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# Economic Evaluation of the Pupil Learning Credits Pilot Scheme

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## Executive summary

The Pupil Learning Credits (PLC) policy initiative was one of the reforms introduced to address the problems of inner city schools in England. It was introduced in 2001 and targeted on pupils of age 11 to 14. The aim has been to provide additional learning opportunities for those whose social circumstances are particularly difficult.

This report is one of a number of reports published as part of the PLC Evaluation and should be read in conjunction with the other PLC reports (see page 17). In this report, we present an analysis of the effect of the PLC programme on pupil attainment and attendance at school in the most recent year (2002-2003) – two years after it was introduced. We do this by comparing these outcomes in schools affected by PLCs relative to a comparison group, before and after the PLC policy was introduced. It is difficult to distinguish the effects of the PLC initiative from the effects of 'Excellence in Cities', and results have to be interpreted with this in mind.

Results suggest that PLCs (or more conservatively – the combined effects of this policy and Excellence in Cities) had a positive impact on pupil attainment in Mathematics and on pupil attendance at school. Specifically, the effect has been to raise the percentage of pupils achieving Level 5 or above (i.e. the government target) at Key Stage 3 by about 2 percentage points. However, there has been no effect on attainment in English. With regard to pupil attendance, the effect has been to reduce absences by about half a day.

Has the policy been worth the cost? To do an accurate Cost-Benefit Analysis, one would need to know how such effects translate to a range of later outcomes – for example, further education, wages, crime. Ideally, one would want to follow the children affected by these particular reforms as they progress through school and into the labour market.

As a result of the limited information available at this time, it is only possible to do a very simple Cost-Benefit Analysis under strong assumptions. However, our analysis suggests that the policy is potentially cost-effective. Indeed, given the low per pupil cost of the policy, expected benefits do not have to be very large to generate a positive expected return.

## 1. Introduction

An important aim of government policy relates to raising standards in inner city schools, where problems of social disadvantage are often reflected in very low relative measures of school performance. 'Excellence in Cities' (EiC) was introduced in September 1999 and involved the distribution of funds to schools within specified inner city areas for particular programmes. The 'Pupil Learning Credits' (PLC) Policy Initiative was introduced within a subset of these schools in September 2001. The latter initiative is targeted on pupils of age 11 to 14 (Key Stage 3), where the aim is to provide additional learning opportunities for those whose social circumstances are particularly difficult. Among the differences between PLCs and EiC is that in the former initiative more flexibility is given to schools about how the funds may be used[1] and the target group is more narrowly defined (i.e. pupils of age 11 to 14 rather than the whole school). The funding per pupil is higher on average in the former scheme. The average funding per pupil in EiC schools is about £120 (although there is considerable heterogeneity between schools), whereas with regard to PLCs, it is about £360 for schools where over 50 per cent of students are eligible for free school meals and about £260 for other PLC schools.

The aim of this paper is to present an analysis of the effect of the PLC programme on pupil attainment and attendance at school in the most recent year (2002-2003) – two years after it was introduced. We do this by comparing these outcomes in schools affected by PLCs relative to a comparison group, before and after the PLC policy was introduced. There are two main difficulties. Firstly, the PLC initiative was introduced to a subset of schools affected by EiC. This makes it difficult to distinguish the impact of the two initiatives. Secondly, PLCs were deliberately targeted at the most disadvantaged schools. This makes it difficult to define a suitable comparison group. We address these problems as far as possible by only using the subset of schools designated as EiC in either the first Phase (starting in September 1999) or the second Phase (starting in September 2000); and by controlling for a rich set of variables. Hence, we evaluate the effect of PLC over a period in which all schools in the 'treatment' group (i.e. affected by PLC policy) and the comparison group had been affected by EiC policy for at least a year.[2]

Results suggest that PLCs had an impact on pupil attainment on Maths (though not on English) and on pupil attendance at school. Given the modest costs of the policy, this improvement is likely to be cost-effective. This is shown in the context of a fairly crude Cost-Benefit Analysis. To find out the actual long-term impact of the programme, it will be important to commission research in the future that will investigate whether participants benefit later on in their school career and ultimately in the labour market.

In Section 2, we explain the initiatives in a more detailed way before describing the data in Section 3. In Section 4, we present a descriptive analysis of changes between 2001 and 2003 in the treatment and comparison group schools. Then

[1] However, as the EiC initiative has progressed, more flexibility has been given to schools about how available funding can be used.

[2] This does not entirely solve the problem as the impact of EiC has changed over time. See Machin *et al.* (2005).

in Section 5, we present the empirical model and results. In Section 6, we present a Cost-Benefit Analysis. Finally, in Section 7, we discuss conclusions.

## 2. Policy Initiatives: Excellence in Cities and Pupil Learning Credits

Excellence in Cities was introduced in over 400 schools in 1999 (EiC Phase 1) and a further 315 schools in 2000 (EiC Phase 2). The programme has continued to be extended and now covers over a third of secondary schools as well as over 1,000 primary schools. A similar programme, Aimhigher, has also been introduced to target post-compulsory phases of education. The core strands of EiC are as follows: Learning Mentors, to help students overcome educational or behavioural problems; Learning Support Units, to provide short-term teaching and support programmes for difficult pupils; and a Gifted and Talented programme, to provide extra support for 5-10 per cent of pupils in each school. The EiC policy also involves the designation of schools as Specialist and Beacon and the creation of City Learning Centres and EiC Action Zones.

The Pupil Learning Credits (PLC) Policy Initiative was implemented on a pilot basis from September 2001, mainly within a subset of schools designated as EiC in 1999 (i.e. Phase 1) and also for some schools designated as Excellence Cluster schools in 2001. The latter group is not included in this analysis.[3] Thus, there are 233 PLC schools used in this analysis out of a total of about 260. While the first phase of EiC applied to all schools within designated Local Education Authorities (24 in total), schools were selected for the PLC pilot by DfES on the basis of their degree of disadvantage (as indicated by the percentage of students known to be eligible for Free School Meals). Thus, the most disadvantaged schools within Phase 1 of EiC were selected for the PLC pilot.

The stated aim of the PLC initiative is to provide schools attended by disadvantaged students with funding to enable provision of "the kind of opportunity that many more advantaged pupils take for granted: extra music tuition, museum and theatre visits, as well as extra support in the core curriculum if it is necessary" (DfEE, 2001). Braun *et al.* (2003) describe the broad range of activities undertaken with PLC funding such as trips and residential activities, extra-curricular activities, resources for departments, staffing, outside specialists/visitors and prizes/awards. Hence there is much scope for discretion in how resources are used. The question we address is whether this multitude of activities had any impact in raising average pupil attainment or increasing attendance at school. Since PLCs are targeted on pupils of age 11 to 14, we focus on pupil attainment at the end of Key Stage 3. We consider attendance at school using a measure of school-level absences.

## 3. Data description

This analysis is based on pupil-level data sets of Key Stage 3 attainment and school-level data. The pupil-level data set consists of a data set of all students who were in Year 9 in either 2003 or 2001 (i.e. the Key Stage 3 exam year)[4]. This data set contains detailed information on the student's attainment at Key Stage 3, their Key Stage 2 test

[3] The small number of PLC schools designated as EiC in 2001 (i.e. in Excellence Clusters) are excluded from this analysis as it would not be possible to make any attempt at distinguishing the effects of PLC from the effects of EiC.

[4] In this paper, school years refer to the end of the academic year, when tests take place. For example, 2003 refers to the academic year 2002-2003.

results, gender, date of birth and codes for the primary and secondary schools attended. School-level data consists of variables contained in the School Performance tables and the LEA and School Information Service (LEASIS), which have been matched up with the pupil-level attainment data using the school codes provided in both data sets.[5] In this analysis, only 'non-special' schools that are LEA maintained are included – thus maintained schools that exist exclusively for students with special needs are excluded, as are all independent schools.

Given that PLC was implemented in a subset of EiC Phase 1 schools, we restrict our sample to schools in EiC Phase 1 and Phase 2. Schools in the former group had been affected by EiC policy for two years prior to the introduction of PLC whereas schools in the latter group had been in the policy for one year. Restricting our sample of schools in this way limits the potential for confounding the effects of PLC with EiC. However, it does not eliminate this risk given that there is heterogeneity between schools in the amount of resources available for EiC. On account of this (and potentially for other reasons), EiC may be more effective in some schools than in others, and its effectiveness may change over time.

Our methodology involves comparing performance measures for 'treatment' (subject to the PLC policy) schools with schools in two possible comparison groups. The first comparison group consists of all non-PLC schools in EiC Phase 1 and Phase 2. The second comparison group consists of all non-PLC schools in EiC Phase 1. Summary statistics for selected variables are shown in the Appendix (Table A.1). Since the PLC policy was targeted on schools within EiC Phase 1 that had a high percentage of students known to be eligible for Free School Meals, it is not surprising to see that these schools are considerably more disadvantaged (on average) than schools in either comparison group.[6] PLC schools are also very different from schools in the comparison groups according to a number of other variables. For example, they have a higher percentage of students with Special Educational Needs (both statemented and non-statmented) and 'non-white' students. It is important to bear this in mind when considering descriptive statistics for the outcome variables.

## 4. Descriptive analysis

In Table 1, we show summary statistics for the outcome variables of primary interest in each group of schools: the 'treatment group' (i.e. schools affected by PLCs) and the two comparison groups: first, all non-PLC schools in areas affected by EiC Phase 1 and Phase 2; and second, all non-PLC schools in EiC Phase 1.

With regard to pupil attainment, we focus on the probability of attaining level 5 or above in Maths and English respectively. There are 9 possible levels at Key Stage 3. Level 5 is the expected standard for pupils at the end of Key Stage 3 (age 14) and forms the basis of government targets.[7]

The first two sections of Table 1 show the percentage of students attaining level 5 or above within each group of schools in 2001 and 2003. For both Maths and English, PLC schools start from a much lower base. For example, in Maths the percentage of students attaining level 5 or above in 2001 is 44.24 in PLC schools compared to 64.45 in non-PLC schools in EiC Phase 1 or 2 and 69.09 in non-PLC

[5] It was also necessary to change school codes in the various files where these had changed over the relevant time period.

[6] The precise qualification to become a PLC school was that in January 2000, schools in designated areas had to have at least 35 per cent of their pupils eligible for Free School Meals.

[7] For 2004, the targets were that 75 per cent of 14 year olds reach this level in Maths and English.

schools in EiC Phase 1. For both English and Maths, the increase over time is higher within PLC schools than in either of the two comparison groups. For PLC schools, the change over time in English and Maths attainment is 5.09 and 8 percentage points respectively, whereas the corresponding change in non-PLC schools (in Phase 1 or 2 areas) is 3.83 and 4.8 percentage points. Hence the 'difference in difference' estimate (i.e. the change over time in PLC schools as compared to non-PLC schools) is about 1.26 percentage points for English (i.e. 5.09-3.83) and 3.2 percentage points for Maths (i.e. 8-4.8).

The second two sections of Table 2 show the percentage of half days missed for the different groups of schools.[8] Similarly to the attainment outcomes, PLC schools have a different starting point, with a higher percentage of absences in 2001. On average, the percentage of half days missed in PLC schools is 11.89. The corresponding figure in non-PLC schools in EiC Phase 1 and 2 is 9.57, whereas it is 8.73 in non-PLC schools within EiC Phase 1. The reduction in absences between 2001 and 2003 is higher in PLC schools at 1.77 per cent compared to the reduction in the other comparison groups (.94 and .77 per cent respectively). Hence the 'difference in difference' estimate is -.83 percentage points (i.e. -1.77 – [-.94]) when PLC schools are compared to non-PLC schools in EiC Phase 1 and Phase 2 areas and -1 percentage point (i.e. -1.77 – [-.77]) when compared to non-PLC schools in EiC Phase 1 areas. Thus, the reduction in school absences is about 1 percentage point higher in schools that were exposed to the PLC policy over this time period.

**Table 1: Descriptive Statistics on Key Stage 3 Attainment and Absences**

| | Treatment Group: PLC schools | Non-PLC schools in EiC Phase 1 or Phase2 | Non-PLC schools in EiC Phase 1 |
|---|---|---|---|
| **KS3 Maths: Percentage attaining Level 5** | | | |
| 2001 | 44.24 | 64.45 | 69.09 |
| 2003 | 52.24 | 69.25 | 73.61 |
| Change, 2001 to 2003 | 8 | 4.8 | 4.52 |
| Number of pupils | 80181 | 185407 | 73212 |
| Number of schools | 233 | 491 | 191 |
| **KS3 English: Percentage attaining Level 5** | | | |
| 2001 | 46.07 | 64.72 | 69.63 |
| 2003 | 51.52 | 68.55 | 74.14 |
| Change, 2001 to 2003 | 5.45 | 3.83 | 4.51 |
| Number of pupils | 80086 | 92827 | 73178 |
| Number of schools | 233 | 491 | 191 |
| **Absences: Percentage Half Days Missed in School** | | | |
| 2001 | 11.89 | 9.57 | 8.73 |
| 2003 | 10.12 | 8.63 | 7.96 |
| Change, 2001 to 2003 | -1.77 | -.94 | -.77 |
| Number of Schools | 233 | 491 | 191 |

Notes: KS3 levels calculated from pupil-level administrative data on Key Stage 3 test results; absences calculated from school-level data from the Secondary School Performance Tables.

[8] It has been pointed out that policy has changed in relation to absences, which may have an impact on recorded absences. As long as this uniformly affects PLC and non-PLC schools, this will have no effect on results reported in this analysis.

However, given the very different characteristics of PLC schools compared to schools in the comparison groups, one cannot attribute the relative improvement in PLC schools to the effects of the PLC policy. To establish the causal role of the PLC policy, we need to apply our empirical model.

## 5. Empirical Model

*Modelling Approach*

The aim of our modelling approach is to identify the effect of PLC policy on pupil-level and school-level outcomes while taking account of other factors that may be related to the outcome measures – in particular if such factors are also correlated with being observed as a PLC school. A simple model of pupil attainment could be described as follows:

$$P_{ist} = P(X_{ist,} Z_{st}, T_t) \qquad (1)$$

Where $Z_{st} = [PLC_s, W_{st}]$

P denotes pupil attainment of pupil *i* in school *s* at time *t*. This depends on variables in the function $P(X_{ist,} Z_{st}, T_t)$, where X is a vector of individual characteristics such as prior attainment; Z is a vector of school characteristics; and T represents year effects. School characteristics consist of a variable denoting whether or not a school is PLC and a vector of other variables W, which includes the percentage of pupils eligible for Free School Meals in a school; pupil numbers; the percentage of students with Special Educational Needs and a range of other relevant factors that may influence pupil attainment.

A version of this model which might be estimated is as follows:

$$P_{ist} = \alpha_0 + \gamma PLC_s + \lambda W_{st} + \eta X_{ist} + \psi T_t + \varepsilon_{ist} \qquad (2)$$

Where $\gamma$, the coefficient on PLC, is of main interest since this measures the relationship between being a PLC school and pupil attainment. However, it seems likely that whether or not a school is 'PLC' is correlated with other variables that also affect pupil attainment. For example, we noted that PLC schools have very different observable characteristics (such as eligibility for Free School Meals) than schools in the comparison groups; and in Table 1 that the outcome measures for PLC schools are considerably lower that those of the comparison groups in the pre-policy period. Hence, as well as controlling for a range of variables (as represented by X, W and T), it may be important to control for whether or not the school was a PLC school in the pre-policy period[9], or even more stringently, to include a dummy variable for each secondary school in the data. The latter approach controls for any school-specific factors (whether or not they are observable) that may influence pupil attainment. However, if we want to pursue either of these options, then estimation of equation (2) will not reveal the effect of the PLC policy. To estimate the effect of PLC policy on pupil attainment in this context requires data from more than one time period and from periods where schools change PLC status. In this case, equation (2) can be rewritten either as (3a) or (3b)

[9] Controlling for whether the school is defined as 'PLC' in the pre-policy period means controlling for permanent differences between PLC and non-PLC schools – the fact that there are permanent differences between the two groups is very evident in Table 2, where it is clear that outcomes differ substantially in the pre-policy period as well as in the post-policy period.

$$P_{ist} = \alpha_0 + \beta PLC_s T_{t=2003} + \gamma PLC_s + \lambda W_{st} + \eta X_{ist} + \psi T_t + \varepsilon_{ist} \quad (3a)$$

$$P_{ist} = \alpha_0 + \alpha_s + \beta PLC_s T_{t=2003} + \lambda W_{st} + \eta X_{ist} + \psi T_t + \varepsilon_{ist} \quad (3b)$$

Where $PLC_s T_{t=2003}$ is an interaction term, which is equal to one if the school is a PLC school and the year is 2003 (i.e the time period in which PLC policy was in effect). This allows us to identify the effect of PLC policy while also taking account of whether the school was a PLC school in the pre-policy period (i.e $PLC_s$ – in equation 3a) or controlling for secondary school dummies (or 'school fixed effects', as denoted by $\alpha_s$ – in equation 3b).[10] Thus $\beta$ is the coefficient of interest. It captures shifts in pupil attainment within treatment schools vis-à-vis comparison group schools that occur after the policy is introduced.

The analysis for absences is the same as that outlined above except that it is at school-level, as pupil-level information on absences is not collected nationally.

*Results: pupil attainment*

We present statistical estimates of the impact of PLCs for Maths in Table 2. This consists of two panels, each of which focuses on a different comparison group: in the upper panel, the comparison group is all non-PLC schools in areas affected by EiC Phase 1 and Phase 2; in the lower panel the comparison group is all non-PLC schools within EiC Phase 1 areas. Each panel has three specifications, starting with a simple specification in column (1) that only includes controls for whether the school is 'PLC', a year dummy and an interaction term between this year dummy and whether the school is in 'PLC' (which allows us to identify the policy effect). In column (2), we include a very rich set of school-level controls as well as the pupil's gender and prior attainment at Key Stage 2. A list of the included variables can be found in the notes to Table 2. Then in column (3), we also include school fixed effects, as well as this very long list of controls. This detailed specification is reported for boys and girls separately in columns (4) and (5).

The simplest specification (column 1) shows a positive impact of the PLC initiative (i.e. the interaction term between PLC and Year=2003). This is just another way of showing the descriptive results reported in Table 1 and shows the probability of attaining level 5 or above in Maths to be .032 (or 3.2 percentage points) higher in PLC schools compared to non-PLC schools as a result of the policy.[11] When controls are added, the magnitude of the effect reduces to .021 (or 2.1 percentage points). The effect is about the same for boys and girls. The effects are the same whether we use the larger comparison group (i.e. non-PLC schools in EiC Phase 1 and Phase 2 areas) or the smaller one (i.e. non-PLC schools in EiC Phase 1 areas). The results can be interpreted as showing that PLC increases the number of pupils that attain level 5 or above by 2.1 percentage points.

An analogous structure is presented for English in the Appendix (Table A.2). However, in this case, the small differential between PLC and non-PLC schools in the

[10] In regressions where school fixed effects are controlled for, $\gamma$ is not estimated as whether or not the school is PLC is incorporated within $\alpha_s$.

[11] However, we cannot completely separate out the effect of EiC Phase 1 and PLC, given that PLC was introduced to the most disadvantaged schools in EiC Phase 1; and the effects of EiC policy are stronger for more disadvantaged schools and change over time (as reported in Machin *et al*., 2005). The effects here are more accurately interpreted as reflecting the combined impact of EiC and PLC.

simple specification disappears completely once controls are added to the regression. There appears to be no effect of the PLC policy on this measure of attainment.

**Table 2: Maths Key Stage 3 – Probability of Attaining Level 5**

Sample: PLC schools and all other EiC Phase 1 and Phase 2 schools

| | (1) Only PLC, EiC & year variables | (2) Includes KS2, gender & all school variables | (3) Includes KS2, gender & all school variables & KS3 school fixed effects | (4) As column (3) Boys only | (5) As column (3) Girls only |
|---|---|---|---|---|---|
| PLC *Year=2003 | .032 (.006) | .021 (.005) | .021 (.005) | .021 (.006) | .022 (.006) |
| PLC | -.202 (.010) | -.011 (.006) | -- | -- | -- |
| Sample size | 265588 | 265588 | 265588 | 133192 | 132291 |
| Number of schools | 724 | 724 | 724 | 649 | 670 |
| R-squared | .03 | .54 | .55 | .55 | .55 |

Sample: PLC schools and all other EiC Phase 1 schools

| | (1) Only PLC, EiC & year variables | (2) Includes KS2, gender & all school variables | (3) Includes KS2, gender & all school variables & KS3 school fixed effects | (4) As column (3) Boys only | (5) As column (3) Girls only |
|---|---|---|---|---|---|
| PLC *Year=2003 | .035 (.007) | .020 (.006) | .021 (.006) | .022 (.007) | .019 (.007) |
| PLC | -.248 (.012) | .001 (.008) | -- | -- | -- |
| Sample size | 153393 | 153393 | 153393 | 76532 | 76777 |
| Number of schools | 424 | 424 | 424 | 362 | 379 |
| R-squared | .06 | .54 | .52 | .53 | .52 |

Notes: robust standard errors in parentheses (clustered on secondary schools). All specifications include gender, prior attainment at age 11, a year dummy, school fixed effects and a range of variables relevant to the pupil's secondary school and primary school: number of pupils; pupil-teacher ratio; percentage of pupils with Special Educational Needs (with/without statement); percentage of pupils eligible for Free School Meals; percentage of non-white pupils; average performance of primary school (in terms of absences; attainment) at the time when it was attended by the pupil; average performance of secondary school in the pre-policy period (in terms of absences; attainment) dummies for the following: all boys school; all girls school; religious school; sixth form (secondary); grammar school (secondary); modern school (secondary); primary school type (infant; independent; special; other); missing value dummies;

It may be thought that the PLC policy would only have an effect around the government target of level 5. Possibly resources might be concentrated on those pupils most likely to move over this particular threshold and hence results reported above would give a misleading impression of the educational effect of the policy. In Table 3, we show the effect of PLC policy (i.e. the coefficient on PLC*Year=2003) for other measures of the dependent variable using the most detailed specification (i.e. as in column 3 above) for all students and then for boys and girls separately.

The results in Table 3 show a slightly smaller effect of the PLC policy on the probability of attaining level 4 or above in Maths. The estimated effect of PLC policy is about 1.4-1.5 percentage points. However, this is fairly close in magnitude to that considered above in Table 2 and suggests that the policy is not only moving students from levels 4 to 5. However, once again, there is no effect for English. Effects of PLC

on the 'average level' are also shown. This amounts to treating the level (on a scale of 0-8) as a continuous variable.[12] This involves a strong assumption as it treats a move between each successive category as equivalent. However, using this measure, the effect of .067 and .064 for Maths can be interpreted in the following way: the PLC policy led to an increase in attainment of between .064 and .067 levels; or it increased the number of students moving up a level in PLC schools by between 6.4 and 6.7 percentage points. One can also interpret this coefficient in terms of standard deviations (unlike when using the discrete measures). In this case, the effect of PLC policy may be interpreted as generating an increase in attainment of between .036 and .038 standard deviations.[13] There is no statistically significant effect of PLC policy on the average level attained in English. We use these results for the Cost-Benefit Analysis, which is described in Section 6.

**Table 3: Effects of PLC on Various Measures of Attainment**

Sample: PLC schools and all other EiC Phase 1 and Phase 2 schools

| Dependent variable | (1) Includes KS2, gender & all school variables & KS3 school fixed effects | (2) As column (1) Boys only | (3) As column (1) Girls only |
|---|---|---|---|
| KS3 Maths Level 4 or above | .014 (.004) | .012 (.005) | .015 (.005) |
| KS3 Maths average level | .067 (.018) | .051 (.022) | .083 (.022) |
| KS3 English Level 4 or above | .003 (.007) | .007 (.010) | -.001 (.007) |
| KS3 English average level | .036 (.030) | .039 (.035) | .033 (.033) |

Sample: PLC schools and all other EiC Phase 1 schools

| Dependent variable | (1) Includes KS2, gender & all school variables & KS3 school fixed effects | (2) As column (1) Boys only | (3) As column (1) Girls only |
|---|---|---|---|
| KS3 Maths Level 4 or above | .015 (.005) | .013 (.006) | .017 (.006) |
| KS3 Maths average level | .064 (.022) | .046 (.028) | .081 (.025) |
| KS3 English Level 4 or above | -.001 (.008) | .002 (.011) | -.004 (.007) |
| KS3 English average level | .005 (.037) | .013 (.043) | -.002 (.042) |

Notes: as for table 2. Coefficient reported on PLC*Year=2003.

Finally, schools are allocated a different amount of pupil expenditure depending on the percentage of children in the school known to be eligible for Free School Meals. There are two categories. Schools with over 50% of pupils known to be eligible for Free School Meals obtain about £360 per pupil, whereas other PLC schools obtain about £240 per pupil. Hence, it is of interest to consider the effect of PLC according to whether the school is receiving the larger or smaller per pupil expenditure. However, it is difficult to say whether heterogeneity in the effect of the policy is due to the effect of the higher expenditure or the effect of a given amount of expenditure on schools with different characteristics.

[12] 'B - Below Level' and 'N – not entered' are treated as level 1 whereas 'A – absent' and 'D – disapplied' are treated as level 0. This is in line with DfES practice of not treating such observations as missing. Treating all these codes as level 1 does not effect the results greatly. Coefficients reduce from .067 to .059 and .064 to .055.

[13] This is computed by dividing the coefficients of .064 and .067 respectively by the standard deviation of the outcome variable (1.77 and 1.76 in the two samples).

Results are reported in Table 4 where the dependent variable considered is whether the student attains level 5 or above in Maths. PLC*High represents PLC schools with over 50 per cent of students known to be eligible for FSM and therefore eligible for the higher per-pupil PLC expenditure. PLC*Low represents other PLC schools (which all have at least 35 per cent of students eligible for FSM). The two coefficients of interest are PLC*High*Year=2003 and PLC*Low*Year=2003. On average, there is only a slightly larger impact of the PLC policy on schools within the high FSM/high expenditure category. However, for girls, there is a statistically different impact with girls in the 'high FSM/high expenditure' category being helped to a greater extent by the PLC policy.

**Table 4: Maths Key Stage 3 – Probability of Attaining Level 5**

Sample: PLC schools and all other EiC Phase 1 and Phase 2 schools

| | (1) Only PLC, EiC & year variables | (2) Includes KS2, gender & all school variables | (3) Includes KS2, gender & all school variables & KS3 school fixed effects | (4) As column (3) Boys only | (5) As column (3) Girls only |
|---|---|---|---|---|---|
| PLC*High*Year=2003 | .033 (.008) | .022 (.007) | .023 (.007) | .020 (.008) | .027 (.009) |
| PLC*Low*Year=2003 | .030 (.007) | .021 (.006) | .020 (.006) | .021 (.008) | .019 (.007) |
| PLC * High | -.257 (.012) | -.024 (.009) | -- | -- | -- |
| PLC * Low | -.167 (.012) | -.009 (.006) | | | |
| Sample size | 265588 | 265588 | 265588 | 133192 | 132291 |
| Number of schools | 724 | 724 | 724 | 649 | 670 |
| R-squared | .04 | .54 | .55 | .55 | .55 |

Sample: PLC schools and all other EiC Phase 1 schools

| | (1) Only PLC, EiC & year variables | (2) Includes KS2, gender & all school variables | (3) Includes KS2, gender & all school variables & KS3 school fixed effects | (4) As column (3) Boys only | (5) As column (3) Girls only |
|---|---|---|---|---|---|
| PLC*High*Year=2003 | .036 (.009) | .021 (.007) | .022 (.007) | .021 (.009) | .024 (.010) |
| PLC*Low*Year=2003 | .033 (.008) | .019 (.007) | .020 (.007) | .023 (.009) | .015 (.008) |
| PLC * High | -.303 (.014) | -.012 (.014) | -- | -- | -- |
| PLC * Low | -.213 (.013) | -.002 (.008) | | | |
| Sample size | 153393 | 153393 | 153393 | 76532 | 76777 |
| Number of schools | 424 | 424 | 424 | 362 | 379 |
| R-squared | .06 | .54 | .54 | .55 | .54 |

*Pupil attendance at school*

It is also of interest to consider whether the policy had any impact on increasing pupil attendance at school. This is measured by data on school-level absences, which is collected in the School Performance Tables. In Table 5, we show results from school-level regressions where the dependent variable is the percentage of half days missed due to absences.

As before, there are two panels corresponding to regressions using the alternative comparison groups. The first three columns show results from the simplest specification in column (1) to the most detailed in column (3), which includes school

fixed effects. Since the data is at school-level, regressions cannot be estimated separately by gender.

For both comparison groups, the results show a very consistent pattern: the reduction in absences attributable to the PLC policy becomes smaller once controls are added. In the most detailed specification, the magnitude of the reduction is between .43 and .58 of a percentage point.[14]

**Table 5: Absences – % half days missed**

Sample: PLC schools and all other EiC Phase 1 and Phase 2 schools

| | (1) Only PLC, EiC & year variables | (2) Includes KS2, gender & all school variables | (3) Includes KS2, gender & all school variables & KS3 school fixed effects |
|---|---|---|---|
| PLC *Year=2003 | -.822 (.157) | -.636 (.151) | -.582 (.245) |
| PLC | 2.32 (.26) | .156 (.075) | -- |
| Sample size | 1398 | 1398 | 1398 |
| Number of schools | 718 | 718 | 718 |
| R-squared | .13 | .90 | .95 |

Sample: PLC schools and all other EiC Phase 1 schools

| | (1) Only PLC, EiC & year variables | (2) Includes KS2, gender & all school variables | (3) Includes KS2, gender & all school variables & KS3 school fixed effects |
|---|---|---|---|
| PLC *Year=2003 | -1.00 (.16) | -.554 (.177) | -.425 (.315) |
| PLC | 3.169 (.288) | .172 (.113) | -- |
| Sample size | 831 | 831 | 831 |
| Number of schools | 422 | 422 | 422 |
| R-squared | .23 | .92 | .95 |

Notes: robust standard errors in parentheses (clustered on secondary schools). All specifications include school fixed effects and the average (school-level) values of the variables listed in the notes to table 3.

## 6. Cost-Benefit Analysis

We have seen that the impact of PLC policy was to raise attainment in Maths (though not in English) and to reduce absences (or equivalently, increase pupil attendance). This is true for those schools which had been exposed to EiC policy for the entire period. However, one still needs to be cautious in the interpretation of effects. Even schools within EiC Phase 1 will have received different amounts of expenditure as a result of this policy, with disadvantaged schools having received greater amounts. Hence it is possible that effects which are apparently attributable to the PLC policy are also there as a result of higher expenditure which has been allocated under the EiC policy. Although the PLC policy was introduced after the EiC policy, it is possible for policies to have a different effect over time – and in this case, a higher effect as

[14] The magnitude of this reduction is not statistically significant in the most detailed specification when the comparison group is non-PLC schools in EiC Phase 1 areas. However, the sample size is quite small and the specification is very stringent – leading to high standard errors. The size of the coefficient is very close to that obtained when using the larger comparison group (which is statistically significant).

schools adapt to the policy. Thus, one might attribute the effects in the above section to the PLC policy, or more conservatively, to some combination of the PLC and EiC policies.

To do an accurate Cost-Benefit Analysis, one would need to know how such effects translate to a range of later outcomes – for example, further education, wages, crime. Ideally, one would want to follow the children affected by these particular policies (and comparison groups) as they progress through school and into the labour market. There are many difficulties. For example, due to the recent introduction of Key Stage tests, there is no direct estimate of the impact they have on future wages.

As a result of the limited information available at this time, it is only possible to do a very crude Cost-Benefit Analysis under strong assumptions. However, this gives a rough idea of whether we should think of this policy as potentially cost-effective. Hence, we adopt the following procedure[15]: to quantify the benefit of the estimated improvement in monetary terms, we take a one level improvement to correspond to two years of schooling (following the national curriculum). To make this calculation, we use the coefficients in Table 3 (which show the effect of the PLC policy on the average level attained in Maths and English). Since the effect for English is very far from statistical significance (and the coefficient is almost zero for the Phase 1 comparison group), we assume that the policy had zero impact on attainment in English. Results for English and Maths are given equal weight.

Benefits are thus translated into corresponding years of schooling (zero for English and .064x2 for Maths). The overall benefit is then multiplied by the wage return to an additional year of schooling (assumed to be 8 per cent) and applied to a measure of wages from the age of 21 to 64. We use the Family Resources Survey to obtain a wage profile.[16] This enables an estimate of the total increase in wages due to the higher attainment observed in PLC schools.

The costs correspond to PLC spending per pupil for each of the two years that pupils were exposed to the policy. We approximate this as £288 per pupil per year.[17] In order to estimate the rate of return to PLC, we compare the total discounted costs and benefits from the start of the policy until retirement from the labour market. Comparing the discounted additional earnings to the discounted costs gives an estimated annual rate of return from investment in the policy of about 9 per cent.[18]

This estimate is based on very strong assumptions and hence cannot be taken too seriously. However, it suggests that the PLC policy is potentially cost-effective, which in turn appears to be driven by the low cost of the policy. The important

[15] The method and data is identical to that used in the economic evaluation of the Excellence in Cities Primary Pilot, described in Emmerson *et al.* (2004).

[16] Our analysis assumes that wages increase by two per cent per year in real terms. Obviously, it is likely that wage profiles in the future will differ from those that currently exist. This may be particularly true for women if employment rates continue to increase.

[17] This is based on the fact that funding per pupil is £360 in PLC schools where over 50 per cent of students are eligible for free school meals and £240 in other PLC schools. The latter schools constitute about 40 per cent of all PLC schools. (360x.4) + (240x.6)=288

[18] The rate of return of the policy (R) equalises the discounted total cost to the discounted total benefit. Denoting the cost per pupil in year t as Ct, the average increase in levels as λ, the return in terms of wages of an extra year's education as r and expected wages in a given year by $w_t$, R solves:

$$\sum_{t=0}^{2} \frac{C_t}{(1+R)^t} = \sum_{12}^{55} \frac{2\lambda r w_t}{(1+R)^t}$$

For more details see Krueger and Whitmore (1999).

question for future research is whether the educational benefits identified in this research are meaningful and genuinely translate into higher educational attainment in the future and subsequently into the labour market. Another important question is the consequence of higher pupil attendance at school in terms of current and future outcomes.

## 7. Conclusions

This paper presents an analysis of the of the Pupil Learning Credits (PLC) Policy Initiative two years after its introduction. This is one of a range of initiatives which has been targeted on schools in disadvantaged areas, and was introduced within a subset of schools that were already part of another such initiative, Excellence in Cities (EiC). We try to identify the effect of PLC policy by comparing outcomes in PLC schools and non-PLC schools in these areas, before and after the PLC policy was introduced. Results suggest that PLC had a positive effect on pupil attainment in Maths at Key Stage 3 – for example, increasing the probability of achieving the expected standard (level 5+) by about 2 percentage points. It also raised pupil attendance. To ascertain the educational value of this improvement, together with longer-term outcomes, one would want to follow these students over time (as well as those in the comparison group schools). However, educational and labour market gains only need to be modest to generate benefits in excess of the costs of this policy. As with Excellence in Cities, the per-pupil costs of the programme are quite low. As demonstrated by the crude Cost-Benefit Analysis in this report, the programme is likely to be cost-effective. Hence, providing more resources to disadvantaged schools really does make a difference in terms of raising pupil attainment and can be extremely cost-effective.

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## Appendix

### Table A.1: Summary Statistics

| | PLC Schools | Non-PLC schools in EiC Phase 1 or Phase 2 | Non-PLC schools in EiC Phase 1 |
|---|---|---|---|
| Number of schools | 233 | 484 | 190 |
| Pupil-teacher ratio | 15.84 | 16.70 | 16.83 |
| Number of pupils | 925 | 1045 | 1094 |
| Percentage of SEN students, with statement | 3 | 2 | 2 |
| Percentage of SEN students, no statement | 26 | 17 | 15 |
| Percentage of FSM students | 48.26 | 22.96 | 17.79 |
| Religious school | .22 | .26 | .33 |
| Sixth form | .42 | .51 | .68 |
| Percentage of non-white students | 49 | 16 | 20 |
| Boys school | .11 | .06 | .10 |
| Girls school | .18 | .08 | .14 |
| Grammar school | .00 | .03 | .05 |
| Modern school | .00 | .01 | .00 |
| Percentage: 5+ A-C GCSE/GNVQ grades: 2001 | 28 | 44 | 51 |
| Percentage: 5+ A-G GCSE/GNVQ grades: 2001 | 83 | 88 | 91 |
| Average GCSE/GNVQ score: 2001 | 29.27 | 36.74 | 40.01 |
| Authorised absences (% days missed) | 9.24 | 8.15 | 7.45 |
| Unauthorised absences (% days missed) | 2.59 | 1.25 | 1.09 |

Notes: means of selected variables by group of schools, based on 2001 values. Variables are derived from the Secondary School Performance Table and the LEA and School Information System.

## Table A.2: English Key Stage 3 – Probability of Attaining Level 5

Sample: PLC schools and all other EiC Phase 1 and Phase 2 schools

| | (1) Only PLC, EiC & year variables | (2) Includes KS2, gender & all school variables | (3) Includes KS2, gender & all school variables & KS3 school fixed effects | (4) As column (3) Boys only | (5) As column (3) Girls only |
|---|---|---|---|---|---|
| PLC *Year=2003 | .013 (.010) | .005 (.010) | .005 (.010) | .006 (.011) | .004 (.011) |
| PLC | -.186 (.013) | -.008 (.010) | -- | -- | -- |
| Sample size | 265392 | 265392 | 265392 | 133165 | 132135 |
| Number of schools | 724 | 724 | 724 | 648 | 670 |
| R-squared | .03 | .46 | .48 | .48 | .45 |

Sample: PLC schools and all other EiC Phase 1 schools

| | (1) Only PLC, EiC & year variables | (2) Includes KS2, gender & all school variables | (3) Includes KS2, gender & all school variables & KS3 school fixed effects | (4) As column (3) Boys only | (5) As column (3) Girls only |
|---|---|---|---|---|---|
| PLC *Year=2003 | .006 (.012) | -.003 (.011) | -.004 (.011) | -.001 (.013) | -.007 (.013) |
| PLC | -.236 (.015) | -.010 (.014) | -- | -- | -- |
| Sample size | 153264 | 153264 | 153264 | 76519 | 76671 |
| Number of schools | 424 | 424 | 424 | 361 | 379 |
| R-squared | .06 | .45 | .47 | .48 | .45 |

Notes: as for Table 2 in text.

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