



Lost Learning, Lost Earnings



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KEY FINDINGS

- With coronavirus cases rising across the country, the Test and Trace system already encountering significant difficulties, and growing numbers of school pupils out of school once more in self-isolation, another disrupted school year for many seems inevitable.
- This study combines an analysis of the Labour Force Survey, the lost learning due to school closures between March and July 2020, and the unequal experiences depending on socio-economic background to estimate the potential impact on earnings and employment later in life. The analysis finds that school closures are likely to have substantial negative labour market impacts for those from less-well off groups, their chances of social mobility, and on the economy in general.
- In general, the earnings and employment returns to each additional year of post-compulsory schooling are higher for men and women from lower socio-economic groups (SEGs) and last for at least twenty years from the age of 21.
- A variety of data sources indicate that school closures had a greater impact on those from lower socio-economic groups than those from higher groups, including the amount of time spent learning each day, and the effectiveness of that learning. It is estimated that, compared to a normal year, secondary school children from a high SEG experienced an average loss of learning of 21% of the 2019/20 school year, compared to 34% for those from low SEGs.
- The long term negative impact on earnings is estimated to be much higher for those from less well-off backgrounds. In net present value terms, the impact would be £3,870 for men from low SEGs, compared to £1,570 for men from high SEGs. For women, the corresponding estimates are £3,800 and £710, respectively.
- Those from low socio-economic backgrounds who won't go on to university are likely to be hit hardest. In cash terms (i.e. undiscounted) and before tax, this amounts to as much as £22,500 for men from low SEGs and £14,600 for women from low SEGs.
- This means that total net economic loss for just this one year group in England would be at least £1.585 billion.
- There is also likely to be a significant negative impact on social mobility. The proportion of boys from low-socioeconomic backgrounds becoming one of the highest earners is projected to drop from 16.3% to 15%. For girls, the drop would be from 15.3% to 14.6%.

1. INTRODUCTION

Since the initial closure of schools on March 20th 2020 to all but the children of key workers, in-person attendance at secondary schools hovered at approximately 1-2% of normal rates throughout March and April, increasing to 3% of normal levels in May and approximately 6% at the start of June.¹ Attendance was particularly low at state secondary schools, where, despite 90% of these schools being 'open', pupil attendance remained at approximately 1% of normal levels over the entire period.

Clearly, the impact of school closures and the replacement of in-person learning with remote activity is likely to have significant effects on all pupils. This is especially true for those pupils from lower socioeco-

omic groups (SEGs),² who might already face inadequate learning resources at home (made worse by potential parental unemployment and reduced furlough income during the lockdown).³ This is made worse by the absence of adequate technology to access remote lessons offered by schools,⁴ as well as insufficient ongoing parental support, given the lower likelihood of these children's parents being able to work from home due to the nature of their employment.

Combined with the expected general labour market scarring, the learning loss resulting from school closures (and the potential impact on educational progression) is likely to have a significant detrimental effect on the prospects of young people once they enter the labour market. In this report, we estimate the effective loss

in learning as a result of the pandemic by socioeconomic group, as well as the potential consequential impact on labour market prospects (in terms of earnings and employment) in the medium term. We thus estimate the expected economic loss to the individual learner and the Exchequer (by SEG and gender) associated with the cohort of secondary school students undertaking Key Stage 4 exams (i.e. GCSEs, in Year 11) in England in the 2019/20 academic year.⁵ Our analysis assumes that the impact on individuals' labour market outcomes will last for a maximum of up to 20 years, and these impacts are measured from age 21 onwards (i.e. we measure these effects between the age of 21 and 40).

2. METHODOLOGY

2.1 Estimating the impact of schooling on labour market outcomes

2.1.1 Data sources

To undertake the analysis of the impact of the loss in learning, we used UK Quarterly Labour Force Survey (QLFS) data.⁶ Since 2014, the third quarter (June to September) of the QLFS has incorporated a module of questions on social mobility, including information on the occupation of the main earner in the survey respondent's household when the respondent was aged 14. Table 1 presents information on how we used this information to group respondents into low vs. high SEGs.⁷ The QLFS also reports information on respondents' current earnings and employment status, education attainment, and personal characteristics. We used the third quarter of the QLFS for each year between 2014 and 2019 to analyse the impact of gaining an additional year of post-compulsory schooling on individuals' annual earnings and their probability of being in employment, by socioeconomic background and gender.

2.1.2 Econometric modelling

To estimate the impact of an additional year of post-compulsory schooling on earnings and employment outcomes, we undertook an econometric analysis using an Ordinary Least Squares model (in the case of earnings) and a Probit model (in the case of employment status). The models followed the standard approach in the academic literature by controlling for personal, regional, and job-related characteristics.⁸ The model was estimated on a subset of the available sample. In particular, we imposed the following sample restrictions:

- Number of post-16 years of schooling: Given the focus on a learning loss at the age of 16, and the fact that the impact of the learning loss is likely to affect those individuals who have relatively limited post-compulsory education, the analysis was restricted to individuals with a maximum of four years of post-16 schooling (measured by when the individual left full-time education).⁹ In addition, we assumed that only those pupils who do not achieve

Table 1. Definition of low and high socioeconomic groups used in the QLFS analysis (based on the occupation of the main wage earner in respondents' households at age 14)

High SEG	Low SEG
1 'Managers, Directors and Senior Officials'	6 'Caring, Leisure and Other Service Occupations'
2 'Professional Occupations'	7 'Sales and Customer Service Occupations'
3 'Associate Professional and Technical Occupations'	8 'Process, Plant and Machine Operatives'
4 'Administrative and Secretarial Occupations'	9 'Elementary Occupations'.
5 'Skilled Trades Occupations'	'No one was earning'

Note: Based on QLFS variables SMEARNER and SMSOC101.
Source: London Economics' analysis of Quarterly Labour Force Survey data for 2014-2019

higher education qualifications (or equivalent) will be affected by the Covid-19 school closures. Hence, the econometric analysis was restricted to individuals with educational qualifications at Level 3 or below.¹⁰

- Age-band: As noted above, the analysis assumes a 20-year persistency, estimating the impact of the learning loss on labour market outcomes between the ages of 21 and 40. To measure differences in the impact of schooling over time, the econometric analysis was undertaken separately for individuals aged between 21 and 30 (i.e. to measure the effect over the first 10 years) and between 31 and 40.¹¹

2.1.3 Results and implications

The results of the econometric analysis, presented in Table 2, indicate that the estimated marginal earnings and employment returns to an additional year of post-compulsory schooling vary significantly depending on gender, SEG and age band. In particular, for men between the ages of 21 and 30 in the low SEG, the earnings premium associated with a year of post-compulsory schooling stands at approximately **4.0%** (compared to **2.4%** for women). In contrast, for both men and women from high SEGs, the earnings return is **zero**. With the exception of women from low SEGs who achieve an increased probability of being in employment

Table 2. Estimated marginal earnings and employment returns to a year of post-compulsory schooling, by SEG, gender and age band

Measure and age bands	Low SEG		High SEG	
	Male	Female	Male	Female
Earnings (%)				
Age 21-30	4.0%	2.4%	0.0%	0.0%
Age 31-40	9.4%	2.6%	8.0%	6.1%
Employment (percentage points)				
Age 21-30	0.0	5.9	0.0	0.0
Age 31-40	3.3	6.9	1.6	2.1

Note: Analysis of the UK Labour Force Survey based on pooled data for Q3 2014 to Q3 2019, for individuals living in England only. Earnings are calculated in June 2020 prices and represent the percentage earnings boost or percentage point boost in employment resulting from an additional year of post-compulsory education. Econometric results relating to earnings have been exponentiated. Sample restricted to individuals with no more than four years of post-compulsory schooling and with highest qualification (at Level 3 or below) achieved by the age of 21. Any results that were not statistically significant at the 10% level have been reported as zero.
Source: London Economics' analysis of Quarterly Labour Force Survey data for 2014-2019

(of **5.9 percentage points**), employment is unaffected by an additional year of post-compulsory schooling in the first ten years of labour market participation.

Between the ages of 31 and 40, additional years of post-compulsory schooling have a relatively larger impact on labour market outcomes. In particular, men from low SEGs see a **9.4%** earnings impact alongside a **3.3 percentage point** employment effect from an additional year of schooling. Women from low SEGs also see a labour market benefit from schooling – in particular in respect of employment (**2.6%** earnings impact alongside a **6.9 percentage point** employment effect). For both men and women from high SEGs, there is a large (**6-8%**) earnings effect alongside a **1-2 percentage point** employment effect.

The econometric results for this group of learners (i.e. those individuals with less than four years of post-compulsory education and without higher education qualifications (or equivalent)) imply that schooling has relatively large and persistent positive effects on earnings and employment well into adulthood. This suggests that any school closures that might impact the quantity or quality of schooling received would have long-term labour market effects - and would disproportionately impact learners from low SEGs.

2.2 Estimating the loss of learning associated with Covid-19 school closures

To estimate the size of the learning loss - in terms of the proportion of the 2019-20 academic year that was 'lost' to pupils in the cohort of interest - we combined information on the duration of the Covid-19 school closures in England with estimates of the daily number of hours that pupils spent on learning before and during the lockdown. This information was then combined with estimates of the extent to which the remote (replacement) learning during lockdown compensated for the loss of in-person teaching, and how this varied by SEG.

2.2.1 School closures

In England, Local Authority maintained schools must open for at least 380 sessions (190 days) during a school year;¹² however, the exact

term dates are determined by school employers. In the case of maintained schools, the school employer is the Local Authority, while for some other school types,¹³ the employer is the Governing Body. Academies (including free schools) can determine their own term dates. As such there is some degree of variation by (and within each) Local Authority in terms of the number of days that schools were actually closed during the lockdown. We have assumed, that with the exception of children of key workers, schools were closed for in-person provision for **71 days** from March 20th, 2020 (equivalent to **37%** of the school year).¹⁴

2.2.2 Learning during lockdown

In terms of the quantity of lost learning per day, recent survey evidence on inequalities in children's experiences of home learning during the pandemic¹⁵ suggests that the number of hours of learning received by secondary school children in households in the highest family earnings quintile was approximately **7.1 hours** per day pre-lockdown (in 2014-15) compared to approximately **5.1 hours** during lockdown (a decline of **2.1 hours** per day (or **29%**)). The corresponding estimates for secondary school children in the lowest family earnings quintile were estimated to be **6.2 hours** and **3.9 hours** respectively (a decline of **2.3 hours** per day (or **37%**)). This analysis illustrates that the daily time spent on learning during lockdown declined to a slightly greater extent for children from lower SEGs as compared to higher SEGs (in absolute terms, though the loss in learning was noticeably greater in percentage terms).

2.2.3 Effectiveness of replacement learning

Despite the attempts of the government to mitigate the effect of school closures, differential access to learning resources (both in the home and in terms of being able to access remote learning resources offered by schools) is likely to have had an impact on the quality of the learning received by secondary school children from different SEGs. This is identified in a recent Institute for Fiscal Studies analysis,¹⁶ but also by the World Bank,¹⁷ stating that "A successful remote learning strategy relies on multiple delivery approaches. COVID-19 has exposed the digital divide and the

differences that disproportionately impact [...] poor communities within countries. In no case do we expect the mitigation to fully compensate for school closures and the accompanying learning losses. For high-income countries, mitigation effectiveness could range from 15% to 60%, also reflecting both greater household access to technology and the expected effectiveness of what is offered".

Based on these World Bank ranges of the effectiveness of remote learning during lockdown, we assumed that, for secondary school children from high SEGs, **60%** of the learning during lockdown was effective, compared to just **15%** for children from low SEGs.

2.2.4 Estimated learning loss

Combining the information on the number of school days in an academic year, the duration of school closures in England during lockdown, the average number of hours of learning received in a 'normal' school year and during lockdown, as well as the 'effectiveness' of remote learning, we estimated that, compared to a normal year, a secondary school child from a high SEG experienced a **21%** loss in learning (on average)¹⁸ compared to a **34%** average loss for those from a low SEG.¹⁹

Clearly, it is very challenging to estimate the impact of school closures on the loss of learning. To put our above estimates into context, a number of other organisations have also assessed the impact of the pandemic on young peoples' learning. In particular, in July, the National Foundation for Education Research administered a survey of teachers (in state-funded mainstream primary and secondary schools in England), asking them to indicate the extent to which they believed their pupils were currently behind their curriculum learning compared to where they would be at this time of year (i.e. in July) in a normal school year.²⁰ The survey results indicate that the perceived learning loss in the most deprived schools was approximately **3.7 months**, compared to **2.4 months** in the least deprived schools.²¹ Based on a 12-month calendar year, this corresponds to a **31%** and **20%** learning loss for students in the most and least deprived schools, respectively, thus suggesting similar learning losses as assumed in the analysis at hand.

2.3 The student cohort under consideration

The analysis is based on the expected labour market outcomes (between the ages of 21 and 40) achieved by the cohort of secondary school pupils undertaking Key Stage 4 exams (i.e. GCSEs) in England in 2019-20. Overall, there were **566,674** pupils in the cohort undertaking Key Stage 4 in 2019-20 (based on statistics published by the Department for Education).²² Information on parental occupation is not collected for pupils, so we used an alternative indicator to identify the proportion of the cohort coming from low vs. high SEGs. Specifically, we used separate information (again published by the Department for Education)²³ on the breakdown of Key Stage 4 students (in 2018-19)²⁴ by Income Deprivation Affecting Children Index (IDACI)²⁵ decile (based on pupil residency). Using this information, based on the proportion of KS4 pupils living in the **30%** most deprived areas,²⁶ we estimated that approximately **34%** of Year 11 pupils were from low SEGs. Applying this proportion to the relevant student cohort, we thus estimated that, out of the total of **566,674** pupils undertaking Key Stage 4 exams in England in 2019-20, **193,259** are from low SEGs, while the remaining **373,415** students are from high SEGs.²⁷

2.4 Progression rates to higher education

As previously discussed, one of the key factors in the analysis relates to the assumption that despite the extensive learning loss suffered by all secondary school pupils, for those individuals that are expected to progress to higher education, the effects may dissipate entirely and not be reflected in any labour market penalty during adulthood (e.g. due to higher ability and motivation). Essentially, we assume that the labour market penalty associated with the learning loss will be incurred by only those individuals likely to achieve lower levels of post-compulsory education.

Combining information on Key Stage 4 long-term progression rates to higher education at the school level (for the 2012-13 Key Stage 4 cohort)²⁸ and deprivation quintiles for English secondary schools,^{29, 30} the analysis suggests that the progression rate amongst Key Stage 4 pupils

to higher education by the age of 20 or 21 stands at **41.2%** for individuals from high SEGs (identified as those belonging to the top 70% of the IDACI distribution) compared to **33.7%** for lower SEGs (bottom 30% of the IDACI distribution).

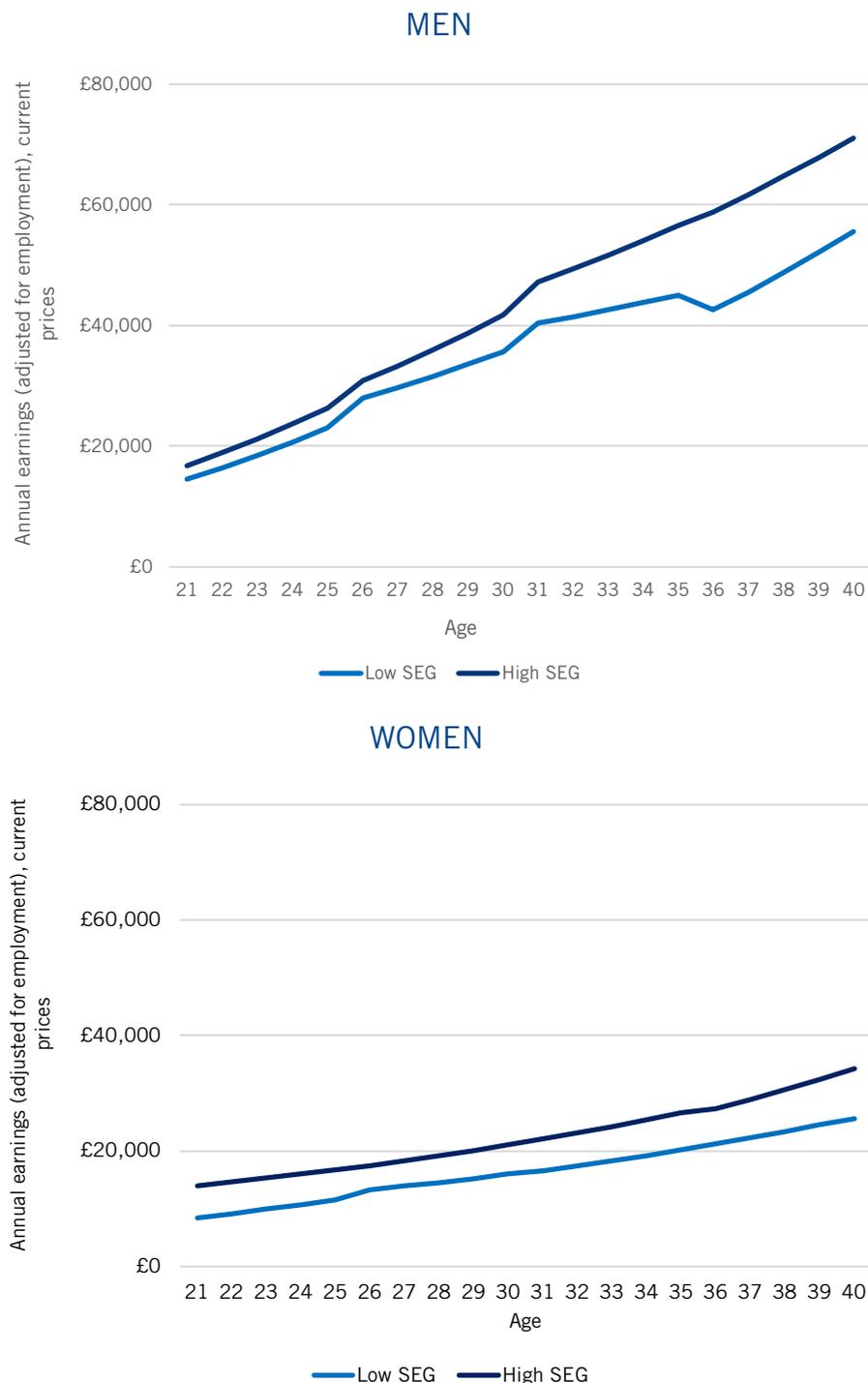
2.5 Baseline age-earnings profiles by SEG and gender

The final building block of the analysis involves the estimation of the

baseline age-earnings profiles (i.e. the earnings profiles that students in the cohort would have achieved (between the ages of 21 and 40) if they had not experienced the learning loss associated with Covid-19 school closures), by socioeconomic group and gender.

To achieve this, using the above-described information from the 3rd Quarter of the Labour Force Survey between 2014 and 2019, we esti-

Figure 1. Baseline annual (employment-adjusted) age-earnings profiles, by gender and SEG



Note: All estimates are presented in current prices and cash terms (i.e. not discounted into present values). The estimates are based on learners who are expected not to achieve higher education qualifications (or equivalent).

Source: London Economics' analysis of Quarterly Labour Force Survey data for 2014-2019

mated average annual earnings³¹ and employment probabilities by gender, age,³² and low vs. high SEG (again focusing only on individuals living in England with Level 3 qualifications or below as their highest qualifications achieved). We then multiplied the earnings profiles by the probability of employment in each instance, to arrive at employment-adjusted age-earnings profiles. Subsequently, these historic annual earnings estimates were updated to reflect future earnings growth (using forecasts of average UK real earnings growth published by the Office for Budget Responsibility)³³ that would be ex-

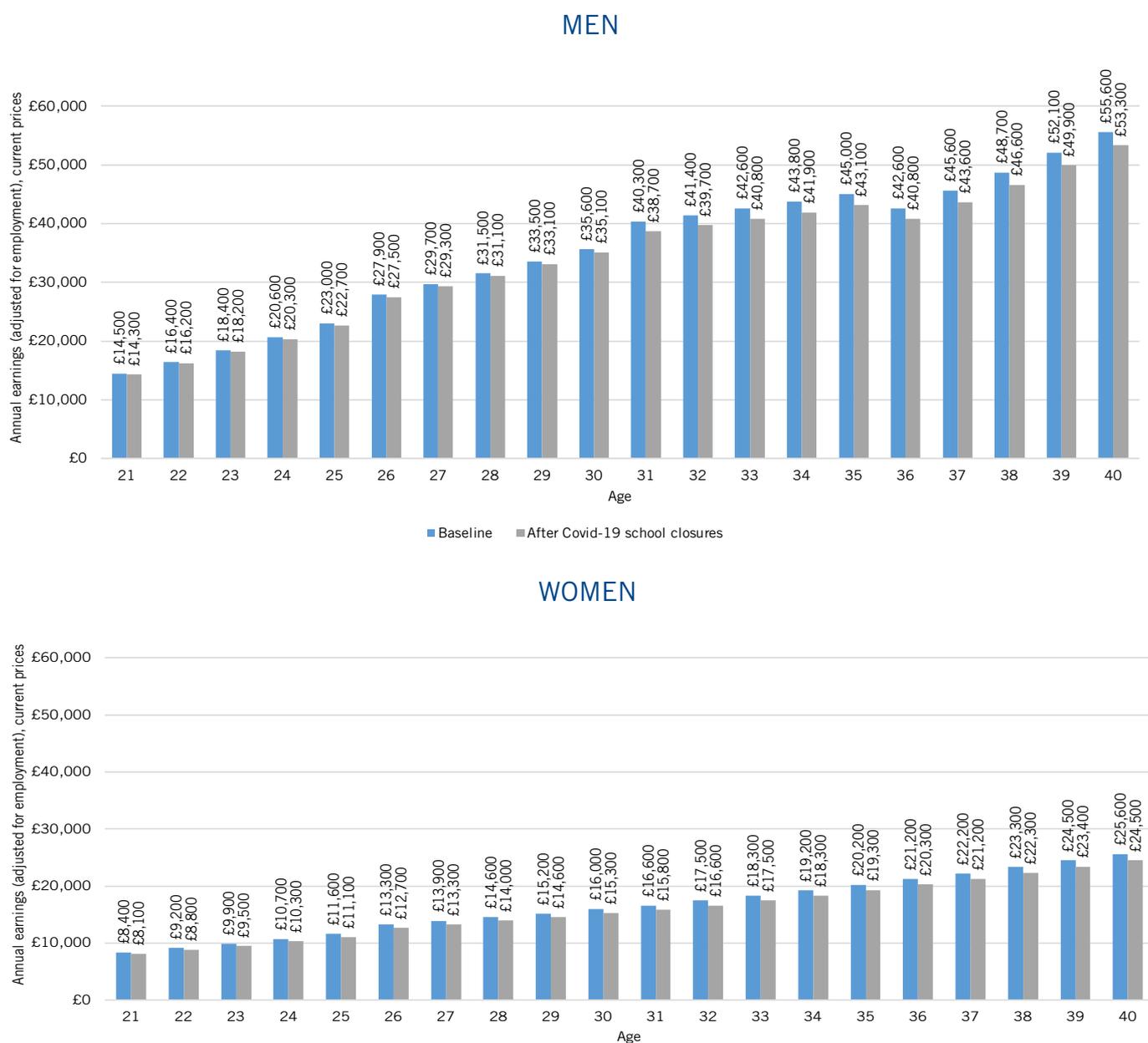
pected to be experienced by the current cohort of Key Stage 4 students upon entering the labour market from the age of 21. The resulting baseline employment-adjusted age-earnings profiles by gender and socioeconomic grouping are presented in Figure 1.³⁴ As expected, the analysis demonstrates higher earnings for men compared to women, and for individuals from higher SEGs compared to lower SEGs.

3. THE IMPACT OF SCHOOL CLOSURES

3.1 Earnings in baseline and after Covid-19 school closures

To estimate the expected loss in (employment-adjusted) earnings for students in the cohort of interest associated with the Covid-19 school closures, we combined the baseline age-earnings profiles (see Section 2.5) with the estimated marginal earnings and employment returns to a year of schooling (see Section 2.1.3) and the estimated learning loss resulting from school closures (i.e. **34%** for low SEGs and **21%** for high SEGs;

Figure 2. Annual (employment-adjusted) age-earnings profiles for students from low SEGs - Baseline and after Covid-19 school closures



Note: All estimates are presented in current prices and cash terms (i.e. not discounted into present values), and have been rounded to the nearest £100. The estimates are based on learners who are expected not to achieve higher education qualifications (or equivalent). Source: London Economics' analysis

see Section 2.2.4). Specifically, we assumed that the corresponding proportion of a year's worth of the estimated earnings and employment return to schooling would be lost in each year for which the effect persisted (i.e. between the ages of 21 and 40). This was undertaken separately by SEG and by gender – and again focusing only on those students in the cohort expected not to subsequently achieve higher education qualifications.

Figure 2 presents the resulting (employment-adjusted) age-earnings profiles for students in the cohort from low SEGs following the learning loss associated with Covid-19 school closures (for those students expected not to achieve higher education qualifications).³⁵ Compared to the Baseline, in current prices and cash terms (i.e. undiscounted), we estimate that the learning loss associated with Covid-19 school closures will result in a loss in (employment-adjusted) gross earnings of approximately **£22,500** for men from low SEGs and **£14,600** for women from low SEGs.

3.2 Student and Exchequer losses per student

Figure 2 presented the employment-adjusted gross annual earnings (in the Baseline and post Covid-19) for those students in the 2019-20 GCSE cohort expected not to progress to HE.

To understand the economic loss to current GCSE students once they en-

ter the labour market (again, between the ages of 21 and 40, i.e. assuming a 20-year persistency effect), we consider the loss in after-tax earnings (i.e. after the deduction of income tax and employee National Insurance). We applied discounting³⁶ and adjust for expected inflation³⁷ to illustrate the economic loss in present value terms in constant 2019-20 prices. In addition, we then adjusted the estimates for the likelihood of progression into higher education (see Section 2.4), to arrive at a weighted average of the economic loss across students expected not to progress to higher education (facing the above labour market penalties) and those expected to achieve higher education qualifications (assumed not to be affected by the learning loss).

As presented in Figure 3, the resulting expected loss in after-tax earnings per student stands at **£3,870** for men from low SEGs, compared to **£1,570** for men from high SEGs. For women, the corresponding estimates are **£3,800** and **£710**, respectively.³⁸

We also consider the loss in Exchequer revenues that would occur alongside the loss in earnings. These estimates include the loss in income tax and employee National Insurance receipts, but also the associated loss in employer National Insurance receipts. The analysis suggests that the present value of the expected loss in taxation receipts stands at **£2,570** for a representative man from a low

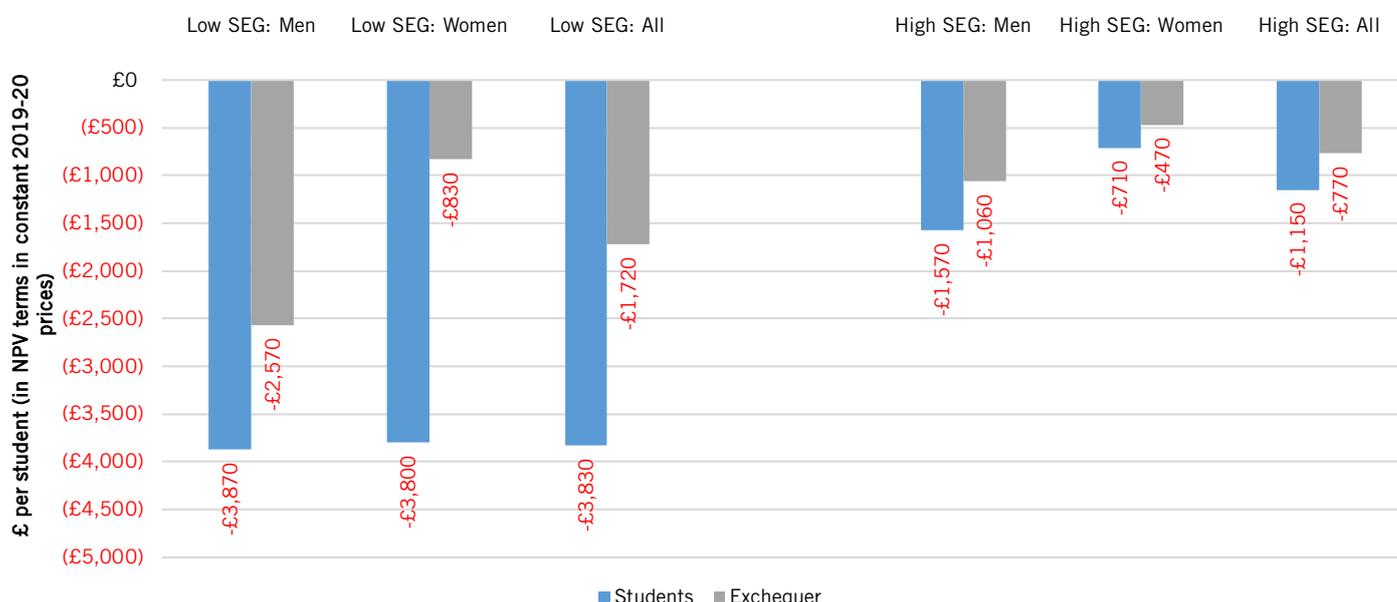
SEG compared to **£1,060** for a man from a high SEG. For women, the corresponding estimates are **£830** and **£470**, respectively.

On average across male and female students in the cohort of GCSE students, the present value of the loss in net earnings stands at **£3,830** per learner for students from low SEGs, and **£1,150** per learner from high SEGs (or **£2,070** per learner across the entire cohort). The corresponding loss to the Exchequer stands at **£1,720** per learner from low SEGs and **£770** for learners from high SEGs (or **£1,100** per learner across the entire cohort).

3.3 Aggregate economic losses

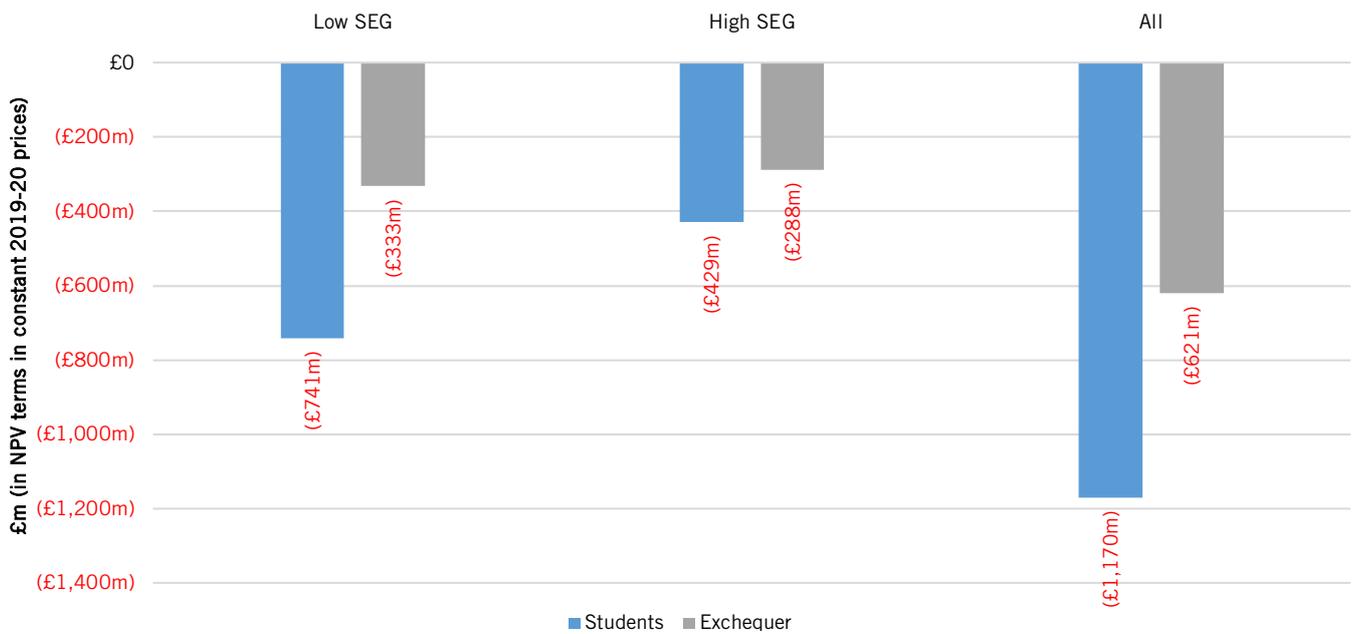
Aggregating the above losses to the student and the Exchequer across the entire 2019-20 cohort of GCSE Key Stage 4 students, Figure 4 presents the total student and Exchequer losses associated with the Covid-19 pandemic school closures and consequential loss of learning. The analysis suggests that, for this single cohort and assuming a 20-year persistency effect, the economic loss to students stands at approximately **£1.170 billion** (**£741 million** associated with low SEG learners and **£429 million** associated with high SEG learners), while the corresponding loss to the Exchequer was estimated at **£621 million** (**£333 million** associated with low SEG learners and **£288 million** associated with high SEG learners).

Figure 3. Student/Exchequer losses per student associated with Covid-19 school closures (present values in constant 2019-20 prices), by gender and SEG



Note: All estimates have been discounted to present values, presented in 2019-20 prices, and rounded to the nearest £10.
Source: London Economics' analysis

Figure 4. Total student/Exchequer losses associated with Covid-19 school closures (present values in constant 2019-20 prices), by SEG



Note: All estimates have been discounted to present values and presented in 2019-20 prices. Source: London Economics' analysis

The analysis suggests that the total impact of school closures (assuming a 20-year persistency effect) stands at approximately **£1,585 million**.³⁹

3.4 Impact on social mobility

In addition to the above-presented core analysis, we also assessed the extent to which the learning loss might impact individuals from low SEGs in terms of their position in the income distribution between the ages of 21 and 30. To achieve this, using the same data sources as in the main analysis, we undertook an econometric analysis (specifically, an Ordered Probit model) to assess the correlation between an additional year of post-compulsory schooling and the likelihood of being in a particular income quintile (ordered from 1 (bottom quintile) to 5 (top quintile)).⁴⁰ The regressions were undertaken for individuals aged 21-30, again with highest qualifications at Level 3 or below. The income quintiles for this group of individuals were computed separately for men and women.

The results, presented in Table 3, suggest that an additional year of post-compulsory schooling increases the likelihood of a man from a low SEG being in the top income quintile (Quintile 5) between the ages of 21 and 30 by **3.6 percentage**

Table 3. Marginal effect of an additional year of post-compulsory schooling on the likelihood of being in a particular income quintile at age 21-30, by SEG and gender

Income quintile	Low SEG		High SEG	
	Male	Female	Male	Female
1 – lowest income quintile	-3.7ppt	-2.7ppt	-	-
2	-1.6ppt	-0.6ppt	-	-
3	-	-	-	-
4	1.6ppt	1.0ppt	-	-
5 - highest income quintile	3.6ppt	2.0ppt	-	-

Note: Based on pooled data for Q3 2014 to Q3 2019. Marginal effects reported. As with the marginal earnings and employment returns (see Section 2.1.3), the analysis is restricted to individuals living in England, with a maximum of 4 years of post-16 education, the highest qualification (at Level 3 or below) achieved by the age of 21. Income quintiles are calculated separately for men and women, but combining all individuals holding a Level 3 qualification (or below) as their highest qualification (irrespective of whether they are from a high or low SEG). Any results that were not statistically significant at the 10% level have been reported as zero.

Source: London Economics' analysis of Labour Force Survey between 2014 and 2019

points, while the corresponding impact for women stands at **2.0 percentage points**. For individuals from a low SEG, an additional year of post-compulsory schooling will also increase the likelihood of being in the 2nd highest income quintile (Quintile 4) by **1.0-1.6 percentage points**. In contrast, an additional year of post-compulsory schooling has **no statistically significant impact** on the

probability that an individual from a high SEG will be in any particular income quintile.

As discussed in Section 2.2.4, the learning loss associated with Covid-19 school closures was estimated at **34%** of the academic year for low SEG students and **21%** for high SEG students. Adjusting the probabilities above for this loss in learning suggests that the Covid-19 school

closures would be expected to reduce the likelihood of a man from a low SEG (and not expected to achieve higher education qualifications) being in the top income quintile between the ages of 21 and 30 by **1.2 percentage points**, while the corresponding impact for women stands at **0.7 percentage points** (and **0.5 percentage points** or **0.3 percentage points** in respect of the 2nd highest quintile for men and women respectively). In contrast, school closures are expected to have no impact on the probability that an individual from a high SEG (and not expected to achieve higher education qualifications) will enter a specific income quintile between the ages of 21 and 30.

4. CONCLUSIONS

Following recent increases in education funding, the minimum core funding levels attracted by mainstream secondary schools in 2020-21 increased to **£5,000** per pupil per annum.⁴¹ The economic losses to the Exchequer associated with Covid-19 school closures and the associated loss in learning for the 2019-20 cohort of GCSE students stand at approximately **20%** of a year's worth of funding overall (though the losses are much greater for young people from low SEGs). Incorporating the additional losses to the individual through labour market scarring effects increases this much further. Efforts

by the Department for Education to remedy the learning loss through the introduction of a £350 million tutoring fund are welcome and will be vital to mitigating the impact on the learning of many young people. The Education Endowment Foundation, the Trust's sister charity, has been allocated £76m to fund high-quality tuition partners as part of this effort. However, given the scale of the challenge being faced, this is unlikely to be sufficient on its own to address the new challenges faced by disadvantaged young people, and further action will be needed to avoid long-term damage to their life chances and prospects for social mobility.

REFERENCES

1. Department for Education (2020), "Coronavirus (COVID-19) attendance in educational and early years settings in England – summary of returns to 4th June 2020" ([link](#))
2. Education Endowment Foundation (2020), "Impact of school closures on the attainment gap: Rapid Evidence Assessment", June 2020 ([link](#)). The analysis identifies the likely impact of school closures on the attainment gap between low and high SEGs. However, the authors state that the school closures due to Covid-19 are fundamentally different to the closures contained in the review. Specifically, there were no examples of unplanned closures of the length already experienced by schools in England. The evidence on school closures almost exclusively focuses on summer holidays and younger children.
3. Joyce, R., and Xu, X., (2020), "Sector shutdowns during the coronavirus crisis: which workers are most exposed?", IFS Briefing Note, April 2020 ([link](#))
4. Elliot-Major, L. and Machin, S. J., (2020), "Covid-19 and social mobility", CEP Covid-19 analysis Paper No. 004 ([link](#))
5. The economic loss to these students captures the loss in after-tax earnings (i.e. after the deduction of income tax and employee National Insurance contributions) associated with the learning loss during Covid-19 school closures. The economic loss to the Exchequer then captures the associated reduction in Exchequer revenues in terms of income tax, National Insurance contributions from employees, as well as National Insurance contributions from employers.
6. End User Licence version.
7. A more refined classification (NS-SEC) of socio-economic status can be derived using employment status information and the most detailed level of SOC2010 (occupation code). However, the variable SMSOC104 'Occupation of main wage earner when respondent was 14 years old (Unit level, i.e. 4 digits)' is not available under the End User Licence version of the QLFS.
8. Control variables include information on personal characteristics (age, ethnic background, marital status and number of children) and job characteristics (part-time status, public or private sector, temporary or permanent job, large workplace), as well as regional and time dummies.
9. Based on variable EDAGE in the QLFS. We also restricted the sample to those achieving their highest qualification by the age of 21, excluding those re-entering education later on.
10. Level 3 in the Regulated Qualifications Framework (RFQ).
11. In the analysis, we only retained Wave 1 respondents resident in England (providing a total sample of approximately 9,200 observations with non-missing information in terms of SEG, and approximately 4,800 observations with non-missing information in terms of both SEG and earnings (aged between 21 and 40)).
12. House of Commons (2019), "The School Day and Year (England)", Briefing Note 07148, July 2019 ([link](#))
13. The Local Authority is also considered the school employer in the case of community, voluntary-controlled, community special or maintained nursery schools. For foundation, voluntary-aided and foundation special schools, the Governing Body is the employer, while Academies, including free schools, set their own term dates.
14. Based on schools being closed for 17 weeks and 3 days (88 days) minus 4 Bank Holidays, 9 Easter vacation days and 4 half term days. We also assume that despite the very partial increase in in-person teaching to some year groups in some schools in June and July 2020, the cancellation of GCSE examinations means that for the cohort of pupils under consideration, school closures lasted the full **71 days**.
15. Institute for Fiscal Studies (2020), "Inequalities in children's experiences of home learning during the COVID-19 lockdown in England", Working Paper 202/26 ([link](#))
16. Institute for Fiscal Studies (2020), "Primary school closures created substantial inequality in time spent learning between pupils from poorer and better-off families - and re-opening schools may be the only remedy", IFS Observation Note, August 2020 ([link](#)).
17. World Bank (2020), "Simulating the potential impacts of Covid-19 school closures on schooling and learning outcomes: A set of global estimates", June 2020 ([link](#))
18. For a secondary school pupil from a high SEG, in a normal year, we estimated that they would undertake **1,355 hours** of learning (**190 x 7.1 hours**). In contrast, in 2019-20, they would be expected to undertake **848 hours** of learning pre-lockdown (**119 x 7.1 hours**) and **216 hours** during the school closure period (**71 days x 5.1 hours x 60%** (effectiveness adjustment)). This results in a total of **1,065 hours** of learning in 2019-20 (corresponding to a **21%** reduction compared to a 'normal' academic year).
19. For pupils from low SEGs, we estimated that a representative child would undertake **1,169 hours** of learning per annum in a normal year (**190 x 6.2 hours**). In 2019-20, they would be expected to undertake **732 hours** of learning pre-school closures (**119 x 6.2 hours**) and just **41 hours** during the lockdown period (**71 days x 3.9 hours x 15%** (effectiveness adjustment)). This results in a total of **773 hours** of learning in 2019-20 (a **34%** reduction compared to a 'normal' year).
20. National Foundation for Education Research (2020). "The challenges facing schools and pupils in September 2020" ([link](#))
21. School deprivation levels are based on the percentage of pupils registered for free school meals.
22. Department for Education (2020), "Headcount for 'Pupil characteristics - national curriculum year and gender' from 'Schools, pupils and their characteristics' in England for 2019/20" ([link](#))
23. Department for Education (2020), "Destinations of KS4 and 16 to 18 (KS5) students: 2018. Longer term destination measures for 2012 to 2013 cohort" ([link](#))
24. 2018-19 was the latest academic year for which this information was available at the time of writing.
25. The IDACI is a subset of the income deprivation domain of the Index of Multiple Deprivation (IMD), and measures the proportion of all children aged 0 to 15 living in income deprived families (i.e. in families in receipt of certain benefits, with an

equivalised income that is below 60% of the median before housing costs). The IDACI is based on the year 2015, and is based on Lower-Layer Super Output Areas in England defined by 2011 Census data.

26. While there is no defined measure to identify deprived areas, we decided to use the widest measure commonly used (as we are not trying to focus on the most heavily deprived areas only). In fact, the Ministry of Housing, Communities and Local Government in the 'English Indices of Deprivation 2019 Frequently Asked Questions (FAQs)' ([link](#)) reports that 'There is not a definitive way to present the data. It is common to describe how relatively deprived a neighbourhood is by saying whether it falls among the most deprived 10 per cent, 20 per cent or 30 per cent of small areas in England (although there is no definitive cut-off above which an area is described as 'deprived').' This definition has been used in a variety of studies and research (see for example the Department for Education on assessing deprivation ([link](#))).

27. Note that the 2019-20 Key Stage 4 data published by the Department for Education provides a breakdown of Key Stage 4 students by 'disadvantaged status'. Pupils are defined as disadvantaged if they are known to have been eligible for free school meals in the past six years (from Years 6 to 11), if they are recorded as having been looked after for at least one day, or if they are recorded as having been adopted from care' ([link](#)). However, since this definition is mainly based on whether the pupil was in receipt of free school meals, it is too restrictive for the purposes of the current analysis (as this measure only identifies highly disadvantaged pupils), so that we have used the separate information on IDACI instead.

28. Department for Education (2020), "Longer term destination measures for 2012 to 2013 cohort" ([link](#))

29. Ofsted (2020), "State-funded school inspections and outcomes: management information. Management information - state-funded schools - as at 31 July 2020" ([link](#))

30. In the Ofsted data on schools, deprivation is based on the Income Deprivation Affecting Children Index

2015. The deprivation of a provider is based on the mean of the deprivation indices associated with the home post codes of the pupils attending the school, rather than the location of the school itself. The schools are divided into five equal groups (quintiles), from 'most deprived' (quintile 5) to 'least deprived' (quintile 1).

The information on secondary schools' IDACI quintile was matched with the long-term progression rates into higher education for the 2012-13 Key Stage 4 cohort. We then computed the higher education progression rates for each quintile (covering both selective and non-selective schools and using the number of pupils at the end of KS4 as weights). Again, based on the assumption that the 30% of schools at the lower end of the deprivation distribution provides an indication of the likely higher education progression rate achieved by individuals from low SEGs, higher education progression rates were estimated using a weighted average (by pupil numbers) of school-quintile specific progression rates. Given that only information on quintiles is provided, the average for the bottom 30% was calculated using 100% of the average for the bottom quintile and 50% of the average for the second quintile.

31. All earnings were calculated in June 2020 prices.

32. Given the relatively limited sample size, we used the QLFS to estimate average earnings across 5-year age bands, which we subsequently 'smoothed' to achieve more detailed earnings and employment profiles by age.

33. Office for Budget Responsibility (2020), "Economic and fiscal outlook – March 2020" ([link](#))

34. Note that these age-earnings profiles are presented in current prices and cash terms (i.e. not discounted into present value terms). In Section 3, the expected loss in earnings as a result of the Covid-19 pandemic are presented in constant 2019-20 prices, and discounted to present value terms.

35. Again, these age-earnings profiles are presented in current prices and cash terms (i.e. not discounted into present value terms).

36. HM Treasury (2018), "The Green Book. Appraisal and Evaluation in

Central Government" ([link](#)). Based on this, we assume a real annual discount rate of 3.5%.

37. Bank of England (2020), "Monetary Policy Report. January 2020" ([link](#)). Based on this, we assume an annual CPI inflation rate of 2%.

38. Note that these losses to students and the Exchequer should not be added to generate a total effect on the UK economy. This is because the Exchequer loss per student includes National Insurance contributions from employers (which constitute a transfer from employers to Treasury from an economy-wide perspective).

39. Note that the losses to students should not be added to the loss incurred by the Exchequer to generate a total effect on the UK economy. This is because the Exchequer loss includes National Insurance contributions from employers (which constitute a transfer from employers to Treasury from an economy-wide perspective).

40. Quintiles were defined based on real hourly earnings. The ordered probit regression also included the standard set of explanatory variables used in the earnings regressions. In addition, the analysis was again restricted to individuals living in England only, with a maximum of four years of post-16 schooling, and with highest qualifications at Level 3 or below.

41. House of Commons (2019), "School funding in England: FAQs", CBP 08419, 18th December 2019 ([link](#))

42. Schools Week (2020) "£1bn schools coronavirus 'catch-up' package revealed", 19th June 2020 ([link](#))