1pp
311	0.4%	0.0pp
1,641	2.3%	0.3pp
3,994	5.5%	0.4pp
20,924	28.7%	2.2pp
3,768	5.2%	2.9pp
4,693	6.4%	0.5pp
72,954	100.00%	

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