Expelled: The Effects of Being Permanently Excluded From School on Early Career Earnings

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Abstract

This report evaluates the effect of being permanently excluded on a pupil's early career earnings and the extent to which this relationship may be explained using GCSE attainment. The analysis uses an extract of the Longitudinal Education Outcomes (LEO) dataset, which describes the pathway of pupils in England through school and into the labour market. A within school and cohort fixed effects model is used to estimate the effect of permanent exclusion on earnings at the age of 25 and between 26 and 30 years old. The findings indicate being permanently excluded incurs a significant, non-negligible earnings penalty in both periods, after controlling for pupil characteristics. A mediation analysis is used to estimate the extent to which this penalty can be explained by poorer key stage 4 (KS4) attainment among permanently excluded pupils. The results show KS4 attainment only partially mediates the exclusion-earnings relationship, as there remains a significant direct effect of permanent exclusion on earnings.

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1. Introduction

The COVID-19 pandemic has recently highlighted the negative impact of lost-learning on pupil outcomes. The OECD report that pupils who experienced significant disruption to their learning now face lower incomes and poorer labour market outcomes over their lifetime (Hanushek and Woessmann, 2020). This has renewed debate on the use of permanent exclusion (previously referred to as expulsion) as a disciplinary measure in schools, as it causes pupils to miss considerable amounts of education, often in crucial development years. Whilst the social and academic impacts of permanent exclusion are relatively well documented in the literature, there is a lack of empirical evidence on how it may affect a pupil's earnings trajectory. This report therefore investigates the relationship between permanent exclusion and early career earnings for pupils in England who completed their GCSEs between the 2005/06 and 2008/09 academic years.

A permanent exclusion is when a pupil is permanently removed from the school roll and is no longer allowed to return to that school. This is a 'last resort' sanction, enforceable only by the headteacher. A pupil can be permanently excluded following a serious or persistent breach of a school's behaviour policy. Alternatively, exclusion can be justified when allowing the pupil to remain in school would seriously harm the education or welfare of the pupil themselves or others (DfE, 2022a).

Pupils who are disadvantaged (defined as being eligible for free school meals) are more likely to be excluded than their peers (Gazeley, 2013). The Insitute for Fiscal Studies report that there is already a significant gap in the attainment of disadvantaged pupils relative to non-disadvantaged pupils, which translates into slower earnings growth and poorer prospects in the labour market for those who are worse off (Farquharson, McNally and Tahir, 2022). Therefore, permanent exclusions could have a compounding effect on existing inequalities and exacerbate worse earnings outcomes. In the context of a recent widening of the disadvantage gap between pupils during the COVID-19 pandemic (ibid.), this report seeks to quantify the impact of permanent exclusions on earnings and expand on the currently limited evidence base.

Econometric techniques are used in this study to estimate the exclusion-earnings relationship for pupils who have been permanently excluded at least once, relative to their non-excluded peers. The next chapter provides an overview of the context for this research and its motivations. Following this is a discussion of findings from the existing literature and the supporting economic theory. Next, the report outlines the dataset and methodology used to answer the research question. Here, two main hypotheses are presented. First, that permanent exclusions result in lower earnings. Second, that the predicted earnings penalty can be explained by lower GCSE attainment among permanently excluded pupils. This chapter also explains the assumptions relied upon and the main limitations of the analysis. Next, the results of the within school and cohort fixed effects regression and estimates of the exclusion-earnings relationship are presented. This is followed by the results of the mediation analysis and subsequent adjusted earnings penalties. Finally, there is an appraisal of the findings alongside a discussion of their implications and other potential avenues for future research.

2. Background and Rationale

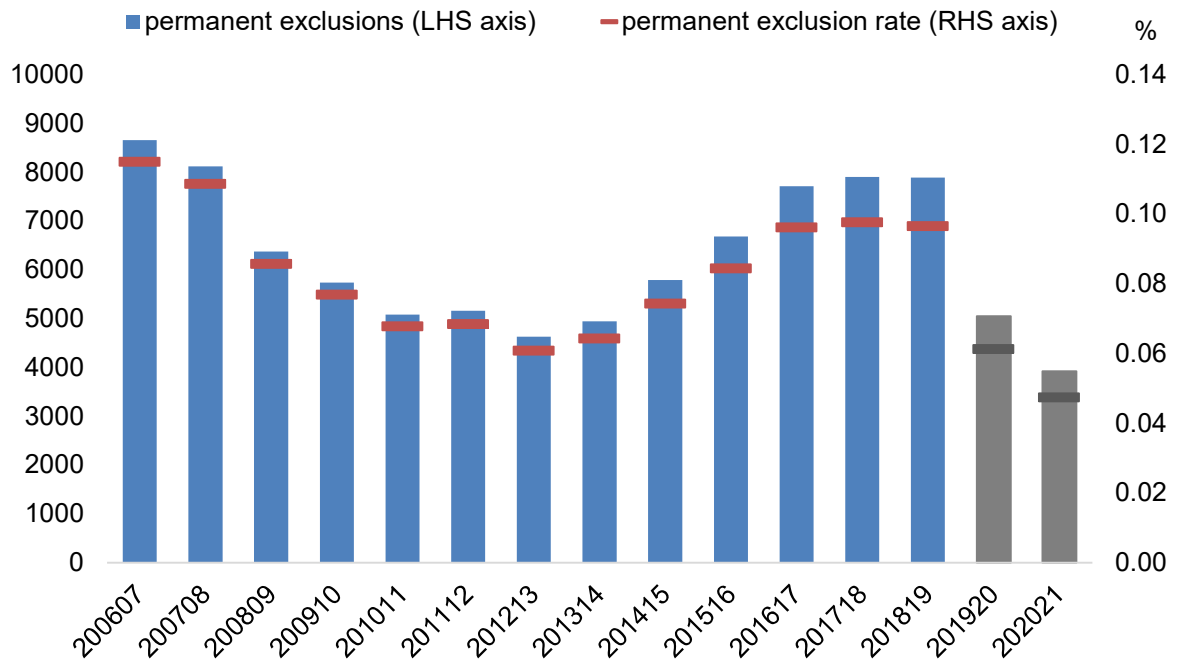
Permanent exclusions lead to significant learning losses as they cause pupils to spend an extended period outside of a formal classroom setting, in some cases this can be up to one year (Berridge et al., 2001). In their official guidance, the Department for Education (DfE) set out a process for schools to follow regarding permanent exclusions (DfE, 2022a). After being permanently excluded, it is the responsibility of the parent or guardian to keep the pupil at home for the first five days of the exclusion. It is recommended that work should be set and marked by the excluding school over this five-day period, but this is not a legal requirement. From the sixth day, it is the responsibility of the Local Authority to find suitable alternative full-time education (if the child is of compulsory school age). This may be in a mainstream school, pupil referral unit or another form of alternative provision. Exclusions are reviewed by the governing board up to 15 days after occurring, and their decision may subsequently undergo independent review at the request of the pupil or their parents. Some permanently excluded pupils drop out of the state-funded school system altogether, for example if a parent elects to educate their child from home (Thomson, 2018).

In some cases, pupils are unlawfully excluded from school through 'off-rolling'. This is when, in the interest of the school, pupils are removed from the register without it being formally recorded as a permanent exclusion. An alternative form of off-rolling is when parents are pressured to remove their child from the school themselves (Gill, Quilter-Pinner and Swift, 2017). Schools may differentially remove disruptive pupils to minimise their negative impact on the schools' performance (Machin and Sandi, 2019). Pupils with Special Educational Needs (SEN) may also be unlawfully excluded if the school feels it cannot accommodate for them (DfE, 2022a).

There has been mounting concern over the use of off-rolling by the Office of the Schools Adjudicator (2018), Ofsted (2018), the Education Policy Institute (2019) and the Children's Commissioner (2019). Cole et al. (2019) also reports off-rolling has become increasingly common and highlights that the practice disproportionately affects children with SEN and those from socially deprived backgrounds. Whilst these unlawful exclusions are not (by their nature) captured in the data, their impact may be approximated using recorded instances of permanent exclusion. Therefore, this research question is relevant in helping bring to light the negative effects of off-rolling.

In 2018/19, there were 7,894 permanent exclusions in England. This is equivalent to a rate of 0.1% or 10 in every 10,000 pupils. Permanent exclusions decreased from the 2019/20 Spring term onwards due to national COVID-19 restrictions on education (Figure 1). Restrictions included school closures and prioritised attendance for the children of key workers.

Figure 1: Number and rate of permanent exclusions in England, by academic year



Source: Permanent exclusions and suspensions in England: 2020/21 academic year (GOV.UK, 2022).

Despite the fall in permanent exclusions during the pandemic, data shows the number and rate of permanent exclusions in the Spring term of the 2021/22 academic year were over four times higher compared to the same term in 2020/21. This indicates that, in the absence of further restrictions, permanent exclusions could continue to increase back to pre-pandemic levels.

Data on '*Permanent exclusions and suspensions in England*' includes the reason for exclusion and disaggregates exclusion statistics by region and a range of pupil characteristics (GOV.UK, 2022). The most common reason given for permanent exclusion is persistently disruptive behaviour. This accounted for 33% of exclusions on average between 2006/07 and 2018/19. Other, less common reasons include physical and verbal abuse, and drugs and alcohol related exclusions. Over the series, boys have consistently had more than three times the number of permanent exclusions than girls. Permanent exclusions also increase with age and are most prevalent in Year 10, when pupils are 14 years old.

Indicators of disadvantage are also disproportionately represented in permanent exclusion statistics. Between 2006/07 and 2018/19, the permanent exclusion rate for pupils eligible for Free School Meals (FSM) was on average four times higher than for non-eligible pupils. Over the same period, the exclusion rate for pupils with a statement of SEN was six times higher than for pupils not identified as SEN. This figure rises to 8.8 times higher for pupils *without* a statement of SEN. Therefore, this study is relevant to the DfE in considering how school discipline measures affect their aim of supporting the most disadvantaged and vulnerable children and ensuring no pupil is left behind (DfE, 2021).

3. Literature Review

Most studies assess the causes of permanent exclusion, as summarised by Graham et al. (2019). Inequalities associated with poverty, being in care, having Special Educational Needs (SEN), and being of certain ethnic minorities are all well documented risk factors associated with school exclusion (Riddell and McCluskey, 2012; Tawell and McCluskey, 2021). Analysis for the Timpson Review estimates the odds ratios of being permanently excluded for different pupil and school characteristics (DfE, 2019a). The results concur that disadvantaged children are more likely to be permanently excluded, as well as those with a higher absence rate and pupils attending schools with a worse Ofsted rating. Conversely, pupils with higher attainment at key stage 2 (KS2) and those at 'Outstanding' schools are less likely to be permanently excluded (see Appendix A). Where possible, factors which effect the likelihood of permanent exclusion are included as controls in the regression analysis in this report.

Human capital and signalling theory both predict positive returns to education. In his seminal paper, Becker (1964) posits a relationship between education and earnings. This is underpinned by the assumption that people invest in education to increase their human capital (defined as skills, knowledge, and capabilities), implying a worker's productivity increases in function with time spent in education. This leads to higher earnings for better-educated individuals, a finding which holds across different countries and time periods (Card, 1999). Alternatively, signalling theory suggests investment in additional years of education acts as a "signal" of higher productivity which employers then use to screen workers and allocate higher wages (Weiss, 1995). As permanent exclusions *reduce* the time a pupil spends in education; this implies being excluded has an adverse effect on a pupil's earning potential.

The literature generally supports this theory, finding adverse impacts on pupils caused by time spent away from school. Cattan et al. (2022) report that disrupted school days cause early losses in human capital, which accumulate over time and lead to income penalties. One way the impact on human capital can be observed is through attainment outcomes. Permanent exclusions are found to have a considerably greater impact on attainment than receiving one or multiple suspensions, also known as fixed period exclusions (DfE, 2019a). Therefore, this study does not consider fixed period exclusions as their impact is less likely to affect earnings as pupils move into the labour market. As such, the terms 'excluded' and 'permanently excluded' are used interchangeably throughout this report.

The Youth Cohort Study on the *Activities and Experiences of 19-year-olds* found permanently excluded pupils were less likely to have done any GCSEs, and those who did had lower grades (DfE, 2011). By the age of 16, only 5% of permanently excluded pupils had achieved Level 2 (five or more GCSEs with grades A* to C), compared to 67% of non-excluded pupils. By the age of 19, 71% of permanently excluded pupils had still not achieved *any* Level 2 qualification, compared to just 15% of non-excluded pupils. While this does not directly imply a reduction in income, Hodge, Little and Weldon (2021) find a significant association between GCSE results and lifetime earnings. Therefore, poorer attainment at GCSE may be the mechanism through which permanently excluded pupils experience an earnings penalty.

The literature also finds permanently excluded pupils obtain lower levels of qualifications and suffer poorer labour market outcomes compared to pupils who have never been excluded. Daniels et. al. (2003) conducted a longitudinal study of permanently excluded pupils. Two

years after exclusion, only half of the sample were engaged in education, training, or employment. Of those who returned to education, just over half obtained any kind of qualification. This is supported by Brookes, Goodall and Heady (2007) who report that exclusions reduce the highest level of qualification achieved, and the likelihood of accessing higher education. Using Labour Force Survey (LFS) data, this is estimated to lead to a gap in earnings of £21,175 over the lifetime of permanently excluded pupils, compared to their non-excluded peers. However, the analysis assumes permanently excluded pupils with the *same* level of attainment as their non-excluded peers are equally as likely to attend further education. As this is at odds with the literature, the predicted earnings gap is likely to be an underestimate. The earnings effect is also estimated using secondary survey data. This report improves on this approach by applying a predicted earnings penalty to the average earnings of pupils *within* the sample.

The DfE (2011) also report that pupils who are permanently excluded are more likely to be Not in Education, Employment or Training (NEET) as young adults. This implies permanent exclusion is an obstacle to achieving paid employment, indicating lower average earnings. However, econometric estimations of the exclusions-earnings relationship in the literature are limited. Madia et al. (2022) use a mixture of logit, propensity score matching, and fixed effects regression analysis to estimate the effect of permanent exclusions on a range of labour market outcomes. They use a single cohort of 6,632 students from the Next Steps survey, of whom 86 were excluded. Exclusion was found to increase the risk of becoming NEET at age 19, as well as increasing the risk of being inactive, unemployed, and earning lower wages at age 25.

This study applies a similar approach, however, it expands upon the above analysis in two ways. First, the sample size and coverage of the LEO data is significantly greater than the Next Steps survey. This allows *multiple* cohorts of pupils to be considered and substantially increases the number of observed permanent exclusions. Second, earnings are evaluated over a *longer* period. As well as earnings at age 25, this study also estimates the effect on earnings in the 2019/20 tax year, when pupils are between 26 and 30 years old. As such, this report provides a more robust estimation of the exclusion-earnings relationship.

4. Data

The research question is investigated using the Longitudinal Education Outcomes (LEO) data, which links information from the National Pupil Database (NPD) with HM Revenue and Customs (HMRC) earnings records. The LEO data contains pseudo-anonymised individual-level information on pupil pathways through the state education system and into the labour market. Variables include pupil and school characteristics, educational attainment, and labour market outcomes such as employment and earnings.

The LEO data is made up of different cohorts of students who did their GCSEs in the same academic year. The analysis in this report uses cohorts who completed their GCSEs in the 2005/06, 2006/07, 2007/08 and 2008/09 academic years. As there are relatively few permanent exclusions compared to the pupil population and the availability of information on the year group of exclusion is not consistent, the cohorts are pooled together. This increases the number of observed permanent exclusions and years passed since competing key stage 4

(KS4), allowing for a more robust identification of effects (Hodge, Little and Weldon, 2021). See Appendix B for more detailed information on the cohorts used.

One of the main advantages of using the LEO data is that it samples most pupils in England. Therefore, it is representative of the pupil population. This also means it has a much higher sample size compared to alternative longitudinal studies of pupils, such as the Longitudinal Survey of Young People in England (Collingwood et al., 2010). The linking process which joins administrative and education datasets to create LEO is also reported by Anderson and Nelson (2021) to be of very high quality. They find 96% individuals were matched in the 2005/06 and 2006/07 cohorts and indicate match rates improve with later cohorts. Therefore, another benefit of this data is a low proportion of incorrect matches.

A subsample of the LEO dataset is used in this analysis for which school and pupil level information is available. This excludes non-state funded schools (such as independent schools) as data on permanent exclusions is not collected in these settings. The final sample contains 2,327,639 pupils, of which 8,871 (0.4%) were permanently excluded at least once (see Appendix B). Of the pupils who had been permanently excluded, only 97 (1.1%) were excluded twice, and none were excluded more than twice. Therefore, this analysis only estimates the impact of being permanently excluded at least once. Further research could assess the impact of multiple permanent exclusions on earnings. Table 1 presents summary statistics for the subsample of LEO data which is used for this analysis.

Table 1: Summary statistics for regression variables.

Excluded	**No (= 0)**	**Yes (= 1)**
Sample size (no. of pupils)	2,318,768	8,871
Pupil characteristics		
Gender		
Male	51.1%	76.3%
Ethnicity		
White	84.0%	78.0%
Asian	6.9%	6.1%
Black	3.7%	7.8%
Mixed	2.6%	4.5%
Other	0.9%	0.6%
Unclassified	1.8%	2.9%
Disadvantage		
Pupils with Special Educational Needs (SEN)	20.3%	50.7%
Eligible for Free School Meals (FSM)	12.6%	21.0%
Mean Income Deprivation Affecting Children Indices (IDACI) score: *Proportion of all children aged 0 to 15 living in income deprived families in the pupil's local area.*	0.22	0.29
Pupils with English as an Additional Language (EAL)	9.4%	8.5%
Attainment		
Mean key stage 2 (KS2) level: *Ranges from level 2 to level 6. Pupils are expected to achieve level 4* (DfE, 2014).	4.1	3.7

Mean key stage 4 (KS4) points: *average point scores awarded for GCSEs and equivalent results* (Pearson, 2016)	42.1	10.3
Other		
Mean GCSE absence rate (%): *percentage of possible sessions missed in year 11*	9.7%	30.6%
Earnings		
Aged 25		
Mean annual earnings	£20,000	£13,740
Median annual earnings	£19,100	£12,070
In 2019/20 (aged 26 to 30)		
Mean annual earnings	£23,710	£15,510
Median annual earnings	£21,680	£13,140

Note: see methodology for definitions of included variables

Of the pupils identified as having Special Educational Needs (SEN), 18.7% of pupils who had not been excluded had a statement of SEN compared to 22.2% of permanently excluded pupils. For robustness, a variable which differentiates between pupils with and without a statement of SEN was tested in the regression. The literature also identifies differences in the exclusion rate between minority ethnic groups. So, a variable indicating the pupil's minority ethnic group (rather than their major ethnic group as in Table 1) was also tested in the regression. In both cases, the earnings-exclusion relationship was unaffected by the inclusion of these variables, so they were not used in the main analysis.

5. Methodology

a. Empirical approach

Consistent with the literature, the wage equation uses the log of annual earnings. As such, the analysis does not include those who report zero earnings. Earnings are adjusted to the price level in the latest available tax year (2020/21) using a CPIH deflator to ensure comparability across cohorts. Two alternative earnings variables are used: earnings at age 25 and earnings in the 2019/20 tax year, respectively. The first captures earnings nine years after completing key stage 4 (KS4). The latter captures earnings between 10 and 13 years after completing KS4, when pupils are age 26 to 30 years old. Earnings up to 2019/20 are used as this is the last tax year of earnings available which is unaffected by the COVID-19 pandemic.

Each earnings indicator is regressed on a dummy variable indicating whether a pupil has been permanently excluded, and a vector of control variables (X_i) including pupil characteristics, prior attainment, and sociodemographic factors (see Table 2). This gives the following regression equations:

$$\ln(earnings\ aged\ 25) = \alpha + \beta_1(Excluded) + \beta_2 X_i + \varepsilon_i \quad (1)$$
$$\ln(earnings\ in\ 19/20) = \alpha + \beta_1(Excluded) + \beta_2 X_i + \varepsilon_i \quad (2)$$

Table 2: Vector of control variables

X_i	Definition
Gender	Gender dummy variable = 1 if Male, = 0 if Female
Major ethnic group	Indicator for whether a pupil's ethnicity is Asian (including Chinese), Black, Mixed, Other (including Arab) or Unclassified. Reference group = White
SEN	Special Educational Needs (SEN) dummy variable = 1 if SEN, = 0 if non-SEN
FSM	Free School Meals (FSM) Eligible dummy variable = 1 if FSM eligible, = 0 not eligible for FSM
IDACI	Income Deprivation Affecting Children Indices (IDACI) score (between 0 and 1)
EAL	English as an Additional Language (EAL) dummy variable = 1 if EAL, = 0 for non-EAL pupils
GCSE absence rate	Number of absent school days (*not* including the permanent exclusion period) divided by the number of total possible sessions (school days), in year 11.
KS2 level	Average English and Maths level at the end of KS2.

A pupil's absence rate is included in the analysis as it found to significantly increase the likelihood of being permanently excluded (see Literature Review). A higher absence rate is also strongly associated with poorer KS4 attainment outcomes (DfE, 2016). Therefore, it may have a bearing on future earnings. However, as the absence from school may happen *after* the permanent exclusion, this introduces endogeneity into the model via post-treatment variable bias. However, the effect of this is assumed to be small.

It is assumed there is unobservable heterogeneity between schools which has a bearing on both the likelihood of permanent exclusions and earnings. For example, teacher quality or a school's disciplinary culture. To account for this, a within school fixed effects model is employed as in Madia et. al (2022) and Yaluma, Little and Leonard (2021). As the analysis combines multiple cohorts of pupils, a cohort fixed effect is also used. As such, changes in earnings are less likely to be reflective of systematic variation between cohorts.

However, the inclusion of several cohorts gives rise to the 'age-period-cohort (APC) problem' as per Hodge, Little and Weldon (2021). The presence of the APC is a limitation of the analysis as the effect of all three factors on earnings cannot be controlled for at once. Additionally, there are many unobservable pupil characteristics which drive both exclusions and earnings (such as motivation, attitude, and parental aspirations) which cannot be captured in the data. Therefore, even after accounting for school fixed effects, the model likely suffers from omitted variable bias. This means causality cannot be established from the results.

The resulting model estimates the impact of permanent exclusions on earnings for those with

non-zero income at the age of 25 and between 26 and 30 (in the 2019/20 tax year). Using fixed effects, this relationship is evaluated for pupils within a school, in the same academic cohort, controlling for their individual characteristics. The first hypothesis of this report is that being permanently excluded will reduce a pupil's early career earnings compared to their non-excluded peers.

There is literature to support the impact of permanent exclusions on KS4 attainment, as well as the impact of KS4 attainment on earnings respectively (see Literature Review). Therefore, the second hypothesis of this report is that the impact of permanent exclusion on earnings may be (either partly or fully) explained by an adverse effect of permanent exclusion on a pupil's attainment at KS4. However, permanent exclusions may also have a direct relationship with earnings that is independent of KS4 attainment. To quantify the relative importance of these channels, mediation analysis is used, as introduced by Baron and Kenny (1986). This secondary analysis uses KS4 points (average point scores awarded for GCSEs and equivalent results) to measure attainment.

When regressing earnings on both the mediator (KS4 attainment) and independent variable (permanent exclusion dummy) the parameters have a combined 'Total Effect'. This is composed of the Average Causal Mediation Effect (ACME) and Average Direct Effect (ADE). The ADE is the direct relationship between permanent exclusions and earnings, *after* controlling for KS4 attainment. The ACME is the indirect relationship between permanent exclusion and earnings, which occurs through an association between permanent exclusions and KS4 attainment. Mediation analysis uses a set of regressions to calculate these effects. First, the Total Effect is calculated by estimating β_1 in regressions (1) and (2). Then, the effect of being permanently excluded on KS4 attainment is calculated using equation (3) below. Lastly, the mediator is added to the original regression as a control, as in equations (4) and (5) below. The ACME is then calculated by multiplying β_3 and β_6 together.

$$KS4\ attainment = \alpha + \beta_3(Excluded) + \beta_4 X_i + \varepsilon_i \quad (3)$$

$$\ln(earnings\ age\ 25) = \alpha + \beta_5(Excluded) + \beta_6(KS4\ attainment) + \beta_7 X_i + \varepsilon_i \quad (4)$$

$$\ln(earnings\ in\ 19/20) = \alpha + \beta_5(Excluded) + \beta_6(KS4\ attainment) + \beta_{10} X_i + \varepsilon_i \quad (5)$$

In this report the ACME is calculated using the mediation function in R as described by Tingley et al. (2014). A bootstrapping procedure is applied to 1,000 resamples of data to test the significance of the mediation outputs. However, fixed effects models are not supported by the mediate function. Therefore, school and cohort fixed effects are replaced by the inclusion of school-level characteristics and a cohort identifier variable in the regression specification (see Appendix C). As such the 'total effect' estimated by the mediation function is not comparable to the total effect estimated by the fixed effects model.

A significant ACME indicates there is a mediation effect present. If the ADE becomes insignificant in the mediation output, we can say the relationship is *fully* mediated. This means the *entire* relationship between permanent exclusions and earnings can be explained by the relationship between permanent exclusions and KS4 attainment. If the ADE remains

significant even after controlling for the mediator, the exclusion-earnings relationship is only *partially* mediated. This implies there is some direct effect of permanent exclusion on earnings which is independent of attainment.

a. Assumptions

Baron and Kenny (1986) state that to establish mediation, several conditions must hold. First, exclusions must be shown to affect the dependent variable, earnings. This means β_1 must be significant in equations (1) and (2). Second, the exclusion variable must affect the mediator, meaning β_3 must be significant in equation (3). Lastly, KS4 attainment must affect earnings when included in the full regression – β_6 must be significant in equations (4) and (5). Significant effects at the 1% level are found for all these coefficients, implying the required assumptions for mediation analysis are met.

Imai, Keele, and Tingley (2010) suggest two additional conditions are required to make valid inferences about mediation effects. Firstly, the treatment (whether a pupil is excluded or not) should be statistically independent. However, pupils are not randomly excluded. When this is the case, it is advised the assumption can be met by including all relevant pre-treatment confounders. So, the model is assumed to control for all factors affecting the likelihood of permanent exclusion and is subsequently assumed to meet the first requirement. Secondly, after controlling for treatment and pre-treatment confounders, the mediator must occur independently. This means for pupils with the same permanent exclusion status and identical characteristics, KS4 attainment outcomes should be random. This is deemed unlikely to hold even in randomised control trials. As this second requirement cannot be proven, care should be taken when interpreting the results of the mediation analysis.

c. Limitations

The main limitation of this study is selection bias caused by the omission of a high number of permanent exclusions from the analysis. This is a result of data collection and treatment issues, as discussed below. This selection bias decreases the size of the exclusion-earnings estimator, meaning the impact of permanent exclusions is *understated*. Selection bias also threatens the external validity of the results, so they should be interpreted with caution.

For the 2005/06 cohort, exclusions data was only collected for pupils in Year 11. For each subsequent cohort, exclusions data was collected for an additional school year (see Appendix B). So, any pupils (in the first three cohorts) who were permanently excluded in a year group for which data was not collected will not be recorded as having been excluded. Instead, they are incorrectly treated as having *never* been excluded. To test for the impact of this, a robustness regression is run on the 2008/09 cohort, as this is the only cohort with exclusions data for every year group.

Further, the LEO data only includes schools which had GCSE students and only includes pupils who are listed on KS4 performance tables. After being permanently excluded, pupils are more likely to attend non-mainstream settings in their next school (Timpson, 2019). These may be less likely to offer GCSEs, instead providing alternative qualifications such as Technical Awards (DfE, 2019b). Permanently excluded pupils are also less likely to

undertake GCSE (or equivalent) qualifications, particularly as some are home schooled or drop out of state-funded education (see Literature Review). Therefore, the analysis only estimates the exclusion-earnings relationship for pupils who (following their exclusion) remain in mainstream school settings and are entered for GCSE exams. Here, 'mainstream settings' refers to Local Authority maintained schools, special schools, or academies. This excludes independent schools and alternative provision settings, such as pupil referral units.

Only those with non-zero earnings at age 25 or in the 2019/20 tax year are included in the regression. Therefore, the model estimates the exclusion-earnings relationship which is *conditional* on being employed. As the literature suggests being permanently excluded is associated with a higher likelihood of being unemployed, NEET or inactive, there is a large *unconditional* effect on earnings which is not captured in the results. This creates additional downward bias and implies the findings are not generalisable to the whole (excluded) pupil population.

Finally, in the LEO data, a marker is given to indicate the year group of a pupil at the time of exclusion. Information about the school attended by each pupil is subsequently taken from the school in which they completed their GCSEs. For pupils who were permanently excluded, this will be the school they moved to rather than the school they were excluded from. So, unobservable school-level factors which affect the likelihood of permanent exclusion may not be accurately captured by the data, particularly if the two schools have significantly different characteristics. This introduces endogeneity into the model. Further analysis could employ a more sophisticated matching technique to match LEO data with exclusions tables to identify and control for the school(s) excluded pupils had previously attended. However, this was considered out of scope for this analysis due to limited data availability.

6. Results

a. Within School and Cohort Fixed Effects model

Table 3 presents the coefficient estimates for models (1) and (2). Model (1) captures the relationship between permanent exclusion and earnings at age 25, which occurs nine years after a pupil completed key stage 4 (KS4). Model (2) captures the exclusion-earnings relationship in the 2019/20 tax year, which occurs between 10 and 13 years after a pupil completed KS4 (depending on the cohort). In 2019/20, pupils were aged between 26 and 30 years old.

The results show that permanently excluded pupils experience a non-negligible earnings penalty, both at the age of 25 and between 26 and 30 years old, which is significant at the 1% level. This holds after controlling for a range of pupil characteristics and applying school and cohort fixed effects. To evaluate potential selection bias, the regression was also run exclusively on the 2008/09 cohort. A negative relationship between exclusion and earnings persists in both models, which is significant at the 1% level. This implies the main results are robust (see Appendix E).

All the coefficients of the pupil characteristic variables are significant at least at the 10% level in both models, with the exception of English as an Additional Language (EAL) in model (1).

Consistent with the literature, this suggests a range of pupil characteristics, including deprivation and ethnicity, have a significant bearing on the exclusion-earnings relationship. For the full table of results (including control variables) see Appendix D.

Table 3: School & Cohort Fixed Effects income models with robust standard errors

	Dependent variable:	
	log earnings at age 25	log earnings in 2019/20
	Model (1)	Model (2)
Excluded	**-0.1769*** **	**-0.2726*** **
(Yes = 1)	(0.0280)	(0.0299)
Controls for pupil characteristics	Yes	Yes
School and Cohort fixed effects	Yes	Yes
Observations	1,704,604	1,654,678
R2	0.0571	0.0770
Adjusted R2	0.0550	0.0750
F Statistic	7,920.6460*** (df = 13; 1700918)	10,596.4700*** (df = 13; 1650992)

Notes: Number of observations vary as missing data is excluded.

*** $p<0.1$, ** $p<0.05$, * $p<0.1$*

To interpret the estimated coefficient, an earnings penalty in percentage terms can be calculated by taking the exponent of the coefficient minus one. Estimates from model (1) find being permanently excluded reduces a pupil's earnings at the age of 25 by 16.2%, relative to their non-excluded peers. Comparatively, in model (2) when considering earnings between the ages of 26 and 30, the estimated penalty increases to 23.9%.

$$Model\ (1): \quad (e^{-0.1769} - 1) * 100 = -16.2\%$$
$$Model\ (2): \quad (e^{-0.2726} - 1) * 100 = -23.9\%$$

The percentage effect size reported by model (2) is higher (in absolute terms) than that reported by model (1). This may suggest the earnings penalty from being permanently excluded increases over time. However, as more years pass after completing KS4, earnings tend to stabilise, and more pupils will have completed higher education. As such, the larger effect size in model (2) likely reflects the inclusion of additional years over which the impact of permanent exclusions can materialise. Therefore, it could be argued that the coefficient reported by model (2) is a more accurate estimate of the exclusion-earnings relationship.

b. Mediation Analysis

Mediation analysis is used to test whether the earnings penalty from being permanently excluded can be explained by a relationship between permanent exclusion and KS4 attainment. The Average Causal Mediation Effect (ACME), Average Direct Effect (ADE) and Total Effect are estimated using bootstrapping procedures computed over 1,000 data subsamples. Confidence intervals at the 95% level are also reported. A significant ACME is reported for both models. However, a direct effect of permanent exclusions on earnings remains, which is significant at the 1% level even after controlling for the mediator. This indicates KS4 only *partially* mediates the exclusions-earning relationship.

Table 4: Mediation Analysis for Model (1) – earnings at age 25

Non-parametric Bootstrap Confidence Intervals with the Percentile Method

	Estimate	95% CI Lower	95% CI Upper	p-value
ACME	-0.0719	-0.0772	-0.07	<2e-16 ***
ADE	-0.1272	-0.1797	-0.07	<2e-16 ***
Total Effect	-0.1991	-0.2345	-0.14	<2e-16 ***
Prop. Mediated	0.3612	0.2866	0.49	<2e-16 ***
Sample size	1,704,604			
Simulations	1,000			

Notes: Number of observations vary as missing data is excluded.

**** p<0.1, ** p<0.05, * p<0.1*

Table 4 presents the mediation outputs for model (1). The ACME is statistically significant at the 1% level. However, full mediation does not occur as a significant direct effect (ADE) remains, after controlling for the mediator. This indicates the earnings penalty at age 25 for permanently excluded pupils is only *partially* mediated by KS4 attainment, with 36% of the total effect occurring through this channel. This means a substantial proportion of the relationship between permanent exclusions and earnings is independent of attainment at KS4.

Table 5: Mediation Analysis for Model (2) – earnings in 2019/20

Non-parametric Bootstrap Confidence Intervals with the Percentile Method

	Estimate	95% CI Lower	95% CI Upper	p-value
ACME	-0.0955	-0.1022	-0.09	<2e-16 ***
ADE	-0.1741	-0.2304	-0.12	<2e-16 ***
Total Effect	-0.2696	-0.3287	-0.21	<2e-16 ***
Prop. Mediated	0.3544	0.2902	0.45	<2e-16 ***
Sample size	1,654,678			
Simulations	1,000			

Notes: Number of observations vary as missing data is excluded.

**** p<0.1, ** p<0.05, * p<0.1*

Table 5 presents the mediation outputs for model (2). The ACME is also statistically significant at the 1% level. After controlling for the mediator, the direct effect of permanent exclusions on earnings remains significant at the 1% level. This shows the earnings penalty for permanently excluded pupils in 2019/20 is also only *partially* mediated by KS4 attainment. The proportion mediated (35%) is similar to that reported for model (1). This suggests the indirect relationship between KS4 attainment and earnings does not change substantially when evaluating earnings over a longer period. Overall, when accounting for KS4 attainment as a mediating channel, the direct relationship between permanent exclusion and earnings remains significant and non-negligible in both periods. The predicted earnings penalties post-mediation can be transformed into an adjusted percentage effect on earnings.

$$Model\ (1) - \ after\ mediation: \quad (e^{-0.1272} - 1) * 100 = -11.9\%$$
$$Model\ (2) - \ after\ mediation: \quad (e^{-0.1741} - 1) * 100 = -16.0\%$$

c. Average earnings effect

The estimated earning penalties both before and after mediation can be used to calculate an average earnings effect by applying them to the mean annual earnings of pupils in the sample (see Appendix F). Before accounting for the mediator, being permanently excluded is estimated to reduce average annual earnings at age 25 by £3,200. Considering earnings when pupils are between 26 and 30 years old, this increases to £5,700. After accounting for the mediator, being permanently excluded is estimated to reduce average annual earnings at age 25 by £2,400. When pupils are between 26 and 30 years old, this figure becomes £3,800. However, as the fixed effects and mediation analysis use different model specifications, the two sets of effects are not directly comparable. Also, the earnings figures are an average for *all* pupils in the sample. Therefore, the estimated effect masks a lot of potential variation between different characteristic groups, such as ethnicity or gender. As such, the results should only be treated as indicative.

7. Conclusion and discussion

Using school and cohort fixed effects regressions, this report finds being permanently excluded is associated with a significant earnings penalty, after controlling for pupil characteristics. At the age of 25, earnings are 16.2% lower for permanently excluded pupils relative to their non-excluded peers. This increases to 23.9% when pupils are between 26 and 30 years old. Mediation analysis reveals this earnings penalty can be partially explained by poorer key stage 4 (KS4) attainment. This supports the theory that being permanently excluded has an adverse effect on a pupil's human capital, which subsequently reduces their earnings potential.

These findings may be relevant to policy makers seeking to reduce the economic costs of permanent exclusions or off-rolling. One way of doing so could be minimising learning losses from permanent exclusion. For example, by increasing the efficiency of the referral system which places pupils in alternative provision. Policy makers could also legally require (rather than recommend) the provision of set and marked work during the transitory period between schools. Funding could also be provided directly to schools to deliver targeted catch-up provision, such as tutoring, for permanently excluded pupils to improve their KS4 attainment.

However, on average across the two models, KS4 attainment is only estimated to account for 36% of the negative association with earnings. After controlling for this, a significant *direct* relationship between permanent exclusion and earnings remains. The mediated earnings penalty at age 25 is 11.9%, rising to 16.0% when pupils are between 26 and 30 years old. The drivers of this residual effect could be investigated further by testing for additional mediators, such as the highest level of qualification achieved.

The exclusions-earnings relationship might also be driven by a range of social, emotional, and behavioural factors beyond human capital. These could include worsened mental health, increased propensity for crime, and social exclusion (Daniels and Cole, 2010, Parker et al. 2016; Williams, Papadopoulou and Booth, 2012). Intrinsic characteristics such as a pupil's aspirations or feelings of disaffection may also contribute to future earnings. For example, Berridge et al. (2001) found permanent exclusions reduce a pupil's affiliation and commitment to a conventional way of life. However, the relative importance of such factors cannot be inferred from this analysis.

Overall, this report finds that permanent exclusions have an adverse effect on pupil outcomes, consistent with the existing literature. However, comparable empirical studies exploring the impact on earnings are limited. To expand upon this study, heterogeneity analysis could be used to assess how the exclusion-earnings relationship varies across different pupil characteristics and reasons for exclusion. To correct for the downward bias on these results, future analysis should also evaluate the *unconditional* exclusion-earnings relationship. This can be done by estimating the effect of permanent exclusion on the likelihood of obtaining paid employment. Finally, linking education and administrative data with qualitative surveys which capture the social, emotional, and behavioural impacts of permanent exclusion will be invaluable in forming a more holistic picture of the exclusion-earnings relationship.

8. References

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9. Appendices

Appendix A: Factors associated with likelihood of permanent exclusion.

Odds ratio	Characteristic group	Characteristic	Reference group (i.e. relative to)
Significantly greater than 1	Disadvantage	Pupils eligible for free School Meal (FSM)	Non-FSM pupils
Increased		Pupils with a higher	Those with one standard

likelihood of being permanently excluded relative to the reference group.		Income Deprivation Affecting Children Index (IDACI) rank	deviation lower IDACI rank
	Special Educational Needs (SEN)	Pupils receiving SEN support	Non-SEN pupils
	Ethnic Minority groups	Black Caribbean (boys and girls) Mixed White and Black Caribbean (boys and girls)	White British pupils
	Truancy	Pupils with a higher absence rate	Pupils with one standard deviation lower absence rate
	Ofsted rating	'Requires Improvement' and 'Inadequate' schools	Ofsted 'Good' schools
Significantly less than 1 *Decreased likelihood of being permanently excluded relative to the reference group.*	Prior attainment	Those with higher average KS2 results	Those with one standard deviation lower average KS2 results
	Ethnic Minority groups	Asian girls and Indian boys	White British pupils
	School type	Alternative Provision settings and Special Schools	LA Maintained schools
	Ofsted rating	'Outstanding' schools	Ofsted 'Good' schools

Source: Department for Education - Timpson review of school exclusion: technical note

Appendix B: LEO pupil cohort information

KS4 Cohort	**Earnings in 2019/20**			**Coverage of exclusions data**
	Earnings age 25			
Academic year in which GCSE's were completed	*Tax year nine years after KS4 completed*	*Number of tax years after KS4 completed*	*Age of pupil*	*Permanent exclusions which occurred in…*
2005/06	2015/16	13	29/30	Year 11 only
2006/07	2016/17	12	28/29	Years 10 and 11

2007/08	2017/18	11	27/28	Years 9, 10 and 11
2008/09	2018/19	10	26/27	Years 8, 9, 10 and 11

KS4 cohort	Total pupils	Permanently excluded pupils	Percent of pupils permanently excluded
200506	578,116	581	0.1%
200607	586,626	1,711	0.3%
200708	588,543	3,066	0.5%
200809	574,354	3,513	0.6%
Total	2,327,639	8,871	0.4%

Appendix C: Additional variables for replacement of fixed effects

$Additional\ X_i$	Definition
Percent eligible for Free School Meals (FSM)	Pupils eligible for FSM as a proportion of total pupils in a school (%)
Percent with a statement of Special Education Needs (SEN)	Pupils with a statement of SEN as a proportion of total pupils in a school (%)
School progress score	Average of a schools' pupils' Progress 8 scores. This indicates whether pupils in the school made above, or below average academic progress compared to similar pupils in other schools (DfE, 2023).
School type	Indicator for whether a pupil's school is an academy, special school, or pupil referral unit. Reference group = Local Authority maintained schools
KS4 cohort	Flag for whether a pupil belongs to the 2006/07, 2007/08 or 2008/09 GCSE cohort. Reference group: 2005/06 cohort.

Appendix D: Full model results

School & Cohort Fixed Effects income models with robust standard errors:

	Dependent variable:	
	log earnings at age 25	log earnings in 2019/20
	Model (1)	Model (2)
Excluded	-0.1769***	-0.2726***
(Yes = 1)	(0.0280)	(0.0299)

Gender	0.2207***	0.2949***
(Male = 1)	(0.0024)	(0.0024)
Ethnicity: Asian	0.0303***	0.0471***
(Ref = White pupils)	(0.0060)	(0.0059)
Ethnicity: Black	-0.1645***	-0.1245***
(Ref = White pupils)	(0.0063)	(0.0063)
Ethnicity: Mixed	-0.0949***	-0.0791***
(Ref = White pupils)	(0.0055)	(0.0055)
Ethnicity: Other	-0.0591***	-0.0298**
(Ref = White pupils)	(0.0117)	(0.0116)
Ethnicity: Unclassified	-0.0495***	-0.0266***
(Ref = White pupils)	(0.0062)	(0.0066)
SEN needs	-0.1383***	-0.1447***
(Yes = 1)	(0.0027)	(0.0027)
FSM eligible	-0.1195***	-0.1162***
(Yes = 1)	(0.0031)	(0.0031)
IDACI score	-0.2459***	-0.2928***
	(0.0066)	(0.0066)
EAL	-0.0034	0.0306***
(Yes = 1)	(0.0052)	(0.0053)
GCSE absence rate	-0.0121***	-0.0120***
	(0.0001)	(0.0001)
KS2 level	0.1657***	0.2136***
	(0.0015)	(0.0014)
Observations	1,704,604	1,654,678
R2	0.0571	0.0770
Adjusted R2	0.0550	0.0750
F Statistic	7,920.6460***	10,596.4700***
	(df = 13; 1700918)	(df = 13; 1650992)

Notes:

**** p<0.1, ** p<0.05, * p<0.1*

Number of observations vary as missing data is excluded.

Appendix E: Robustness regression – 2008/09 cohort only

School & Cohort Fixed Effects income models with robust standard errors:

	Dependent variable:	
	log earnings at age 25	log earnings in 2019/20
	Model (1)	Model (2)
	2008/09 cohort only	2008/09 cohort only
Excluded	**-0.2100*****	**-0.2523*****
(Yes = 1)	(0.0457)	(0.0474)
Control for pupil characteristics	Yes	Yes
School and cohort fixed effects	Yes	Yes
Observations	420,626	414,317
R2	0.0531	0.0644
Adjusted R2	0.0455	0.0567
F Statistic	1,800.1540*** (df = 13; 417274)	2,174.4510*** (df = 13; 410973)

Notes: **** p<0.1, ** p<0.05, * p<0.1*

Number of observations vary as missing data is excluded.

Appendix F: Average earnings impact calculations

		Prior to mediation		**Post-mediation**	
	Mean annual earnings (whole sample)	Predicted effect	Penalty	Predicted effect	Penalty
Age 25	£19,980	-16.2%	-£3,237	-11.9%	-£2,378
In 2019/20	£23,680	-23.9%	-£5,660	-16.0%	-£3,789