The evaluation of DEIS at post-primary level: Closing the achievement and attainment gaps

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Educational Research Centre

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Chapter 1: **Introduction**

Since the DEIS (Delivering Equality of opportunity in Schools) programme began in the 2006/2007 school year, the Educational Research Centre (ERC) has been evaluating it on behalf of the Department of Education and Skills (DES). The evaluation is attempting to monitor the implementation of DEIS and assess its impact on students, families, schools, and communities at primary and post-primary levels. A variety of methodological approaches have been used in the collection of evaluation data (e.g., questionnaire studies, large-scale achievement testing programmes, school visits, interviews, and focus groups). Many evaluation reports have been published, some of which concern DEIS primary schools in rural areas (Weir, Archer & Millar, 2009; Weir & McAvinue, 2013), DEIS primary schools in urban areas (Kavanagh & Weir, 2018; Kavanagh, Weir & Moran, 2017; Weir & Archer, 2011; Weir & Denner, 2013; Weir & McAvinue, 2012; Weir & Moran, 2014), and DEIS post-primary schools (McAvinue & Weir, 2015; Weir, McAvinue, Moran & O'Flaherty, 2014).

This report is the latest in a series of reports on the evaluation of the DEIS programme at post-primary level, and describes student attainment in terms of Junior and Senior cycle retention rates, and student achievement in terms of performance in the Junior Certificate Examination (JCE). The report continues the examination of trends in these outcomes over a fifteen-year period in DEIS and non-DEIS schools. In addition to what was done previously, it examines how student achievement relates to medical card possession (a proxy for low family income) and gender in DEIS and non-DEIS schools. Also, the data are used to examine the extent to which a 'social context' effect operates in schools. Such an effect refers to the extent to which student outcomes in a school are negatively affected by increasing densities of students from poor socioeconomic backgrounds, over and above the impact of the student's own background. The findings are compared with those reported by Sofroniou, Archer and Weir (2004) who conducted similar analyses using data from the JCE in 1998.

The DEIS programme

DEIS was introduced in primary and post-primary schools in Ireland in the 2006/2007 school year, and is aimed at providing supports to schools with high concentrations of students from socioeconomically disadvantaged backgrounds who are at risk of educational failure.

In order to get up-to-date, valid information on educational disadvantage in order to identify schools for inclusion in the programme, the DES asked the ERC in 2006 to conduct an assessment of levels of disadvantage in all schools nationwide. At primary level, this was done by surveying all principals about the socioeconomic characteristics of their pupils (for a detailed account of how this was done and how programme schools were identified, see Archer & Sofroniou, 2008). A survey was not used to assess levels of disadvantage at post-primary level, rather the ERC was given access to a variety of post-primary databases containing various educational and socioeconomic data, and the ERC used these data to produce a rank order of schools based on levels of disadvantage. This rank order was then used in the identification of schools for the post-primary dimension of DEIS. The development of that index was guided by the wording in Section 32 (9) of the Education Act (1998), in which disadvantage is defined in terms of both learning outcomes and social and economic factors (i.e., educational disadvantage exists when poor educational outcomes are related to student background factors). On this basis, for a school to be eligible for extra resources under DEIS, there

needed to be evidence that the school was experiencing educational problems (e.g., it was below average on the percentage of students retained to Junior Certificate) **and** had above average percentage enrolment of students from poor backgrounds (e.g., large percentages of medical card holders1). Therefore, the index needed to contain at least one educational measure and at least one socioeconomic measure. Following some exploratory work in which different combinations of variables were compared, the final index was based on adding the percentage of medical cards at Junior Cycle and the percentage of students that dropped out prior to completing Junior Cycle to the following variables: the percentage retention rate to Junior Certificate; an examination or Overall Performance Score (OPS) based on the average Junior Certificate Examination performance of all students in the school (a more detailed explanation of the OPS is provided later in this report) and the percentage retention rate to Leaving Certificate. In the case of each of the variables, averages for several years were used in the ranking process (see Weir, 2006 for more detail on the identification process). In its first year (2006/07), there were 203 post-primary schools in DEIS.2 By 2016/17, the number had reduced to 185 as a result of closures and amalgamations. However, in February 2017, the DES announced that it was admitting a further 14 post-primary schools to the programme bringing the total number of participating schools up to 199. The DES published a new DEIS plan in 2017 in which some additional supports to schools were announced (DES, 2017).

Since 2017, all post-primary schools participating in DEIS are entitled to the following:

- Additional grant aid based on level of disadvantage.
- Enhanced guidance allocation of 1.15 of the Pupil Teacher Ratio (non-DEIS allocation is 0.4).
- Enhanced rate of funding under the School Books Grant Scheme.
- Access to Home School Community Liaison (HSCL) services.
- Priority access to Schools Meals Programme.
- Access to range of supports under School Completion Programme.
- Access to Junior Certificate Schools Programme.
- Access to Leaving Certificate Applied Programme.
- Priority access to Centre for School Leadership.
- Priority access to a range of professional development supports.
- Expansion of NEPS provision in DEIS schools.
- Roll out of Friends Programme to all DEIS schools.

(Source: www.education.ie, 2018).

Monitoring of student outcomes as part of the evaluation

As well as monitoring aspects of the programme's implementation (e.g., the extent to which schools have taken up the 'Friends' programme), it is important that the evaluation includes the monitoring of student outcomes. There is a wealth of literature, both Irish and international, that shows a very strong and persistent relationship between poverty and educational outcomes (Reardan, 2011; Sofroniou, Archer & Weir, 2004; Weir, 2001). At primary level, standardised test data in reading and

1 The Junior and Leaving Certificate examination fees are waived for students whose families possess medical cards. The databases received by the ERC from the State Examinations Commission (SEC) contain an indication of whether or not individual students received a fee waiver on this basis.

2 The correct term for the programme is the School Support Programme under DEIS. However, DEIS has replaced the SSP in common parlance, and a decision was taken to use the term 'DEIS' here also.

mathematics collected as part of the evaluation show that the achievements of students in urban DEIS primary schools have improved on each of four rounds of testing between 2007 and 2016, but that their achievements are still well below the national norm (Kavanagh, Weir & Moran, 2017). The monitoring of outcomes for the evaluation at post-primary level has been greatly facilitated by the availability of population-level JCE data provided by the SEC for all post-primary schools nationally.

An earlier evaluation report (Weir, McAvinue, Moran, & O'Flaherty, 2014) examined change in retention levels, performance in the Junior Certificate Examination, and rates of medical card possession among students enrolled in DEIS post-primary schools over time. In the report's conclusion, Weir et al. (2014) noted:

> Outcome data, including student retention levels and performance in the Junior Certificate Examination, reveal increases in both since the programme was introduced. Although not clear cut, there are indications that progress in these outcome measures may be associated with the introduction of DEIS. These outcome data require further monitoring in the future, and it will be important to examine (insofar as the data allow), the relationship between implementation levels and outcomes. It is planned to prepare brief updates on outcomes such as retention and examination performance as further datasets become available (Weir et al., 2014, p55).

While the DES publishes fairly regular descriptive reports on retention at second level [see, for example, DES (2018) for the most recent report], the analyses here differ in that they involve an examination of trends in Junior Certificate examination performance as well as in Junior and Leaving Certificate retention levels. In 2015, the longitudinal analyses were extended to include an additional year of data for Junior Certificate and Leaving Certificate retention (the 2008 entry cohort), and three additional years of data on Junior Certificate results for the 2012, 2013 and 2014 examination cohorts (McAvinue & Weir, 2015). The results confirmed those of the earlier study, with the authors noting:

> Extending the trend analyses in the current report provides slightly stronger evidence to suggest that the increases in achievement in the JCE overall and in the subjects of English and Mathematics are more marked in SSP than in non-SSP schools than was found by Weir et al. (2014). Trend analysis of retention data revealed similar patterns to previous analyses (i.e., retention rates increased over the period in both SSP and non-SSP schools but the magnitude of increase was greater for SSP schools). Also, cohorts from 2004 on, attending both SSP and non-SSP schools, were marked by a significant increase in trend in relation to both Junior and Senior Cycle retention. A finding that emerged from the current analysis but was not noted previously is that the magnitude of this increase in retention to Junior Cycle (but not Senior Cycle) was greater in SSP than non-SSP schools (McAvinue & Weir, 2015, p18-19).

The current report utilises retention data for the most recent entry cohorts (2009, 2010 and 2011) and the most recent JCE achievement data for students who took the examination in 2015, 2016, and 2017 in continuing the monitoring of these trends. It should be noted that the evaluation was designed within the constraint imposed by the inability to establish a control group. The preselection

of DEIS schools made it impossible to subsequently identify a matched control group of schools with similar levels of disadvantage. However, even if that had not been the case, a control group would not have been viable because it is not desirable to withhold treatment from pupils who could benefit from that treatment. It would be particularly unethical to withhold treatment when those additional resources had emanated from the exchequer on the basis of an identified need. The design of the analyses presented here rests on the existence of a comparison cohort of non-DEIS schools. The current analyses benefit from the fact that all schools nationally are represented, and therefore the outcomes are based on the population of DEIS and non-DEIS second level schools rather than on samples.

The current analyses are designed to replicate and extend earlier analyses reported by McAvinue and Weir (2015). The main aims are as follows:

- To examine the trend in the JCE overall and in JCE English and mathematics among the population of post-primary students up to 2016.
- To examine the trend in the JCE overall and in JCE English and mathematics among the population of post-primary students up to 2016 in DEIS and non-DEIS schools.
- To examine trends in Junior and Senior Cycle retention rates among up to the 2011 entry cohorts of post-primary students.
- To examine trends in Junior and Senior Cycle retention rates among the 2009, 2010 and 2011 entry cohorts of post-primary students separately for DEIS and non-DEIS schools.
- To examine trends in medical card possession in all schools, and separately in DEIS and non-DEIS schools.
- To place all of the above findings in the context of those reported on previously.

In addition, on this occasion the analyses will be extended as follows:

- To examine if the social context effect identified by Sofoniou et al. (2004) still exists and, if so, to examine if it is of the same magnitude as it was in 1998.
- To examine the relationship between gender and achievement in the JCE at two time points - 2007 (which may be regarded as baseline data) and 2016; to investigate whether boys or girls (or both) are implicated in the observed narrowing of the gap JCE outcomes over time.
- To examine the nature of the increases in achievement in the JCE by comparing the percentages of students opting for Foundation, Ordinary and Higher level in 2007 and 2016 (the former could be considered baseline data) and by comparing the percentages of students achieving each grade in JCE English and mathematics in 2007 and 2016.
- To examine the achievement gap between medical card holders and non-medical card holders in DEIS and non-DEIS schools.

Analytic approach

Multilevel modelling approaches were adopted for many of the analyses in the current report (that is, data were analysed in such a way as to take the clustered nature of the data into account). In relation to the trend analyses, two-level growth curve models were specified, with year at level one and school at level two, in order to model change in achievement and retention in schools over time. Such an approach has advantages over traditional approaches for analysing longitudinal data (such as repeated measures ANOVA or MANOVA). For example, these traditional approaches require that all subjects have an equal number of data points and those with any missing data points are deleted listwise (in the present study this would mean that any school that did not have data for every year of interest would be dropped from the analysis, leading to a considerably reduced dataset); multilevel models of longitudinal data do not impose this constraint. The approach taken allowed estimation of

fixed effects of interest: the initial achievement or retention level (mean intercept) and rate of change over time (mean slope) for the population as a whole. Random effects (i.e. the between school-variability in the individual intercepts and slopes) could also be estimated. The inclusion of school DEIS status as a time-invariant covariate allowed investigation of whether trends in achievement and retention varied significantly for schools in DEIS and not in DEIS.

In analyses exploring contextual school effects at a single point of time (i.e. the investigation of a social context effect in the most recent year for which data are available), two-level models were also specified, this time with students at level 1 and schools at level 2. Socioeconomic status (SES) was included in the models twice, once as an individual, student-level variable and once as an aggregated, school-level variable. This contextual model allows examination of the effect of school socioeconomic composition over and above individual SES. All multilevel analyses were undertaken using Mplus version 7 (Muthén & Muthén, 1998-2012).

Chapter 2: **Results**

Achievement in the Junior Certificate Examination

In line with earlier reports on the evaluation of DEIS at post-primary level, student performance in the Junior Certificate Examination (JCE) is described here using an Overall Performance Scale (OPS) adopted directly from that used by Kellaghan and Dwan (1995) in their analysis of the 1994 Junior Certificate results. Computing an OPS score involves the allocation of numerical values to the alphabetical grades awarded to JCE candidates in individual subjects and summing these values produce an index of a candidate's general scholastic achievement (Table 1). The OPS score is based on a student's performance in the seven subjects in which he or she performed best. The maximum possible OPS score is 84 (which is achieved by a student who is awarded seven "A" grades on Higher Level papers), while the lowest possible OPS score is 0 (where a student does not achieve at least a grade "F" on any of his/her best seven papers). The OPS score is considered to be a useful broad measure of a candidate's achievements in the JCE (Kellaghan & Dwan, 1995; McAvinue & Weir, 2014; Sofroniou, Archer & Weir, 2004). These OPS scores can then be aggregated to produce an index of school-level achievement in the JCE.

Table 1: Individual subject performance scale scores corresponding to grade categories at each examination level

Higher	Ordinary	Foundation	Score
A			12
B			11
C			10
D	A		9
E	B		8
F	C		7
	D	A	6
	E	B	5
	F	C	4
		D	3
		E	2
		F	1

Clearly, it is important to continue to monitor educational outcomes in DEIS schools. However, the change to the grading system in Junior Certificate English introduced in 2017, and which it is planned to extend to other subjects in the future, will make it impossible to continue to examine

trends in achievement in the way that it has been done in the current paper. The two marking schemes have many differences that make them incomparable. For example, there are fewer grades in the new system (6 vs 7), the boundaries for the grades have changed (the old top grade – A – was 85-100% while the new top grade – Distinction – is 90-100%, and the new scheme does not have the option of students taking the subject at Foundation level (geared towards the needs of students who might have difficulty with Ordinary or Higher level papers). A further issue may be even more problematic for a comparison of JCE data pre- and post- 2017. It appears, from preliminary analysis of JCE English grades in 2016 and 2017, that the change to the new scheme has been accompanied by an increase in students achieving higher grades. This is based on the outcome of an exercise carried out at the ERC in which the individual marks allocated in 2016 were converted to the 2017 grading scheme. This revealed that while the distributions for both years were similar at Higher level, at Ordinary level more students achieved higher grades (i.e., Distinction, Higher merit) in 2017 than in 2016 (Millar, 2018). Furthermore, if we assume that the 2017 cohort of students taking English at Ordinary level contained those that would have opted for Foundation level had it been available, that also suggests that the shift to the 'merit-based' system has been accompanied by some grade inflation. Any future examinations of long-term trends in achievement in the state examinations will require exploring ways of equating the old and new grading systems.

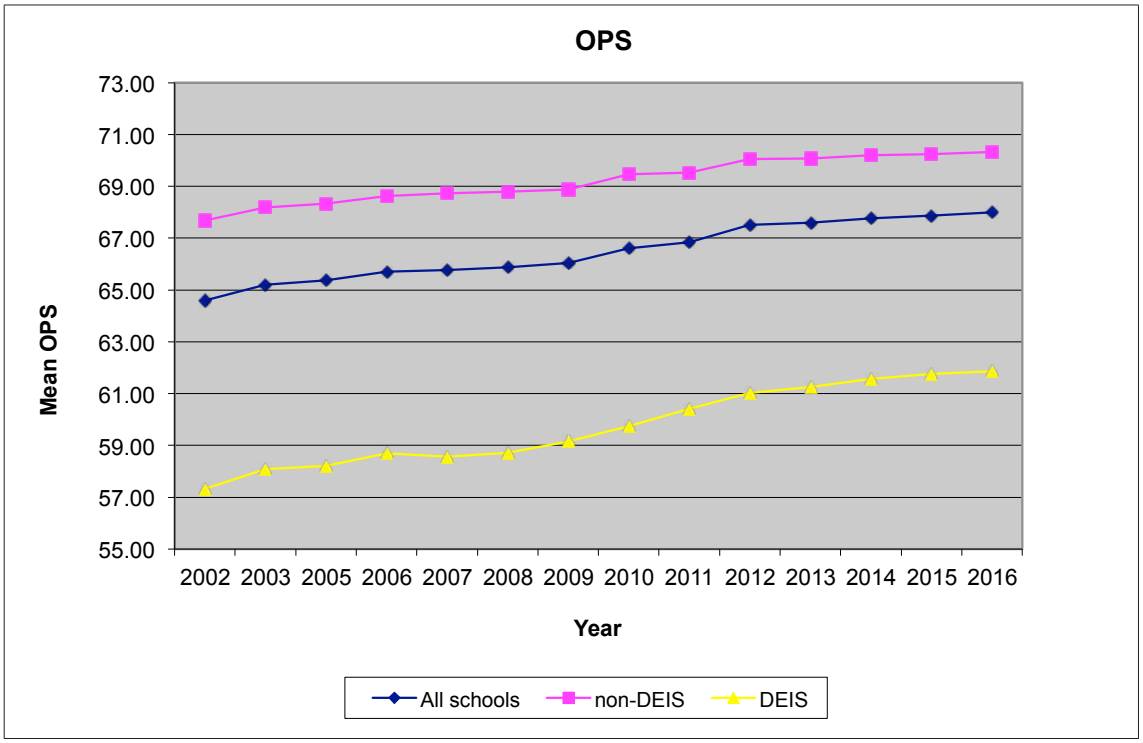
Overall performance

Figure 1 displays the school mean OPS score in the Junior Certificate Examination over a fifteen-year period from 2002 to 2016. The mean scores of DEIS, non-DEIS and all schools are depicted by separate lines.

The effect of time on school OPS was statistically significant, with an average annual rate of increase of .24 OPS points across all schools ($p < .001$) from 2002 to 2016. There was also a significant gap between non-DEIS and DEIS schools over this period. In 2002, the mean OPS score in DEIS schools was estimated at 10.5 points (approximately one standard deviation) lower than that in non-DEIS schools. The average annual rate of increase in non-DEIS schools from 2002 to 2016 was 0.19 OPS points, but was significantly higher ($p < .001$) for DEIS schools, at an average increase of 0.33 points per year, representing a narrowing of the gap in JCE achievement between DEIS and non-DEIS schools over the period.

In both 2002 and 2016, the mean OPS score of non-DEIS schools was roughly equivalent to seven C grades on Higher Level papers (at 67.7 and 70.3 OPS points in 2002 and 2016, respectively). In 2002, the average OPS in DEIS schools was 57.3 points, which is approximately equivalent to seven B grades on Ordinary Level papers or seven E grades on Higher Level papers. In 2016, the mean OPS in DEIS schools was 61.9 points, which is approximately equivalent to seven A grades on ordinary level papers or seven D grades on higher level papers (in reality, a student achieving an OPS of 57 or 62 will most likely have earned that score on the basis of a mixture of grades and levels). In other words, the increase in OPS in non-DEIS schools was not of sufficient magnitude to increase the average JCE grade, but the increase in DEIS schools equated to an approximate increase of one letter grade.

Figure 1: Average Overall Performance Scale score in the Junior Certificate Examination from 2002 to 2016 in all schools, DEIS schools and non-DEIS schools[3]



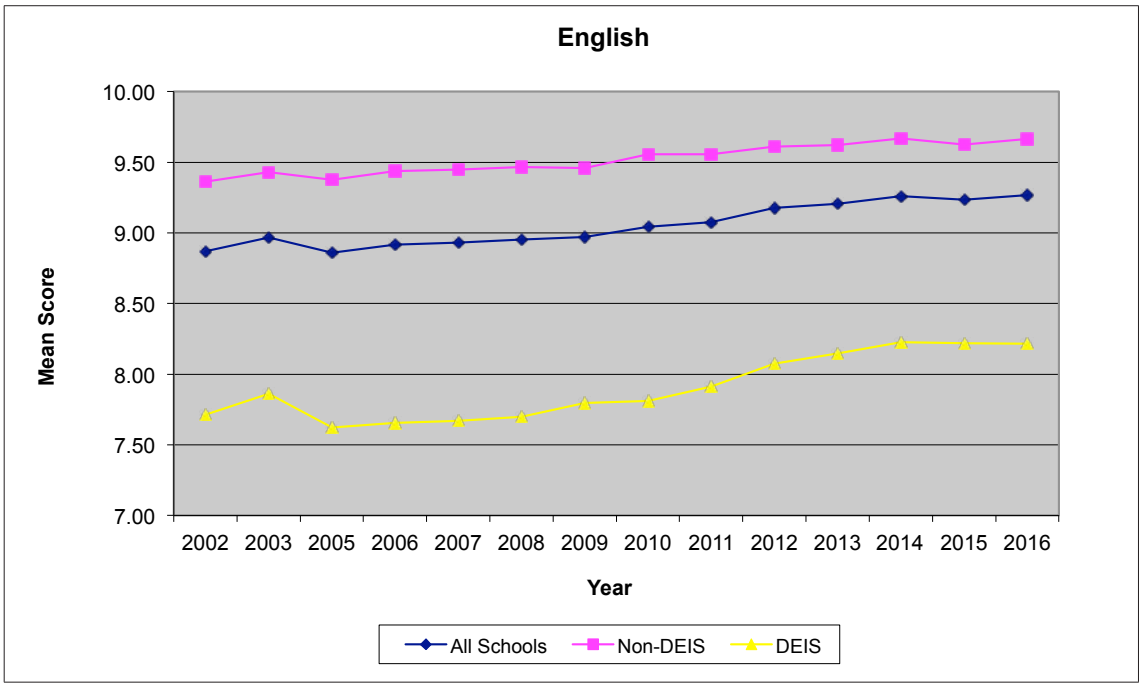
3 OPS data for 2004 were not available to the authors.

Junior Certificate English performance

In addition to looking at overall JCE performance, it is also possible to examine trends in performance in particular subjects, using the 12-point performance scale presented in Table 1.

Figure 2 displays the mean performance score for English from 2002 to 2016 for all schools, DEIS and non-DEIS schools. In 2002, the mean English score for all schools was estimated as 8.8 points. The effect of time on English scores was statistically significant (p <.001), with an average yearly increase of 0.03 points across all schools. In 2002, the gap between the mean English score in DEIS and non-DEIS schools was significant (p <.001) and estimated as 1.8 points, in favour of non-DEIS schools. In non-DEIS schools, there was an average increase of 0.02 points per year from 2002 to 2016, while in DEIS schools it was significantly higher (p <.001), at 0.04 points, indicating a narrowing of the gap in average performance in JCE English between DEIS and non-DEIS schools over time such that in 2016, the difference was around 1.4 points.

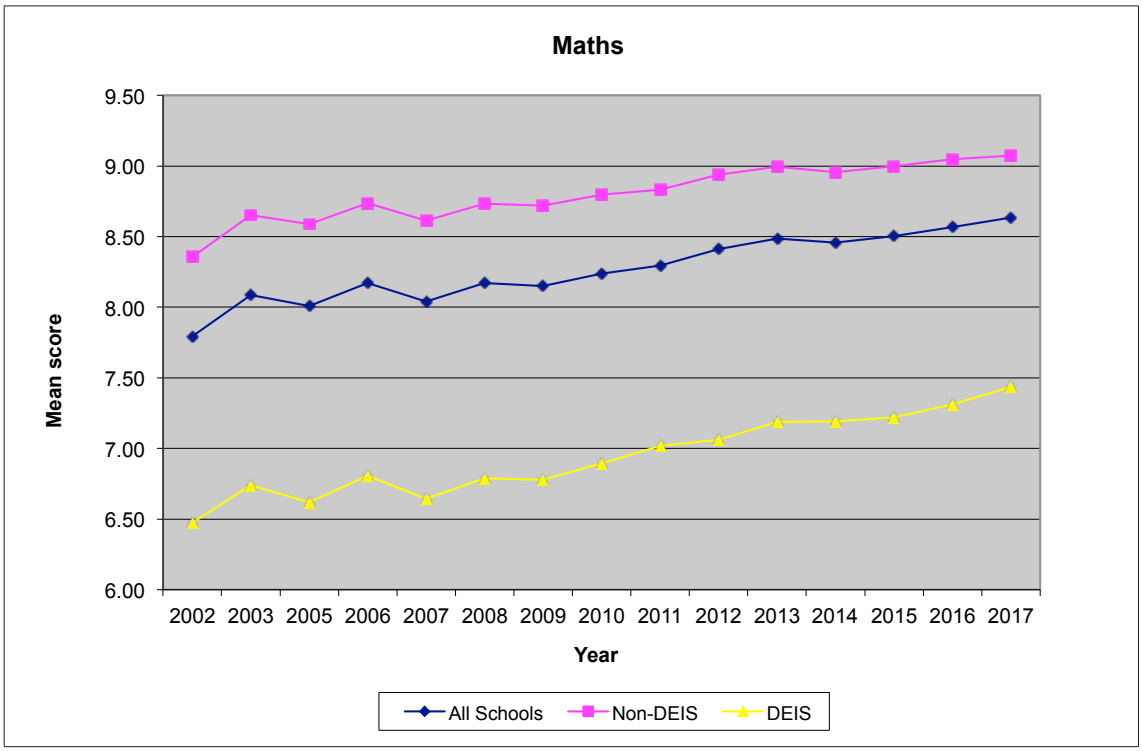
Figure 2: Mean Junior Certificate Performance Scale scores in English from 2002 to 2016 in all schools, DEIS schools and non-DEIS schools



Junior Certificate mathematics performance

Figure 3 presents the mean performance scores for mathematics from 2002 to 2017 in DEIS, non-DEIS and all schools.[4] When considering all schools together, there was a significant positive effect of time on mathematics scores, with an average annual increase of 0.05 points from a mean of 7.8 points in 2002. In 2002, the mean mathematics score of non-DEIS schools was significantly higher ($p < .001$), by 1.9 points, than the mean of DEIS schools. In non-DEIS schools, the rate of increase was 0.041 per year from 2002 to 2017, while in DEIS schools it was 0.014 higher, at 0.055 points per year. Again, the rate of increase in scores was significantly higher ($p < .001$) in DEIS schools than in non-DEIS schools over the period of interest, indicating a narrowing of the gap in average achievement between DEIS and non-DEIS schools over time, from 1.9 to 1.2 points.

Figure 3: Mean Junior Certificate Performance Scale scores for mathematics from 2002 to 2017 in all schools, DEIS schools and non-DEIS schools



Uptake of Foundation, Ordinary and Higher Level JCE papers in 2007 and in 2016

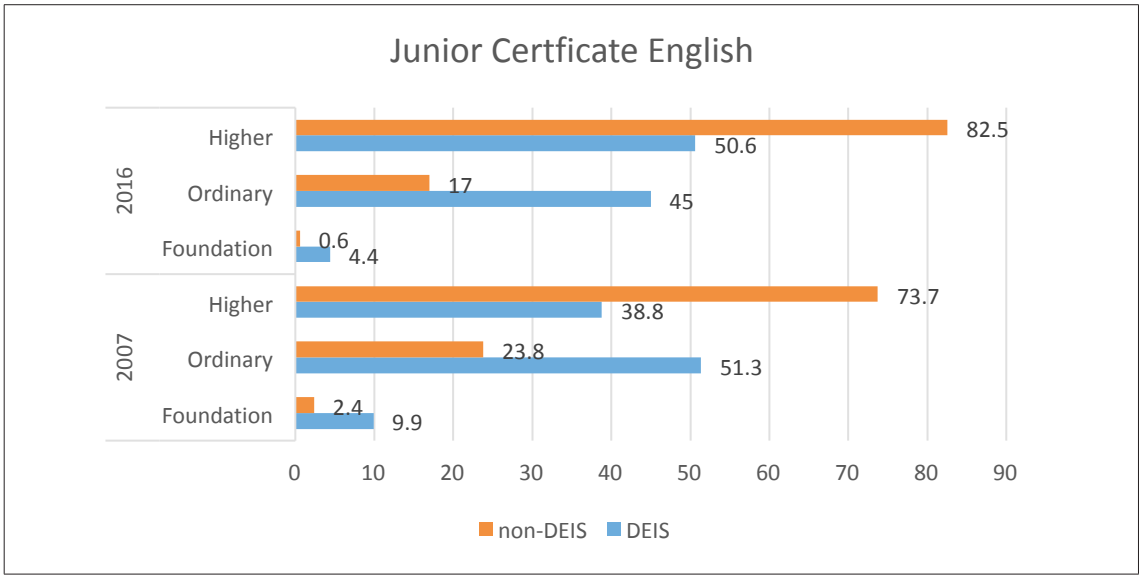
The data also permit examination of the proportion of students who sat Foundation, Ordinary and Higher Level papers in English and mathematics at different points in time. Of particular interest is the comparison of these proportions at the beginning of the DEIS programme (2007) with those in 2016, the most recent year for which data are available[5]. In 2007, one in ten (10%) students in DEIS schools sat the Foundation Level English paper; by 2016, this had reduced to 4%. Additionally, in 2007 more

4 As there was no change in the grading scheme for JCE mathematics similar to that which occurred for English after 2016, 2017 represents the most recent year for which mathematics performance data are available for inclusion in the trend analysis.

5 As previously mentioned, 2016 was the last year in which students had the option of taking Foundation level English in the JCE.

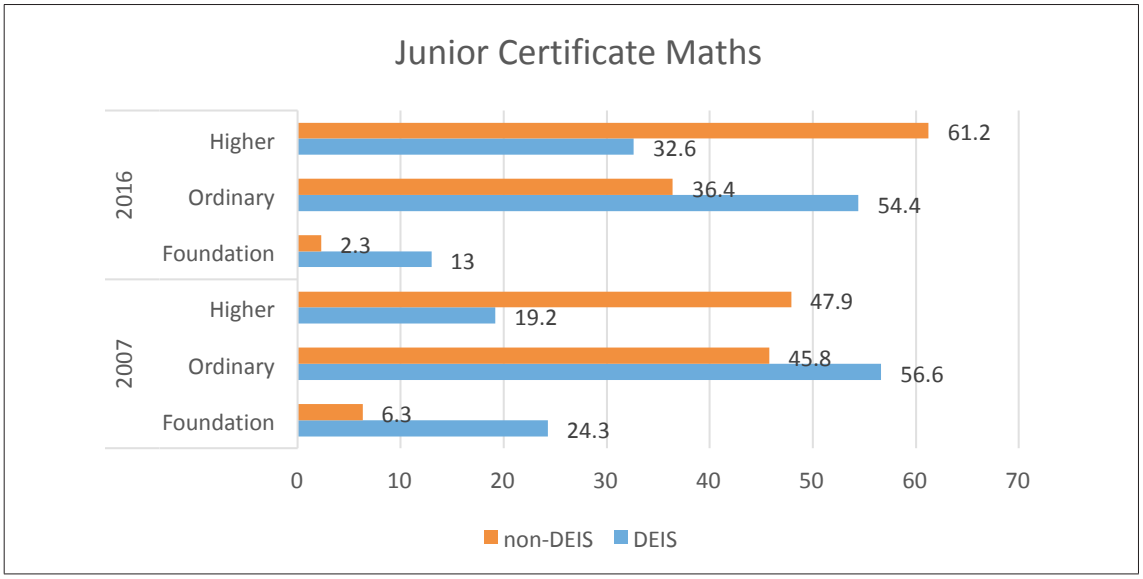
students in DEIS schools sat the Ordinary Level paper (51%) than sat the Higher Level paper (39%); in 2016, a higher proportion of DEIS students took the examination at Higher Level (51%) than Ordinary Level (45%). In 2007, just 2% of students in non-DEIS schools who sat an examination in Junior Certificate English took the Foundation Level paper; in 2016, the figure was lower than 1% (Figure 4).

Figure 4: Percentages of students in DEIS and non-DEIS schools sitting Foundation, Ordinary and Higher Level JCE English papers in 2007 and 2016



In 2007, approximately one quarter (24%) of students in DEIS schools who sat the Junior Certificate mathematics examination took a Foundation Level paper. By 2016, this had reduced to 13% (Figure 5). In non-DEIS schools, the percentage taking a Foundation Level paper reduced from 6% in 2007 to 2% in 2016. Furthermore, the proportion of DEIS students taking the Higher Level mathematics paper increased from one fifth (19%) in 2007 to one third (33%) in 2016. The corresponding change in non-DEIS schools was from 48% in 2007 to 61% in 2016.

Figure 5: Percentages of students in DEIS and non-DEIS schools sitting Foundation, Ordinary and Higher Level JCE mathematics papers in 2007 and 2016



Achievement and gender

The data also afforded the opportunity to investigate whether there were gender differences in JCE achievement and, if so, whether these varied by school DEIS status.

In 2007, at the beginning of the DEIS programme, the gender gap in OPS in non-DEIS schools was 2.3 points in favour of girls (Cohen's *d* = 0.23)[6], while in DEIS schools, the gap was 2.6 points (*d* = 0.23). In other words, gender gaps in overall JCE achievement were in the same direction and of similar magnitude in both DEIS and non-DEIS schools at the start of the DEIS programme (Table 2). In 2016, the gender gap in achievement was 2.5 OPS points, in favour of girls, in both school types, with effect sizes of 0.29 and 0.24 in non-DEIS and DEIS schools, respectively. The gender gap in DEIS schools remained stable from 2007 to 2016, and widened marginally in non-DEIS schools. Since the introduction of DEIS, the mean OPS score of girls in non-DEIS schools increased by 1.9 points from 2007 to 2016 (*d* = 0.20) while the mean achievement of boys in non-DEIS schools increased by 1.7 points (*d* = 0.18). In DEIS schools, the mean OPS of girls increased by 4.1 points (*d* = 0.38), and increased for boys by 3.3 points (*d* = 0.31). Therefore, the gap between girls in non-DEIS and DEIS schools has narrowed since the introduction of the programme, as has the gap between boys in non-DEIS and DEIS schools.

Table 2: Mean JCE OPS scores of girls and boys in DEIS and non-DEIS schools in 2007 and 2016

	2007				2016			
	Girls		Boys		Girls		Boys	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Non-DEIS	69.7	9.76	67.4	10.07	71.6	8.46	69.1	9.06
DEIS	60.0	11.42	58.3	11.16	64.1	10.33	61.6	10.36

In relation to English, girls in both non-DEIS and DEIS schools outperformed boys in non-DEIS schools by 0.7 of a point in 2007 (Table 3), equating to effect sizes of 0.33 and 0.32 in non-DEIS and DEIS schools, respectively. In 2016, there was also gender gap in favour of girls in both DEIS and non-DEIS schools. The mean English performance score of girls in non-DEIS schools was 10.0 and for boys was 9.4 (*d* = 0.39). In DEIS schools the mean English performance score of girls was 8.8, compared to 8.0 for boys (*d* = 0.43). From 2007 to 2016, the mean English performance scores of girls and boys in non-DEIS schools increased by 0.3 (*d* = 0.21) and 0.4 points (*d* = 0.22), respectively. In DEIS schools, the mean scores of girls and boys increased by 0.6 (*d* = 0.30) and 0.5 points (*d* = 0.24), respectively.

Table 3: Mean JCE English performance scores of girls and boys in DEIS and non-DEIS schools in 2007 and 2016

	2007				2016			
	Girls		Boys		Girls		Boys	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Non-DEIS	9.7	1.86	9.0	2.08	10.0	1.43	9.4	1.61
DEIS	8.2	2.19	7.5	2.18	8.8	1.85	8.0	1.95

6 Effect sizes are quantifications of the difference between two means. In this report, Cohen's d (Cohen, 1988) effect sizes are reported. A Cohen's d effect size is the standardised difference between two mean scores that is expressed in standard deviation units. Cohen (1988) suggested that d = 0.2 represents a 'small' effect size, 0.5 can be considered a 'medium' effect size and 0.8 represents a 'large' effect size. According to the What Works Clearinghouse (2014), an effect size of 0.25 or higher in educational research can be considered 'substantively important'.

In mathematics, gender gaps in achievement were very small in both 2007 and 2016 and were in favour of girls in all instances (Table 4). In 2007, the gap between girls and boys in non-DEIS schools was 0.2 points (d = 0.09), while in DEIS schools then gap was 0.1 point (d = 0.05). In 2016, in non-DEIS schools, the difference between the mean score of girls (9.1) and that of boys (9.0) was also very small (d = 0.05). Similarly, the mean mathematics score of girls in DEIS schools was 7.5, compared to 7.4 for boys in DEIS schools (d = 0.07). From 2007 to 2016, the mean mathematics score of girls in non-DEIS schools increased by 0.5 points (d = 0.24), while for boys, the increase was 0.6 points (d = 0.27). In DEIS schools, the mean mathematics score of girls increased by 0.8 points from 2007 to 2016 (d = 0.32), compared to an increase of 0.7 points for boys (d =0.32).

Table 4: Mean JCE mathematics performance scores of girls and boys in DEIS and non-DEIS schools in 2007 and 2016

	2007				2016			
	Girls		Boys		Girls		Boys	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Non-DEIS	8.6	2.32	8.4	2.38	9.1	1.89	9.0	2.00
DEIS	6.8	2.31	6.7	2.28	7.5	2.11	7.4	2.16

Achievement of medical card holders in DEIS and non-DEIS schools

In both DEIS and non-DEIS schools, gaps existed between the average achievements of students from medical card holding families and those from families without medical cards (Table 5). In 2007, the mean OPS score for non-medical card holders in non-DEIS schools was 70.1, while medical card holders in non-DEIS schools had a mean OPS score of 61.8 (d = 0.75). The size of the effect can be considered large. The mean OPS score of students from non-medical card holding families in DEIS schools was 62.5 points in 2007, compared to a mean of 55.6 points for students in medical card holding families in DEIS schools (d = 0.57, representing a medium-sized effect). In 2016, non-medical card holders also significantly outperformed medical card holders in both non-DEIS (d = 0.72) and DEIS schools (d = 0.52). From 2007 to 2016, the largest increases in average OPS scores were among medical card holding students in DEIS schools (d =0.48), followed by non-medical card holders in DEIS schools and medical card holders in non-DEIS schools (d = 0.38 and 0.37, respectively). The smallest increase in mean OPS scores was among non-medical card holding students in non-DEIS schools (d = 0.27).

Table 5: Mean OPS scores of students from medical card and non-medical card holding families in DEIS and non-DEIS schools in 2007 and 2016

	2007				2016			
	No med card		Med card		No med card		Med card	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Non-DEIS	70.1	9.20	61.8	11.0	72.4	7.71	66.2	9.51
DEIS	62.5	10.67	55.6	10.74	65.8	10.01	60.6	10.16

In 2007, the mean Junior Certificate English scores of students from non-medical card holding families were higher than the mean scores of students from medical card holding families in both non-DEIS (d = 0.67) and DEIS schools (d = 0.41; Table 6). By 2016, the gap had reduced somewhat in non-DEIS schools (d = 0.58) and stayed the same in DEIS schools (d = 0.42). The largest increases

in average English achievement over the period 2007-2016 in English were among medical card holders in non-DEIS and DEIS schools, with effect sizes of 0.44 and 0.42, respectively, compared to 0.34 for non-medical card holders in DEIS schools and 0.25 for non-medical card holders in non-DEIS schools.

Table 6: Mean JCE English performance scores of students from medical card and non-medical card holding families in DEIS and non-DEIS schools in 2007 and 2016

	2007				2016			
	No med card		Med card		No med card		Med card	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Non-DEIS	9.6	1.79	8.2	2.33	10.0	1.38	9.1	1.69
DEIS	8.2	2.21	7.3	2.11	8.9	1.89	8.1	1.93

At the start of the DEIS programme, there were also substantial gaps in mean mathematics scores between students from medical card and non-medical card holding families in both non-DEIS and DEIS schools (Table 7), with effect sizes of 0.78 and 0.50, respectively. In 2016, the difference between the means of medical card and non-medical card holding students in non-DEIS equated to an effect size of 0.69; in DEIS schools, the corresponding effect size was 0.53. The largest increases in average mathematics scores from 2007 to 2016 were among medical card holders in non-DEIS schools (d = 0.50), followed by medical card holders in DEIS schools (d = .43), non-medical card holders in DEIS schools (d = 0.41) and non-medical card holders in non-DEIS schools (d = 0.30).

Table 7: Mean JCE mathematics performance scores of students from medical card and non-medical card holding families in DEIS and non-DEIS schools in 2007 and 2016

	2007				2016			
	No med card		Med card		No med card		Med card	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Non-DEIS	8.9	2.18	7.1	2.42	9.5	1.78	8.2	1.97
DEIS	7.2	2.30	6.1	2.11	8.1	2.14	7.0	2.04

Social context effect

In 2004, Sofroniou, Archer and Weir used medical card and OPS data from 1998 in order to investigate whether there was a 'social context effect' on student achievement, i.e., to test the hypothesis that there was a negative effect on student achievement of increasing concentrations of students from socioeconomically disadvantaged backgrounds. Sofroniou, Archer and Weir (2004) found that there was a substantial relationship between individual student achievement and the proportion of students from medical card holding families in the school, over and above the effect of individual family medical card possession on achievement. Here, we describe the results of an analysis that replicates Sofroniou et al.'s (2004) analysis, using data from 2016.[7]

Of primary interest for the current investigation is the portion of variance in student achievement between schools. As shown in Table 8, 17% of the variance in JCE English achievement and 18% of the variance in JCE mathematics achievement was between schools; in 2016, 25% of the variance

7 In both 1998 and 2016, the modelling undertaken assumed linear relationships.

in English achievement and 25% of the variance in mathematics achievement was between schools. This indicates that post-primary schools differed from one another more in 2016, with respect to JCE English and mathematics performance, than was the case in 1998.

The two student-level variables on which data were available, gender and medical card possession, explained 31% of the between-school variance in English and mathematics achievement in 2016. The addition of the measure of social context, the percentage of students from medical card holding families, explained an additional 40% of the between-school variance in English achievement and an additional 42% of the between-school variance in mathematics achievement in 2016, indicating a clear social context effect. The three-variable models explained 71% and 73% of the between-school variance in English and mathematics JCE achievement in 2016, respectively,[8] up from 57% and 41% in English and mathematics, respectively, in 1998. Furthermore, the three-level models explained 10% of the total variance in English achievement and 7% of the total variance in mathematics achievement in 1998; in 2016, the percentage of total variance explained was 18% for both English and mathematics achievement (Table 8).

There was no significant cross-level interaction between school SES and gender in either subject, i.e. the relationship between school SES and achievement (in English or mathematics) did not differ significantly for boys and girls. This contrasts with the findings of Sofroniou et al. (2004), who found that the social context effect was greater for boys in 1998.

Table 8: Summary of the partitioning of variance in English, mathematics, and overall achievement, and the percentages of between-school and total variance explained, 1998 and 2016

	Expressed as a percentage of between-school variance				*Expressed as a percentage of total variance*			
	1998		**2016**		**1998**		**2016**	
	English	**Maths**	**English**	**Maths**	**English**	**Maths**	**English**	**Maths**
Percentage of total variance that is between schools	16.8	17.5	24.5	24.9				
Percentage of between-school variance explained by individual medical card possession and gender	31.7	22.5	31.2	31.0	5.3	3.9	7.6	7.7
Additional percentage of between-school variance explained by percentage of medical cards in the school	25.3	18.8	40.1	41.7	4.3	3.3	9.8	10.4
Total percentage of between-school variance explained by the three-variable model	57	41.2	71.3	72.7	9.6	7.2	17.5	18.1

Table adapted from Sofroniou, Archer and Weir (2004).

In relation to English, at the school level, each percentage increase in medical card holding students was associated with a 0.027 decrease in English performance score (after accounting for the effects of student-level medical card possession). A school with zero medical card holders was

8 Although not the focus of the current investigation it is worth noting that the three-variable model explained 22% of the within-school variance in English JCE achievement in 1998, and 18% of the within-school variance in mathematics achievement; in 2016, the corresponding percentages were 9% and 7% for English and mathematics, respectively. In other words, while the models explained a substantial amount of the variation in school-level achievement, additional variables would be required to more comprehensively account for achievement variation at the individual level.

estimated as having a mean English performance score of 10.8 in 2016, while a school with the mean percentage of medical card holders (43%) has an estimated mean English score of 9.6 (i.e. approximately 2/3 *SD* lower than a school with none), and a school with 75% medical card holders has an estimated English score of 8.7 (1.2 standard deviations lower than schools with no medical card holders and 2/3 *SD* lower than schools with the mean percentage of medical card holders).

In relation to mathematics, each percentage point increase in medical card holding students is associated with a 0.034 decrease in mathematics performance score. A school with no students from medical card holding families has an estimated mean mathematics score of 10.5, while a school with the average percentage of medical card holders has an estimated mean mathematics score of 9.0 (0.7 standard deviations lower than a school with none) and a school with 75% medical card holding students has an estimated mathematics score of 8.4 (1.2 standard deviations lower than a school with no medical card holders and 0.3 standard deviations lower than a school with the mean percentage).

Retention to Junior Certificate

Figure 4 presents the mean percentage retention to Junior Certificate for cohorts between 1995 and 2011, for all schools, DEIS schools and non-DEIS schools.

Trends over time

Considering all schools together, there was a significant positive effect of cohort on retention to Junior Certificate ($p < .001$), with an average yearly increase in retention of 0.17 percentage points. There was a significant gap in retention rates and in trends in retention over time between DEIS and non-DEIS schools. In the first cohort for which data are available (the 1995 cohort), non-DEIS schools were estimated as having an average retention rate that was 8.1 percentage points higher than that in DEIS schools. However, DEIS schools showed a significantly higher rate of change in retention over time, with the increase in non-DEIS schools estimated as 0.06 percentage points per year, compared to 0.43 percentage points in DEIS schools. Non-DEIS schools were estimated as having a very high retention rate in 1995, at 96%, while in DEIS schools, the retention rate for the 1995 cohort was at 88% (i.e. there was considerably less scope for improvement over time in non-DEIS schools than in DEIS schools).

Retention to Leaving Certificate

Figure 5 displays the mean percentage retention to Leaving Certificate for the 1995 to 2011 cohorts for all, DEIS and non-DEIS schools.

Trends over time

Across all schools, there was a significant positive effect of cohort on retention to Leaving Certificate ($p < .001$), with an average yearly increase in retention of 1%. There was a significant difference in trends in retention over time between DEIS and non-DEIS schools. In the 1995 cohort, non-DEIS schools were estimated as having an average retention rate to Leaving Certificate that was 22.6 percentage points higher than that in DEIS schools. However, DEIS schools experienced a significantly higher rate of change in retention over time, with the increase in DEIS schools estimated as 1.56 percentage points per year, compared to 0.75 percentage points in non-DEIS schools.

Figure 6: Average percentage retention to Junior Certificate for the 1995 to 2011 cohorts in all schools, DEIS schools and non-DEIS schools.

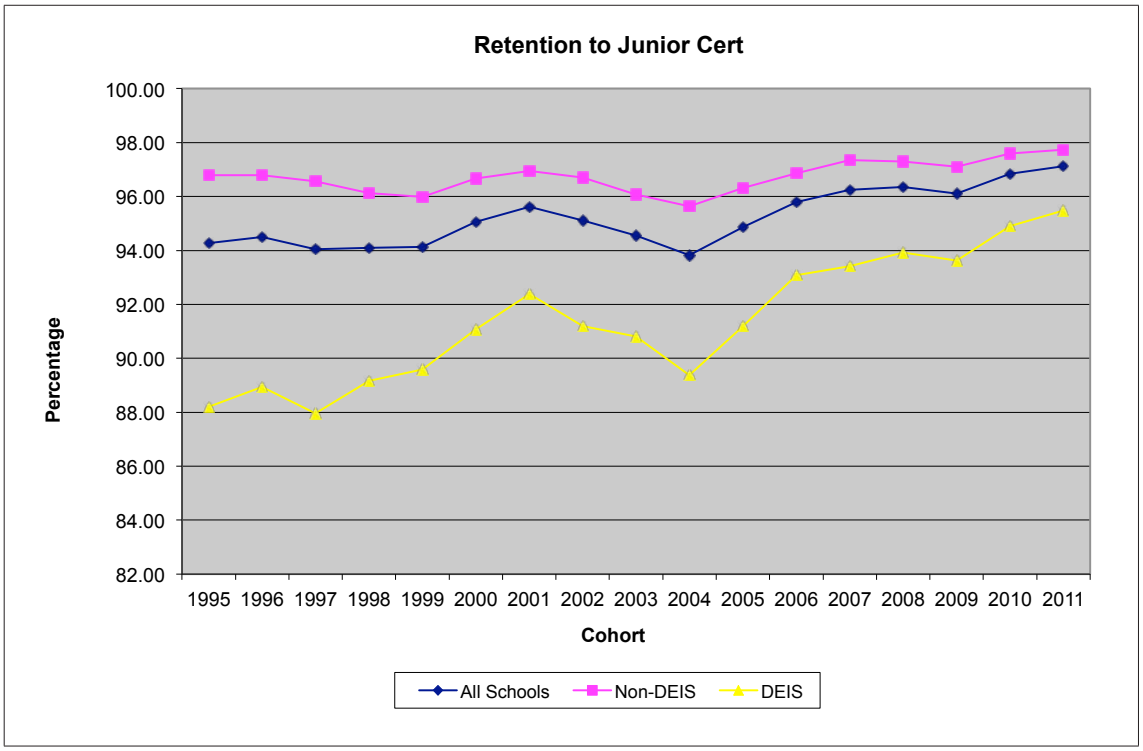
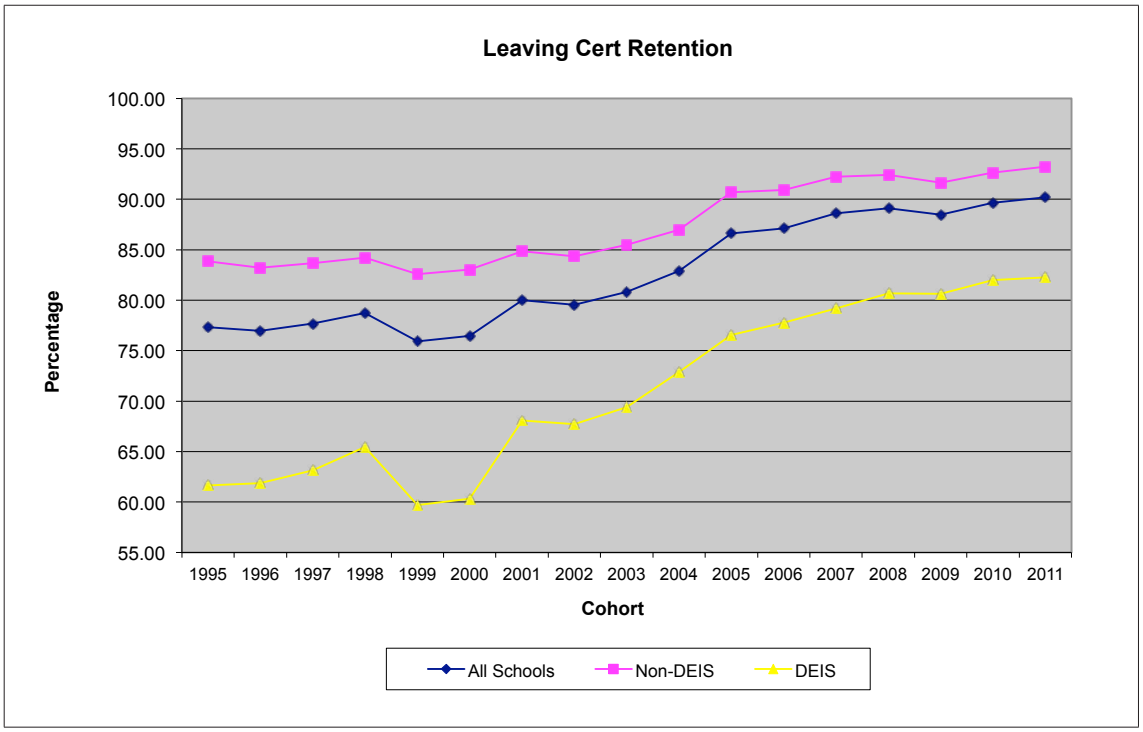


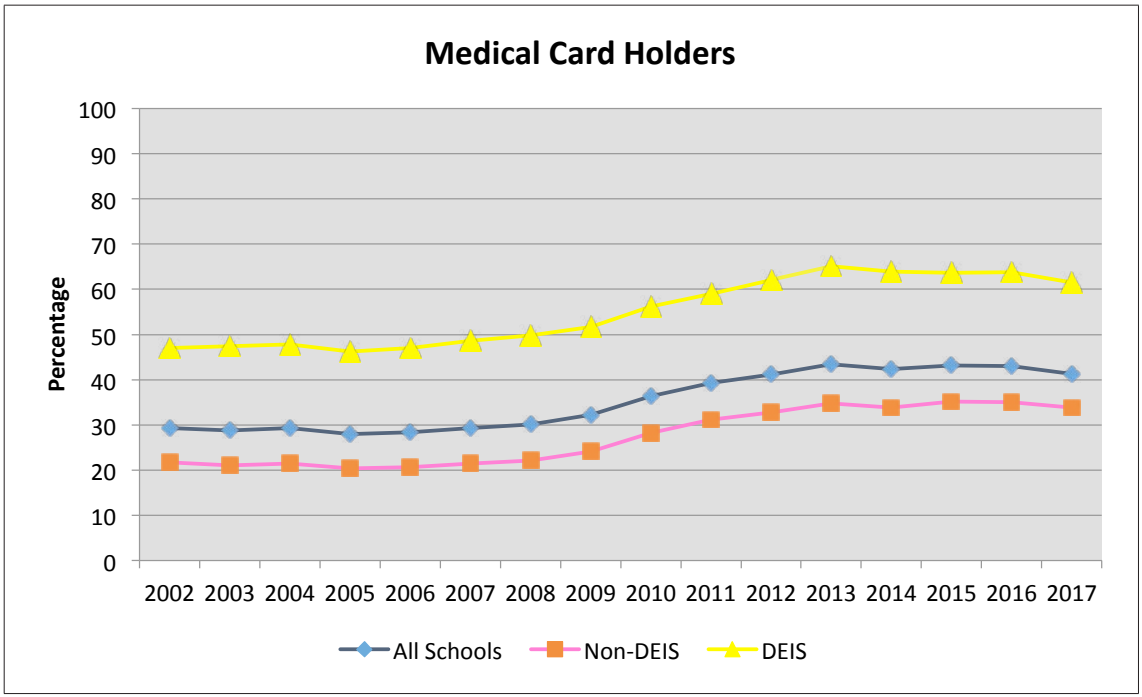
Figure 7: Average percentage retention to Leaving Certificate for the 1995 to 2011 cohorts in all schools, DEIS schools and non-DEIS schools.



Percentage of medical card holders in DEIS and non-DEIS schools

As the examination fee for the Junior Certificate is waived for students who hold a full medical card, information on the percentage of medical card holders is available for all post-primary schools. Figure 6 displays the percentage of medical card holders in all schools, DEIS and non-DEIS schools from 2002 to 2017.

Figure 8: Average percentage of students with medical cards in all schools, DEIS schools and non-DEIS schools



Overall, the mean percentage medical card possession across all schools was estimated as 24.7% in 2002, increasing by an average of 1.3 percentage points on average each year (a significant positive trend). There was a significant gap between DEIS and non-DEIS schools, with the trend of increasing percentages of medical card holders estimated to be .3 percentage points higher in DEIS schools than non-DEIS schools. Specifically, the mean percentage medical card status in non-DEIS schools was estimated at 17.1% in 2002, increasing by an average of 1.2 percentage points yearly. The mean in DEIS schools in 2002 was estimated as 44.4%, increasing by an average of 1.5 percentage points each year.

The relationship between poverty and achievement in all schools at the start of DEIS (2007) and in 2016 was examined by correlating the percentage of medical card holders at school level with average school-level OPS. In 2007, the correlation between medical card possession and JCE achievement in all schools was -0.76 and in 2016 was -0.79, indicating a very strong relationship between home background and achievement across all post-primary schools nationally, with a slightly stronger relationship between socioeconomic background and achievement in 2016 than at the beginning of the DEIS programme.

To examine the relationship separately in DEIS and non-DEIS schools, another set of correlations were computed for 2007 and 2016. These showed that in DEIS schools in 2007, the correlation between medical card possession and achievement was -.52, while in 2016 it was -.56. In non-DEIS schools, the correlation between medical card possession and achievement in 2007 was -.60, and in 2016 it was -.72

Rates of medical card possession have increased in both DEIS and non-DEIS schools since the introduction of the programme. In 2007, just over one fifth of students in non-DEIS schools were from medical card holding families, compared to approximately half in DEIS schools (Table 8). In 2017, the most recent year for which data are available, approximately one third of students in non-DEIS schools were from medical card holding families, compared to 62% of students in DEIS schools.

Table 8: Mean percentage medical card holders in non-DEIS, DEIS and all schools in 2007 and 2017

	2007	2017
	%	%
Non-DEIS	21.4	33.9
DEIS	48.6	61.6
All schools	29.4	41.3

Summary

Trends over time in achievement and retention in post-primary schools in Ireland were examined using centrally-held data made available to the Educational Research Centre as part of the evaluation of the School Support Programme under DEIS. Significant positive trends in achievement (overall performance, performance in English and performance in mathematics in the Junior Certificate Examination) were identified over the fifteen-year period from 2002 to 2016[9]. Additionally, when looking at the 1995 to 2011 cohorts of students, significant positive trends were identified in the retention to Junior Certificate and to Leaving Certificate.

From the available data, it was also possible to compare schools in DEIS to schools not in the programme. While positive trends in achievement and retention were identified in both DEIS and non-DEIS schools, there was evidence that improvements in these outcomes were more marked in DEIS than in non-DEIS schools. Since the introduction of DEIS, there have been reductions in the proportion of students in DEIS schools sitting Foundation Level papers in English and mathematics, and increases in the proportion sitting Higher Level papers in these subjects. Significant gaps in the proportion of students from medical card holding families between schools in and out of the DEIS clearly indicate that students attending the two different school types have continued to have differences in terms of the socioeconomic backgrounds of students who attend them.

Gender gaps in achievement were in favour of girls in all instances. Gaps were larger in English than in mathematics, where they can be described as very small. On the whole, gender gaps in achievement in DEIS and non-DEIS schools have remained relatively stable since the introduction of the DEIS programme.

Between-school variance in JCE achievement was greater in 2016 than in 1998, meaning schools differed more from one another with respect to English and mathematics achievement than they did in 1998. There was evidence of a clear social context effect in post-primary schools in 2016. After controlling for the effects of individual SES on overall achievement, there was a significant effect of school SES on school-level achievement in both JCE English and mathematics. The effect was stronger in 2016 than it was in 1998. While the effect was shown to be greater for boys than for girls in 1998, in 2016 there was no significant gender interaction.

9 2017 in the case of mathematics.

Chapter 3: Discussion

In general, the outcomes of the analyses undertaken for the current report are consistent with previous findings. Findings relating to the main aims of the current analyses outlined in the introduction are provided below. These are followed by a final general conclusion.

Trends in achievement in the JCE in DEIS, non-DEIS, and all schools

As was found on previous occasions, the trend analysis revealed a statistically significant upward trend in overall achievement (OPS) in the JCE between 2002 and 2016 across all schools. Significant upward trends were also found between 2002 and 2016 for the individual JCE subjects of English and mathematics.

All of the previous analyses identified a sizeable gap between the achievements in the JCE of students in DEIS and non-DEIS schools. The trend analysis indicates that increases in OPS scores, and in JCE English and mathematics, have been larger in DEIS schools than in non-DEIS schools. The examination of the achievements of boys and girls revealed that girls outperformed boys in English and mathematics, with larger differences observed in English. However, the fact that this gap remained fairly stable in both DEIS and non-DEIS schools since the programme was introduced indicates that the improved outcomes cannot be attributed to a disproportionate improvement among boys or girls. Put another way, if the DEIS programme is responsible for the improvements observed, it has had similar positive impacts on the achievements of boys and girls.

In an attempt to identify the source of the improvements in outcomes in DEIS schools, the percentages of students opting for Foundation, Ordinary and Higher level papers in English and mathematics in 2007 and 2016 (again, representing what could be regarded as baseline and follow-up data) were examined. This was to investigate whether or not the source of the improvement in OPS scores could be linked to students in DEIS schools shifting from taking papers at basic levels to more demanding levels. The results indicated that such a shift had taken place, with smaller percentages of students in DEIS schools in 2016 than in 2007 opting to take English and mathematics at Foundation level. This was accompanied by an increase in the percentages of students in DEIS schools taking both subjects at Higher level. These changes may reflect increased confidence among students in their own abilities, as well as raised expectations among themselves and their teachers. It will be interesting to monitor the impact of removing the Foundation-level option from JCE English from 2017 onwards (and the gradual extension of this to other subjects) as the Foundation-level option was much more commonly availed of by students in DEIS schools than in non-DEIS schools.

Clearly, if the year-on-year increase in our three measures of achievement is greater in DEIS than in non-DEIS schools, the achievement gap must have narrowed between 2002 and 2016. Indeed, the overall gap in OPS has reduced from 10.5 in 2002 to 4.6 points in 2016 (OPS averages of 75.3 and 61.9 in 2016, respectively). The gap between DEIS and non-DEIS schools has also reduced in English and mathematics. In relation to the most recent years of 2015 and 2016, increases in achievement in DEIS schools were recorded for both years in OPS and in the subject area of mathematics, but not for English (although, notwithstanding this, trend analysis revealed a significant overall upward trend in achievement in English between 2002 and 2016). The fact that McAvinue and

Weir's (2015) analysis revealed a significant increase in the magnitude of the positive trend in OPS around the time DEIS resources were introduced suggests that participation in the programme may be responsible for some of the increase in OPS.

Trends in retention to Junior and Senior Cycle among the population of post-primary students up to 2017, and among students in DEIS and non-DEIS schools

The current analyses revealed that retention levels overall continued to rise since McAvinue and Weir (2015) reported on retention analyses up to and including the 2008 entry cohort[10]. As found previously, the trend analysis revealed a statistically significant upward trend in retention for the entry cohorts between 1995 and 2011 (the latter representing, in the main, those taking the JCE in 2014) across all schools. Those entering First year in 1995 had an eventual retention rate of 94.3%, and retention levels for students in the most recent cohort (2011) were the highest recorded of any cohort examined at 97.1%. There was a similar significant upward trend in Senior Cycle retention rates for the 1995 – 2011 cohort. In 1995, the Leaving Certificate Examination (LCE) completion rate was 77.3%. This increased to an all-time high of 90.2% for the most recent cohort that entered in 2011 and would have been expected to complete the LCE by 2017. This represents an average annual increase of 1% over the 17-year period.

Over the period studied, the increase in retention rates is clearly much greater for Senior than for Junior Cycle. This is almost certainly largely due to the fact that Junior Cycle rates were already very high at the start and, therefore, there was less room for improvement. Also, participation in education as far as Junior Cycle (or until the age of 16) is compulsory, whereas Senior Cycle completion is not. It is worth noting that economic conditions can affect retention rates. In times of recession, retention rates tend to increase and in times of economic prosperity they tend to decrease. This means that observed fluctuations may reflect increased employment opportunities as much as the effects of educational reforms. It should be noted that the recent recovery in the economy appears not to have impacted negatively on retention rates as yet, although it will be interesting to continue to monitor trends with this in mind over the next few years.

It is not surprising that there are sizeable gaps in retention between schools in DEIS and not in DEIS. This is because retention rates to Junior and Senior Cycle were used in assessing levels of educational disadvantage[11] when schools were being identified for participation in the programme. In 1995, 88.2% of students in DEIS schools completed Junior Cycle compared with 96.8% of those in non-DEIS schools. This represented a gap of 8.6% percentage points. Among the most recent student cohorts, the retention rate has risen to 95.5% for students in DEIS schools and to 97.7% for students in non-DEIS schools. The magnitude of the gap in Junior Cycle retention rates has now reduced to 2.2%. This reflects the fact that average percentage retention rates in DEIS schools grew more quickly (by an average of 0.43 points per year) compared with non-DEIS schools (in which

10 The findings reported here differ slightly from those reported in the most recent DES retention report (DES, 2018). This is for a variety of reasons, the most significant of which is that our analyses are based on school-level data whereas the DES report figures on individual student basis. This approach was taken because the DEIS evaluation is concerned with monitoring outcomes in schools participating in the programme and comparing those with non-participating schools. Also, we are interested in issues such as how the density of students from poor backgrounds at school level impacts on outcomes over and above students' own backgrounds. This is facilitated by using a school-level approach (see page 5).

11 The other variables being examined here – percentage fee-waiver based on medical card possession and achievement in the JCE in the form of the OPS score – were also used in the index of disadvantage used to identify post-primary schools for inclusion in DEIS.

growth of 0.06 percentage points was found). The starting gap in retention to Senior Cycle is even greater than for Junior Cycle. In 1995, the percentage retention rate in non-DEIS schools was 83.8%, while in DEIS schools it was 61.7%, a gap of 22.1 percentage points. The rates for the most recent cohorts are 82.3% and 93.2% for DEIS and non-DEIS schools respectively, which represents a gap of about 11 percentage points. Therefore, what has happened over the 17-year period of study is that Senior Cycle retention rates in DEIS schools have increased to a level which is comparable with rates in non-DEIS schools in 1995.

It is impossible in this kind of analysis to attribute the observed increases in retention to specific factors. For example, we already mentioned the possible impact of economic factors on retention. It seems equally likely that legislation which makes compulsory the completion of Junior Cycle has had an impact on both Junior and Senior Cycle retention rates. It is also reasonable to expect that interventions aimed at keeping students in education for longer, such as the School Completion Programme available to all participating DEIS schools, has had an impact on retention rates. The extent to which this is the case is beyond the scope of what it is possible to examine here, but the issue could be investigated using other methods such as case studies, interviews, and focus groups. It is also important to note that retaining a greater percentage of students in the education system may result in retaining academically weaker students that might have previously dropped out of school. This would be expected to manifest itself in poorer academic outcomes, such as JCE achievement, among the cohorts involved. The evidence from the analyses presented here suggests that JCE achievement in DEIS schools has improved significantly despite the increase in percentages of students being retained in DEIS schools. This may indicate that the programme is contributing to improved educational outcomes.

Trends in medical card possession among the population of post-primary students up to 2017, and among students in DEIS and non-DEIS schools

At the start of our period of study in 2002, almost a quarter (24.7%) of all students' families possessed medical cards. Medical card possession rates were much higher in DEIS schools (44.4%) than in non-DEIS schools (17.1%), with the differential extending to 27.3%. This is not unexpected, as medical card possession was one of the variables used to identify schools for inclusion in DEIS. An examination of the trend over the 16-year period reveals that medical card possession in both DEIS and non-DEIS schools remained fairly stable between 2002 and 2006 and began to increase from 2007 onwards, coinciding with the beginning of an economic recession. Between 2007 and 2013 the percentage of medical card holders in DEIS and non-DEIS schools grew annually, but the increases were significantly greater in DEIS than in non-DEIS schools. In 2013, the average percentage of medical card holders in DEIS schools was 65.1% compared with 34.7% in non-DEIS schools, representing a gap of 30.4%. The percentages of medical card holders have decreased since 2013 to 61.6% in DEIS schools and to 33.9% in non-DEIS schools, but clearly this decrease has been greater in non-DEIS schools. The most recent gap of 27.7% between the percentage of medical card holders in DEIS and non-DEIS schools is marginally greater than the one that existed in 2002 at the beginning of the period of study.

It is worth commenting on this for two reasons. The first is that, contrary to anecdotal evidence that the recession impacted on all socioeconomic groups equally (or some claims that more affluent families were disproportionately impacted by it), our findings suggest that those already experiencing disadvantage were impacted to a greater extent. Second, students in DEIS schools continued to

improve their retention levels and outcomes in the JCE at a faster rate than their counterparts in non-DEIS schools despite the fact that proportionately more of their families were deemed eligible for medical cards on the basis of low incomes. It is possible that participation in DEIS played a part in mitigating the effects of poverty on participants. In the next section, this is explored further by examining the impact of increasing densities of medical card holders (a proxy for poverty or disadvantage) in schools on overall achievement levels, and the relationship between medical card possession and outcomes in DEIS and non-DEIS schools.

The relationship between medical card possession and achievement in all schools, and in DEIS and non-DEIS schools

As in the case in all schools in the population, the relationship between home background and outcomes strengthened slightly between 2007 and 2016 in both DEIS and non-DEIS schools, although to a much greater extent in non-DEIS schools. The higher correlation in non-DEIS schools is probably a result of much greater variation in outcomes and home background in these schools. The fact that the already high correlations grew slightly between 2007 and 2016 suggests that the relationship between home background and outcomes strengthened in recent years. This finding is noteworthy because if efforts to address disadvantage, such as the DEIS programme, were having an impact in the intended ways (i.e., mitigating the impact of poverty on outcomes), the strength of that relationship would be expected to show signs of reducing rather than increasing. However, the finding may reflect the fact that there were slightly more medical card holders in DEIS schools than in non-DEIS schools in 2016 (a difference of 28.7%) than had been the case in 2007 (27.1%).

The 'social context effect' in 2016, and a comparison with 1998

The 'social context effect' refers to the fact that student achievement is negatively affected by the presence of increasing densities of students from disadvantaged backgrounds (Sofroniou, Archer & Weir, 2004). In their investigation of the social context effect, Sofroniou et al. (2004) used individual and school-level medical card possession, gender, and English and Mathematics performance scores from the JCE in 1998. Their analysis uncovered substantial relationships between individual achievement and the percentage of medical card holders in the school, over and above the relationship between achievement and medical card possession at the individual level. In terms of variation at the school level, the two individual-level variables included in the models (gender and whether or not the student's family had a medical card) explained 29.5% of the between-school variance. Adding the percentage of medical card holders in the school to the model (i.e., the social context) brought about a substantial additional increase (29.3%) in the amount of between-school variance explained, and brought the total amount of between-school variance explained in achievement in JCE English to 58.8%.

In the most recent analysis, data on medical card possession at individual and school level were used in conjunction with JCE English and mathematics outcomes to see if the social context effect was found for outcomes in JCE 2016, and, if so, whether the magnitude was similar to that found by Sofroniou et al. (2004). The current findings support the existence of a social context effect well in excess of that identified by Sofroniou et al. (2004). Among students that took JCE English in 1998 and 2016, individual medical card possession respectively explained similar amounts of the variance in achievement (31.7% and 31.2%). However, the additional percentage of variance in achievement in English explained by the percentage of medical cards in the school rose from 25.3%

in 1998 to 40.1% in 2016. Furthermore, the total amount of between-school variance explained in achievement in JCE English by individual and school-level medical card possession combined went from 58.8% in 1998 to 71.3% in 2016. This means that the social context in the school had a much greater impact on outcomes in 2016 than was the case in 1998. The same pattern was observed for mathematics achievement, although possession of a medical card at individual level explained more of the variance in achievement in 2016 (31.0%) than in 1998 (22.5%). Medical card possession at school level explained an additional 18.8% of the variance in mathematics achievement in 1998, but the equivalent figure had increased to 41.7% in 2016.

The achievement difference in JCE English between a school with zero medical card holders is estimated as 2/3 of a standard deviation higher than schools with the average percentage (43%) of medical card holders, and 1.2 standard deviations higher than schools in which 75% of those enrolled have medical cards. The impact of concentrations of medical holders is similar in relation to mathematics achievement with an average difference of 1.2 standard deviations between schools with no medical card holders and 75% of students with medical cards.

The outcome of the analysis here supports the targeting of schools with concentrations of students from poor backgrounds, such as those identified for DEIS, rather than allocating resources on the basis of more dispersed disadvantage. This is particularly indicated in light of the strength of the social context effect identified in 2016.

Conclusion

The current set of analyses show that progress continues to be made by students in DEIS post-primary schools. Extending the trend analysis to include data for the most recent years confirms that the upward trend found in earlier analyses is continuing, and that the achievement and attainment gap between DEIS and non-DEIS schools continues to narrow. This cannot be explained by reductions in poverty levels in DEIS schools: Data on the percentages of medical card holders (our proxy for poverty) in all schools shows that in comparison with non-DEIS schools, DEIS schools have increased the relative percentage of medical card holders since 2007 when the programme began. A strong social context effect, well in excess of that identified by Sofroniou et al. (2004) was identified in our analyses. This indicates that the impact of being a student in a school with concentrations of others from poor socioeconomic backgrounds has a substantial negative impact on achievement regardless of whether a student him or herself has a medical card. Moreover, the recent improvements in outcomes have occurred in an environment in which between-school differences in achievement have increased at the same time as the social context effect has strengthened. The social context effect is a difficult issue to address from a policy point of view because a multiplicity of factors (e.g., parental choice, housing policy) are involved. However, at the very least, this finding provides a compelling reason to continue to target resources at schools with concentrations of students from poor socioeconomic backgrounds.

Further monitoring of trends as part of the programme's evaluation is recommended. However, there are likely to be challenges associated with undertaking this exercise in future. For example, we are approaching a ceiling effect in relation to Junior Cycle retention rates with little room for further improvement. Therefore, this outcome variable is unlikely to remain a useful indicator for much longer. Also, future examinations of long-term trends in achievement in the state examinations will require exploring ways of equating the old and new grading systems. This presented a minor difficulty in relation to the analyses of OPS and English performance scores for the JCE in 2017 on this occasion, but it will become more problematic as the new grading is extended to other subjects.

Finally, although it did not impact on the analyses undertaken on this occasion, the admission of new schools to DEIS in 2018 changed the number of schools in the DEIS and non-DEIS cohorts from that point onward. These 'new' schools may differ in certain ways from the original schools in the programme because the way in which they were selected for inclusion differed (see DES, 2017). For example, educational outcomes were not used in the identification of the recently included schools, but were used in combination with medical card percentages in the original identification of schools for the DEIS programme in 2006 (see Weir, 2006). The existence of the social context effect in 2016, and the finding that it is stronger than that identified previously, suggests that positive discrimination towards schools with concentrations of students from poor backgrounds should be continued, and that these schools should continue to be targeted for additional resources.

The fact that our analyses show that the gap continues to narrow is very welcome. However, a significant gap still exists. A recent UNICEF report included a league table in which 41 of the world's richest countries (all members of the OECD or the EU) were ranked in terms of measures of educational equality at preschool, primary and post-primary levels. In the table in which a rank of 1 indicated the lowest level of inequality, Ireland received an overall rank of 2, indicating that based on the measures considered, Ireland had the second lowest level of educational inequality among the 41 countries assessed (UNICEF, 2018). The authors stated that 'Ireland and Slovenia are in the bottom third of countries (high inequality) for preschool enrolment, but move to the top third (low inequality) towards the end of secondary school' (UNICEF, 2018, p.3). The assessment of inequality at post-primary level was based on the magnitude of the gap in the achievements of each country's best and worst performing 15-year old students in the OECD's PISA study (the Programme for International Student Assessment). The findings of the UNICEF report are welcome in that they show that the overall gap in Ireland is smaller than that of most countries. However, it must be acknowledged that on the basis of the findings in our current study, much of the inequality in educational outcomes that does exist has its basis in income inequality. Therefore, it is important to recognise this and to continue efforts to address the educational problems experienced by our most marginalised students.

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