Inequality and Segregation in Northern Ireland Schools

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Chapter 6
Inequality, Segregation, and Underachievement in Northern Ireland's Post-Primary Schools

6.1. Introduction

The focus of this chapter is the highly unequal and segregated system of schooling provision in Northern Ireland. As Table 6.1 shows, of the 24,147 Year 12 pupils in Northern Ireland in 2013, 79% obtained 5+A*-C GCSEs and 60% obtained 'good' GCSEs in the form 5+A*-C GCSEs (E&M). The latter figure compares favourably with the 59% of pupils in England who got good GCSEs in 2013.

However, masking this headline achievement rate of 60% of pupils obtaining good GCSEs are two disturbing features which are often swept under the carpet. First, the 60% good GCSEs pass rate was a weighted average of a superlative performance by Northern Ireland's 68 grammar schools, with a 94% of their Year 12 pupils obtaining good GCSEs pass rate (that is, 5+A*-C (E&M) GCSEs), and an undistinguished performance by its 137 secondary schools, with only 38% of their Year 12 pupils obtaining good GCSEs. There is thus a 56 percentage point (pp) gap between Northern Ireland's grammar and secondary schools in the proportions of their pupils obtaining good GCSEs and, as worryingly, this gap has shown little sign of reducing over time: the proportions in 2009 were, respectively, 94% and 35%.

Taken collectively, Northern Ireland's post-primary secondary schools fail to meet the minimum acceptable standard for post-primary schools in England of 40% of Year 12 pupils obtaining 5+A*-C (E&M) GCSE passes. However, this collective failure masks an even deeper failure at the level of individual schools. Of Northern Ireland's 137 secondary schools, 82 (or 60%) performed below the '40% standard' and, in these underperforming schools, the average proportion of Year 12 pupils obtaining 5+A*-C (E&M) GCSE passes was just 28% while, in the secondary schools that were not underperforming it was 51%.

The second worrying feature is that the attainment gap in Northern Ireland between FSM and non-FSM pupils with, respectively, 34% and 68% of pupils in each group obtaining good GCSEs in 2013. This attainment gap of 34pp contrasts with the attainment gap of only 13pp for inner London where 54% of FSM, and 67% of non-FSM, school leavers obtained good GCSEs (Greaves et. al., 2014). So, there are three aspects to performance inequality within Northern Ireland's schooling system: (i) inequality between grammar and secondary schools; (ii) inequality between secondary schools; and (iii) inequality between FSM and non-FSM pupils.

Table 6.1: Salient Features of Northern Ireland's Post-Primary Schooling System, 2013

	Number of Schools	Total Enrolment	Year 12 enrolment	Year 14 enrolment	FSM pupils	SEN pupils	5+A*-C	5+A*-C (E&M)	2+A*-E	3+A*-C
Total Schools	205	142,960	24,147	13,743	19.0	19.8	78.8	59.5	98.0	65.3
Grammar Schools:	68	62,599	9,403	8,303	7.4	7.9	97.3	93.9	99.6	77.1
Catholic Grammars	*30*	*27,661*	*4,017*	*3,741*	*10.2*	*8.9*	*98.4*	*94.9*	*99.5*	*80.1*
Protestant Grammars	*38*	*34,938*	*5,386*	*4,562*	*5.1*	*7.1*	*96.4*	*93.1*	*99.6*	*74.7*
Secondary Schools:	137	80,361	14,744	5,440	28.0	28.9	67.0	37.5	95.5	46.6
Maintained	*67*	*40,015*	*6,990*	*3,136*	*32.1*	*29.2*	*73.8*	*41.0*	*95.6*	*49.9*
Controlled	*49*	*27,692*	*5,562*	*1,472*	*23.1*	*27.3*	*58.9*	*33.2*	*95.8*	*41.0*
Other	*21*	*12,654*	*2,192*	*832*	*25.8*	*31.8*	*66.3*	*37.3*	*94.7*	*43.5*
Western Board	40	25,642	4,133	2,526	24.1	23.5	80.8	58.9	98.3	63.8
Southern Board	47	30,656	5,516	2,961	18.4	14.9	80.2	61.6	98.2	70.0
Belfast Board	34	29,417	4,625	3,230	22.0	25.6	83.4	63.0	96.2	63.0

North-East Board	48	32,019	5,502	2,843	15.0	15.3	77.1	57.3	99.1	65.3
South-East Board	36	25,226	4,371	2,183	15.8	20.7	72.3	56.2	98.6	64.3
Financial Stress=1	10	2,758	593	143	40.0	41.3	57.5	25.7	90.0	47.9
Financial Stress=2	8	3,140	804	174	32.8	33.4	63.1	28.8	85.6	35.6
Financial Stress=3	48	36,153	6,367	3,152	23.2	20.5	76.2	51.6	96.9	59.8
Financial Stress=4	138	100,103	16,251	10,206	16.5	18.5	81.3	65.3	98.6	67.8

Underlying these aspects of *performance* inequality in Northern Ireland's post primary schools is *access* inequality whereby free school meal (FSM) pupils and pupils with special educational needs (SEN) are grossly under-represented in grammar schools. As Table 6.1 shows, of the total enrolment pupils in grammar schools in 2012-13, only 7% were FSM pupils and 8% were SEN pupils. In contrast, of the total enrolment pupils in secondary schools, 28% were FSM pupils and 29% were SEN pupils. So, half of the total number of secondary school pupils - compared to only 15% of grammar school pupils - came from deprived backgrounds (FSM pupils) or had special educational needs (SEN).

Lastly, there is the high level of segregation in Northern Ireland's schooling system which exists notwithstanding the Northern Ireland Executive promoting *Cohesion, Sharing and Integration* as a strategic policy (Northern Ireland Executive, 2011). As the Department of Education statistics (2011/12) show:

- In the primary sector: 5.4% of Catholics attended controlled primary schools; 1% of Protestants attended maintained primary schools; and 5.5% of primary school children attended integrated schools.
- In the secondary school sector: 2.1% of Catholics attended controlled secondary schools; 0.8% of Protestants attended maintained secondary schools; and 14.4% of secondary pupils attended integrated schools.
- In the grammar school sector: 7.7% of Catholics attended Protestant grammar schools; and 0.9% of Protestants attended Catholic grammar schools.
- Overall, 6.9% of primary and post-primary pupils attend integrated schools.

Many young people in Northern Ireland never experience cross community education until they attend university. The segregated school system has resulted in ethno-religious isolation which reinforces 'intra-sectoral bias, stereotyping and prejudice' (Hughes, 2010: 829). The First Minister referred to the current education system as 'a benign form of apartheid which is fundamentally damaging to our society' (Robinson, 2010). The Department of Education's policy *Community Relations, Equality and Diversity in Education* (CRED, 2011a: 25) also makes clear a commitment to shared education through encouraging 'greater sharing and collaboration across and between all educational settings on a cross community basis'. On the face of it, Catholics are much more willing to go to Protestant schools than Protestants are to attend Catholic schools with the largest movement of Catholic pupils being into Protestant grammar schools.

In this chapter, we analyse each of these issues in turn starting with 'performance inequality', first between grammar schools and secondary schools and, second, between secondary schools only. In conducting this analysis, two methods are used to quantify the nature of such inequalities. The first is that of inequality decomposition whereby *overall* inequality is expressed as the sum of 'between group' and 'within group' inequality. This technique is applied to grammar/secondary inequality so that inequality in educational performance between the 205 post-primary schools in Northern Ireland can be decomposed as the sum of inequality *between* grammar and secondary schools and *within* grammar and secondary schools. The intellectual foundations for this decomposition lie in Theil

(1967), Shorocks (1980), and Cowell and Jenkins (1995) and the details of the decomposition are contained in an appendix to this chapter.

In analysing inequality in educational performance *between secondary schools*, we use the concept of equity-adjusted performance due to Anand and Sen (1997) which in turn is based on the social welfare interpretation of inequality pioneered by Atkinson (1970). The central idea here is that of 'inequality aversion' through which one would be prepared to sacrifice a greater mean outcome, accompanied by higher inequality, for a lower mean income with lower inequality. The size of the sacrifice would depend upon how much one disliked inequality (the degree of inequality aversion) and would result in what Anand and Sen (1997), in the context of the UNDP's Human Development Indices, refer to as 'equity-adjusted achievements'. The technical details of the link between welfare and inequality are also set out in an appendix to this chapter.

Another aspect of inequality analysed in this chapter is as, noted earlier, exemplified by the absurdly small proportion of grammar school pupils who are 'disadvantaged', either in terms of parental income (FSM pupils) or in terms educational needs (SEN pupils). We refer to this inequality as 'access inequality' and first present a measure of the difficulty that FSM and SEN pupils have in accessing grammar schools and, following that, suggest policies for addressing this problem.

After the analysis of inequality in post-primary education, outlined above, the chapter addresses the issue of religious segregation in Northern Ireland's primary and post-primary schools. After analysing the issues surrounding school segregation we propose a means of overcoming the deleterious consequences of such segregation, *without requiring pupils to surrender their religious identity*, through the medium of 'shared education'. We emphasise in this chapter that there is a clear and important distinction between *integrated* education which, 22 years after its inception in 1992, has not proved popular with Northern Ireland parents - with less than 9% of post-primary pupils attending integrated schools - and *shared* education which is being accepted more readily.

Lastly, this chapter addresses the question of underachievement of FSM post-primary pupils, relative their non-FSM counterparts and, in particular, by FSM pupils from a Protestant background.

6.2. Differences in Educational Outcomes between Grammar and Secondary Schools

In discussing differences in educational performance between grammar schools and secondary schools we focus on the proportion of Year 12 pupils obtaining 5+A*-C (E&M) GCSE passes and on the proportion of Year 14 pupils obtaining 3+A*-C A-level passes because it is with respect to these two indicators that the difference between the two sectors is most marked. As Table 6.1 shows, the proportion of 5+A*-C (E&M) GCSE passes was , respectively, 94% and 38% for grammar and secondary schools and the proportion of 3+A*-C A-level passes was , respectively, 77% and 47% for grammar and secondary schools.

Given the division of schools by two groups, grammar and secondary, there are two sources of inequality: *between-group* and *within-group*. The method of inequality decomposition attempts to separate (or decompose) overall inequality into its constituent parts: between-group and within-group. When the decomposition is *additive*, overall inequality can be written as the *sum* of within group and between group inequality.

$$\underbrace{I}_{\text{overall ineqality}} = \underbrace{A}_{\text{within group inequality}} + \underbrace{B}_{\text{between group inequality}}$$

The between group inequality arises because the mean performance of grammar schools is different from the mean performance of secondary schools. As noted earlier, the average proportion of 5+A*-C (E&M) GCSE passes was , respectively, 94% and 38% for grammar and secondary schools and the proportion of 3+A*-C A-level passes was , respectively, 77% and 47% for grammar and secondary schools. It is these differences in average values between the groups that lead to the

term *B*, above. But there are also differences in performance between schools *within* the secondary and the grammar sectors. It is these within-group differences that lead to the term *A*, above.

Only inequality indices which belong to the family of *Generalised Entropy Indices* are additively decomposable (Shorrocks, 1980). These indices are defined by a parameter θ and when $\theta=0$ the inequality index is Theil's (1967) Mean Logarithmic Deviation (MLD) Index:

$$I(\mathbf{p};N)=\left(\sum_{i=1}^{N}\log(p_i/\bar{p})\right)/N \qquad (6.1)$$

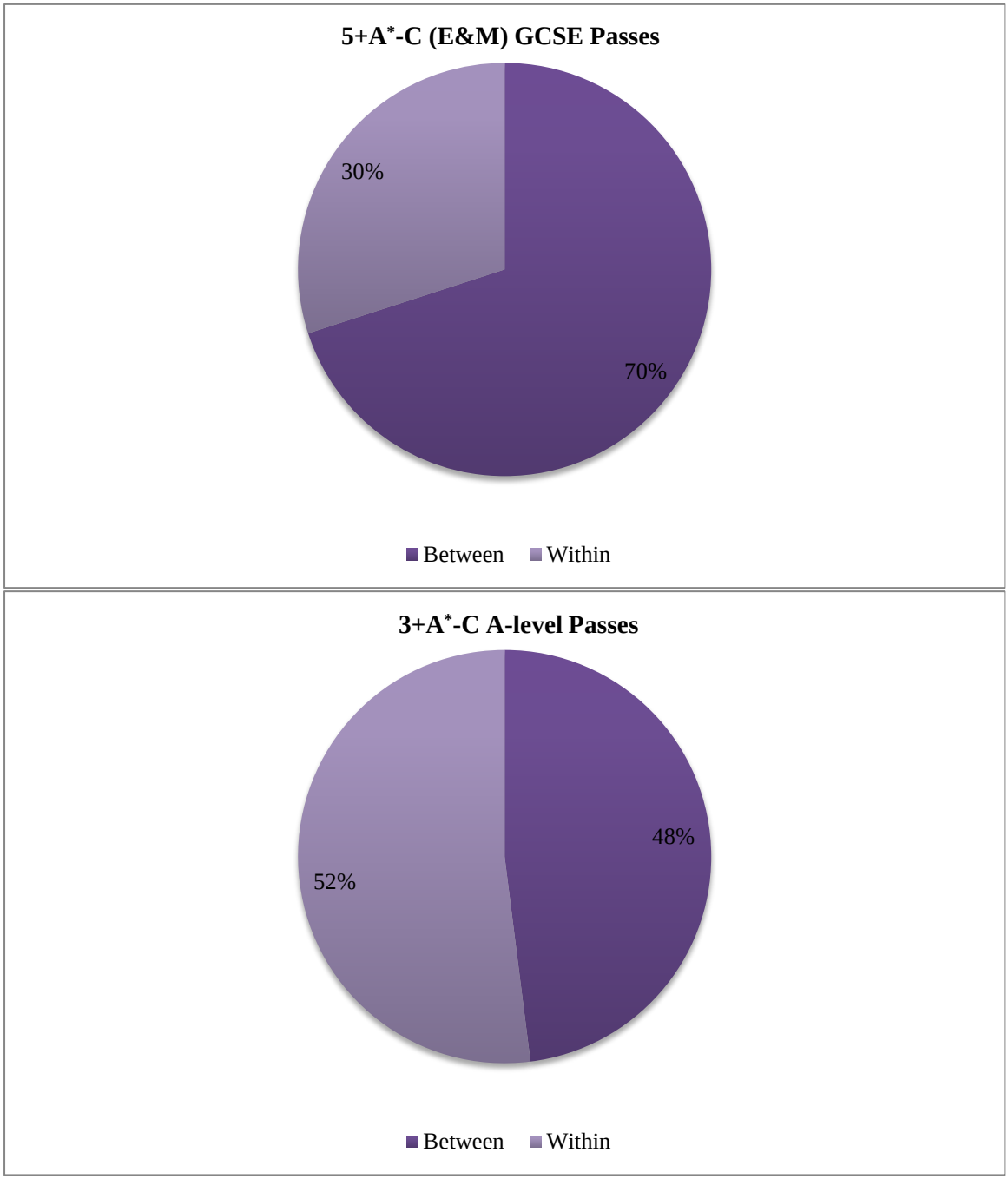
where: N is the number of schools, p_i is the 'performance' of school i $(i=1\ldots N)$; $\bar{p}$ is the mean performance over the N schools; and $\mathbf{p}=\{p_i\}$ is the vector of performances.

When inequality is additively decomposed then one can say that the basis on which the schools were subdivided (in this case, grammar/secondary) contributed [(B/I)×100]% to overall inequality, the remaining inequality, [(A/I)×100]%, being due to inequality *within* the groups. If, indeed, inequality can be 'additively decomposed' along the above schema, then, as Cowell and Jenkins (1995) have shown, the proportionate contribution of the between-group component (**B**) to overall inequality is the income inequality literature's analogue of the R^2 statistic used in regression analysis: the size of this contribution is a measure of the amount of inequality that can be 'explained' by the factor (or factors) used to subdivide the sample (gender; maternal literacy status etc.). Inequality decomposition provides a way of analysing the extent to which inter-group inequality can be 'explained' by a factor of division. The basic question that this section seeks to answer is how much of the overall inequality between Northern Ireland's post-primary schools, in their GCSE and A-level performances can be explained by the grammar/secondary binary divide?

Inter-school inequality in 5+A*-C (E&M) GCSE passes, as measured by the MLD index of equation (6.1), was 0.148. Of this total equality, inequality *between* grammar and secondary schools contributed 0.103 (70%) and inequality *within* the two sectors contributed 0.045 (30%). Similarly, inter-school inequality in 3+A*-C A-level passes, as measured by the MLD index of equation (6.1), was 0.061. Of this total equality, inequality *between* grammar and secondary schools contributed 0.029 (48%) and inequality *within* the two sectors contributed 0.032 (52%). These contributions are illustrated in Figure 6.1.

The most significant feature of these results is the large proportion of post-primary educational inequality in Northern Ireland – two-thirds in the case of inter-school differences in proportions obtaining 5+A*-C (E&M) GCSE passes, and nearly half in the case of inter-school differences in proportions obtaining 3+A*-C A-level passes - that can be explained by a *single* factor: the grammar/secondary divide. To put this result into perspective, Cowell and Jenkins (1995) found that three factors taken collectively – age, sex, and race of the family head – could not explain more than 20%-25% of income inequality in the United States. In this context, to explain 48%-70% of educational inequality by a single factor is, indeed, a remarkable achievement!

Figure 6.1 Contributions to Inequality in Educational Performance, Grammar/Secondary



6.3. Differences in Educational Outcomes between Secondary Schools

There was very little difference between grammar schools in their examination performance in 2013, either in their proportions obtaining 5+A*-C (E&M) GCSE passes or in their proportions obtaining 3+A*-C A-level passes. Grammar schools in the lowest and highest deciles of achievement had mean success rates of 99% and 88% with respect to 5+A*-C (E&M) GCSE passes and mean success rates of 89% and 64% with respect to 3+A*-C A-level passes. The picture with respect to secondary schools was very different. Secondary schools in the lowest and highest deciles of achievement had mean success rates of 58% and 21% with respect to 5+A*-C (E&M) GCSE passes and mean success rates of 65% and 26% with respect to 3+A*-C A-level passes.

A popular measure of inequality, with respect to a specific achievement, is the *Kuznets (1955) ratio*. This is the ratio of achievements of the highest and lowest deciles. For example, in its most usual application to measuring income inequality, the Kuznets ratio is the ratio of the mean incomes of the richest 10% and the poorest 10% of earners. Applying this concept to inequality in educational performance, the Kuznets ratio for grammar schools was, on the basis of the above figures, 1.1 with respect to 5+A*-C (E&M) GCSE passes and 1.4 with respect to 3+A*-C A-level passes; the Kuznets ratio for secondary schools was much greater: 2.8 with respect to 5+A*-C (E&M) GCSE passes and 2.5 with respect to 3+A*-C A-level passes.

Yet another popular measure of inequality is the *Gini coefficient*. Applied to schools, and using the notation under equation (6.1), the Gini coefficient associated with his scores is defined as:

$$G = \frac{1}{2N^2\overline{p}}\sum_{i=1}^{N}\sum_{j=1}^{N}|\,p_i - p_j\,| \qquad (6.2)$$

In other words, the Gini coefficient is computed as half the mean of the difference in proportions obtaining 5+A*-C (E&M) GCSE passes (or 3+A*-C A-level passes) between pairs of schools, divided by the average score ($\overline{p}$). So, *G=0.10* implies that the average difference in proportions, *between two schools chosen at random*, will be 20% of the average score: if $\overline{p}$ *=50%*, this difference will be 10 percentage points (pp).

The value of the Gini coefficient for grammar schools, in respect of their proportions (of relevant pupils) with 5+A*-C (E&M) GCSE passes and 3+A*-C A-level passes, were, respectively, 0.035 and 0.078. Taken in conjunction with the mean proportions of 94% and 77% (Table 6.1), these results imply that two grammar schools chosen at random would differ in their proportions of Year 12 pupils 5+A*-C (E&M) GCSE passes by 7% of 94% (that is, by 6.6pp) and would differ in their proportion of Year 14pupils 3+A*-C A-level passes by 15.6% of 77% and (that is, by 12pp).

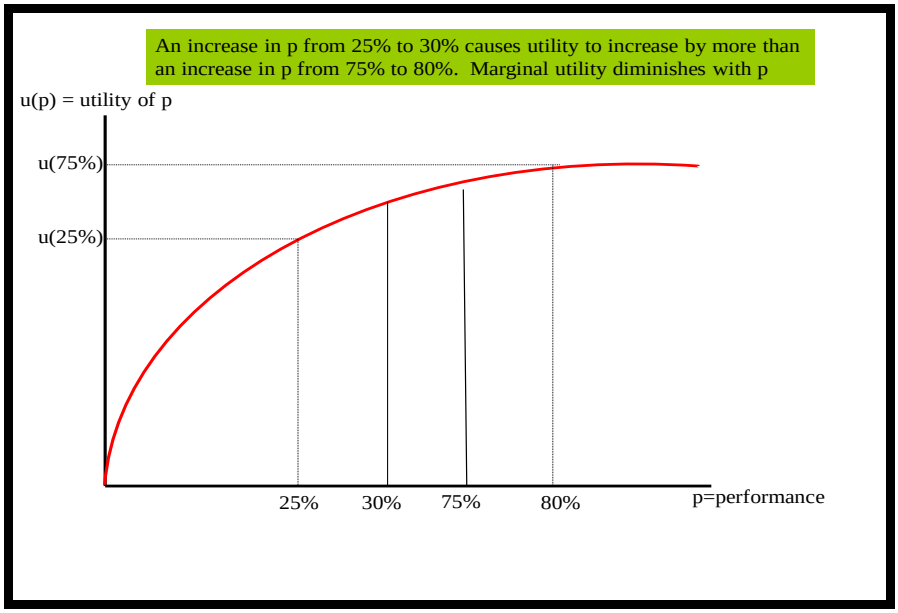
In contrast, the value of the Gini coefficient for secondary schools, in respect of their proportions (of relevant pupils) with 5+A*-C (E&M) GCSE passes and 3+A*-C A-level passes, were, respectively, 0.217 and 0.201. Taken in conjunction with the mean proportions of 38% and 47% (Table 6.1), these results imply that two secondary schools chosen at random would differ in their proportions of Year 12 pupils 5+A*-C (E&M) GCSE passes by 43% of 38% (that is, by 16pp) and would differ in their proportion of Year 14pupils 3+A*-C A-level passes by 40% of 77% and (that is, by 31pp). Since, as we have shown, there was very little inequality in educational performance between grammar schools, our focus will be on inter-school inequality in educational performance between secondary schools.

The reason for this focus on inequality is that, as Atkinson's (1970) seminal paper showed, there is a close relation between social welfare and inequality. Adapting Atkinson's (1970) paper to inequality in educational performance we can, using the notation used in equation (6.1), define an *additively separable educational welfare function as*:

$$W = \sum_{i=1}^{N} U(p_i) \qquad (6.3)$$

In equation (6.3), *U* is the utility of school *i* (*i=1…N*) where this utility depends positively on the proportion of its pupils who achieve a 'good' result; W is the level of educational welfare and is expressed as the sum of the school utility functions.

Figure 6.2: A Concave Utility Function and Diminishing Marginal Utility



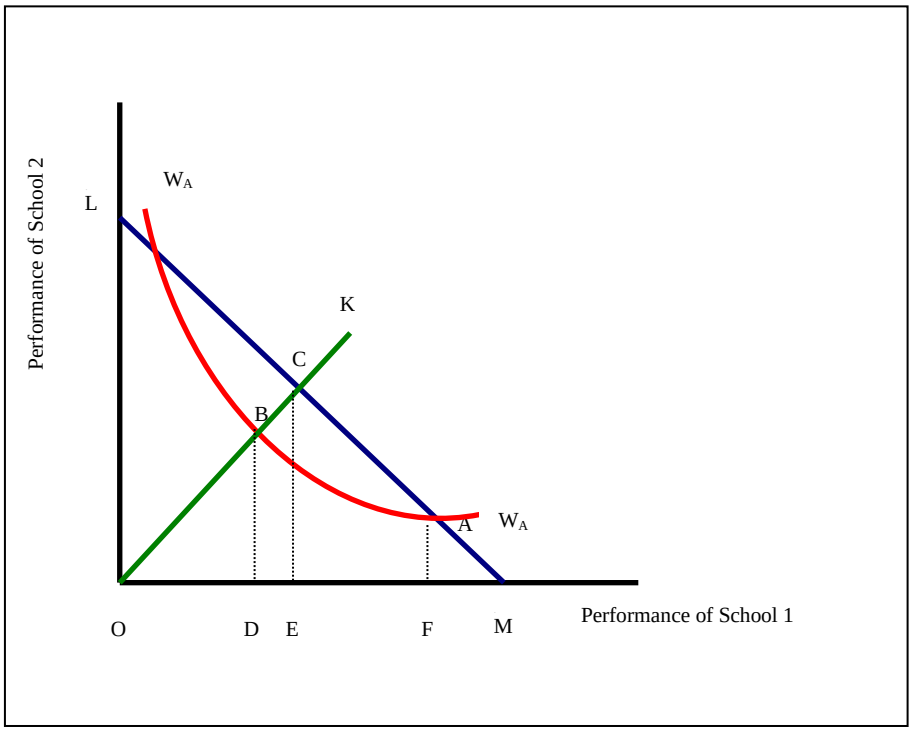
The important assumption made with respect to the utility function, *U*, is that it is *concave* (Figure 6.2) or, equivalently, that it embodies *diminishing marginal utility*. In other words, the increase in utility from a *given* performance improvement will depend upon the level of performance from which it is achieved. In effect this means that a school that raises its performance from 25% to 30% will experience higher utility than will a school that raises its performance from 75% to 80% (that is, by the same amount (5pp) but from a 75% success rate). The implication of this assumption is that *educational welfare will be maximised when every school has the same level of performance*, that is, $p_1 = p_2 = .. = p_N$. The fact that, in practice, schools do not have the same level of performance means that educational welfare is sub-optimal.

The fact that welfare is sub-optimal in the presence of inter-school inequality is the consequence of *inequality aversion* on the part of the policy maker. Inequality aversion implies a willingness to sacrifice a higher mean performance in order to obtain a higher degree of equality (lower inequality). This leads very naturally to the concept of *equally distributed equivalent* (EDE) performance: this is the level of performance which, *if equally distributed across the schools*, yields the same level of educational welfare as the existing performance level and its existing inter-school distribution.

These ideas are illustrated in Figure 6.4. The line LM shows the various distributions of performance (defined as the proportion of the relevant pupils obtaining good GCSE or A-level grades) between two schools, 1 and 2, for a given level of overall performance $\overline{p}$ =OE. At the point C on LM, both schools have the same performance so that: $p_1 = p_2 = \overline{p} = OE$. If the actual distribution is at point A ($p_1^A > p_2^A$), then the social welfare associated with this is W_A. A lower level of performance, OB which is equally distributed between schools 1 and 2 yields the same level of welfare as the higher level OE distributed according to A. Following Atkinson (1970), we term OB (< OE) as the

'equally distributed equivalent' (EDE) performance: *it is the level of performance which, if equally distributed, would be welfare-equivalent to a higher performance level, distributed unequally*.

Figure 6.4: The Equally Distributed Equivalent Performance



The above view of the welfare-reducing effects of inequality raises an important question: by how much is welfare reduced through inequality? Atkinson (1970) showed that the answer to this question depended on society's 'aversion to inequality': the same distribution of income would generate different welfare levels, depending upon how much society disliked inequality. If society was relaxed about inequality (low inequality aversion), the reduction in welfare would be small; on the other hand, if society greatly disliked inequality (high inequality aversion), the reduction in welfare, would be large. Atkinson (1970) measured inequality aversion by the value of a (inequality aversion) parameter, $\varepsilon \geq 0$. When $\varepsilon = 0$, we are *not at all* averse to inequality implying that we would not be prepared to accept even the smallest reduction in average income in order to secure an equitable distribution. The degree of inequality aversion increases with the value of ε: the higher the value of ε, the more averse we would be to inequality and, in order to secure an equitable distribution of income, the greater the reduction in average income we would find acceptable.

On the basis of these concepts, Anand and Sen (1997), in a paper prepared for the 1995 *Human Development Report*, pointed out that a country's non-economic achievements were likely to be unequally distributed between subgroups of its population. For example, in terms of gender equality, which was the focus of their concern, the female literacy rate, or female life expectancy, was often lower than that for males. In the face of such inter-group inequality, they argued that a country's achievement with respect to a particular outcome should not be judged exclusively by its mean level of achievement (for example, by the average literacy rate for a country) but rather by the mean level *adjusted to take account of inter-group differences in achievements*. Anand and Sen (1997) proposed a method, based on Atkinson's (1970) paper, for making such adjustments and they termed the resulting indicators *equity sensitive indicators*. They further suggested that assessments of country achievements should be made on the basis of such equity sensitive indicators rather than, as was often the case, on the basis of its mean level of achievement. This would then allow a comparison between

two countries, one of which had a lower mean achievement level, but a more equitable distribution of achievement, than the other[1].

These ideas can, equally well, be applied to the measurement of educational performance. We can reduce the average performance of a schooling system, $\overline{p}$, of a country by the amount of inter-group inequality in living standards to arrive at p^e, the EDE performance level. This is the "equity sensitive" performance level for the schooling system, $p^e \leq \overline{p}$ and it yields the same level of educational welfare (is welfare equivalent to) as the current level of performance with the current inter-school distribution. More formally:

$$W = N \times U(p^e) = \sum_{i=1}^{N} U(p_i) \qquad (6.4)$$

The size of this reduction, $\overline{p} - p^e$, depends upon our aversion to inequality: the lower our aversion to inequality, the smaller will be the difference and, in the extreme case in which there is no aversion to inequality ($\varepsilon = 0$), there will be no difference between the average, and the equity sensitive, performance levels.

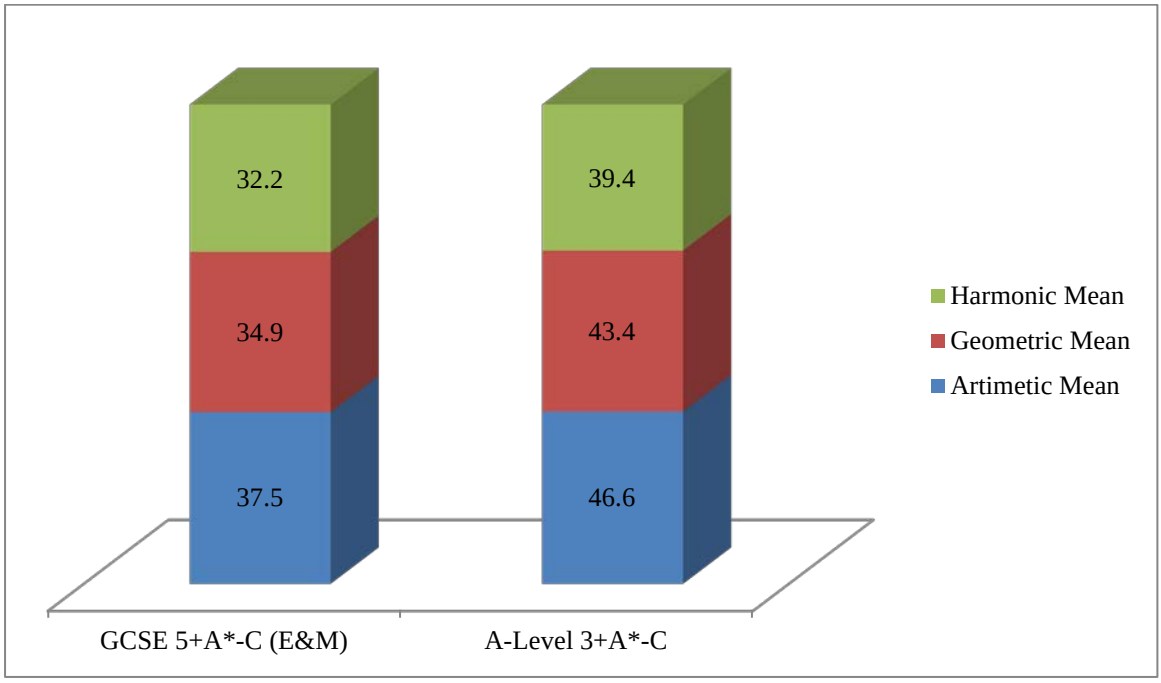
Three special cases, contingent upon the value assumed by ε, may be distinguished:

1. When $\varepsilon = 0$ (no inequality aversion), p^e is the *arithmetic mean* of the school performance levels: $p^e = \overline{p}$.
2. When $\varepsilon = 1$, p^e is the *geometric mean* of the school performance levels:
$$p^e = \left[\prod_{i=1}^{N} (p_i)^N\right]^{1/N} < \overline{p}.$$
3. When $\varepsilon = 2$, p^e is the *harmonic mean* of the school performance levels:
$$p^e = \left[\sum_{i=1}^{N} \frac{1}{p_i}\right]^{-1} < \overline{p}.$$

The EDE performance levels associated with ε=0 (arithmetic mean), ε=1 (geometric mean), and ε=2 (harmonic mean) are shown in Figure 6.5 for the proportion of Year 12 pupils in Northern Ireland's secondary schools obtaining 5+A*-C (E&M) GCSE passes and for the proportion of Year 14 pupils in Northern Ireland's secondary schools obtaining 3+A*-C A-level passes.

[1] Anand and Sen (1997) compared the Honduras (with an average literacy rate of 75%, distributed between men and women as 78%, 73%) with China (with an average literacy rate of 80%, distributed between men and women as 92%, 68%) and asked which country should be regarded as having the 'better' achievement with regard to literacy: China with a higher overall rate or the Honduras with greater gender equality?

Figure 6.5: Equally Distributed Equivalent Performance Levels in Secondary Schools, 5+ A*-C GCSE and 3+A*-C A-level passes



Percentage of relevant pupils (Year 12 for GCSE, Year 14 for A-levels) obtaining the grades shown

6.4. Difficulties of Accessing Grammar Schools by FSM and SEN pupils

Given the fact that the performance of grammar schools is so much superior to that of secondary schools, a disturbing feature of Northern Ireland's post-primary schooling system is that pupils from deprived backgrounds (FSM pupils) pupils with special educational needs (SEN pupils) were grossly under-represented in grammar schools. As Table 6.1 shows, 57% of the total number of secondary school pupils, compared to only 15% of grammar school pupils, was FSM or SEN.

Table 6.2: Distribution of FSM and SEN pupils by type of School (2012/13)

	Grammar School	Secondary Schools	Total
FSM Pupils	4,632	22,501	27,133
SEN Pupils	4,945	23,224	28,169
Other Pupils	53,022	34,636	87,658
Total Pupils	62,599	80,361	142,960

Table 6.2 explores in greater detail the distribution of the different types of pupils between grammar and secondary schools. In the school year 2012-13, there were a total of 27,133 FSM post-primary pupils in Northern Ireland of whom only 4,632 (17%) went to grammar schools with the remaining 22,501 FSM pupils (83%) in secondary schools. Similarly, there were a total of 28,169 SEN post-primary pupils in Northern Ireland of whom only 4,945 (18%) were grammar school pupils with the remaining 23,224 SEN pupils (82%) in secondary schools. By contrast, of the 87,658 post-primary pupils in Northern Ireland *who were neither FSM nor SEN pupils*, 53,022 (60%) attended grammar schools while the remaining 34,636 pupils (40%) were secondary school pupils. Given this information, one can measure access inequality to grammar schools between FSM, SEN, and non-FSM/SEN pupils as follows.

The number is Table 6.2 suggest that an indicator of the difficulty that pupils from different groups had in accessing grammar school education was provided by comparing their representation in the population of pupils with their representation among grammar school pupils. So, for example,

FSM and SEN pupils were disproportionately *underrepresented* among grammar schools because while they, respectively, comprised 19% and 20% of Northern Ireland's post-primary pupils they, respectively, accounted for only 7% and 8% of its grammar school pupils. Similarly, pupils who were not deprived (that is, neither FSM nor SEN) were disproportionately *overrepresented* among grammar schools because while they constituted 61% of Northern Ireland's post-primary pupils, they comprised 85% of its grammar school pupils. Against this background, the relevant question is how to merge these disproportions in presence in a universal (all pupils) compared to a specific (grammar school) population into a *single* measure of *access inequality*. Ideally such a measure should satisfy the "Pigou-Dalton condition" which, applied to the present study, requires that an increase in FSM (or SEN) pupil numbers in grammar schools, *at the expense of an equal reduction in the number of non-deprived pupils*, would reduce access inequality.[2]

Suppose the three groups are indexed *k=1* (FSN), *k=2* (SEN), and *k=3* (non-deprived) such that N_k and G_k are the numbers of pupils from *each* group in, respectively *all* schools and in grammar schools. Then $N = \sum_{k=1}^{3} N_k$ and $G = \sum_{k=1}^{3} G_k$ are, respectively, the total number of pupils in all schools and in grammar schools.

One way of measuring inequality in a variable is by *the natural logarithm of the ratio of the arithmetic mean of the variable to its geometric mean.*[3] As Bourguignon (1979) demonstrates, such a measure satisfies *inter alia* the Pigou-Dalton condition (discussed above). This idea translates very naturally, from its usual application to income inequality, to measuring the degree of inequality associated with educational (or labour market or health) outcomes in which people in different population groups meet with different degrees of success in securing a "desirable outcome". In this study, the three groups are FSM, SEN, and non-deprived pupils and the "desirable outcome" is access to a grammar school education. The variable of interest is the *access rate* to grammar schools of pupils from group *k - defined as the proportion of pupils from that group who were grammar school pupils* - and it is inequality in the distribution of this rate between the three groups that is sought to be measured. This inequality is referred to, hereafter, as “access inequality”.

The success rate of group *k* (denoted e_k) is $e_k = G_k / N_k,\ 0 \le e_k \le 1$. Then the arithmetic and geometric means of e_k are, respectively:

$$\bar{e} = \sum_{k=1}^{3} e_k n_k \quad \text{and } \hat{e} = \prod_{k=1}^{3} (e_k)^{n_k} \quad \textit{where } n_k = N_k / N,\ \sum_{k=1}^{3} n_k = 1 \tag{6.5}$$

so that the measure of access inequality is:

$$J = \log(\bar{e} / \hat{e}) = \log(\bar{e}) - \sum_{k=1}^{K} n_k \log(e_k) \tag{6.6}$$

Now from the definition of e_k:

$$e_k = G_k / N_k = (G_k / N_k)(N / G)(G / N) = (G_k / G)(N / N_k)(G / N) = (g_k / n_k)\bar{e} \tag{6.7}$$

where: $g_k = G_k / G$ and $n_k = N_k / N$ are, respectively, group *k's* share of grammar school pupils and of all pupils. Employing equation (6.7) in equation (6.6):

[2] In the language of inequality analysis this transfer *from* an "access-rich" group *to* an "access-poor" group constitutes a progressive transfer and, by virtue of this, is inequality reducing.

[3] See Bourguignon (1979) , Theil (1967), and Borooah (2001).

$$J = \log(\bar{e} / \hat{e}) = \log(\bar{e}) - \sum_{k=1}^{3} n_k \log(e_k) = \log(\bar{e}) - \sum_{k=1}^{3} n_k \log\left[\frac{g_k}{n_k}\bar{e}\right] = \sum_{k=1}^{3} n_k \log\left[\frac{n_k}{g_k}\right] \qquad (6.8)$$

From equation (6.8), inequality is minimised when *J=0*. This occurs when $n_k = g_k$, that is when each group's share in the total of all pupils *(n_k)* is equal to its share in the total of grammar school pupils (g_k). Otherwise, *J>0*.

From the data shown in Table 6.2, the values of g_k for FSM, SEN and non-deprived pupils are, respectively: 0.074, 0.079, and 0.847. The values of n_k for FSM, SEN and non-deprived pupils are, respectively: 0.19, 0.197, and 0.613. This implies that, from equation (6.8), and multiplying by 100, *J=16.1*.

To put this result in perspective, Borooah (2001) computed the values for employment inequality in Northern Ireland (the *J* value of equation (6.8)) in the days when the Catholic share in employment fell well short of the community's share of the labour force. This shortfall, in turn, generated debate about labour market discrimination and spawned the Equal Opportunities Legislation that has utterly transformed Northern Ireland's labour market. These results, which are reproduced below in Table 6.3, show that, even in those dark days of prejudice and discrimination, the disadvantage faced by Catholic job-seekers was considerably less than the difficulties encountered by post-primary pupils from deprived backgrounds in entering the portals of Northern Ireland's grammar schools.

Table 6.3: Shares (%) in Employment and the Labour Force
Catholics and Protestants (Men)

	Employment share		Labour Force Share		J value
Year	C	P	C	P	
1990	38	62	41	59	5.35
1991	38	62	42	58	6.82
1992	34	66	38	62	6.89
1993	38	62	41	59	4.07
1994	37	63	40	60	5.64

C=Catholic; P=Protestant
Source: Borooah (2001)

The inequality measure, *J*, of equation 6, has along the lines suggested by Bourguignon (1979), an appealing interpretation. If social welfare is the sum of identical and concave group utility functions whose arguments are e_k then social welfare is maximised when e_k - the success rate of a group - is the same for every group. If the utility functions are of the logarithmic form (that is $U(e_k) = \log(e_k)$), then *J* represents the distance between *maximum* level of social welfare ($\log(\bar{e})$) and the *actual* level of social welfare ($\sum_{k=1}^{3} n_k \log(e_k)$): *social welfare is maximised when access inequality is minimised*!

Selection Tests: FSM pupils and Grammar School Admission

Access inequality arises because of the use of selection tests for admission to grammar schools, conducted at the age of 11 by means of, the popularly termed, '11+' examination. Those who would defend the pupil composition of grammar schools, in terms of their FSM/non-FSM proportions, would argue that grammar school admission should depend solely upon results in the 11+ examination: the test is an arbiter of pupil ability and those who pass this test are *ipso facto* best equipped to benefit from the well-resourced grammar school system and, therefore, are most deserving of entry into such schools. In this section we question the assumption that the test is *always*

a good arbiter of pupil quality and examine the conditions under which it might fall short in this regard.

Strictly speaking, selection tests are primarily a measure of the ability of candidates to score on the particular test they are taking. There may be correlation (large or small) between candidates' test scores and some latent quality (which, by definition, is unobservable) they possess which is the object of interest. We measure the efficacy of a test in terms of this association between the test outcome and this latent quality. The use of selection tests for grammar school admission is just a particular example of situations in which the outcome of a test - positive or negative - is used to determine whether or not a condition (a prospective pupil is worthy of grammar school admission) exists. As such, it is susceptible to a fallacy that is inherent in such situations: confusing the chance that a candidate would pass the test *if he/she is a 'good' pupil* with the chance that a candidate is a 'good' pupil *if he/she passed the test*. In legal situations this is referred to as the *Prosecutors' Fallacy* (Thompson and Schumann, 1987; Aitken, 1996); in medical situations it is termed the *Doctors' Fallacy* (Zackrisson *et. al*., 2006, Mlodinow, 2009, pp. 114-116); and in labour market situations as the *Employment Fallacy* (Borooah, 2010).[4] A similar fallacy could arise in situations where people are denied access to grammar schools on the basis of the outcome of a selection test. This is referred to here as the *selection fallacy* and this section provides quantitative estimates of the size of this fallacy.

We assume that there is some innate intellectual quality (IIQ) in a pupil (for, ease of reference, a pupil is 'good' or 'not good') on the basis of which (and only on that basis) it will be decided whether he/she is admitted to a grammar school. Since we cannot observe this innate quality, we use a proxy observation based on the results of a selection test such that a candidate gains grammar school entry if, and only if, he/she 'passes' the test. Now suppose that 1, 000 candidates sit the set and the prior belief is that, of these, 280 (28%) are 'good' candidates. Traditionally, only the top 28% of candidates in the (erstwhile) 11+ exam obtained grammar school entry. The nature of the test is such that a 'good' pupil will have a 95% chance of *passing* the test (and, therefore, a 5% chance of failing the test) and a 'not good' pupil will have an 85% chance of *failing* the test (and, therefore, a 15% chance of passing the test). In statistical parlance, the probability of a 'true positive' (95%) is referred to as the *sensitivity* of the test and the probability a 'false negative' (85%) is referred to as the *specificity* of the test.[5]

On the basis of prior belief, there are 280 'good' pupils among the candidates, of whom 266 will pass the test and 14 will fail the test. Similarly, the prior belief is there are 720 'not good' pupils among the candidates of whom 612 will fail the test and 108 will pass the test. So, in total, 374 pupils will pass the test, and of these, 266 pupils (71%) will be 'good' pupils and 108 (29%) will be 'not good' pupils. So, 71% of grammar school pupils (all of whom got in by virtue of having passed the selection test) will be 'good' pupils, deserving of grammar school entry, but 29% of grammar school pupils will not be 'good' pupils and, therefore, undeserving of entry.

This result arises for two reasons. First, there is the prior belief that, given the rigorous nature of grammar school education, only a limited proportion of candidates (28%, on our assumption) have

[4] A prosecutor argues that since the probability of observing a particular piece of evidence (say, blood type identical to that found at the scene of the crime), *under the assumed innocence of the defendant*, is very small the probability of the defendant being innocent, *given that his blood type matches that at the crime scene*, must also be very small. A doctor argues that since the probability of a person testing HIV positive, *if he/she was HIV free*, is very small, the probability of a patient being HIV free, *given that he/she tested HIV positive*, must also be very small. A labour market analyst argues that because only a small proportion of persons in regular employment are from a particular group, the probability of a person from that group being in regular employment must also be small.

[5] So, the probability of a 'true negative' (5%, in the example) is 1-sensitivity, and the probability of a 'false positive' (15%, in the example) is 1-specificity.

the IIQ to benefit from it. The second reason is that the probability of a 'false positive' – meaning a 'not good' student passes the test - is pitched at 15%. Why should we expect the probability of a 'false positive' to be so high? As stated earlier, at its most basic, a selection test measures the ability of a candidate to pass the test. With suitable parental encouragement, coaching, and burning of midnight oil, it is not unreasonable to assume that 15% of 'not good' pupils can be taught (can teach themselves) to pass the test and thus generate 'false positives'.

Now suppose that pupils are of two types, FSM and non-FSM, and that of the 1,000 candidates, 200 are FSM and 800 are non-FSM. The prior belief is that there is no difference in IIQ between the two groups so that the prior expectation is that 56 FSM candidates and 244 non-FSM candidates (28% of their respective totals) have the IIQ needed to cope with, and benefit from, grammar school education. We assume that the sensitivity of the test remains the same so that there is a 95% chance that a 'good' candidate, regardless of group, will pass the test. However, because non-FSM candidates have the advantage of greater parental resources, and possess greater awareness of the importance of going to grammar school, the chances of 'not good' candidates passing the test (the likelihood of a 'false positive') will be higher for non-FSM candidates than for FSM candidates. Suppose that the probability of a false positive is 5% for FSM, and 20% for non-FSM, candidates. Then we can make the following calculations.

1. Of the 800 non-FSM candidates, the prior belief is that 224 are 'good' and 576 are 'not good'. Of the 224 'good', and the 576 'not good', non-FSM candidates, respectively, 213 (95% of 224) and 115 (20% of 576) candidates will pass the test. This means that of the 328 non-FSM candidates who pass the test, 65% will be 'good' candidates and 35% will not be 'good' candidates.
2. Of the 200 FSM candidates, the prior belief is that 56 are 'good' and 144 are 'not good'. Of the 56 'good', and the 144 'not good', FSM candidates, respectively, 53(95% of 56) and 7 (5% of 144) candidates will pass the test. This means that of the 60 FSM candidates who pass the test, 88% will be 'good' candidates and 12% will not be 'good' candidates.

Because of differences between non-FSM and FSM candidates, in resources and in awareness of the importance of education, there will be a greater proportion of non-FSM, compared to FSM, grammar school pupils 'who do not deserve to be there'. On the basis of our assumptions, this 'undeserving pupils' gap' is 9pp. *Entirely as a consequence of differences in the probability of false positives between the two groups*, the proportion of FSM and non-FSM pupils in the grammar schools' intake , respectively, 15% (60/388 pupils) and 85% (328/388 pupils) does not reflect their respective shares of 20% and 80% in the candidate population.

If, say, grammar schools invested in FSM pupils by offering coaching to FSM pupils and, thereby, raised the probability of a false positives for FSM pupils from 5% to 15%, then of the 144 'not good' FSM candidates, 22 will pass the test. This will raise the proportion of FSM pupils in grammar schools from 15% (60/388) to 19% (78/403) and *access inequality will be all but eliminated*.

The foregoing analysis can be formalised in a *Bayesian* framework. Bayes' Theorem (named after the Reverend Thomas Bayes, an18th century Presbyterian minister) says that the probability of a theory being true (event *T*, i.e. a candidate for the test is a 'good' pupil), *given that the data has been observed* (passed the selection test [event *A*]) is:

$$P(T \mid A) = \frac{P(A \mid T)}{P(A)} \times P(T) \qquad (6.9)$$

where: $P(T)$ represents the *prior* belief that the theory is true and $P(A \mid T) / P(A)$ is the Bayesian "updating factor" which translates one's *prior* belief about the theory's validity into a *posterior*

belief.[6] The probability of observing a positive outcome on the selection test is the sum of the probabilities of a 'true positive' (the candidate passed the selection test *and* was a 'good' pupil) and a 'false positive' (the candidate passed the test and was *not* a 'good' pupil):

$$P(A) = \overbrace{P(A \cap T)}^{\text{prob of true positive}} + \overbrace{P(A \cap \tilde{T})}^{\text{prob of false positive}} = P(T) \times P(A|T) + P(\tilde{T}) \times P(A|\tilde{T}) \tag{6.10}$$

where: $\tilde{T}$ is the event that the pupil was *not* a 'good' pupil. Substituting the expression in (6.10) into equation (6.11) yields:

$$P(T \mid A) = \frac{P(T) \times P(A|T)}{P(T) \times P(A|T) + P(\tilde{T}) \times P(A|\tilde{T})} \tag{6.11}$$

We assume, as earlier, that 95 out of 100 pupils who are 'good' will *pass* the test (their marks on the test will be deemed to be above the limit for grammar school entry) and that 85 out of 100 pupils who are 'not good' will fail the test (their marks on the test will be deemed to be below the limit for grammar school entry): $P(A|T) = 0.95$ and $P(\tilde{A}|\tilde{T}) = 0.85$, where $\tilde{A}$ is the event that a pupil fails the test. The implication of this is that 5% of 'not good' candidates will pass the test and that 15% of 'good' candidates will fail the test. Our assumption is that, *prior to the selection test being administered*, there is a 28% chance that the candidate tested is a 'good' pupil, that is, *P(T)=0.28*.

Substituting these assumed values into equation (6.11) yields:

$$P(T \mid A) = \frac{0.28 \times 0.95}{0.28 \times 0.95 + 0.72 \times 0.15} = 0.71 \tag{6.12}$$

or, in other words, there is a 71% chance that a candidate passing the test will be a 'good' pupil worthy of grammar school entry. This suggests that the selection fallacy, which arose from confusing $P(A|T)[= 0.95]$ with $P(T \mid A)[= 0.71]$, is *not* negligible.

Of course this conclusion depends critically on the assumed parameter values: $P(T) = 0.28, P(A|T) = 0.95,$ and $P(A|\tilde{T}) = 0.15$. The latter two parameter values make, respectively, reference to the two facets of reliability embodied in the test:

1. $P(A|T)$ refers to the likelihood of a pupil *is* 'good' being *correctly* identified.

2. $P(A|\tilde{T})$ refers to the likelihood of a person who *is* 'not good' being *incorrectly* identified.

In statistical parlance, *P(A|T)* is the *sensitivity* of the test and $P(A|\tilde{T})$ is 1- *specificity* of the test. As equation (6.12) shows, there are three factors that affect the probability that passing the test identifies a 'good' pupil. They are: (i) the likelihood of a 'not good' pupil passing the test: $P(A|\tilde{T})$ (ii) the likelihood of a 'good' pupil passing the test: *P(A|T)* and (iii), the *a priori* probability that a candidate appearing in the test is, in fact, a 'good' pupil: *P(T)*.

Now consider two extreme cases. First, suppose that DENI tossed a coin to determine whether or not a pupil should go to grammar school. This is equivalent to assuming that $P(A|T) = P(A|\tilde{T}) = 0.5$. Second, suppose that that a faulty test recorded everyone tested as having

[6] The updating factor is the ratio of the probability of observing the data when the theory is true, to that of observing the data regardless of whether the theory is true or false: $P(A) = P(A|T)P(T) + P(A|\bar{T})P(\bar{T})$, $\bar{T}$ being the event that the theory is false.

passed the test: $P(A|T) = P(A|\tilde{T}) = 1$. Under both scenarios, $P(T|A) = 0.7$: there is a 70% chance that a pupil admitted to a grammar school, on either of these methods, would be a 'good' pupil – not much different from the 71% chance that a candidate who passed the properly conducted selection test would be worthy of grammar school entry!

6.4 Segregation in Northern Ireland's schools

Although, as shown below, Northern Ireland has a highly segregated schooling system, based on schools of a particular religious denomination largely attracting pupils from that religion, there has been no detailed analysis of segregation of pupils by religion and type of school. In presenting, possibly, the first full analysis of this issue, we use the most recent set of data available for school segregation in Northern Ireland which is for the school year 2011-12. For that reason the numbers quoted here differ slightly from the analysis of the earlier sections which was based on 2012-13 figures.

The discussion of school segregation proceeds entirely in terms of the binary divide between Protestant and Catholic pupils even though of Northern Ireland's 146,747 post primary pupils in 2011-12: 75,977 (52%) were Catholic; 56,621 (38%) were Protestant, and 14,149 (10%) were of "other religions".[7] The existence of this third group of "other pupils" is almost always ignored in discussions of schooling segregation. So, while it is well known that 89% of Catholic pupils in Northern Ireland attended "Catholic "schools (secondary or grammar) and 89% of Protestant pupils attended "Protestant "schools (Secondary or Grammar), it is not so well known that 81% of "other" pupils attended "Protestant" schools and only 5% attended "Catholic" schools (Secondary or Grammar), with 14% in Integrated schools (Grant-maintained and Controlled Integrated).

The mirror image of this finding was that several Catholic schools were homogenous in terms of their pupils' religion: 93 out of 101 Catholic schools had fewer than 5% of pupils who were non-Catholic while only five Protestant schools had fewer than 5% of pupils who were non-Protestant. From this analysis, it would appear that while Catholic schools in Northern Ireland catered almost exclusively to Catholic pupils – in aggregate, of the 68,801 pupils in Catholic schools, 67,542 (98%) were Catholic – Protestant schools in Northern Ireland catered for both Protestant pupils and pupils from "other" religious backgrounds: in aggregate, of the 65,815 pupils in Protestant schools, 50,288 (76%) were Protestant and 11,489 (17%) were from other religions, with the remainder of 4,038 pupils (7%) being Catholic. Table 6.1, below, compares pupil numbers in Northern Ireland's post primary schools, by management of school (Catholic/Protestant/Integrated) and by the type of school (Grammar/Secondary) alongside the religion of the pupils, for two years: 1997-98 and, 15 years later, 2011-12.

[7] Other Christian, non-Christian, religion unknown or unstated.

Table 6.4: Segregation in Northern Ireland's Post Primary Schooling: 1997/98 and 2011/12

	Protestant Pupils		Catholic Pupils		Other Pupils		Total Pupils	
	1997-98	2011-12	1977-98	2011-12	1997-98	2011-12	1997-98	2011-12
Protestant Grammar Schools	25,877	25,262	2,495	3,423	6,164	6,772	34,536	35,457
Protestant Secondary Schools	34,795	25,026	1,145	615	4,214	4,717	40,154	30,358
All Protestant schools	60,672	50,288	3,640	4,048	10,378	11,489	74,690	65,815
Catholic Grammar Schools	101	246	27,564	26,548	35	303	27,700	27,097
Catholic Secondary Schools	132	280	46,171	40,994	93	430	46,396	41,704
All Catholic Schools	233	526	73,735	67,542	128	733	74,096	68,801
Integrated Schools	1,608	5,807	2,291	4,397	409	1,927	4,308	12,131
Total	62,513	56,621	79,666	75,977	10,915	14,149	**153,094**	**146,747**

The most significant change over this period was the steep fall in pupil numbers in Protestant schools (by 8,875 pupils between 1997/98 and 2011/12) and the more moderate fall in pupil numbers in Catholic schools (by 5,295 pupils between 1997/98 and 2011/12) accompanied by a sharp rise in pupil numbers in Integrated schools (by 7,823 pupils between 1997/98 and 2011/12). The result of these changes is that total post primary pupil numbers in Northern Ireland fell by 6,347 between 1997/98 and 2011/12.

The other interesting feature of the change in post primary education in Northern Ireland in the past 15 years is the rise in the number of pupils from "other" religions, from 10,915 pupils in 1997/98 to 14,149 pupils in 2011/12. This rise of 3,234 pupils from other religions should be contrasted with the fall in the number of Protestant pupils (by 5,892 pupils) and Catholic pupils (3,689 pupils) between 1997/98 and 2011/12.

The vast bulk of pupils from other religions (95%) went to Protestant schools in 1997-98 when the Integrated school movement was in its infancy). However, 15 years later, when it could be argued that Integrated schools were well established, Protestant schools remained the favourite destination of pupils from other religions with 81% of such pupils going to Protestant schools in 2011/12. The rise in the number of such pupils in the past 15 years has served to erode the religious homogeneity of Protestant schools. In 1997/98, 81% of pupils in Protestant schools (60,672 out of 74,690 pupils) were Protestant; by 2011/12, this proportion had fallen to 76% (50,288 out of 65,815 pupils) with the slack being taken up by pupils from other religions (whose proportion among Protestant school pupils rose from 14% in 1997/98 to 17% in 2011/12).

The popularity of Protestant schools with pupils from other religions was largely with respect to Protestant grammar schools. Of the 11,489 'other religion' pupils who attended Protestant schools, 59% attended grammar schools. Similarly, Catholic pupils (whose proportion in the pupil body of

Protestant schools rose from 5% in 1997/98 to 6% in 2011/12) were attracted to Protestant grammar schools: of the 4,048 Catholic pupils in Protestant schools, 85% were in Protestant grammar schools and only 15% were in Protestant secondary. These observations contrast with the fact that of the 65,815 pupils in Protestant schools, only 54% were in grammar schools.

The result was that, in 2011/12, only five (out of 95) post primary Protestant schools had fewer than 5% of non-Protestant pupils compared to 39 (out of 116) such Protestant schools in 1997/98. The religious homogeneity of Catholic schools remained unchanged over this 15 year period: only three out of 111 Catholic schools in 1997/98, and eight out of 101 Catholic schools in 2011/12, had more than 5% of pupils who were non-Catholic.

Measuring Segregation

The forgoing analysis invites the question of whether the degree of religious segregation in North Ireland's schools can be measured in the presence of three religious groups: Catholic, Protestant, and 'other' religions? As with measuring access inequality, discussed above, an appealing way of viewing segregation is in terms of *group disproportionality* (Reardon and Firebaugh, 2002). So, using this approach, one should compare the proportions of persons, belonging to different groups (Catholic, Protestant, Other in the case of segregation; FSM, SEN, non-FSM/SEN in the case deprivation/special needs) in the total numbers in *a particular organisation* (school, housing estate, or workplace) with the proportions of persons from these groups in the *population at large*. The "distance" between the organisation-specific proportions and the population proportions then provides a measure of segregation. The analysis of access inequality of the previous section, applied to segregation, results in an identical measure of distance (but now denoted by L):

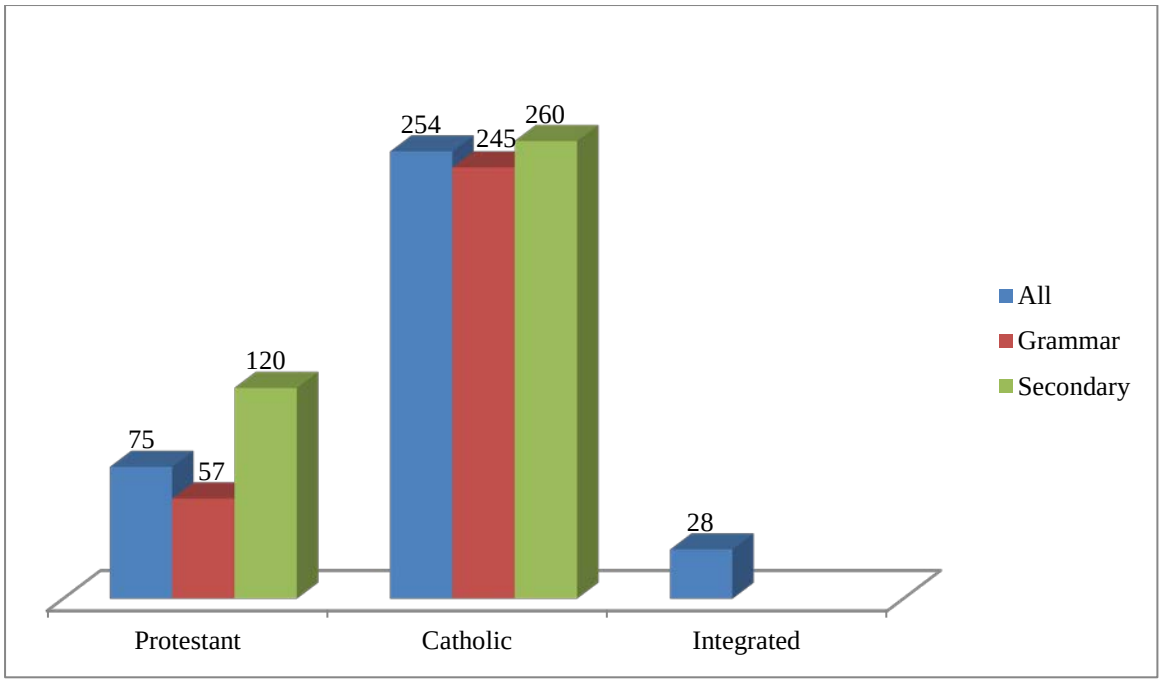
$$L = \sum_{k=1}^{3} n_k \log\left[\frac{n_k}{g_k}\right] \tag{6.13}$$

Where: n_k is the share of pupil group k (Catholic, Protestant, Other) in the pupil population; g_k is the share of pupil group k (Catholic, Protestant, Other) in the pupils of a school or type of school; and L is the measure of segregation.

From equation (6.9), segregation is non-existent when $L=0$. This occurs when $n_k = g_k$, that is when each group's share in the total of all post-primary pupils (n_k) is equal to its share in the total of pupils in a particular type of school; otherwise, $L>0$. The higher the value of L, the greater the degree of segregation or, equivalently, the greater will be the distance from zero segregation. Hypothetically, it could be that L is smaller for particular types of school but larger for others. For example, integrated schools, in which, as shown in Table 6.4, 48% of pupils in 2011-12 were Protestant, 36% were Catholic, and 16% were of 'other' religions, would have a lower L value compared to Catholic schools in which, in 2011-12, 0.7% of pupils were Protestant, 98% were Catholic, and 1.3% were of 'other' religions.

Figure 6.6 shows the values of L, the segregation index, for seven post-primary school types: (i) all Protestant schools; (ii) Protestant grammar schools; (iii) Protestant secondary schools; (iv) all Catholic schools; (v) Catholic grammar schools; (vi) Catholic secondary schools; (vii) Integrated schools. This shows that the degree of segregation in Catholic schools, considered in their entirety, was nine times that in integrated schools: 254 against 28. On the other hand, there the degree of segregation in Protestant schools was only 30% of that in Catholic schools, considered in their entirety (75 versus 254) and only 2.8 times that in Integrated schools. Within a particular category of school, there was a striking difference in segregation between Protestant grammar and secondary schools (57 versus 75) but there was little difference in segregation between Catholic grammar and secondary schools (245 versus 260).

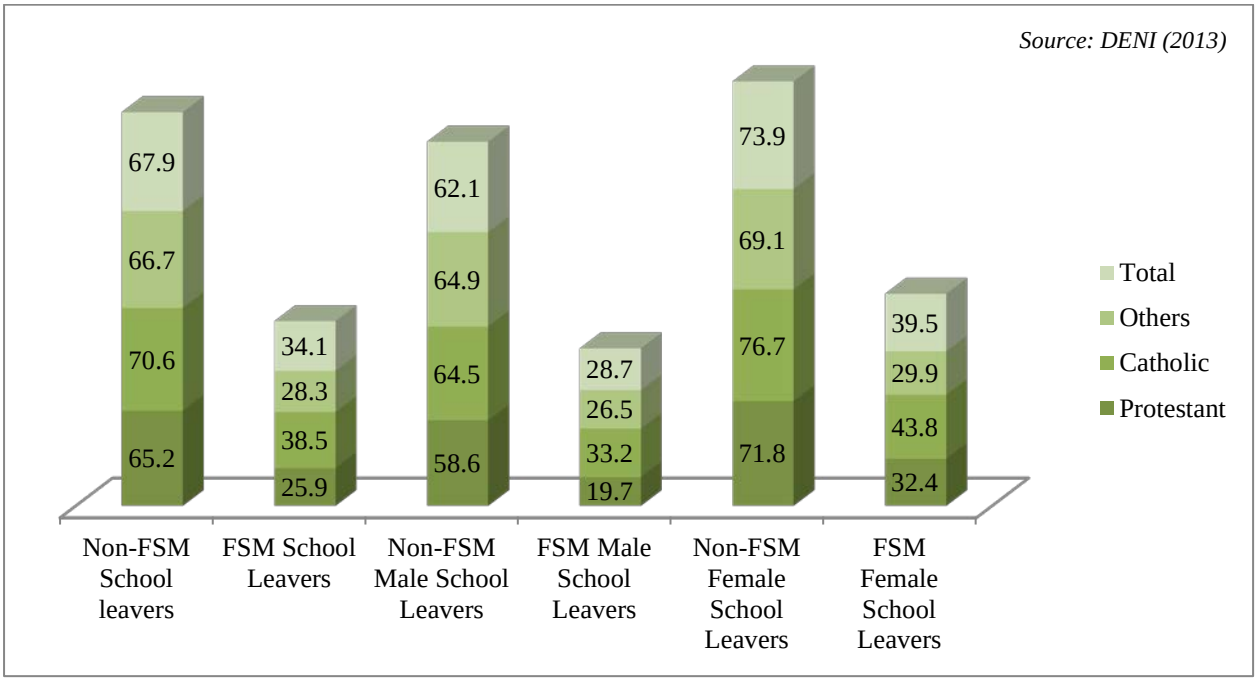
Figure 6.4: Values of the Segregation Index by Type of School



6.5 Underachievement in Post-Primary Education in Northern Ireland

According to aggregate data published by DENI (2013), the proportion of Northern Ireland's pupils obtaining 5+A*-C (E&M) GCSE passes was 62%. However, this aggregate figure masked differences in performance by different pupil groups with the average performance of pupils from some group lying below the Northern Ireland overall average. We define such groups as 'underachieving groups'. Foremost such groups are FSM pupils, only 34.1% of whom obtained 5+A*-C (E&M) GCSE passes in 2011-12. Compounding this is the religion and the gender divide. If we separate FSM pupils by religion and gender, then only 19.7% of Protestant, compared to 33.2% of Catholic, FSM *boys* obtained 5+A*-C (E&M) GCSE passes. For Protestant and Catholic FSM *girls*, the corresponding figures were, respectively, 43.8% and 32.4%. The details of the proportions obtaining 5+A*-C (E&M) GCSE passes by FSM status, religion, and gender are shown in Figure 6.5. This shows that the maximum achievement gap was between FSM, Protestant, boys (only 19.7% of whom obtained 5+A*-C (E&M) GCSE passes) and non-FSM, Catholic, girls (76.7% of whom obtained 5+A*-C (E&M) GCSE passes: there was a gulf of 57pp in their respective success rates with respect to 5+A*-C (E&M) GCSE passes. The details for the different groups, in terms of the proportion of their school leavers obtaining 5+A*-C (E&M) GCSE passes, are set out in Figure 6.5.

Figure 6.5: Under and Overachievement by Pupil Group in 2011-12: Proportion of School Leavers Obtaining 5+A*-C (E&M) GCSE passes



The question is how much did each of these three factors – FSM status, religion, gender - contribute to this gap of 57pp? We can answer this question by isolating the change from each of these factors, holding the others constant. So, *ceteris paribus*, a change in status from FSM to non-FSM would raise the GCSE achievement (as defined above) of FSM Protestant boys from 19.7% to 58.6% (an increase of 38.9pp); a further change of religion would raise the GCSE achievement of non-FSM Protestant (58.6%) to that of non-FSM Catholic boys (64.5%): an increase of 5.9pp. Lastly, the gender effect would raise the GCSE achievement of non-FSM Catholic boys (64.5%) to that of non-FSM Catholic girls (76.7%): an increase of 12.2pp. So, of the original gap of 57pp between FSM Protestant boys and non-FSM Catholic girls: 68% was due to FSM status, 10% was the effect of religion; and 22% was the effect of gender.

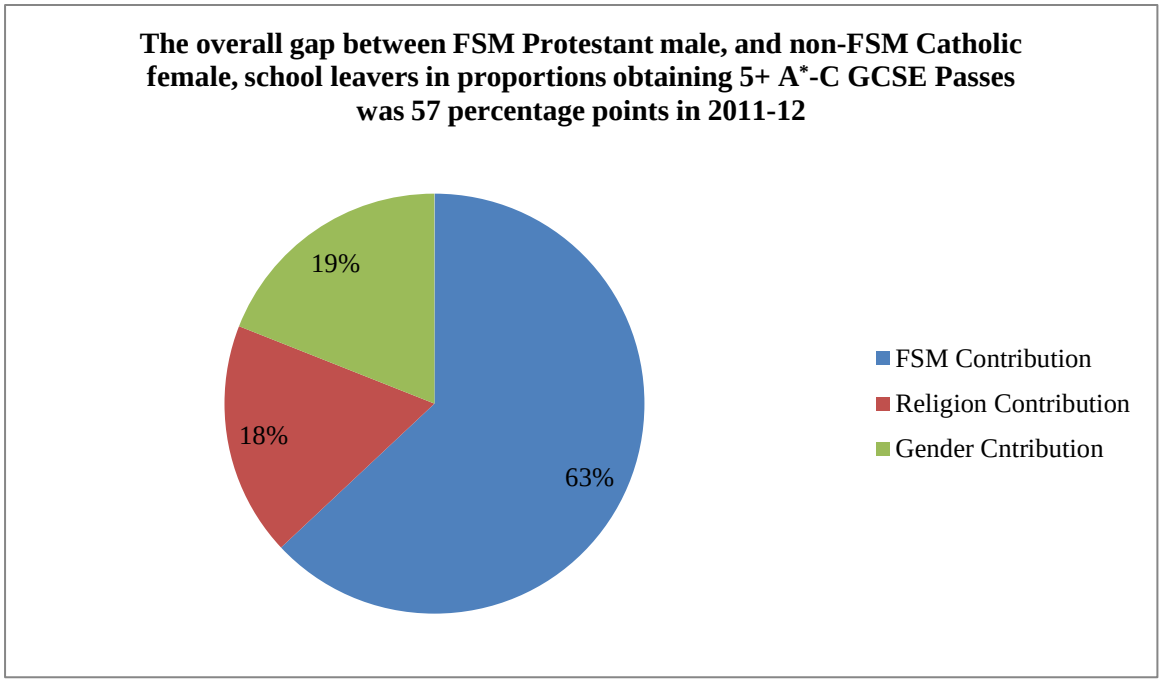
However, the problem is that the decomposition is not unique and depending on the sequence of changes, we would get a slightly different result. In the above example, the sequence was FSM → Religion → Gender. But, equally well, we could have had the sequence Gender → Religion → FSM. In general, there are six possible routes to explaining the 57pp gap in achievement rate between FSM Protestant boys and non-FSM Catholic girls and these are set out below in Table 6.4:

Table 6.4: Six Routes out of FSM Protestant Male School Leavers' GCSE Underachievement

	FSM	Religion	Gender
57 = 76.7-19.7	**58.6-19.7**	**64.5-58.6**	**76.7-64.5**
	FSM	Gender	Religion
57=76.7-19.7	**58.6-19.7**	**64.5-58.6**	**76.7-64.5**
	Gender	Religion	FSM
57=76.7-19.7	**32.4-19.7**	**43.8-32.4**	**76.7-43.8**
	Gender	FSM	Religion
57=76.7-19.7	**32.4-19.7**	**71.8-32.4**	**76.7-71.8**
	Religion	Gender	FSM
57=76.7-19.7	**33.2-19.7**	**43.8-33.2**	**76.7-43.8**
	Religion	FSM	Gender
57=76.7-19.7	**33.2-19.7**	**64.5-33.2**	**76.7-64.5**

The contributions made the three factors - FSM, religion, and gender - to explaining the 57pp gap in achievement rate between FSM Protestant male, and non-FSM Catholic female, school leavers were then computed as the *average* of the contributions made by each of these three factors under the six routes shown in Table 6.4. These percentage contributions (illustrated in Figure 6.6) were: *63% FSM*; *19% gender*; and *18% religion.* On our calculations, these then are the relative strengths of the factors contributing to the educational underachievement of Protestant boys from deprived backgrounds,

Figure 6.6: Percentage Contributions of FSM status, Religion, and Gender to FSM Protestant Male Underachievement in terms of 5+ A*-C GCSE Passes



It is also possible to view educational underachievent (and its mirror image, 'overachievement') in Northern Ireland in terms of *disproprtionality*. The disprportionality arises because the shares of each the 12 groups – obtained by combining the categories FSM/non-FSM, male/female, Catholic/Protestant/Other – in the population of school leavers are different from their shares in the population of those who obtained 5+A*-C (E&M) GCSE passes. [8] For example, in 2011-12, the 4,402 non-FSM, Catholic, female school leavers comprised 19.5% of the total of 22,568 school leavers but the 3,377 non-FSM, Catholic, female school leavers who obtained 5+A*-C (E&M) GCSE passes comprised 24% of the total of 13,990 school leavers who obtained this qualification. At the other extreme, the 590 FSM, Protestant, male school leavers comprised 2.6 % of the total of 22,568 school leavers but the 116 FSM, Protestant, male school leavers who obtained 5+A*-C (E&M) GCSE passes comprised 0.8% of the total of 13,990 school leavers who obtained this qualification.

This idea of disproportionality – which was previously employed in this chapter to measure 'access inequality' to grammar schools in Norhern Ireland and the degree of segregation in Nothern Ireland's post-primary schools - can also be used to measure educational underachievement / overachievement . To do so we define a 'achievement disproportionality' measure, *K* as:

[8] The 12 groups are: 1. FSM Protestant boys; 2. FSM Protestant girls; 3. FSM Catholic boys; 4. FSM Catholic girls; 5. FSM Other religion girls 6. FSM Other religion boys 7. non-FSM Protestant boys; 8. non-FSM Protestant girls; 9. non-FSM Catholic boys; 10. non-FSM Catholic girls 11. non-FSM Other religion boys; 12. non-FSM Other religion girls ;

$$K = \sum_{k=1}^{12} n_k \log\left[\frac{n_k}{g_k}\right] \tag{6.14}$$

Where: n_k is the share of pupil group k ($k=1\ldots12$) in the school leavers' population; g_k is the share of pupil group k ($k=1\ldots12$) in the population of school leavers who obtained 5+A*-C (E&M) GCSE passes; and K is the measure of 'achievement disproportionality'. The value of K, which was computed as 3.8, showed that, *overall*, disproportionality was not a glaring issue in Northern Ireland's GCSE achievements. Indeed, there was less disproportionality in GCSE outcomes than there was, as Table 6.3 shows, in employment outcomes in Northern Ireland in the 1990s and, indeed, as shown earlier, in FSM pupil access to grammar schools.[9]

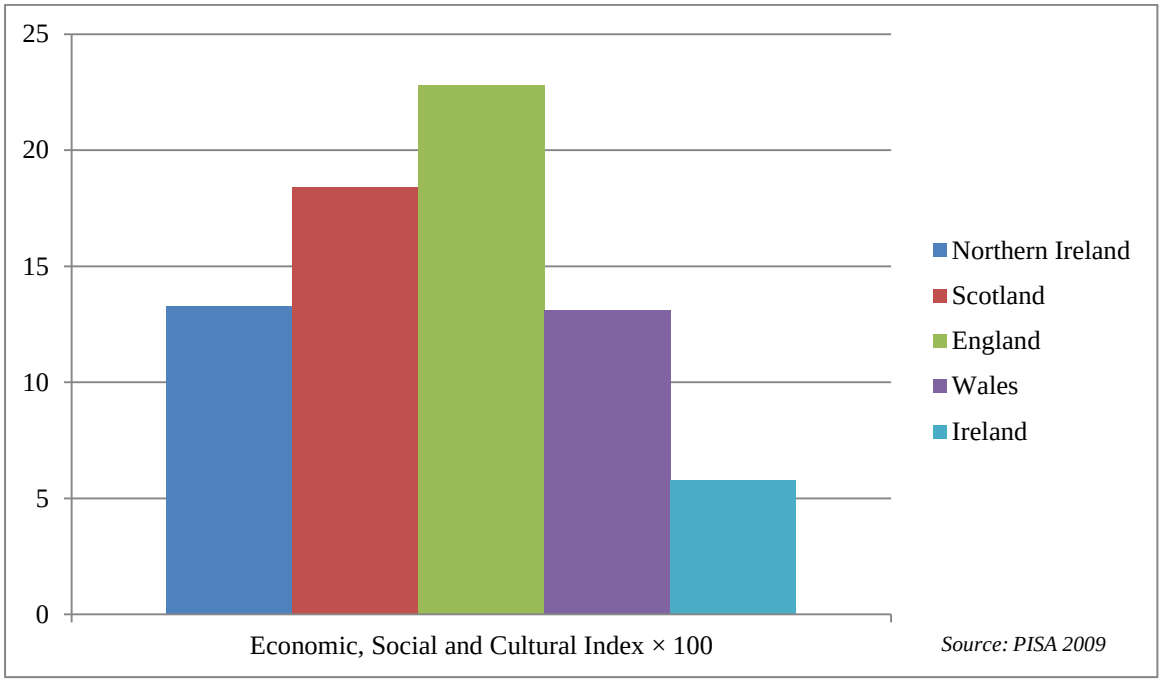
What is a serious issue is the low level of achievement of specific groups. Most narrowly, there is the fact that less than one in five FSM Protestant boys, and less than one in three FSM Protestant girls, left school with 5+A*-C (E&M) GCSE passes. The position for Catholic FSM boys and girls was better: one in three FSM Catholic boys, and over four out of 10 FSM Catholic girls, left school with 5+A*-C (E&M) GCSE passes. In the previous chapter we saw that, compared to Protestant schools, Catholic schools produced better examination results over the aggregate of their school leavers. These results show that Catholic schools *also produced better examination results for their FSM school leavers*: Catholic FSM male and female school leavers outperformed their Protestant counterparts by more than 10pp. So, the question that those responsible for education policy in Northern Ireland must ask is this: what is wrong with Protestant schools and what can they learn from their Catholic neighbours?

6.6 Using PISA data to identify deprived pupils in Northern Ireland

The Programme for International Student Assessment (PISA) is a survey of the educational achievement of 15-year-olds organised by the Organisation for Economic Cooperation and Development (OECD). A total of 65 countries participated in PISA 2009, the fourth survey. This included 33 OECD member countries and 24 members of the European Union (EU). PISA reports the socio-economic background of pupils by means of an Economic, Social and Cultural Status (ESCS) index. This is based on pupils' responses to questions about their parents' background and education and possessions in their homes such a higher value of the index implies a 'better' background. The index is set to a mean of zero across the OECD countries, with a standard deviation of 1. According to Figure 6.7, which shows the mean ESCS index value × 100 for the four countries of the UK (Northern Ireland, Scotland, England, and Wales) and Ireland, the value of this index was highest in England (index value =22.8), next highest in Scotland (18.4), followed by Northern Ireland and Wales (13.2), with Ireland (5.8) bringing up the rear.

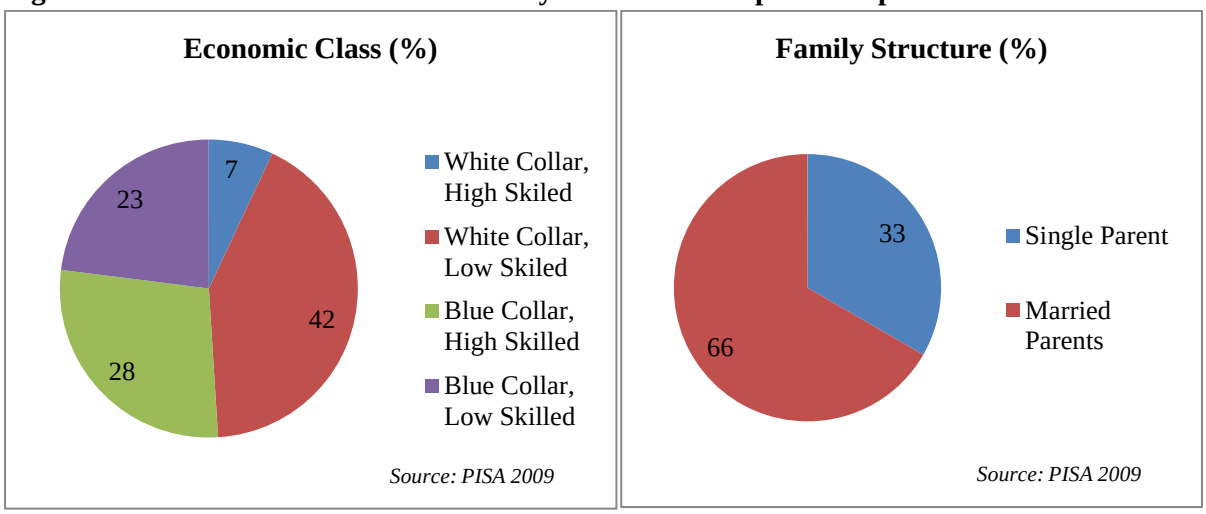
[9] Yet another facet of the disproportionality issue is the fact that, in 2011-12, FSM pupils comprised 17.5% of school leavers, but only 9.6% of school leavers obtaining 5+A*-C (E&M) GCSE passes. The K value for this was 2.9.

Figure 6.7: Average ESCS Index Scores for the United Kingdom countries and Ireland



The values for the ESCS index for Northern Ireland were organised into quintiles such that the 20% of pupils whose ESCS value placed them in the bottom quintile were identified as 'deprived' (corresponding to the FSM pupils who comprised 20% of Northern Ireland's post-primary pupil population) with the remaining pupils (in quintiles 2-5) regarded as 'not deprived'. According to Figure 6.8, which shows the composition of deprived pupils in terms of their family structure and their parents' economic class, 42% of deprived pupils in Northern Ireland (as compared to 28% of all pupils) had parents who were white collar and low skilled, 28% of deprived pupils (as compared to 7% of all pupils) had parents who were blue collar and high skilled, and 23% of deprived pupils (as compared to 6% of all pupils) had parents who were blue collar and low skilled. At the other end of the scale, 7% of deprived pupils (as compared to 60% of all pupils) had parents who were white collar and high skilled. In terms of family structure, 33% of deprived pupils (as compared to 22% of all pupils) lived with just one parent and 66% of deprived pupils (as compared to 77% of all pupils) lived with two parents.

Figure 6.8: The Economic Class and Family Structure of Deprived Pupils in Northern Ireland



The values of the ESCS index also correlate well with factors which might be expected to influence academic success. PISA constructs a 'home educational resource' (HER) index for the pupils that it surveys (such that a low HER value signifies poor resources). Organising the surveyed pupils according by quintiles of the HER index values, we found that 64% of deprived pupils in Northern Ireland, as compared to 27% of non-deprived pupils, were in the lowest HER quintile. Another index constructed by PISA is the 'attitude to school' (ATS) index (such that a low ATS value signifies a poor attitude). Organising the surveyed pupils according by quintiles of the ATS index values, we found that 44% of deprived pupils in Northern, as compared to 34% of non-deprived pupils, were in the lowest ATS quintile. The point can be rounded off by referring to another PISA index relating to the 'joy of reading' (JRD) index (such that a low JRD value signifies a lack of joy in reading). Organising the surveyed pupils according by quintiles of the JRD index values, we found that 34% of deprived pupils in Northern, as compared to 23% of non-deprived pupils, were in the lowest JRD quintile.

Using data from PISA 2009 on pupils and schools it was possible to examine the factors which determined pupil scores in reading and mathematics and the estimates from a multivariate regression equation are shown in Table 6.5. There were 1,817 observations on the 'reading' and the 'mathematics' equations, with adjusted R^2 values of, respectively, of 0.313 and 0.349.

Table 6.5: Factors Determining PISA Reading and Mathematics Test Scores

	Reading				Mathematics			
	Coeff	SE	t value	P value	Coeff	SE	t value	P value
Female	26.6	3.5	7.5	0.0	-18.8	3.1	-6.0	0.0
Grade	11.7	4.7	2.5	0.0	19.5	4.2	4.7	0.0
White collar, high skilled	53.0	8.6	6.1	0.0	54.9	7.6	7.2	0.0
White collar, low skilled	23.4	8.4	2.8	0.0	26.0	7.4	3.5	0.0
Blue collar, high skilled	16.4	9.4	1.7	0.1	24.0	8.3	2.9	0.0
Single Parent Family	-9.5	4.8	-2.0	0.0	-9.2	4.2	-2.2	0.0
Controlled School	-4.4	3.9	-1.1	0.3	-7.4	3.5	-2.2	0.0
Home Possessions Q4	20.6	4.6	4.5	0.0	22.0	4.0	5.5	0.0
Home Possessions Q3	5.9	4.5	1.3	0.2	10.8	4.0	2.7	0.0
Attitude to School Q4	14.9	5.3	2.8	0.0	10.2	4.7	2.2	0.0
Attitude to School Q3	14.1	4.2	3.3	0.0	10.4	3.8	2.8	0.0
Attitude to School Q2	5.1	5.3	1.0	0.3	4.5	4.7	1.0	0.3
Student Behaviour in School Q4	46.7	5.1	9.2	0.0	47.0	4.5	10.5	0.0
Student Behaviour in School Q3	36.9	5.5	6.7	0.0	40.3	4.9	8.3	0.0
Student Behaviour in School Q2	15.7	4.9	3.2	0.0	20.6	4.3	4.8	0.0
Academic Selection in School	49.7	4.2	12.0	0.0	44.7	3.7	12.2	0.0
Deprived Pupil	-11.8	5.7	-2.1	0.0	-9.1	5.0	-1.8	0.1
Intercept	393.5	10.2	38.7	0.0	411.8	9.0	45.8	0.0

Reference categories: Blue collar, low skilled; Two-parent family; Home possessions, Q1; Attitude to school, Q1; Student behaviour, Q1.

In terms of *schools*, the first feature of note in Table 6.5 is that *ceteris paribus* both reading and mathematics scores were significantly lower for controlled, than for maintained, schools. The second feature of note is that both reading and mathematics scores were significantly raised by academic selection. The third feature of note is that both reading and mathematics scores were significantly lower in schools with bad student behaviour – schools in which student behaviour was in

the higher quintiles (Q4, Q3, Q2) did significantly better than schools in the lowest behaviour quintile (Q1, the reference category).

In terms of *pupils*, the first feature of note in Table 6.5 was that *ceteris paribus* girls scored more highly in reading and boys scored more highly in mathematics. The second feature of note is that pupils with white collar high skilled parents had the highest, and pupils with blue collar low skilled parents had the lowest, reading and mathematics scores; similarly, pupils from single parent homes had significantly lower scores than children living with both parents. The third point of interest is that pupils with the best home educational resources had the highest, and pupils with the worst home educational resources had the lowest, reading and mathematics scores. The fourth point of interest is that pupils with the most positive attitude towards school had the highest, and pupils with the least positive attitude towards school had the lowest, reading and mathematics scores. The final point of interest is that *even after controlling for economic class, family structure, and home resources*, there was still remained a significant role for 'deprivation' in terms of influencing academic performance. In other words, these three factors – class, family, and resources, did not exhaust the totality of factors that contributed to pupil 'deprivation'.

6.7 Value-Added by Schools

An important issue in the context of post-primary education in Northern Ireland is the gap in educational performance between FSM and non-FSM pupils. This was highlighted in the previous chapter and again in section 6.5 of this chapter. The importance of closing this gap is recognised by government in Northern Ireland and, indeed, many of the current reforms to the school funding system are predicated on closing this gap. In this section we propose a method for measuring, in terms of this gap, the value-added by Northern Ireland post-primary schools using two pieces of information that are available for every school:

1. The *proportion* of *NFSM* and *FSM* of a school's Year 12 pupils that obtain 'good' GCSEs.
2. The *number* of *NFSM* and *FSM* pupils in a school's Year 12 class,

Suppose there are *N* schools indexed (*i=1…N*) such that M_i^{NFSM} and M_i^{FSM} are the number of *NFSM* and *FSM* pupils, respectively, in Year 12 in that school and P_i^{NFSM} and P_i^{FSM} are the average proportions of its *NFSM* and *FSM* pupils in Year 12 achieving 5+ 'good' GCSEs and. Then the average *absolute performance gap* (*APG*) between *NFSM* and *FSM* pupils in that school is defined by:

$$APG_i = P_i^{NFSM} - P_i^{FSM} \tag{6.15}$$

However, judging schools purely by the size of their *APG* neglects levels of pupil performance; two schools may have the same *APG*, but pupils in one school could be performing at a higher level than in the other school. To correct for this, each school's *APG* is divided by the mean performance of its NFSM pupils, P_i^{NFSM} – that is, the overall proportion of its *NFSM* Year 12 pupils who obtained 'good GCSEs - to arrive at the *performance gap ratio* (PGR):

$$PGR_i = \frac{APG_i}{P_i^{NFSM}} \tag{6.16}$$

Equation (6.16) shows that, for a given *APG*, schools with a higher mean *NFSM* pupil performance will have a lower *PGR*.

However, judging schools purely by the size of their *PGR* may also be misleading because it ignores the proportionate presence of *FSM* pupils in the school's Year 12. Two schools may have the same *APG*, but one might have achieved it by restricting the entry of *FSM* pupils through selective

admission while the other school admitted *FSM* pupils more freely. Arguably, for the same *PGR*, the first school should be deemed to have a less commendable performance than the second. If $K_i = K_i^{NFSM} + K_i^{FSM}$ represents the total number of pupils in Year 12 and $\alpha_i = K_i^{FSM} \big/ K_i$ represents the proportion of *FSM* pupils in the school's Year 12, the *adjusted* PGR (*APGR*) may be defined as:

$$APGR_i = \frac{PGR_i}{\alpha_i} = \frac{APG_i}{P_i^{NFSM}} \times \frac{K_i}{K_i^{FSM}} \tag{6.17}$$

From equation (6.17): $\partial APGR_i \big/ \partial \alpha_i = -\left(APG_i / P_i^{NFSM} \right) < 0$; the adjusted performance gap ratio decreases as the proportion of *FSM* students in the school's Year 12 increases.

The question of what happens to the *APGR* when the 'comparator' performance level, P_i^{NFSM} changes involves a more complex answer. On the one hand, the average performance gap, APG_i, increases as P_i^{NFSM} rises; on the other hand, the average performance gap as a percentage of the 'comparator' performance level, P_i^{NFSM} falls. To analyse the full effect note that, from equation (6.17):

$$\frac{\partial APGR_i}{\partial P_i^{NFSM}} = \frac{\partial PGR_i}{\partial P_i^{NFSM}} = -\frac{\beta P_i^{NFSM} - P_i^{FSM}}{\left[P_i^{NFSM} \right]^2} = \frac{P_i^{NFSM}(1-\beta) - (P_i^{NFSM} - P_i^{FSM})}{\left[P_i^{NFSM} \right]^2} \tag{6.18}$$

Where in equation (6.18), above, $\beta = \partial P_i^{FSM} \big/ \partial P_i^{NFSM} \geq 0$. If $\beta=0$, then an increase in the performance of *NFSM* pupils has no impact on the performance of *FSM* pupils and:

$$\frac{\partial PGR_i}{\partial P_i^{NFSM}} = \frac{P_i^{FSM})}{\left[P_i^{NFSM} \right]^2} > 0 \tag{6.19}$$

and the performance gap ratio *rises* with an improvement in the performance of non-FSM pupils.

If $\beta=1$, then an increase in the performance of *NFSM* pupils is accompanied by an equivalent improvement in the performance of *FSM* pupils and:

$$\frac{\partial PGR_i}{\partial P_i^{NFSM}} = \frac{-(P_i^{NFSM} - P_i^{FSM})}{\left[P_i^{NFSM} \right]^2} < 0 \tag{6.20}$$

and the performance gap ratio *falls* with an improvement in the performance of non-FSM pupils.

The value of β for which the performance gap ratio neither *rises nor falls* with an improvement in the performance of non-FSM pupils is given by:

$$\frac{\partial PGR_i}{\partial P_i^{NFSM}} = \frac{P_i^{NFSM}(1-\beta) - (P_i^{NFSM} - P_i^{FSM})}{\left[P_i^{NFSM} \right]^2} = 0 \Rightarrow \beta = \frac{P_i^{FSM}}{P_i^{NFSM}} \tag{6.21}$$

From the above analysis, one can define the *value added* by a school, VA*i*, as the inverse of its adjusted performance gap ratio, $APGR_i$:

$$VA_i = \left[APGR_i \right]^{-1} = \frac{P_i^{NFSM}}{APG_i} \times \alpha_i \tag{6.22}$$

Contrary to the prior belief that in every school the performance of *FSM* pupils would not be as good as that of *NFSM* pupils, $P_i^{FSM} < P_i^{NFSM}$ there were 22 (out of 204) post-primary schools in

Northern Ireland in which the performance of *FSM* pupils, with respect to 5+ A*-C (E&M) GCSE passes, was *at least as good as* that of *NFSM* pupils ($P_i^{FSM} \geq P_i^{NFSM} \Rightarrow APG_i \leq 0$). These 22 schools are identified in Table 6.6, below and, of these 22 schools, 18 were grammar schools (10 Protestant, eight Catholic); two were maintained; and two were grant maintained integrated. The 10 Protestant grammars had a substantially lower proportion of year 12 FSM pupils than the eight Catholic grammars (5.2% versus 10.5%).

Table 6.6: Schools in which NFSM pupils were outperformed by FSM pupils, 2013

School	Town	Type	% with 5+ A*-C (E&M)		Year 12 numbers	
			NFSM	FSM	FSM	Total
Strangford Integrated College	Carrowdore	GMI	32	45	11	91
Cambridge House Grammar School	Ballymena	Grammar (P)	90	100	10	158
Belfast High School	Newtownabbey	Grammar (P)	92	100	6	139
Rainey Endowed School	Magherafelt	Grammar (P)	94	100	6	101
The Royal School Dungannon	Dungannon	Grammar (P)	95	100	7	100
Malone Integrated College	Belfast	GMI	18	22	36	133
Lurgan College	Craigavon	Grammar (P)	95	100	8	119
Grosvenor Grammar School	Belfast	Grammar (P)	96	100	6	163
Portadown College	Craigavon	Grammar (P)	97	100	6	203
Mount Lourdes Grammar School	Enniskillen	Grammar (C)	90	92	13	91
St Dominic's High School	Belfast	Grammar (C)	98	100	15	142
St Joseph's College	Dungannon	Maintained	21	24	34	94
Banbridge Academy	Banbridge	Grammar (P)	98	100	7	194
Ballymena Academy	Ballymena	Grammar (P)	98	100	7	181
Collegiate Grammar School	Enniskillen	Grammar (P)	99	100	5	75
Loreto Grammar School	Omagh	Grammar (C)	99	100	16	123
St Mary's High School	Downpatrick	Maintained	57	58	12	73
St Louis Grammar School	Ballymena	Grammar (C)	99	100	8	146
Lumen Christi College	Londonderry	Grammar (C)	100	100	7	124
St Joseph's Grammar School	Dungannon	Grammar (C)	100	100	10	76
Our Lady's Grammar School	Newry	Grammar (C)	100	100	10	127
St Mary's Grammar School	Magherafelt	Grammar (C)	100	100	16	165

There were 23 post-primary schools in which the performance of *FSM* pupils, though worse that of *NFSM* pupils ($P_i^{FSM} \geq P_i^{NFSM} \Rightarrow APG_i \leq 0$) with respect to 5+ A*-C (E&M) GCSE passes, was within 10% of the latter's performance. These are shown in Table 6.7 and they comprise 17 Catholic schools: 11 Catholic grammars and six Catholic maintained schools. Of the remaining six schools, 5 were Protestant grammars and one was a grant maintained integrated college.

Table 6.7: Schools in which FSM pupils' performance was less than 10% of NFSM performance, 2013

School	Town	Type	Yr 12 FSM	Yr 12 total	PGR
St John's High School	Omagh	Maintained	12	32	1
St Patrick's Grammar School	Armagh	Grammar (C)	12	116	1
St Paul's High School	Newry	Maintained	41	251	1
St Michael's Grammar	Craigavon	Grammar (C)	16	144	1
St Rose's High School	Belfast	Maintained	30	68	5
St Comhghall's College	Enniskillen	Maintained	19	59	3
St Brigid's College	Londonderry	Maintained	78	127	8
Slemish College	Ballymena	GMI	15	125	5
Regent House School	Newtownards	Grammar (P)	9	218	3
St Malachy's College	Belfast	Grammar (C)	15	160	3
St Columb's College	Londonderry	Grammar (C)	37	208	4
Limavady Grammar School	Limavady	Grammar (P)	16	139	4
St Colman's High School	Ballynahinch	Maintained	16	62	9
St Michael's College	Enniskillen	Grammar (C)	7	97	5
Glenlola Collegiate	Bangor	Grammar (P)	13	163	4
Dominican College	Portstewart	Grammar (C)	9	74	5
St Patrick's Academy	Dungannon	Grammar (C)	22	200	5
St Patrick's Grammar School	Downpatrick	Grammar (P)	13	95	5
Wellington College	Belfast	Grammar (P)	9	122	6
Sacred Heart Grammar School	Newry	Grammar (C)	13	121	6
Thornhill College	Londonderry	Grammar (C)	31	200	6
St Colman's College	Newry	Grammar (C)	10	135	6
Christian Brothers Grammar School	Newry	Grammar (C)	8	136	7

Lastly, at the other end of the scale, Table 6.8 lists the 68 schools in which *not a single FSM pupil* managed to obtain a 5+ A*-C (E&M) GCSE pass. Of these 68 schools, 30 were controlled (secondary); 25 were maintained (secondary); 10 were Integrated; and three were Protestant grammars

Table 6.8: Schools in which not a single FSM Pupil Obtained 5+ A*-C (E&M) GCSE Passes, 2013

School	Town	Type	Yr 12 FSM	Total Yr 12	NFSM Pass Rate
Downshire School	Carrickfergus	Controlled	16	138	37
Devenish College	Enniskillen	Controlled	11	92	35
Newry High School	Newry	Controlled	14	74	50
Blackwater Integrated College	Downpatrick	Integrated	12	68	37
Ballyclare Secondary School	Ballyclare	Controlled	15	173	38
Glastry College	Newtownards	Controlled	18	117	30
Immaculate Conception College	Londonderry	Maintained	12	43	16
St Brigid's High School	Armagh	Maintained	13	41	28
St Patrick's High School	Lisburn	Maintained	10	85	54
Larne High School	Larne	Controlled	15	103	22
Larne Grammar School	Larne	Grammar (P)	6	110	89
Markethill High School	Armagh	Controlled	11	103	46
St Benedict's College	Randalstown	Maintained	20	94	43
The High School Ballynahinch	Ballynahinch	Controlled	5	76	37
Drumglass High School	Dungannon	Controlled	7	79	38
St Joseph's College	Coleraine	Maintained	15	73	42
St Columban's College	Newry	Maintained	14	55	42
Carrickfergus College	Carrickfergus	Controlled	28	135	32
Saintfield High School	Saintfield	Controlled	5	74	48
Ballee Community High School	Ballymena	Controlled	22	72	19
Newtownabbey Community High School	Newtownabbey	Controlled	17	58	50
Ballymoney High School	Ballymoney	Controlled	28	143	33
St Columba's College	Newtownards	Maintained	10	53	48
Lisneal College	Londonderry	Controlled	33	157	32
Hunterhouse College	Belfast	Grammar (P)	7	107	83
Edmund Rice College	Newtownabbey	Maintained	32	119	33
Coleraine College	Coleraine	Controlled	12	54	26
Omagh High School	Omagh	Controlled	7	70	50
St Columbanus' College	Bangor	Maintained	13	96	52
St Mary's College	Enniskillen	Maintained	9	37	33
Integrated College Dungannon	Dungannon	Integrated	17	83	47
Magherafelt High School	Magherafelt	Controlled	16	122	27
City Armagh High School	Armagh	Controlled	8	62	25
Nendrum College	Newtownards	Controlled	12	89	34
De La Salle High School	Downpatrick	Maintained	11	71	31
Shimna Integrated College	Newcastle	Integrated	18	88	32
Orangefield High School	Belfast	Controlled	21	55	16

New-Bridge Integrated College	Banbridge	Integrated	9	89	57
St Patrick's College	Londonderry	Maintained	19	51	53
St Patrick's College	Dungannon	Maintained	35	116	30
St Joseph's College	Enniskillen	Maintained	9	40	61
Our Lady of Mercy Girls' School	Belfast	Maintained	25	66	36
Dundonald High School	Belfast	Controlled	13	67	22
Drumcree College	Portadown	Maintained	9	52	16
St Mary's High School	Craigavon	Maintained	18	69	21
Drumragh College	Omagh	Integrated	11	105	62
Cullybackey High School	Ballymena	Controlled	15	124	26
Banbridge High School	Banbridge	Controlled	13	126	44
Movilla High School	Newtownards	Controlled	22	97	20
Fivemiletown college	Fivemiletown	Controlled	8	72	52
North Coast Integrated College	Coleraine	Integrated	17	79	28
Coleraine Academical Institution	Coleraine	Grammar (P)	7	123	80
Brownlow Integrated College	Craigavon	Integrated	35	94	37
Monkstown Community School	Newtownabbey	Controlled	31	138	18
Castlederg High School	Castlederg	Controlled	20	84	26
St Colm's High School	Magherafelt	Maintained	8	70	50
Holy Trinity College	Cookstown	Maintained	32	102	45
Little Flower Girls' School	Belfast	Maintained	25	109	41
St Fanchea's College	Enniskillen	Maintained	12	55	37
St Patrick's College	Ballymena	Maintained	12	106	44
Laurelhill Community College	Lisburn	Controlled	14	165	42
Dunluce High School	Bushmills	Controlled	19	108	21
Erne Integrated College	Enniskillen	Integrated	17	72	49
Priory College	Holywood	Integrated	20	91	35
St Mary's High School	Enniskillen	Maintained	10	21	75
St Joseph's Boys' High School	Newry	Maintained	21	78	46
St Patricks & St Brigids High School	Londonderry	Maintained	18	107	64
Sperrin Integrated College	Magherafelt	Integrated	7	82	53

6.6 Conclusions

Northern Ireland is praised as an education system which produces high performance levels. This is undoubtedly true for grammar school pupils. However it ignores the fact that only one-third of secondary school pupils obtain 5+ GCSE passes at A* - C grades, including English and Maths. It also conceals the level of inequality which children from disadvantaged backgrounds experience in accessing grammar schools. Structural reforms, proposed school closures and mergers into super-schools will do little to address these problems. School improvement policies employed by the Department of Education have also made no impression on raising standards. This paper offers peer learning, a model based on stronger-weaker school links, as an alternative approach. The pilot shared education programme provides early evidence of trust building between schools which allows for peer learning to happen. The essential point is that parents make a choice on educational grounds rather than the heterogeneity of schools. While segregated schools sit uneasily with a desegregated workforce, poor educational standards fail to prepare pupils for employment, the greater of the two evils.

Those persons, for whom schools have failed, particularly young Protestant males in socially disadvantaged areas, complain that there has been no 'peace dividend' in Northern Ireland or their life chances have not improved as a result of political stability. A desegregated schools system is unlikely to change this – poorly performing schools will not improve educationally by virtue of mixing with those from another religion. Since the Belfast (Good Friday) Agreement in 1998 the data show that aside from Protestant secondary schools, Northern Ireland's schools are becoming much more heterogeneous, although the Catholic school ethos and associated iconography still poses a problem for Protestants attending maintained schools. Shared education has helped to dissolve traditional school boundaries and create circumstances of trust which will allow effective peer learning to take place between schools. In so doing, education performance for all schools is likely to increase and quicken the pace of desegregation which offers societal benefits. An unequivocal focus on raising standards should be at the heart of the reform agenda in Northern Ireland schools. Segregated schooling is much less of an issue than popular belief would imply.

References

Anand, S. and Sen, A. 1997. *Concepts of Human Development and Poverty: A Multidimensional Perspective*. Human Development Papers. New York: UNDP.

Atkinson, A.B. (1970). "On the Measurement of Inequality." *Journal of Economic Theory* **2**(3): 244-263.

Aitken, C. (1996), "Lies, Damned Lies, and Expert Witnesses", Mathematics Today, vol. 32, pp. 76-80.

Borooah, V.K. (2001) 'The Measurement of Employment Inequality between Population Subgroups: Theory and Application', *Labour*, 15:169-89.

Borooah, V.K. (2010), "On the Risks of Belonging to Disadvantaged Groups: A Bayesian Analysis of Labour Market Outcomes", in Rakesh Basant and Abusaleh Shariff (ed), *Handbook of Muslims in India*, Oxford University Press: New Delhi.

Borooah, V.K. and Knox, C. (2012) *Educational Performance and Post-Primary Schools in Northern Ireland*. Jordanstown: University of Ulster.

Bourguignon, F. (1979) 'Decomposable Income Inequality Measures', *Econometrica*, 47: 901-20.

Chapman, C. and Allen, T. (2005) *Partnerships for Improvement: the specialist schools achievement programme*. Coventry: University of Warwick.

Chapman, C. (2008) 'Towards a framework for school-to-school networking in challenging circumstances' *Educational Research* 50 (4): 403-420.

Connolly, P., Purvis, D. and O'Grady, PJ (2013) *Advancing Shared Education*. Report of the Ministerial Advisory Group on Shared Education. www.qub.ac.ck/mag

Cowell, F.A. and Jenkins, S.P. (1995), 'How Much Inequality Can We Explain? A Methodology and an Application to the United States', *Economic Journal*, vol. 105, pp. 421-30.

Department of Education Northern Ireland (2009a) *Schools for the Future: A Policy for Sustainable Schools.* Bangor: Department of Education.

DENI (2009b) *Every School a Good School: A Policy for School Improvement*. Bangor: Department of Education, Northern Ireland.

DENI(2011a) *Community Relations, Equality and Diversity in Education.* Bangor: Department of Education, Northern Ireland.

DENI (2011b) *Count, Read: Succeed A Strategy to Improve Outcomes in Literacy and Numeracy: Every School a Good School.* Bangor: Department of Education, Northern Ireland.

DENI (2012a): http://www.deni.gov.uk/index/facts-and-figures-new/education-statistics.htm accessed 21st November.

Department of Education Northern Ireland (2012b) *Area Planning Guidance*. Bangor: Department of Education, Northern Ireland.

DENI (2012c) *Corporate Plan 2012-15*. Bangor: Department of Education, Northern Ireland.

Education and Training Inspectorate (2012) *Chief Inspector's Report 2010-12*. Bangor: Department of Education, Northern Ireland.

Gallagher, T., Stewart, A., Walker, R., Baker, M. and Lockhart, J. (2010) 'Sharing education through schools working together' *Shared Space*, Issue No. 10: 65-74. Belfast: Community Relations Council.

Hughes, J. (2010) 'Are separate schools divisive? A Case Study from Northern Ireland'. *British Educational Research Journal* 37 (5): 829-850.

Kuznets, S. (1955), "Economic Growth and Income Inequality", *American Economic Review*, **45**: 1-28.

Lindsay, G., Harris, A., Chapman, C. and Muijs, D. (2005) *Schools federations. Preliminary report to the DfES.* Coventry: University of Warwick.

Mlodinow, L. (2009), *The Drunkard's Walk*, Penguin Books: London.

Muijs, D., West, M. and Ainscow, M. (2010) 'Why network? Theoretical perspectives on networking' *School Effectiveness and School Improvement*: *An International Journal of Research, Policy and Practice* 21 (1): 5-26.

Northern Ireland Executive (2011) *Programme for Government 2011-15: building a better future*. Belfast: Office of the First Minister and Deputy First Minister.

Northern Ireland Statistics and Research Agency (2012): *Year 12 and Year 14 Examination Performance at Post Primary Schools in Northern Ireland 2010/11 (revised)*. Bangor: Department of Education.

O'Connor, U., Hartop, B. and McCully, A. (2002) *A Review of the Schools Community Relations Programme.* Bangor: Department of Education.

O'Dowd, J. (2011) *Putting Pupils First: Shaping Our Future*. A statement by the Minister for Education to the Northern Ireland Assembly. Bangor: Department of Education.

O'Dowd, J. (2012) *Putting Pupils First: improving outcomes; improving opportunities*. A statement by the Minister for Education to the Northern Ireland Assembly. Bangor: Department of Education.

Official Report (2012) *Hansard: Education Bill* – Department of Education Briefing, 10th October: 3.

Perry, C. (2012) *Education Bill*, NIAR 699-12. Northern Ireland Assembly: Research and Information Service.

Purvis, D. (2011:4) *Educational Disadvantage and the Protestant working class: a call to action*. Belfast: Purvis Report.

Reardon, S.F. and Firebaugh, G. (2002), "Measures of Multigroup Segregation", *Sociological Methodology*, **32**(1): 33-67.

Shorrocks, A.F. (1980), 'A Class of Additively Decomposable Measures', *Econometrica*, vol. 50, pp. 613-25.

Robinson, P. (2010) 'First Minister argues for a single education system in Northern Ireland' Peter Robinson's speech 15th October to Castlereagh Council – accessible at: www.dup.org.uk

Salisbury R. (2012) Review of the Common Funding Scheme for Schools – accessible at: http://www.deni.gov.uk/review_of_the_common_funding_scheme.pdf.

Sen, A. (1998) 'Mortality as an Indicator of Economic Success and Failure', *Economic Journal*, Royal Economic Society, vol. 108(446); 1-25.

Sen, A.K. (1998), *On Economic Inequality*, Oxford University Press: Delhi.

Shorrocks, A.F. (1980), 'A Class of Additively Decomposable Measures', *Econometrica*, vol. 50, pp. 613-25.

Theil, H. (1967), *Economics and Information Theory*. North-Holland: Amsterdam.

Thompson, W.C. and Schumann, E.L. (1987), "Interpretation of Statistical Evidence in Criminal Trials: the Prosector's Fallacy and the Defense Attorney's Fallacy", *Law and Human Behavior*, vol. 11, pp. 167-187.

Zackrisson, S., Anderson, I., Janzon, L., Manjer, J., Garne, J.P. (2006), "Rate of Over-Diagnosis of Breast Cancer 15 Years after End of Malmo Mamographic Screening", *British Medical Journal*, vol. 33, pp. 689-692.