

# DISCUSSION PAPER SERIES

DP19873

## **PARENTAL INVOLVEMENT IN EDUCATION**

Facundo Albornoz-Crespo, Antonio Cabrales,  
Guillermo Cruces and María Lombardi

**PUBLIC ECONOMICS**

**CEPR**

# PARENTAL INVOLVEMENT IN EDUCATION

*Facundo Albornoz-Crespo, Antonio Cabrales, Guillermo Cruces and María Lombardi*

Discussion Paper DP19873  
Published 22 January 2025  
Submitted 18 December 2024

Centre for Economic Policy Research  
33 Great Sutton Street, London EC1V 0DX, UK  
187 boulevard Saint-Germain, 75007 Paris, France  
Tel: +44 (0)20 7183 8801  
[www.cepr.org](http://www.cepr.org)

This Discussion Paper is issued under the auspices of the Centre's research programmes:

- Public Economics

Any opinions expressed here are those of the author(s) and not those of the Centre for Economic Policy Research. Research disseminated by CEPR may include views on policy, but the Centre itself takes no institutional policy positions.

The Centre for Economic Policy Research was established in 1983 as an educational charity, to promote independent analysis and public discussion of open economies and the relations among them. It is pluralist and non-partisan, bringing economic research to bear on the analysis of medium- and long-run policy questions.

These Discussion Papers often represent preliminary or incomplete work, circulated to encourage discussion and comment. Citation and use of such a paper should take account of its provisional character.

Copyright: Facundo Albornoz-Crespo, Antonio Cabrales, Guillermo Cruces and María Lombardi

# PARENTAL INVOLVEMENT IN EDUCATION

## Abstract

This paper examines how different types of school resources affect parental involvement in children's education and subsequent student effort. Using an original survey of UK primary school parents, we distinguish between school resources for in-person and remote learning. We find that parental involvement serves as a substitute for in-person school resources but complements remote learning resources. Incorporating these findings, we develop a new model of student effort demonstrating that in person learning investments, such as reducing class size, have a positive direct effect on student effort but also trigger a negative indirect effect as parents reduce their involvement. These opposing effects result in a neutral net impact. In contrast, remote learning investments have both a positive direct effect and a positive feedback effect by enhancing parental involvement. We provide evidence supporting these predictions and conduct counterfactual policy analyses, showing that investing in remote learning resources is more cost-effective than reducing class size, subsidizing parental time, or hiring tutors. Notably, ignoring the indirect effect of parental behavioral responses leads to a 15% overestimation of the cost of increasing student effort via remote learning investments.

JEL Classification: I28, J22, J24

Keywords: N/A

Facundo Albornoz-Crespo - [facundo.albornoz@nottingham.ac.uk](mailto:facundo.albornoz@nottingham.ac.uk)  
*University of Nottingham and CEPR*

Antonio Cabrales - [antonio.cabrales@uc3m.es](mailto:antonio.cabrales@uc3m.es)  
*Universidad Carlos III and CEPR*

Guillermo Cruces - [gcruces@cedlas.org](mailto:gcruces@cedlas.org)  
*UNLP and University of Nottingham and CEPR*

María Lombardi - [mlombardi@utdt.edu](mailto:mlombardi@utdt.edu)  
*UTDT*

# Parental Involvement in Education

Facundo Albornoz <sup>\*</sup>   Antonio Cabrales <sup>†</sup>   Guillermo Cruces <sup>‡</sup>  
María Lombardi <sup>§</sup>

December 2024

## Abstract

This paper examines how different types of school resources affect parental involvement in children's education and subsequent student effort. Using an original survey of UK primary school parents, we distinguish between school resources for in-person and remote learning. We find that parental involvement serves as a substitute for in-person school resources but complements remote learning resources. Incorporating these findings, we develop a new model of student effort demonstrating that in-person learning investments, such as reducing class size, have a positive direct effect on student effort but also trigger a negative indirect effect as parents reduce their involvement. These opposing effects result in a neutral net impact. In contrast, remote learning investments have both a positive direct effect and a positive feedback effect by enhancing parental involvement. We provide evidence supporting these predictions and conduct counterfactual policy analyses, showing that investing in remote learning resources is more cost-effective than reducing class size, subsidizing parental time, or hiring tutors. Notably, ignoring the indirect effect of parental behavioral responses leads to a 15% overestimation of the cost of increasing student effort via remote learning investments.

**JEL Codes:** I21, I28, J22, J24

**Keywords:** education, parental involvement, school resources, parental opportunity cost

---

<sup>\*</sup>University of Nottingham, e-mail: [facundo.albornoz@nottingham.ac.uk](mailto:facundo.albornoz@nottingham.ac.uk)

<sup>†</sup>Universidad Carlos III, e-mail: [antonio.cabrales@uc3m.es](mailto:antonio.cabrales@uc3m.es)

<sup>‡</sup>UNLP and University of Nottingham, email: [gcruces@cedlas.org](mailto:gcruces@cedlas.org)

<sup>§</sup>Universidad Torcuato Di Tella, e-mail: [mlombardi@utdt.edu](mailto:mlombardi@utdt.edu)

# 1 Introduction

Schools and parents play pivotal roles in the accumulation of human capital, serving as primary catalysts for student learning. Until recently, most research focused on understanding the learning process by examining school inputs (e.g., Pop-Eleches and Urquiola, 2013), quality of teaching (Rivkin, Hanushek and Kain, 2005 and Chetty, Friedman and Rockoff, 2014, among others), and various pedagogical approaches (e.g., Bassi, Meghir and Reynoso, 2020 and Albornoz, Anauati, Furman, Luzuriaga, Podesta and Taylor, 2020). The importance of parental investment in this process has recently gained increased recognition (Doepke and Zilibotti, 2017; Albornoz, Berlinski and Cabrales, 2018), fostering interest in interventions aimed at enhancing parental engagement with children (Hernández-Agramonte, Namen, Näslund-Hadley and Biehl, 2024 and Angrist, Karlan, Kabay, Lau and Wong, 2024).

While much of the literature assumes that school inputs and parental involvement independently influence student effort, our study provides empirical evidence on how these factors interact. We establish the connection between school inputs and parental involvement and uncover the channels through which they shape student effort. By disentangling these relationships, we offer a deeper understanding of the mechanisms driving student learning, challenging conventional assumptions and informing the design of more effective educational policies.

The interaction between school inputs and parental involvement—and whether and how they affect student effort—is complex, characterized by multiple selection issues that complicate our understanding of this relationship. Are these inputs complements or substitutes, and under which conditions do they enhance or compensate for one another? This paper develops a theoretical model and a series of empirical elicitation exercises to explore these interactions, seeking to clarify the impact of different interventions designed to stimulate children’s learning efforts.

We first study the effect of various types of school resources on parental involvement in the learning process of their children. In particular, we distinguish between school resources for remote and in-person learning. For this purpose, we designed and implemented an online survey of a representative sample of parents of primary-school-aged children in the United Kingdom. Using elicitation exercises, we establish a series of facts about parental involvement. Specifically, we examine responses to changes in both types of school resources, as well as changes in the opportunity cost of parental time. Our findings show that parental involvement is negatively associated with school resources for in-person learning, proxied by class size, but positively correlated with school resources for remote learning, captured by teachers’ effort in preparing homework activities. Furthermore, we establish that decisions regarding parental involvement are negatively influenced by the opportunity cost of their time,

as given by their hourly wage.

We then develop a model to identify the mechanisms driving these main patterns. In the model, human capital accumulation depends directly on children's efforts, school inputs, and parental involvement. We assume a functional form that captures the idea that parental involvement can substitute for in-person school resources while complementing those used in remote learning. School inputs and parental involvement create a framework of incentives and rewards that encourage students to exert effort, leading to a positive direct effect of parental and school contributions on student effort. Moreover, because parental involvement is influenced by school inputs, our model also identifies an indirect effect of school inputs on student effort through this channel. As a consequence, the elasticity of student effort with respect to school inputs includes both direct and indirect effects. Notably, the sign of these indirect effects depends on the nature of the school input.

To evaluate the relative contributions of the direct and indirect effects of school inputs and parental involvement on student effort, we analyze data from our elicitation exercise. As predicted by the model, we find a null overall effect of in-person learning resources on student effort: the positive direct effect of reducing class size is offset by a negative indirect effect stemming from the substitution of parental effort. In contrast, remote learning resources exhibit a positive overall effect: a one standard deviation increase in teacher effort in preparing homework activities leads to a 0.297-hour weekly increase in student effort, up from an average of 1.630 hours. The direct effect accounts for 0.258 additional hours, with further gains driven by increased parental involvement. In summary, while in-person learning resources yield a neutral net effect due to opposing direct and indirect influences, remote learning resources consistently enhance student effort.

To illustrate the quantitative significance of these effects, we use our results to evaluate a series of counterfactual policy measures and their cost-effectiveness using survey data from the United Kingdom. We do not focus on investments in school resources for in-person learning, as we find that this policy has null overall effects on student effort. We thus evaluate the effectiveness of government investments in school resources for remote learning. We then benchmark the impact of this policy against subsidizing parental time by reducing the opportunity costs of supporting their children or offering tutoring sessions, depending on the relative expense. Our findings suggest that investing in school resources for remote learning is more cost-effective in increasing student effort than subsidizing parental time or hiring tutors. Notably, ignoring the indirect effects identified in our analysis leads to a 15% overestimation of the cost of boosting student effort through investments in remote learning resources.

Our study draws from and contributes to several strands of literature. First, it is related to the literature on skill formation (Agostinelli et al., 2022) and parenting

in general (Doepke and Zilibotti, 2017, 2019; Albornoz et al., 2018). While we do not distinguish between parenting styles, we contribute to this literature by studying the interaction between parental involvement and different types of school investments. We also provide evidence on how schools and parents influence students' learning effort.

Previous studies have explored the relationship between parental involvement and broad measures of school inputs, such as school quality (Greaves et al., 2023), specific in-person resources such as class size (Fredriksson et al., 2016; Datar and Mason, 2008), and the role of education policymakers (Albornoz et al., 2018). Studies of the impact of pandemic-induced school closures have also addressed the role of parental involvement in mitigating negative effects (Agostinelli and Wiswall, forthcoming). We show that a more detailed differentiation between school resources devoted to in-person and remote learning is crucial for understanding the determinants of parental involvement in education.

## **2 Survey on parental involvement in education in the United Kingdom**

### **2.1 Survey design and descriptive statistics**

We conducted an online survey in the UK in January of 2023 via Prolific, targeting parents of primary school children (ages 6-11). Participants received £3.15 for completing the survey, which had a median completion time of 8.2 minutes. An attention check at the end was passed by 98.8% of respondents. The full survey is in [Appendix B](#).

We collected data on respondents' demographics, household composition, and details about their children and schools. For parents with multiple children in the target age range, one child was randomly selected as the focus. We also asked about the child's weekly time spent on school-related activities outside regular hours (e.g., homework, reading for school, studying), including how this time was divided between working independently, with the help of the respondent, and with someone else's help.

We collected data on school inputs for in-person learning, including class size, school day length, performance-based groupings, frequency of parent-teacher meetings, and availability of extracurricular activities, teaching assistants, or learning support. We also asked about school resources for remote learning, measured by homework and assessment frequency, teacher effort in preparing homework activities, level of engagement of these activities, and the frequency and usefulness of teacher feedback. Additionally, we gathered information on respondents' educational attainment, employment, and income (grouped into 10 brackets based on the 2022 Annual Survey

of Hours and Earnings).

Our sample consists of 1,384 parents.<sup>1</sup> Table 1 presents some descriptive statistics. Respondents are on average 40 years old, 85% are married or cohabiting, 40% have a university degree, and 85% are employed. Among those employed, 42% work outside the home, with a 35-hour average work week and £30,251 average annual income. A third of our respondents are male, possibly due to the survey topic or availability,<sup>2</sup> but also because women are more likely to live in households with children of these ages (see Appendix Table A.1 on our sample's representativeness). Respondents in our sample have almost two children on average; their children have an average age of 8.6, and 89% attend a public school. These children spend 3.51 weekly hours on schoolwork outside school, divided into 1.63 hours independently, 1.39 with the respondent's help, and 0.49 with help from others. Class sizes average 26.4 students, and school days last 6.39 hours.

To evaluate representativeness, we compared our sample to parents of children aged 6-11 in the UK Labour Force Survey (October-December 2022). We find strong similarities in age, marital status, household composition, and geography (Appendix Table A.1). Our sample has fewer males (31% vs. 43%), slightly more university-educated individuals (40% vs. 36%), and fewer employed individuals (85% vs. 91%). Employed respondents work more hours (34.98 vs. 30.84) but earn slightly less (£18.29 vs. £19.71 per hour). Finally, the tails of the income distribution are slightly underrepresented (Appendix Figure A.1). Overall, our sample closely reflects the UK population, and, as shown below, results remain robust to re-weighting for gender, employment, and income.

## 2.2 Eliciting responses to changes in school resources and parental opportunity cost

In the final section of the survey, respondents were presented with hypothetical scenarios about school resources and hourly wages and asked how they would respond in each case.

Initially, we provided respondents with two hypothetical hourly wages—10% below and 10% above their reported hourly wage—and asked how many hours they

---

<sup>1</sup>We initially surveyed 1,505 individuals but excluded 10 whose children did not live with them, 22 whose children were in nursery school or not enrolled, 24 whose children had no homework or assessments, and 63 who did not complete the entire survey. Additionally, two respondents reporting extreme values of weekly assistance to their child (125 and 136 hours) in the elicitation exercises described in Section 2.2 were removed as outliers.

<sup>2</sup>Similarly, in two online surveys targeting parents of school-age children in England conducted in Boneva and Rauh (2018), only 28% of the respondents were male. This is consistent with several studies showing that women are more likely to participate in traditional or online surveys than men (Curtin et al., 2000; Cull et al., 2005; Smith, 2008).



would work and help their child with schoolwork in each scenario, assuming no other changes.<sup>3</sup> We then presented respondents with two different scenarios concerning the resources provided by their school for in-person learning, proxied by class size. The scenarios were the two closest categories to what the respondent reported.<sup>4</sup> Respondents were asked how many hours their child would spend on homework alone and with their help in each scenario. Finally, we repeated the same exercise providing two hypothetical scenarios for school resources for remote learning, represented by the effort of the teachers in preparing homework activities. The exact wording is available in [Appendix B.2](#).

### 3 Facts about parental involvement

We use the variation from the elicitation exercises to examine how parents respond to changes in school resources and the opportunity cost of their time. For each elicitation exercise in Section 2.2, we construct a pseudo-panel with three observations per respondent: one from the actual survey and two from the hypothetical scenarios. We then use this panel to estimate the following equation:

$$\text{Parental effort}_{is} = \beta X_{is} + \gamma_i + \varepsilon_{is} \quad (1)$$

$\text{Parental effort}_{is}$  measures the weekly hours respondent  $i$  spends helping their child with homework under scenario  $s$ . Our regressor of interest,  $X_{is}$ , measures school resources for in person-learning, school resources for remote learning, or the respondent’s hourly wage in scenario  $s$ . We proxy in-person school resources using class size, and multiply the variable by -1 so that  $\beta$  measures a *decrease* in class size.<sup>5</sup> We measure school resources for remote learning by normalizing the categorical variable measuring teacher effort.<sup>6</sup> In alternative estimations, we express  $X_{is}$  using indicators for each value of the class size and teacher effort categories. We control for all fixed determinants of parental effort by including individual fixed effects ( $\gamma_i$ ), and cluster the standard errors at the individual level. In the estimations where the regressor  $X_{is}$

---

<sup>3</sup>For example, if a respondent earned between £27,757 and £32,259 annually by working 5 days a week for 8 hours a day, their hourly wage would range from £13.34 to £15.51. In the two hypothetical scenarios, the respondent’s hourly wage would be £12.01 (10% lower than the lower limit of his hourly wage bracket) and £17.06 per hour (10% higher than the lower limit of his hourly wage bracket), respectively.

<sup>4</sup>For example, if the reported class size was 26-30 students, the scenarios were 21-25 and 31-35 students.

<sup>5</sup>As our survey provides respondents with class-size intervals to facilitate recall, we take the interval midpoint. For instance, if the class size is between 26 and 30 students, the variable is assigned a value of -28.

<sup>6</sup>Teacher effort is divided into 5 categories, from very low to very high. We assign values from 1 to 5, and then standardize by subtracting the mean and dividing by the standard deviation.

is the respondent's hourly wage, we restrict the sample to employed individuals (84%).

Figure 1 reports the results of these estimations. Consistent with Fredriksson et al. (2016), parental effort decreases with school resources for in-person learning. Specifically, respondents would devote 0.029 hours less per week (as compared to a mean of 1.39 hours) helping their child with schoolwork if class size decreased by one student.<sup>7</sup>

Conversely, we uncover a positive relation between parental effort and remote learning resources, and find that parents would spend 0.204 hours more helping their child if teacher effort in preparing homework activities increased by one SD. Both coefficients are statistically significant at the 1% level. Similar results are obtained for the subsample of employed respondents (see Appendix Figure A.2).

Finally, respondents report that they would spend less time helping their child with schoolwork if their opportunity cost of time increased. In particular, parents would spend 0.053 fewer hours per week for every £1 per hour increase in their hourly wage (statistically significant at the 5% level). Re-weighting our sample to match the UK Labour Force Survey by gender, employment, and income decile does not change our results (see Appendix Table A.2).

We also conduct alternative estimations using indicators for each class size and teacher effort category. In Appendix Figure A.3, we report the estimates and 95% confidence intervals for the impact of increasing school resources from each category to the next. Consistent with our previous findings, decreasing class size reduces parental involvement, especially for large classes. For example, reducing class size from 35+ to 31-35 students lowers weekly parental effort by 0.408 hours, and from 31-35 to 26-30 students by 0.325 hours (both significant at the 5% level). We also find statistically significant effects at a 10% level for reducing class size from 10-15 to 10 or less students, but not for reductions at intermediate values of class size. Our results for teacher effort in preparing homework activities are also consistent with our main estimation. While increasing teacher effort has a positive effect on parental involvement across the distribution, only shifts from low to moderate and moderate to high effort are statistically significant. Specifically, going from low to moderate teacher effort increases parental time by 0.239 weekly hours, and from moderate to higher effort increases it by 0.213 hours per week (both statistically significant at the 1% level).

---

<sup>7</sup>Fredriksson et al. (2016) exploit maximum class size rules in Sweden, and find that decreasing class size by one student lowers the probability a child receives help with homework by nearly one percentage point (from a mean of 80%). If we estimate equation (1) using a dummy for whether the respondent helps the child with schoolwork as the dependent variable, we find that hypothetically adding another student to the class reduces the probability that the respondent helps the child with schoolwork by 0.145 percentage points (statistically significant at the 5% level), from a mean of 83%. Our estimates are likely smaller because we measure help specifically from the respondent, whereas Fredriksson et al. (2016) measure help from anyone.

## 4 A model on student effort, school inputs and parental involvement

### 4.1 Model setup

The elicitation exercises from our survey data on parental involvement in education in the United Kingdom allowed us to derive a series of stylized facts and correlations between school inputs, parental involvement and student effort. In this section, we develop a model to identify the likely mechanisms behind these main patterns.

The model has two participants: children and parents.

**Student's performance and short-term utility** We specify the production function of human capital ( $H_i$ ) for child  $i$  (measured in monetary terms). We assume that learning involves some exogenous characteristics, which comprise both elements from their nature and their environment ( $v_i$ ) and endogenous effort ( $e_i$ ).

Parents and schools can affect this process through different interventions and actions: the parental time dedicated to education  $t_i$ , and school resources for in-person learning ( $c_{1j}$ ) and for remote learning (e.g. homework, summarized by  $c_{2j}$ ), with the sub-index  $j$  denoting the school attended by the child  $i$ . Specifically, we assume,

$$H_i = (\rho v_i + \alpha_1 c_{1j} + \alpha_2 t_i c_{2j} + \beta_1 e_i + \beta_2 t_i e_i)^\eta \quad (2)$$

This functional form reflects the motivated facts uncovered in the previous section. Notice that the parental effort  $t_i$  multiplies remote school activities  $c_{2j}$ , making parental effort complementary to remote school activities. On the other hand, in-person school resources  $c_{1j}$  enter additively, and thus it is a substitute for parental effort. The student effort  $e_i$  enters on its own  $\beta_1 e_i$ , but also multiplying parental effort ( $\beta_2 t_i e_i$ ). This means child effort is both a substitute (from the first of those terms) and a complement (from the second) to parental effort.

The core of our analysis is to understand the parental decision to engage in activities to affect the student effort  $e_i$  and their interaction with school activities. The children's short-term utility is given by:

$$U_i = (\delta_1 c_{1j} + \delta_2 c_{2j} + \gamma t_i + \theta v_i) e_i - \frac{1}{2} e_i^2 \quad (3)$$

Exerting effort implies a cost that takes a quadratic form. Parental and school involvement contribute positively to the utility of the child (i.e.,  $\delta_1$ ,  $\delta_2$  and  $\gamma$  are positive).  $t_i$  is the time parents devote to their children's learning process to induce them to exert costly effort via motivation and monitoring (so their efforts increase benefits and decrease the costs of learning for students). The school also generates

activities to incentivize learning.  $c_{1j}$  and  $c_{2j}$  summarize the strength of school remote and in-person activities. We can think of parental involvement and school activities as incentives for every unit of child effort. Therefore,  $\delta_1 c_{1j} + \delta_2 c_{2j} + \gamma t_i$  is the child's total external/extrinsic reward for a unit of their effort and  $\theta v_i$  represents the intrinsic reward and interest in learning.<sup>8</sup>

**The parents' utility** We assume that every parent has one child and that their utility is influenced by the sum of their welfare, measured in monetary terms and denoted by  $W_i$ , and by the child's performance, also measured in monetary terms and denoted as  $H_i$ . There is a weight on each of the terms, summarized in the constant  $\phi$ . Hence,

$$U_{P_i} = H_i \phi + W_i.$$

Parental monetary welfare depends on the time spent at work or pursuing leisure activities, which is equal to the total time available ( $T$ ) minus the time spent with the child as a consequence of the reward scheme ( $t_i$ ). The opportunity cost of parental time is  $\psi_i$ . Thus, parental welfare is

$$W_i = (T - t_i) \psi_i$$

and the utility is therefore

$$U_P = (\rho v_i + \alpha_1 c_{1j} + \alpha_2 t_i c_{2j} + \beta_1 e_i + \beta_2 t_i e_i)^\eta \phi + (T - t_i) \psi_i \quad (4)$$

## 4.2 Model solution

### Student and parental effort

From equation (3), the optimal student effort is given by (we now suppress the  $i$  and  $j$  subindices for simplicity):

$$e = \delta_1 c_1 + \delta_2 c_2 + \gamma t + \theta v, \quad (5)$$

The first-order condition for the parents' problem is

$$\eta (\alpha_2 c_2 + \beta_2 e) (\rho v + \alpha_1 c_1 + \alpha_2 t c_2 + \beta_1 e + \beta_2 t e)^{\eta-1} - \frac{\psi}{\phi} = 0$$

---

<sup>8</sup>Note that assuming that exogenous characteristics reduce the cost of effort (e.g.  $\frac{1}{2v_i} e_i^2$ ) would be equivalent to assuming that  $v_i$  increases the interest of the child directly. In other words, the child's (or their environment's) characteristics can interchangeably improve motivation once effort is made or decrease effort to attain capital.

and after some algebra we get:

$$t = \left( \frac{\phi\eta}{\psi} \right)^{\frac{1}{1-\eta}} (\alpha_2 c_2 + \beta_2 e)^{\frac{\eta}{1-\eta}} - \frac{\rho v + \alpha_1 c_1 + \beta_1 e}{\alpha_2 c_2 + \beta_2 e} \quad (6)$$

From equation (6) we can get comparative statics for the various variables in the model on parental effort.

$$\begin{aligned} \frac{\partial t}{\partial c_1} &= -\frac{\alpha_1}{(\alpha_2 c_2 + \beta_2 e)} \\ \frac{\partial t}{\partial c_2} &= \alpha_2 \frac{\eta}{1-\eta} \left( \frac{\phi}{\psi} \eta \right)^{\frac{1}{1-\eta}} (\alpha_2 c_2 + \beta_2 e)^{\frac{2\eta-1}{1-\eta}} + \alpha_2 \frac{\rho v + \alpha_1 c_1 + \beta_1 e}{(\alpha_2 c_2 + \beta_2 e)^2} \\ \frac{\partial t}{\partial e} &= \beta_2 \frac{\eta}{1-\eta} \left( \frac{\phi}{\psi} \eta \right)^{\frac{1}{1-\eta}} (\alpha_2 c_2 + \beta_2 e)^{\frac{2\eta-1}{1-\eta}} - \frac{\beta_1}{\alpha_2 c_2 + \beta_2 e} + \beta_2 \frac{\rho v + \alpha_1 c_1 + \beta_1 e}{(\alpha_2 c_2 + \beta_2 e)^2} \\ \frac{\partial t}{\partial \psi} &= -\frac{1}{1-\eta} \frac{1}{\psi^{\frac{2-\eta}{1-\eta}}} (\phi\eta)^{\frac{1}{1-\eta}} (\alpha_2 c_2 + \beta_2 e)^{\frac{\eta}{1-\eta}} \end{aligned}$$

Parental time decreases with the in-person school resources ( $c_1$ ), reflecting their substitutability. On the other hand, it increases with  $c_2$ , the school resources for remote learning activities, as parental time is complementary to it. The effect of student effort ( $e$ ) is more nuanced, as it is both a substitute (represented by  $\beta_1 e$  in the human capital function) and a complement (represented by  $\beta_2 t e$ ). Depending on which of these two effects dominates, the effect of student effort on parental time can be positive or negative. As we show in Section 5.1 below, the positive correlation between student and parental effort suggests that the former dominates. Finally, parental effort decreases with parents' opportunity cost of time, which is consistent with the empirical findings presented in Section 3.

We now back out expressions for the overall effects of changing school resources on student effort.

$$\begin{aligned} \frac{\partial e}{\partial c_1} &= \delta_1 + \gamma \frac{\partial t}{\partial c_1} = \delta_1 - \frac{\gamma \alpha_1}{\alpha_2 c_2 + \beta_2 e} \\ \frac{\partial e}{\partial c_2} &= \delta_2 + \gamma \frac{\partial t}{\partial c_2} = \delta_2 + \gamma \left( \alpha_2 \frac{\eta}{1-\eta} \left( \frac{\phi}{\psi} \eta \right)^{\frac{1}{1-\eta}} (\alpha_2 c_2 + \beta_2 e)^{\frac{2\eta-1}{1-\eta}} + \alpha_2 \frac{\rho v + \alpha_1 c_1 + \beta_1 e}{(\alpha_2 c_2 + \beta_2 e)^2} \right) \end{aligned}$$

The effect of  $c_1$  on child effort is ambiguous. On the one hand there is a direct effect  $\delta_1$  which is positive, but also a negative indirect effect through the substitution between parental and in-person school effort  $-\frac{\gamma \alpha_1}{(\alpha_2 c_2 + \beta_2 e)}$ . In the case of  $c_2$ , the direct  $\delta_2$  and indirect effect  $\gamma \frac{\partial t}{\partial c_2}$  are additive, because of the complementarity between school-home

activity effort and parental effort, resulting in a positive overall effect.

## 5 Relative contribution of direct and indirect effects and their implications for policy

### 5.1 A model-based quantification of direct and indirect effects

The facts about parental involvement which we derived from the estimations of our elicitation exercises (presented in Section 3) show that some school resources complement parental educational efforts, while others act as substitutes. Our model then identifies the mechanisms through which school resources impact student effort, distinguishing between the direct effects and the indirect effects caused by parental responses that either reinforce or counteract the initial direct effects.

In this section, we use the predictions of the model as a guide to quantify the overall, direct and indirect effects on student effort of increasing school resources. We use the same estimation strategy as in Section 3, leveraging the variation from our elicitation exercises. Using the same pseudo-panel, we separately estimate the following equation for each type of school resource:

$$Child\ effort_{is} = \beta X_{is} + \gamma_i + \varepsilon_{is} \quad (7)$$

Our dependent variable,  $Child\ effort_{is}$ , measures the weekly hours of independent study by the child of respondent  $i$  under the hypothetical scenario  $s$  ( $e$  in the model's notation). The regressor  $X_{is}$  measures school resources for either in-person or remote learning ( $c_1$  and  $c_2$ ), measured as in Section 3. Finally,  $\gamma_i$  are individual fixed effects. Our coefficient of interest  $\beta$  measures the overall effect of increasing school resources on student effort ( $\frac{\partial e}{\partial c_1}$  and  $\frac{\partial e}{\partial c_2}$ ), including both direct and indirect effects via changes in parental effort. To distinguish between direct and indirect effects, we add parental effort as a regressor:

$$Child\ effort_{is} = \delta X_{is} + \alpha Parental\ effort_{is} + \tau_i + u_{is} \quad (8)$$

By controlling for parental effort, the coefficient  $\delta$  measures the direct effect of increasing school resources for in-person or remote learning ( $\delta_1$  and  $\delta_2$  in the model). We can then back out the indirect effects operating through changes in parental effort ( $\frac{\partial e}{\partial c_1} - \delta_1$  and  $\frac{\partial e}{\partial c_2} - \delta_2$ ) as the difference between the overall and direct effects ( $\hat{\beta} - \hat{\delta}$ ).

We present the results in Table 2, and compare the estimated direct, indirect, and overall effects for each school resource in Figure 2. Appendix Table A.3 shows that using weights does not change our results. We find a null overall effect of increasing

in-person learning resources ( $c_1$ ) on student effort. As discussed in Section 4.2, this overall effect is ambiguous, with a positive direct effect and a negative indirect effect due to the substitution between parental effort and school resources. Consistent with our model's assumptions, the direct effect is positive, with a 1-student decrease in class size leading to an additional 0.011 hours of student effort per week (statistically significant at the 10% level, with a p-value of 0.055). We should note however that this result is only evident in certain parts of the class size distribution. If we instead estimate this equation using a more flexible functional form with dummies for each class size category, we only find a positive and statistically significant direct effect when class size decreases from 26-30 (the most common response) to 21-25 students (Appendix Figure A.4). Furthermore, consistent with our model assumptions, the correlation between student and parental effort is positive and statistically significant. Overall, we find a negative indirect effect (0.016 fewer hours for each extra student) that completely offsets the positive direct effect, leading to no overall impact.

For remote learning resources ( $c_2$ ), we find a positive overall effect on student effort. Specifically, a 1 SD increase in teacher effort raises student effort by 0.297 hours per week, from an average of 1.630 hours. The direct effect is smaller, at 0.258 additional hours per week, consistent with the model's predictions.<sup>9</sup> As parental effort is complementary to this school input, an increase in  $c_2$  further enhances higher student effort through its positive impact on parental involvement. Importantly, as shown in Appendix Figure A.4, we obtain comparable results with a more flexible functional form using dummies for each teacher effort category. While both the overall and direct effects are positive across the teacher effort distribution, they are only statistically significant for intermediate levels of teacher effort (from low to moderate and from moderate to high).

## 5.2 Policy exercises

In previous sections, we established a series of facts about parental involvement and a model to identify the mechanisms through which school resources impact student effort. We distinguished between the direct effects and the indirect effects caused by parental responses, and we quantified those relative effects. We now use these results to evaluate a series of counterfactual policy measures and their cost effectiveness.

Policymakers have various tools to enhance students' human capital by increasing study time outside school, either independently or with parental help. Although investing in in-person learning may increase human capital, we do not consider this policy due to its null impact on student effort and its negative impact on parental effort.

---

<sup>9</sup>Using seemingly unrelated regressions, we test whether the overall and direct effects differ (i.e, if the indirect effects are statistically significant). We reject the null hypothesis that the indirect effects are zero at a 1% significance level for both types of school resources.



Instead, we focus on increasing resources for remote learning. Another alternative is to incentivize homeschooling by providing parents with monetary rewards, or providing students with tutors.

We use the results from our model and estimations to quantify the cost-effectiveness of each policy in terms of their impact on student effort and parental involvement, distinguishing between direct and indirect effects. We summarize our results in Appendix Table A.4. Finally, in Section 5.3 below, we discuss the implications of our findings for human capital accumulation.

**Investing in school resources for remote learning** Our model and estimations show that increasing school resources for remote learning ( $c_2$ ) has a direct positive effect on both children’s independent study time ( $e$ ) and parental involvement ( $t$ ). Besides from these direct positive effects, the complementarity between child and parental effort further boosts child effort.

The variation in  $c_2$  from our elicitation exercises comes from a hypothetical change in teacher effort for homework preparation. As shown in the top graph of Appendix Figure A.5, the modal response in our sample is moderate teacher effort (41%). We assume this policy involves teachers transitioning from moderate to high effort, resulting in an extra 0.213 weekly hours of parental effort (Appendix Figure A.3). The total effect on the child’s independent study time is 0.310 extra hours per week, with the direct effect being 0.270 extra hours (Appendix Figure A.4).<sup>10</sup>

To calculate the policy’s cost, we assume teachers increase effort by dedicating more time to homework preparation. Appendix Figure A.6 shows the distribution of weekly hours UK teachers spend on lesson planning and grading, based on the 2018 OECD Teaching and Learning International Survey (TALIS) data. We categorize teachers’ effort in the TALIS sample to match the distribution in our survey.<sup>11</sup> Using this approach, we observe that teachers who put in moderate effort when planning lessons and grading spend an average of 14.99 hours per week on this activity, whereas those who put in high effort spend 25.25 hours. Thus, moving from moderate to high effort requires an additional 10.26 hours of teacher time per week. Using teacher salary data from the the 2022 Annual Survey for Hours and Earnings, and assuming a class size of 28 students (the most frequent response in our sample), we estimate this policy costs £6.73 per student per week.<sup>12</sup>

---

<sup>10</sup>If the policy increased teacher effort from low to moderate, the effects would be slightly higher: parental effort would increase by 0.239 weekly hours (vs. 0.213), and the overall and direct effects on student effort would rise to 0.382 (vs. 0.310) and 0.334 extra hours (vs. 0.270), respectively.

<sup>11</sup>We assume teachers with very low effort spend less than 6 hours on lesson planning and grading, based on the 15% of respondents in our sample reporting very low effort and the 15<sup>th</sup> percentile of teacher hours in the TALIS data being 6 hours. We follow the same approach for the remaining teacher effort categories and compute the average hours spent by teachers in each.

<sup>12</sup>With an average weekly teacher salary of £735 and an hourly wage of £18.37 (assuming 40-hour



Putting these results together, we find that each additional hour of independent studying by the child due to increased teacher effort costs £21.71, and each extra hour of child study with parental help costs £31.60. Ignoring the indirect effects of parental effort would lead to an overestimation of the cost of each additional hour of independent study by 15%.<sup>13</sup>

**Subsidizing parental time** An alternative policy is to incentivize parents to homeschool by offering monetary rewards. Assuming parents require their hourly wage to forego an extra hour of work, the average cost of increasing parental time  $t$  by one hour in our sample is £18.29. Due to the complementarity between parental and child effort uncovered by our model and estimations, this policy also indirectly increases child effort  $e$ . As shown in Section 3, one extra hour of parental help leads to 0.477 more hours of independent study by the child. Therefore, the cost of an additional hour of child study is £38.34.

**Hiring tutors** Instead of exogenously increasing the time parents dedicate to assisting their children, an alternative approach is to hire private tutors to support children with their schoolwork.

We assume tutors and parents are equally effective, which might be a strong assumption. This implies that the benefits of this policy are equivalent to those of subsidizing parents' time. The key distinction is the cost, which depends on the expense of hiring a tutor. We assume the tutor's hourly rate is the same as a teacher's hourly wage (£18.37 per hour). This implies a cost of £38.51 for an additional hour of independent study an £18.37 for an extra hour of tutor help, as summarized in Appendix Table A.4. The similarity with the cost of subsidizing parents stems from the close match between teachers' wages and the average hourly wages of respondents. Therefore, the cost-effectiveness of hiring a private tutor versus compensating parent depends on the comparison between parents' wages and tutor fees.

### 5.3 Cost effectiveness of policy alternatives and their determinants

In Appendix Figure A.7, we compare the cost-effectiveness of increasing school resources for remote learning with subsidizing parents or hiring tutors. If parents and tutors are equally effective, policymakers should subsidize parents if their hourly wage is lower than the tutor's rate (£18.37 per hour) and hire tutors otherwise. As shown

---

work weeks), the weekly cost per student of increasing teacher effort from moderate to high is £6.73 ( $10.26 \times 18.37 / 28$ ).

<sup>13</sup>As this policy increases child and parental effort by 0.310 and 0.213 hours per week, and costs £6.73 per student, the cost per hour of child and parental effort is £21.71 ( $£6.73 / 0.310$ ) and £31.60 ( $£6.73 / 0.213$ ), respectively. If only direct effects on child effort are considered (0.270 hours), the cost per hour of student effort is £24.93 ( $£6.73 / 0.270$ ), 15% higher than when considering the overall effect.

in the figure at the top, for households with low wages, subsidizing parents is the most cost-effective way to increase children’s independent study time. However, if parental wages exceed £10.36 per hour (83% of employed individuals in our sample), investing in school resources for remote learning becomes more cost-effective. Note that ignoring the indirect effects resulting from changes in parental effort would lead to the conclusion that investing in school resources for remote learning is always the most cost-effective policy to increase independent study time, as subsidizing parents or hiring tutors only has an indirect effect on child effort. Finally, as shown in the figure at the bottom, hiring a tutor (or subsidizing parents if they have a low wage) is always the most cost-effective way to increase parental involvement.

Overall, we find that if hourly wages are high enough, subsidizing parents or hiring tutors is the more cost-effective way to increase parental effort ( $t$ ), whereas increasing school resources for remote learning is the best way to enhance the independent study time of children ( $e$ ). In such a situation, policymakers should focus on the policy that is most effective at increasing children’s human capital. In the absence of a measure of human capital, we can only conjecture the effect of each policy on human capital using the model’s predictions. Following equation (2), we find that the relative influence of parental effort  $t$  and independent study effort of children  $e$  on the child’s human capital are as follows:

$$\frac{\frac{\partial H}{\partial e}}{\frac{\partial H}{\partial t}} = \frac{\beta_1 + \beta_2 t}{\alpha_2 c_2 + \beta_2 e}$$

As we do not have estimates for  $\alpha_2$ ,  $\beta_1$  and  $\beta_2$ , we cannot quantify the relative contribution of increases in  $t$  and  $e$  to the child’s human capital. However, we can provide general insights based on the predictions of our model. We find that it is more effective to increase the human capital of children attending schools with a high  $c_2$  by means of policies that increase  $t$ , such as hiring a tutor or subsidizing parents to spend time helping their children. The same will be true if the child’s initial level of effort  $e$  is relatively high (e.g., if the child has a high intrinsic reward or interest in learning). On the contrary, if parental effort is relatively high (e.g., if the parent has a low opportunity cost of time), it will be more effective to increase the child’s human capital through policies that increase  $e$ , such as investing in school resources for remote learning.

## 6 Discussion and conclusions

By means of a custom design survey, a series of elicitation exercises and a theoretical model, we are able to illustrate some of the mechanisms behind the intricate relationship between school inputs, student effort and parental involvement. Besides

providing a series of stylized facts, our main insight is that failing to account for the indirect effects generated by parents' reactions to school inputs leads to the overestimation and underestimation of their true impact on student effort, which in turn distorts their perceived cost-effectiveness. In our counterfactual policy exercises we show that investing in school resources for remote learning is more cost effective at increasing student effort than subsidising parental time or hiring tutors, but most importantly, we find that ignoring the indirect effects uncovered by our analysis leads to a 15% overestimation of the cost of increasing student effort via investments in school resources for remote learning.

Further research could focus on developing more detailed measures of parental involvement, student effort, and in person and remote school inputs, and on empirically testing the distinction between direct and indirect effects.

## References

- Agostinelli, Francesco and Matthew Wiswall**, “Estimating the Technology of Children’s Skill Formation,” *Journal of Political Economy*, forthcoming.
- , **Matthias Doepke, Giuseppe Sorrenti, and Fabrizio Zilibotti**, “When the great equalizer shuts down: Schools, peers, and parents in pandemic times,” *Journal of Public Economics*, 2022, 206, 104574.
- Albornoz, Facundo, Maria Victoria Anauati, Melina Furman, Mariana Luzuriaga, Maria Eugenia Podesta, and Ines Taylor**, “Training to teach science: experimental evidence from Argentina,” *The World Bank Economic Review*, 2020, 34 (2), 393–417.
- , **Samuel Berlinski, and Antonio Cabrales**, “Motivation, resources, and the organization of the school system,” *Journal of the European Economic Association*, 2018, 16 (1), 199–231.
- Angrist, Noam, Dean S Karlan, Sarah Kabay, Lincoln Lau, and Kevin Wong**, “Human Capital at Home: Evidence from a Randomized Evaluation in the Philippines,” *Available at SSRN 4956572*, 2024.
- Bassi, Marina, Costas Meghir, and Ana Reynoso**, “Education quality and teaching practices,” *The Economic Journal*, 2020, 130 (631), 1937–1965.
- Boneva, Teodora and Christopher Rauh**, “Parental beliefs about returns to educational investments—the later the better?,” *Journal of the European Economic Association*, 2018, 16 (6), 1669–1711.
- Chetty, Raj, John N Friedman, and Jonah E Rockoff**, “Measuring the impacts of teachers I: Evaluating bias in teacher value-added estimates,” *American economic review*, 2014, 104 (9), 2593–2632.
- Cull, William L., Karen G. O’Connor, Sharp Sanford, and Sukfong S. Tang**, “Response Rates and Response Bias for 50 Surveys of Pediatricians,” *HSR: Health Services Research*, February 2005, 40.
- Curtin, Richard, Stanley Presser, and Eleanor Singer**, “The effects of response rate changes on the index of consumer sentiment,” *Public Opinion Quarterly*, Winter 2000, 64, 413—428.
- Datar, Ashlesha and Bryce Mason**, “Do reductions in class size “crowd out” parental investment in education?,” *Economics of Education Review*, 2008, 27 (6), 712–723.

**Doepke, Matthias and Fabrizio Zilibotti**, “Parenting with style: Altruism and paternalism in intergenerational preference transmission,” *Econometrica*, 2017, 85 (5), 1331–1371.

— **and** —, *Love, money, and parenting: How economics explains the way we raise our kids*, Princeton University Press, 2019.

**Fredriksson, Peter, Björn Öckert, and Hessel Oosterbeek**, “Parental Responses to Public Investments in Children: Evidence from a Maximum Class Size Rule,” *Journal of Human Resources*, 2016, 51 (4), 832–868.

**Greaves, Ellen, Iftikhar Hussain, Birgitta Rabe, and Imran Rasul**, “Parental Responses to Information About School Quality: Evidence from Linked Survey and Administrative Data\*,” *The Economic Journal*, 02 2023. uead015.

**Hernández-Agramonte, Juan Manuel, Olga Namen, Emma Näslund-Hadley, and Maria Loreto Biehl**, “Supporting early childhood development remotely: experimental evidence from SMS messages,” *Journal of Development Economics*, 2024, 166, 103201.

**Pop-Eleches, Cristian and Miguel Urquiola**, “Going to a better school: Effects and behavioral responses,” *American Economic Review*, 2013, 103 (4), 1289–1324.

**Rivkin, Steven G, Eric A Hanushek, and John F Kain**, “Teachers, schools, and academic achievement,” *Econometrica*, 2005, 73 (2), 417–458.

**Smith, William G.**, “Does gender influence online survey participation?: A record-linkage analysis of university faculty online survey response behavior,” Working Paper 29750, ERIC Document Reproduction Service June 2008.

# Tables and Figures

Table 1: Descriptive statistics

	Mean	SD	Min	Max	N
<u>Characteristics of parent and HH</u>					
Age	39.78	11.52	9.00	401.00	1384
Male	0.31	0.46	0.00	1.00	1383
Married	0.63	0.48	0.00	1.00	1384
Cohabiting with partner (not married)	0.22	0.41	0.00	1.00	1384
Number members of HH	4.05	1.09	2.00	12.00	1384
Number of children	1.99	0.78	1.00	7.00	1384
Has a university education	0.40	0.49	0.00	1.00	1384
Works	0.85	0.35	0.00	1.00	1384
Works away from home (if employed)	0.42	0.49	0.00	1.00	1181
Hours worked per week	34.98	17.22	1.00	375.00	1181
Annual income (before taxes)	30250.95	15604.99	8640.00	62679.10	1181
Hourly pay (before taxes)	18.29	13.08	0.44	242.04	1181
<u>Child and school characteristics</u>					
Age	8.57	1.73	6.00	11.00	1384
Male	0.50	0.50	0.00	1.00	1384
Public school	0.89	0.31	0.00	1.00	1384
Has special needs or disability	0.13	0.33	0.00	1.00	1384
Weekly hours doing schoolwork (outside of school)	3.51	3.21	0.00	35.00	1384
Weekly hours doing schoolwork by him/herself	1.63	2.24	0.00	33.00	1384
Weekly hours schoolwork with help of respondent	1.39	1.43	0.00	15.00	1384
Weekly hours doing schoolwork with help of others	0.49	1.39	0.00	28.00	1384
<i>School resources for in person learning</i>					
Number of students per class	26.40	5.05	8.00	38.00	1384
School day length (hours)	6.39	0.52	4.50	9.00	1384
School provides teaching assistant in class	0.80	0.40	0.00	1.00	1384
School provides extra-curricular activities	0.82	0.39	0.00	1.00	1384
School provides tutoring	0.76	0.43	0.00	1.00	1384
Classroom divided by performance levels	0.50	0.50	0.00	1.00	1384
Frequency of parent-teacher meetings (0-2)	1.14	0.57	0.00	2.00	1384
<i>School resources for remote learning</i>					
Frequency of homework assignments (1-5)	2.32	0.98	1.00	5.00	1384
Frequency of assessments (1-5)	2.30	0.98	1.00	6.00	1384
Teacher effort in preparing homework assignments (1-5)	2.70	1.02	1.00	5.00	1384
Level of engagement of homework assignments (1-5)	2.82	1.05	1.00	5.00	1384
Frequency teachers correct homework (1-5)	3.86	1.49	1.00	6.00	1384
Usefulness of feedback on homework (1-6)	3.06	1.66	1.00	6.00	1384

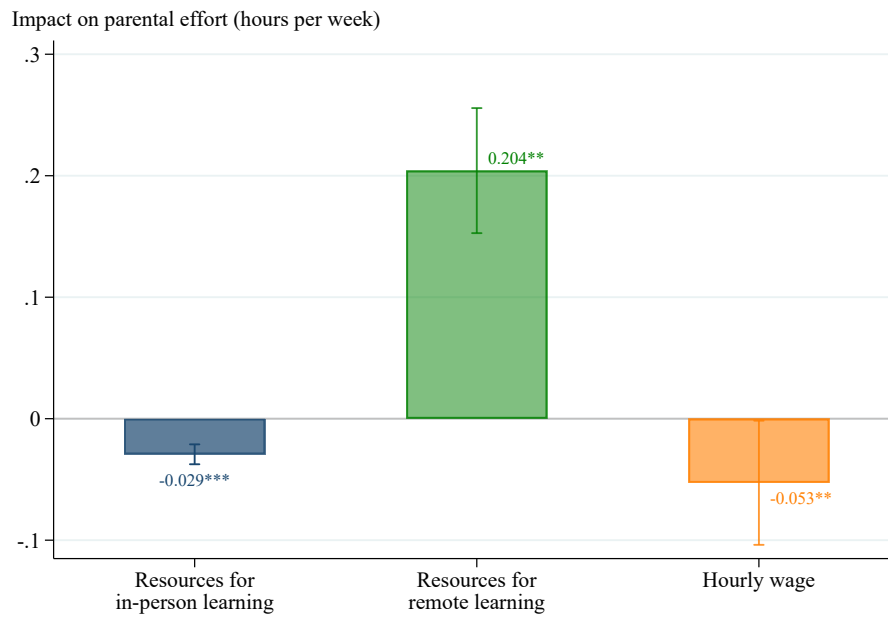
Notes: This table presents descriptive statistics for the sample of respondents from our online survey, described in Section 2.1. We use the midpoint of the income bracket reported by the respondent to calculate his/her annual income.

Table 2: Overall and direct effect of school resources on student effort

	Overall effect		Direct effect	
	(1)	(2)	(3)	(4)
School resources for in-person learning	-0.005 (0.005)		0.011* (0.005)	
School resources for remote learning		0.297*** (0.030)		0.258*** (0.030)
Parental effort			0.523*** (0.141)	0.192** (0.079)
Observations	4,152	4,152	4,152	4,152
Individuals	1,384	1,384	1,384	1,384
R <sup>2</sup>	0.766	0.796	0.805	0.803
Dep. variable mean	1.630	1.630	1.630	1.630

Notes: The sample is composed of respondents from our online survey, described in Section 2.1. Each regression is conducted on a pseudo-panel containing three observations per respondent (the responses to the survey, and two hypothetical scenarios regarding the value of the main regressor). The dependent variable in all regressions measures the weekly number of hours spent by the respondent's child doing homework without assistance. The main regressor in columns (1) and (3) measures the number of students in the child's class (multiplied by -1). The main regressor in columns (2) and (4) measures the effort put by the child's teacher preparing homework activities, and was constructed by normalizing a categorical variable taking values 1 to 5. All regressions control for individual fixed effects. In columns (3) and (4), we control for the weekly number of hours spent by the respondent helping the child with schoolwork. Standard errors clustered at the individual level in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

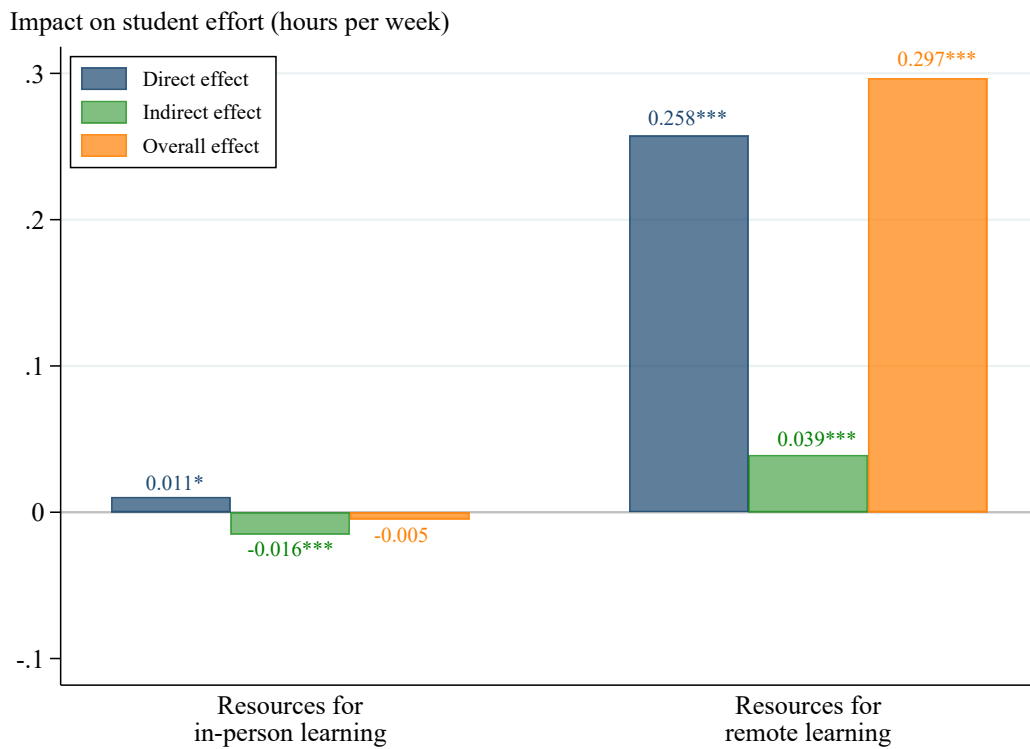
Figure 1: Effect of changes in school inputs and hourly wages on parental effort



Notes: The sample is composed of respondents from our online survey, described in Section 2.1. We present the coefficients and 95% confidence intervals for the main regressors of three regressions conducted on a pseudo-panel containing three observations per respondent (the responses to the survey, and two hypothetical scenarios regarding the value of the regressor). The dependent variable in all regressions measures the weekly number of hours spent by the respondent helping the child with schoolwork, and all regressions control for individual fixed effects. The regressor for the first estimation measures the number of students in the child's class (multiplied by -1), whereas the regressor for the second one measures the effort put by the child's teacher preparing homework activities, and was constructed by normalizing a categorical variable taking values 1 to 5. In the third estimation, the regressor measures the respondent's hourly wage; the sample in this regression was restricted to employed individuals. Standard errors were clustered at the individual level. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.



Figure 2: Effect of changes in school inputs on student effort



Notes: This figure summarizes the results from the regressions presented in Table 2. The indirect effects are calculated as the difference between the overall and the direct effects. Using seemingly unrelated regressions, we test whether the overall and direct effects are statistically different from each other. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

# ONLINE APPENDIX

## Appendix A Appendix Tables and Figures

Table A.1: Survey representativeness

	Our survey	UK Labor Force Survey
Age	39.78	40.91
Male	0.31	0.43
Married or cohabiting	0.85	0.86
Number members of HH	4.05	4.19
Number of children	1.99	2.27
Has a university education	0.40	0.36
Works	0.85	0.91
Works away from home (if employed)	0.42	0.69
Hours worked per week	34.98	30.84
Annual income (before taxes)	30250.95	35245.70
Hourly pay (before taxes)	18.29	19.71
England	0.84	0.86
Wales	0.05	0.05
Northern Ireland	0.02	0.03
Scotland	0.09	0.07

Notes: This table compares the average characteristics of the sample from our online survey with the sample of respondents of the October-December 2022 UK Labour Force Survey who were parents of at least one child ages 6-11 who lived in their household. We use the weights provided in the UK Labour Force survey to calculate the corresponding means.

Table A.2: Effect of changes in school inputs and hourly wages on parental effort (reweighted)

	(1)	(2)	(3)
School resources for in-person learning	-0.029*** (0.004)		
School resources for remote learning		0.214*** (0.030)	
Hourly wage			-0.064** (0.031)
Observations	4,149	4,149	3,543
Individuals	1,384	1,384	1,384
R <sup>2</sup>	0.738	0.720	0.612
Dep. variable mean	1.403	1.403	1.407

Notes: The sample is composed of respondents from our online survey, described in Section 2.1. In column 3, the sample is restricted to employed individuals. Each regression is conducted on a pseudo-panel containing three observations per respondent (the responses to the survey, and two hypothetical scenarios regarding the value of the regressor). Observations are weighted according to the gender, employment status, and income decile of the respondent. The dependent variable in all regressions measures the weekly number of hours spent by the respondent helping the child with schoolwork. The main regressor in column 1 measures the number of students in the child's class (multiplied by -1). The main regressor in column 2 measures the effort put by the child's teacher preparing homework activities, and was constructed by normalizing a categorical variable taking values 1 to 5. In column 3, the main regressor measures the respondent's hourly wage. All regressions control for individual fixed effects. Standard errors clustered at the individual level in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

Table A.3: Overall and direct effect of school resources on student effort (reweighted)

	Overall effect		Direct effect	
	(1)	(2)	(3)	(4)
School resources for in-person learning	-0.005 (0.005)		0.010* (0.006)	
School resources for remote learning		0.315*** (0.033)		0.266*** (0.033)
Parental effort			0.506*** (0.129)	0.228*** (0.071)
Observations	4,149	4,149	4,149	4,149
Individuals	1,384	1,384	1,384	1,384
R <sup>2</sup>	0.778	0.814	0.809	0.823
Dep. variable mean	1.720	1.720	1.720	1.720

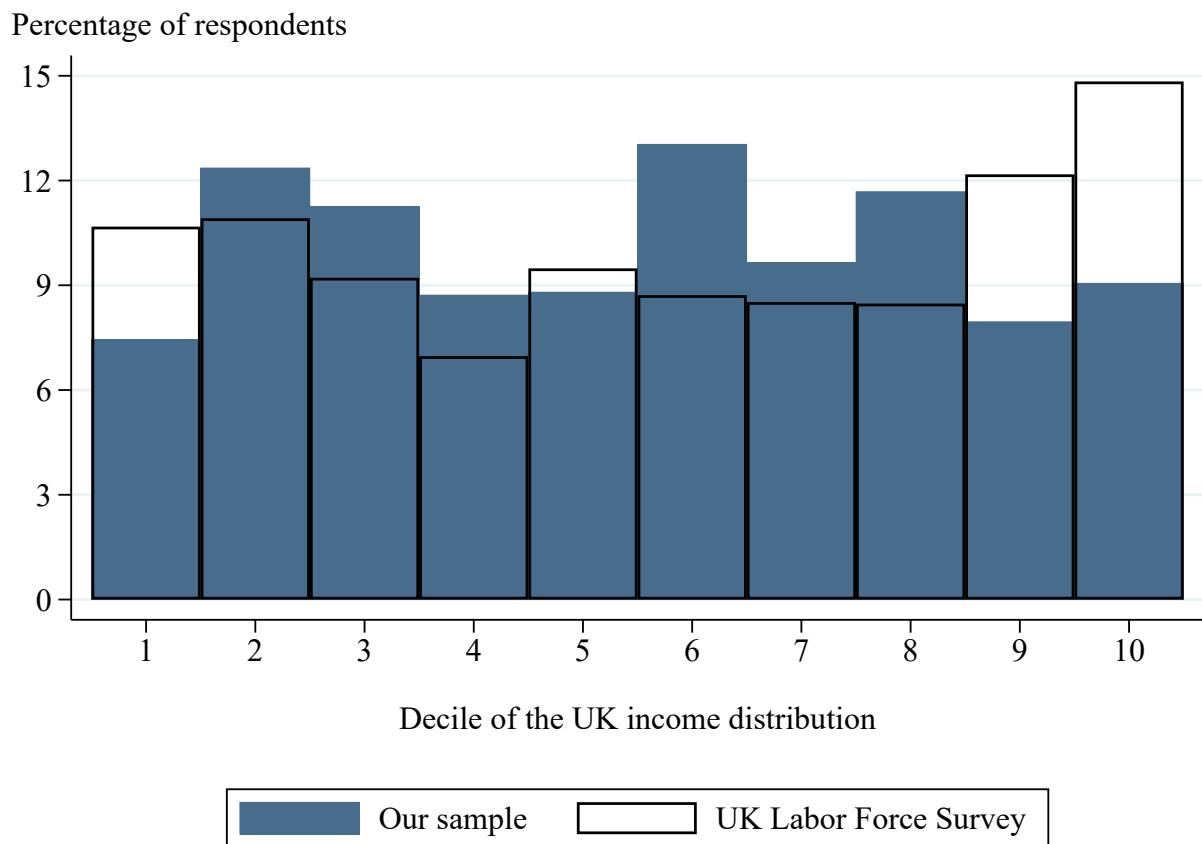
Notes: The sample is composed of respondents from our online survey, described in Section 2.1. Each regression is conducted on a pseudo-panel containing three observations per respondent (the responses to the survey, and two hypothetical scenarios regarding the value of the main regressor). Observations are weighted according to the gender, employment status, and income decile of the respondent. The dependent variable in all regressions measures the weekly number of hours spent by the respondent's child doing homework without assistance. The main regressor in columns 1 and 3 measures the number of students in the child's class (multiplied by -1). The main regressor in columns 2 and 4 measures the effort put by the child's teacher preparing homework activities, and was constructed by normalizing a categorical variable taking values 1 to 5. All regressions control for individual fixed effects. In columns 3 and 4, we control for the weekly number of hours spent by the respondent helping the child with schoolwork. Standard errors clustered at the individual level in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

Table A.4: Summary of cost-benefit of policies to increase student and parental effort

	Policy change		
	School resources for remote learning	Subsidizing parental time	Hiring a tutor
Cost of the policy (in £ per child)	6.73	18.29	18.37
<b>Cost-effectiveness on increasing child effort</b>			
<i>Overall effect</i>			
Increase in child effort (in hours per week)	0.31	0.48	0.48
Cost of increasing child effort (in £ per hour)	21.71	38.34	38.51
<i>Only direct effect</i>			
Increase in child effort (in hours per week)	0.27	0.00	0.00
Cost of increasing child effort (in £ per hour)	24.96		
Cost overestimation from ignoring indirect effects	14.97%		
<b>Cost-effectiveness on increasing parental effort</b>			
Increase in parental effort (in hours per week)	0.21	1.00	1.00
Cost of increasing parental effort (in £ per hour)	31.60	18.29	18.37

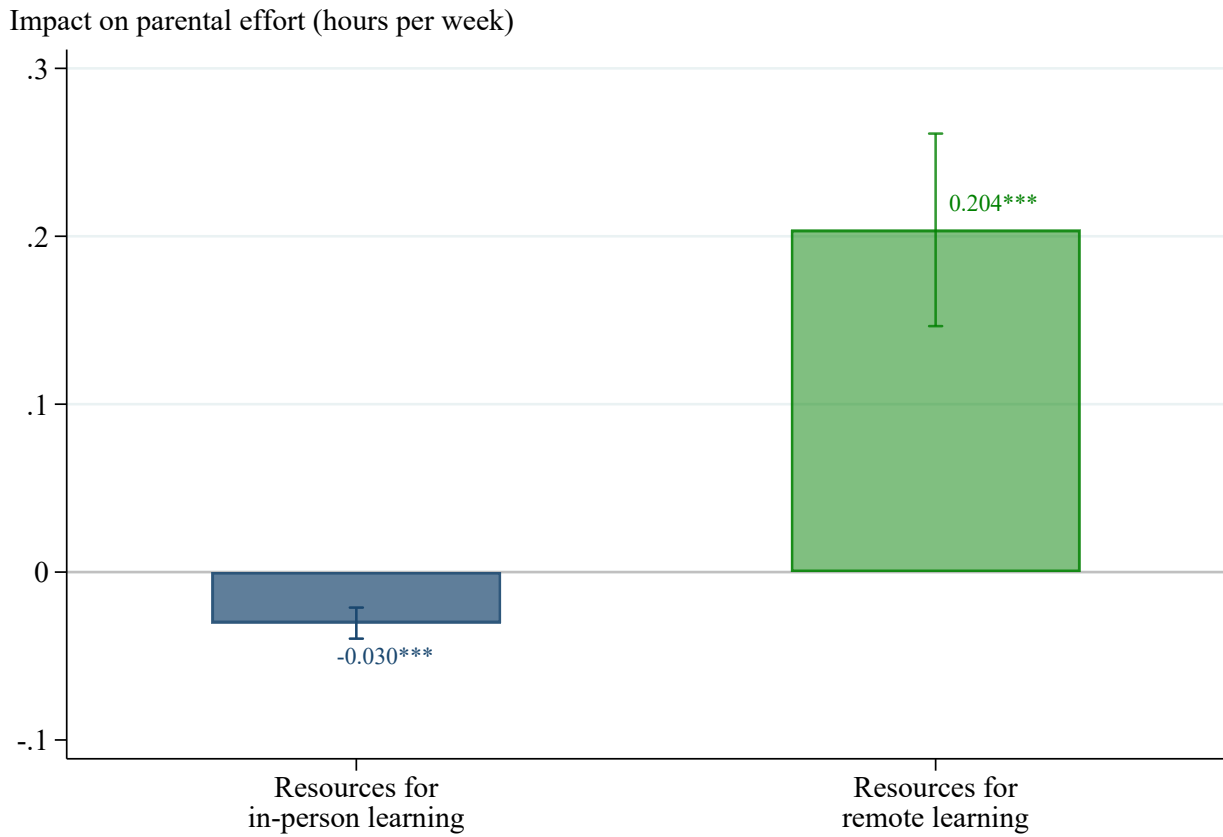
Notes: The table summarizes the results of the cost-benefit analysis conducted in Section 5.3.

Figure A.1: Comparison of income distribution in our sample and the UK Labor Force Survey



Notes: This figure compares the income distribution of the employed individuals of the sample from our online survey with the sample of employed respondents of the October-December 2022 UK Labour Force Survey who were parents of at least one child ages 6-11 who lived in their household. As respondents in our survey only report their income in brackets (using the deciles of the 2022 Annual Survey of Hours and Earnings for the entire population), we show the share of individuals in each survey in each of these deciles. We use the weights provided in the UK Labour Force survey to calculate the corresponding means.

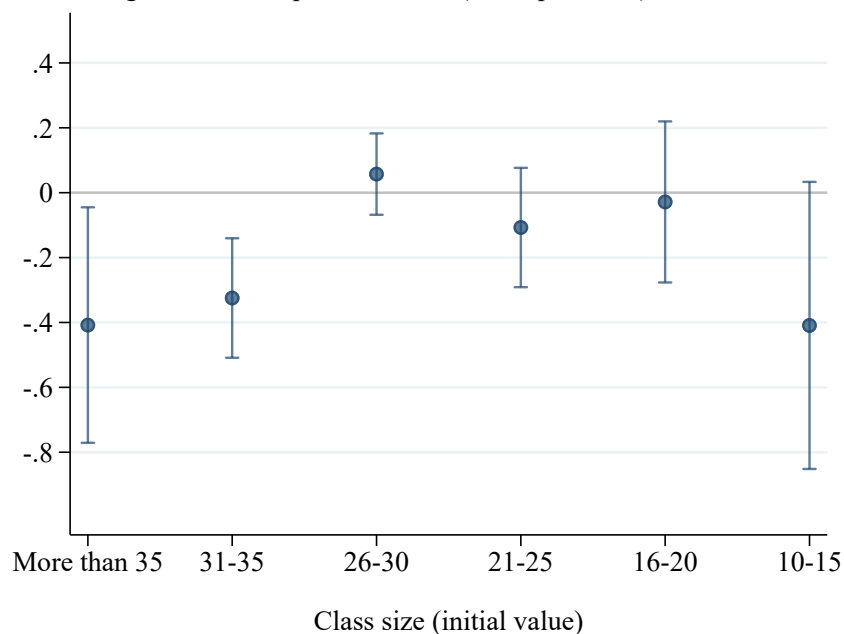
Figure A.2: Effect of changes in school inputs on parental effort (sample of employed respondents)



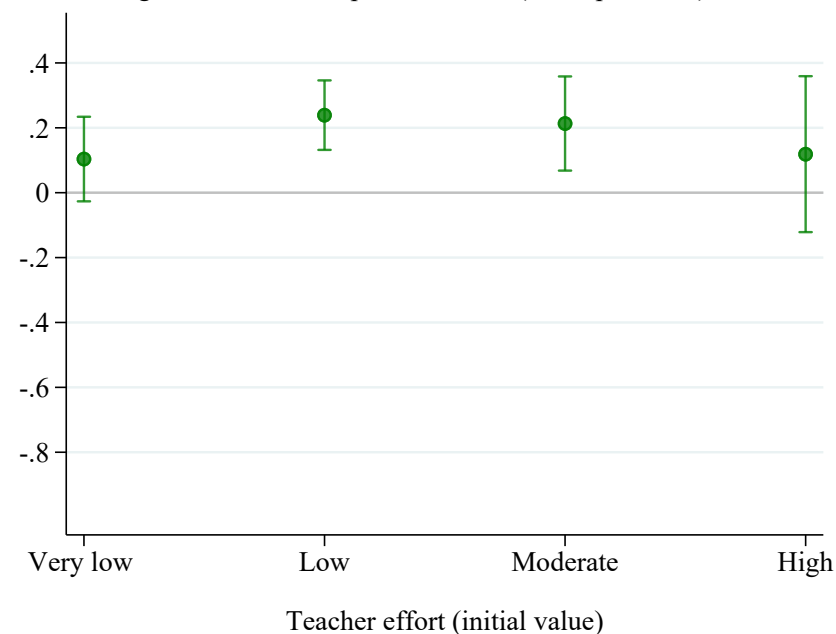
Notes: The sample is composed of the employed respondents from our online survey, described in Section 2.1. We present the coefficients and 95% confidence intervals for the main regressors of two regressions conducted on a pseudo-panel containing three observations per respondent (the responses to the survey, and two hypothetical scenarios regarding the value of the regressor). The dependent variable in all regressions measures the weekly number of hours spent by the respondent helping the child with schoolwork, and all regressions control for individual fixed effects. The regressor for the first estimation measures the number of students in the child's class (multiplied by -1), whereas the regressor for the second one measures the effort put by the child's teacher preparing homework activities, and was constructed by normalizing a categorical variable taking values 1 to 5. Standard errors were clustered at the individual level.

Figure A.3: Effect of changes in school inputs on parental effort – categorical regressors

Effect of reducing class size on parental effort (hours per week)



Effect of increasing teacher effort on parental effort (hours per week)

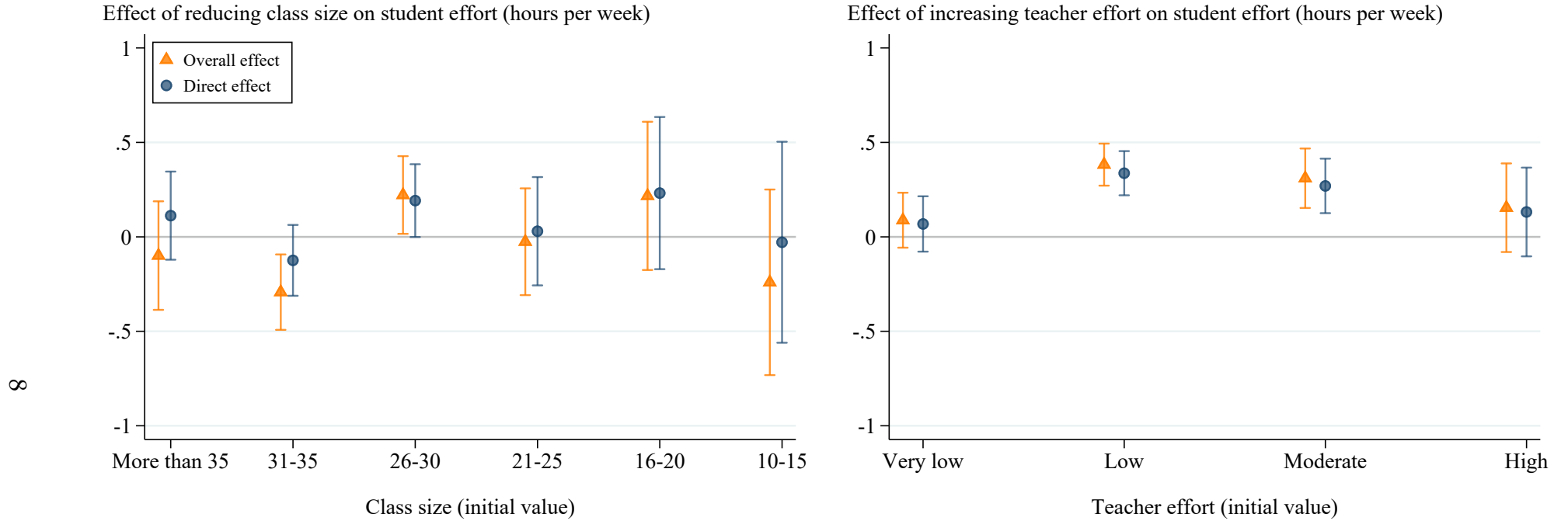


7

Notes: The sample is composed of respondents from our online survey, described in Section 2.1. This figure presents the results of regressions conducted on a pseudo-panel containing three observations per respondent (the responses to the survey, and two hypothetical scenarios regarding the value of the regressors). The dependent variable measures the weekly number of hours spent by the respondent helping the child with schoolwork. The regressors in the figure to the left are dummies for each value of the categorical variable measuring the class size of the respondent's child (omitting the category of 10 or less students). The regressors in the figure to the right are categorical variables measuring teacher effort in preparing homework activities (the omitted category is very high effort). Both regressions control for individual fixed effects, and standard errors are clustered at the individual level. We report the estimates and 95% confidence intervals for the effect of going from the category indicated in the x-axis to the following category. For the example, the estimate for "More than 35" in the figure to the left measures the change in parental effort resulting from a decrease in class size from more than 35 students to 31-35 students.

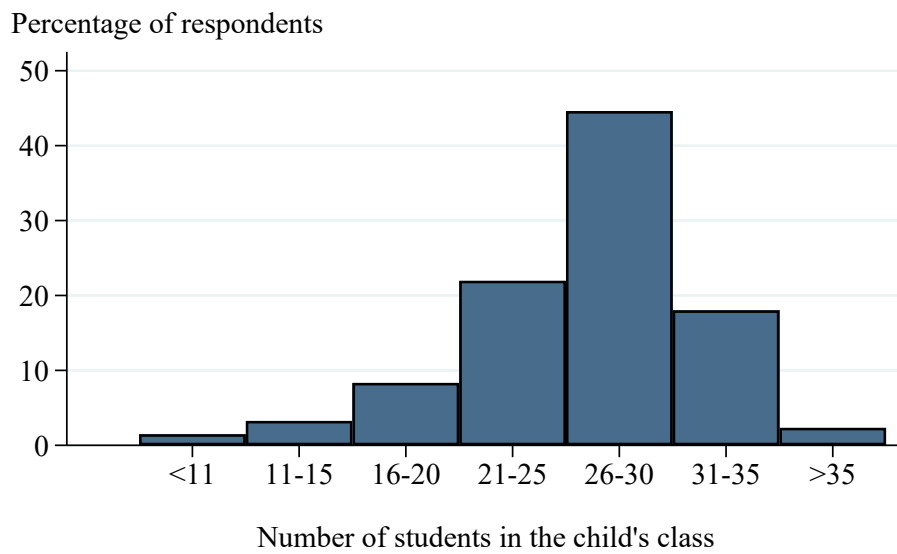
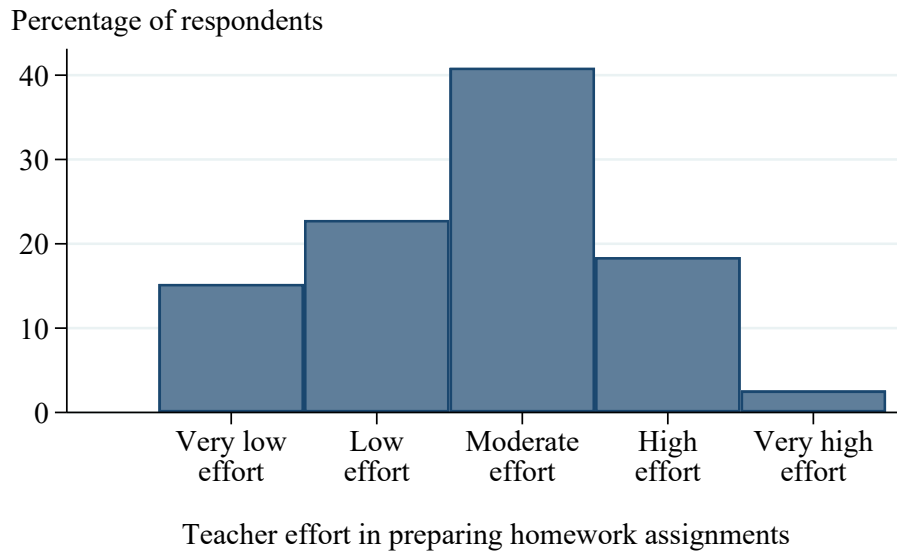


Figure A.4: Effect of changes in school inputs on student effort – categorical regressors



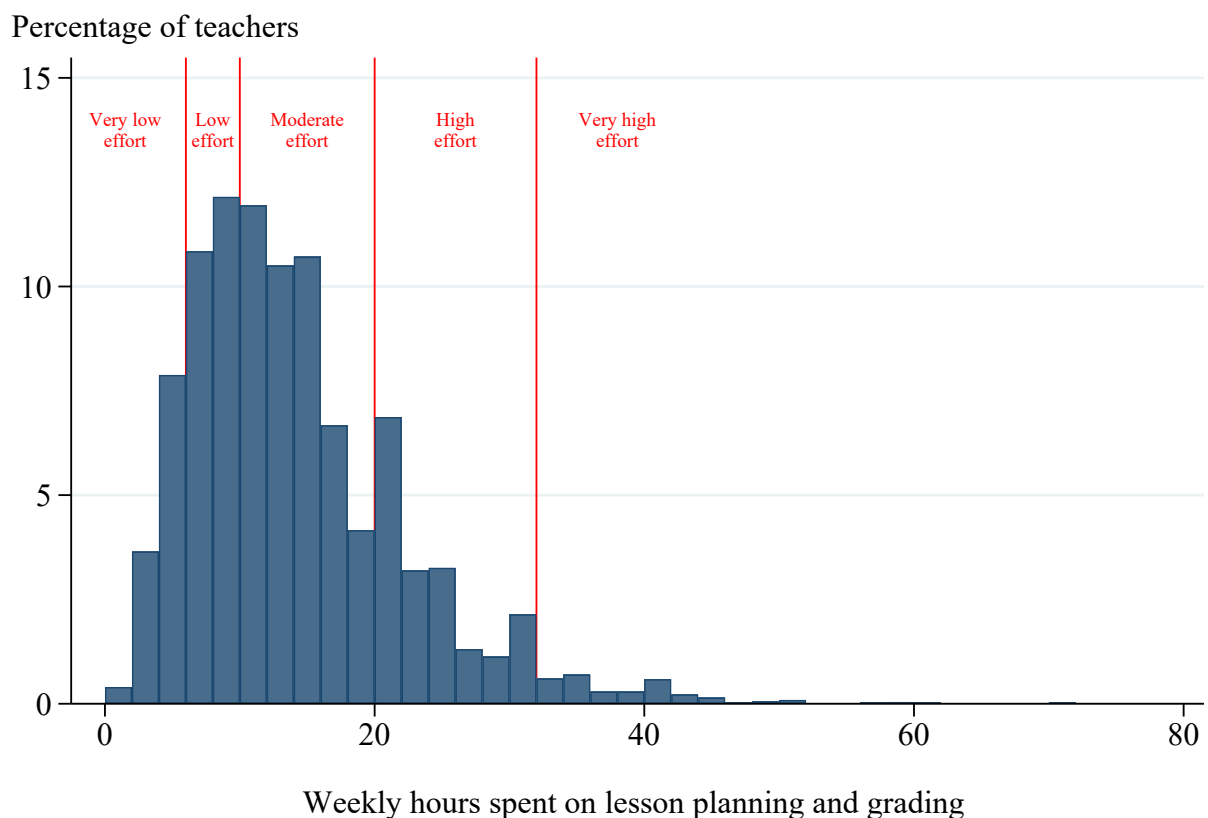
Notes: The sample is composed of respondents from our online survey, described in Section 2.1. This figure presents the results of regressions conducted on a pseudo-panel containing three observations per respondent (the responses to the survey, and two hypothetical scenarios regarding the value of the regressors). The dependent variable measures the weekly number of hours spent by the respondent's child doing homework without assistance. The regressors in the figure to the left are dummies for each value of the categorical variable measuring the class size of the respondent's child (omitting the category of 10 or less students). The regressors in the figure to the right are categorical variables measuring teacher effort in preparing homework activities (the omitted category is very high effort). Both regressions control for individual fixed effects, and standard errors are clustered at the individual level. In the estimations for the direct effect (in blue), we also control for the weekly number of hours spent by the respondent helping the child with schoolwork. We report the estimates and 95% confidence intervals for the effect of going from the category indicated in the x-axis to the following category. For the example, the estimate for "More than 35" in the figure to the left measures the change in student effort resulting from a decrease in class size from more than 35 students to 31-35 students.

Figure A.5: Distribution of teacher effort and class size



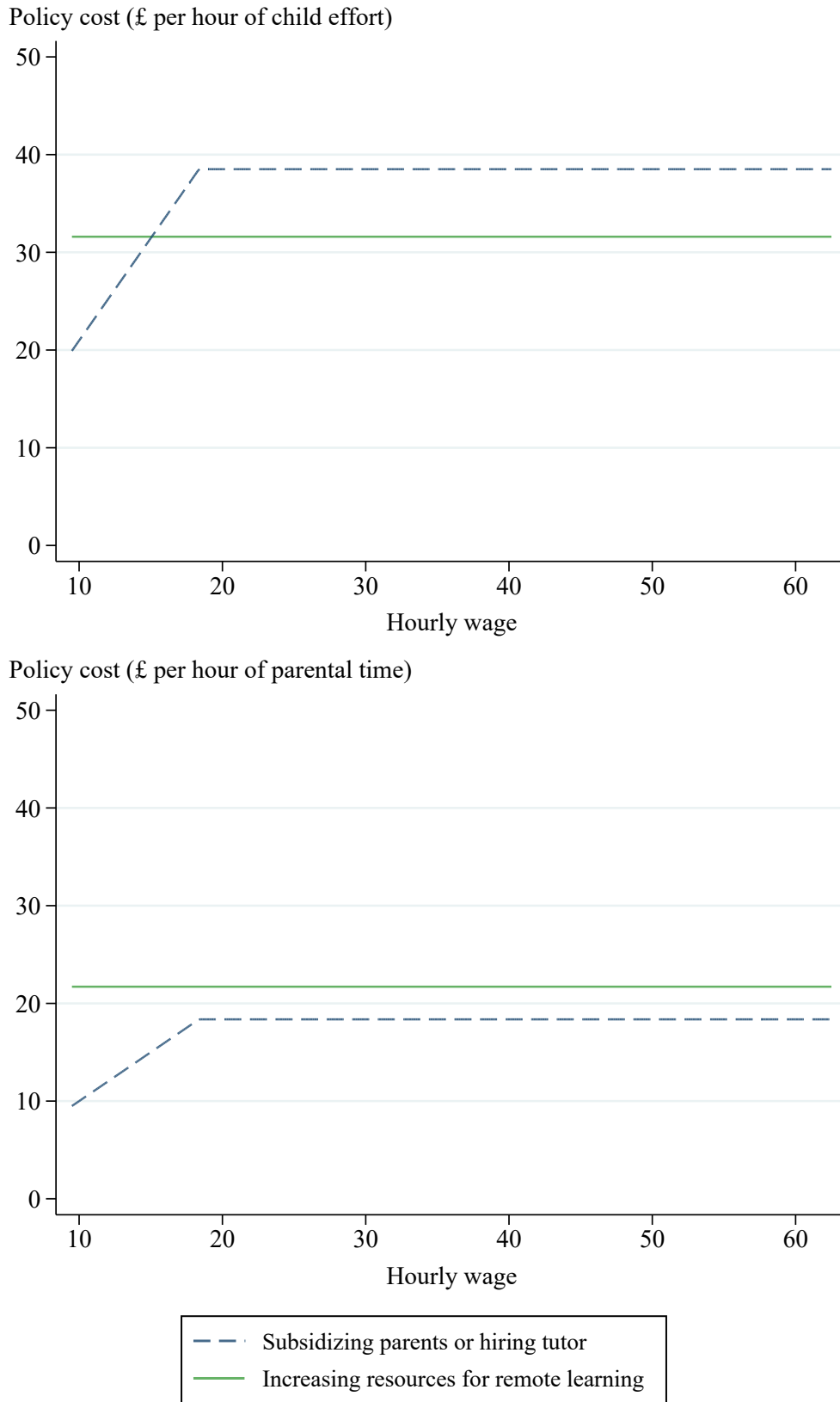
Notes: The sample is composed of the respondents who completed the entire survey. The figure in the top plots the distribution of responses for the categorical variable measuring the effort put the child's teacher(s) into preparing homework activities. The figure in the bottom plots the responses for the categorical variable measuring the number of students in the child's class.

Figure A.6: Time spent by teachers preparing lessons and grading – TALIS survey



Notes: The sample is composed of all teachers in the UK who were interviewed in the 2018 round of the OECD Teaching and Learning International Survey (TALIS). This figure plots the distribution of weekly hours spent by teachers in lesson planning and grading (using the provided weights). The red lines mark the 15<sup>th</sup>, 38<sup>th</sup>, 79<sup>th</sup> and 97<sup>th</sup> percentiles, in order to mimic the categories of teacher effort into preparing homework activities reported by the respondents in our survey.

Figure A.7: Cost of policies to increase student and parental effort



Notes: These figures summarize the results of the cost-benefit analysis conducted in Section 5.3, where the two policies under consideration are subsidizing parents/hiring tutors and increasing resources for remote learning. In the top (bottom) figure, we plot the relation between the cost per hour of child (parental) effort (in £) of each policy and the hourly wage of the child's parents.

# Appendix B Questionnaire

## Appendix B.1 Initial questions

We invite you to participate in a survey for an academic study. All of your answers on this survey are confidential and anonymous. We anticipate that this survey will take approximately 10 minutes to complete. We thank you in advance for your participation.

- To be eligible to participate in this survey, you must be the parent or guardian of a child ages 6 to 11. Are you the parent/guardian of a child ages 6 to 11 who lives in your household at least some days of the week?
  - Yes
  - No
  
- What is your age?
  
- You are...
  - Male
  - Female
  - Prefer not to say
  
- Where do you live?
  - England
  - Wales
  - Northern Ireland
  - Scotland
  
- What is the first part of your postcode (also known as outcode)? *For example, if your postcode is SW1A2AA, we just want the SW1A part.*
  
- What is your marital status?
  - Married
  - Cohabiting with a partner
  - Divorced
  - Widowed
  - Separated

- Single
- How many people live in your household (besides from you)? If there are persons who only live there on some days of the week, please include them in your answer.
  - Children for whom you are a parent/guardian:
  - All other persons:
- Are you the parent/guardian of children of the following ages? Only consider those who live in your household at least some days of the week. Please mark all the options that apply.
  - 6 years old
  - 7 years old
  - 8 years old
  - 9 years old
  - 10 years old
  - 11 years old

---

*Obs: For respondents who have more than one child ages 6-11, we randomly selected one of the ages.*

For the remainder of the survey, we will ask you questions about the child that is X years old that lives in your household and for whom you are the parent/guardian. If you have more than one child of this age, please select one. For the remainder of the survey, we will refer to this child.

- The child is a ....
  - Boy
  - Girl
- Does the child's other parent live in your household?
  - Yes
  - No
- What grade is the child in?

- Reception
- Year 1
- Year 2
- Year 3
- Year 4
- Year 5
- Year 6
- Not enrolled in school

- What type of school is the child enrolled in?

- State school
- Private/independent school
- Faith school
- Special education needs school

- On average, how many hours per week does the child spend doing homework, reading for school or studying outside of school hours? Please also include the time spent during the weekend. Please round up to the nearest whole number.

hours

- Of the Y hours per week the child spends doing homework/studying, how many of these hours are...

on his/her own?	<input type="text"/>	hours
with your help?	<input type="text"/>	hours
with the help of another person?	<input type="text"/>	hours

- How many students are there in the child's class?

- 10 or less
- 11 to 15
- 16 to 20
- 21 to 25

- 26 to 30
  - 31 to 35
  - More than 35
- On a typical day, how long is the child's school day? Include the time spent during break/lunch, but not the time spent on extracurricular activities.
    - Less than 5 hours
    - 5 hours
    - 5 and a half hours
    - 6 hours
    - 6 and a half hours
    - 7 hours
    - 7 and a half hours
    - 8 hours
    - 8 and a half hours
    - 9 or more hours
- How often does your child have to hand in homework for the following subjects?  
*Obs: we asked this question for the following subjects: Math, Language, Sciences, History, and Geography.*
    - Never
    - Once a month
    - Every 2 or 3 weeks
    - Every week
    - More than once a week
    - He/she doesn't have this subject
- How often is your child assessed in the following subjects? *Obs: we asked this question for the same subjects as the previous question, excluding the subjects that the student doesn't have.*
    - Never
    - Once a term
    - Once a month



- Every 2 or 3 weeks
- Every week
- More than once a week

We will now ask you a few questions about the homework activities done by the child. Please take into account homework that the child has to hand in, as well as assessments for which the child has to study at home.

- Rate the **effort put by the child's teacher(s) into preparing homework activities**, with very low effort being a situation in which the teacher takes the homework from a booklet/the internet, and very high effort being a situation in which the teacher creates a personalized activity targeted at his/her students.
  - Very low effort
  - Low effort
  - Moderate effort
  - High effort
  - Very high effort
- How engaging are the homework activities prepared by the child's teacher(s)?
  - Not engaging at all
  - Slightly engaging
  - Somewhat engaging
  - Mostly engaging
  - Very engaging
- How often do the teacher(s) check and/or correct the child's homework?
  - Never
  - Sometimes
  - About half the time
  - Most of the time
  - Always
- How useful is the feedback provided by the teacher(s) on the child's homework?

- The teacher does not provide feedback on the child’s homework
  - Not at all useful
  - Slightly useful
  - Moderately useful
  - Very useful
  - Extremely useful
- Does your child’s school currently offer the following? Select all the options that apply.
    - Extra-curricular activities such as workshops, optional sports or arts activities outside of class time (beyond gym/music/art classes)
    - Support for students with learning difficulties
    - A teaching assistant (besides from the main teacher) present in the classroom during most of the child’s lessons
- Have you had any parent meetings with the teachers and/or authorities of your child’s school in the current school year?
    - Yes, more than one
    - Yes, only one
    - No
- What is the Ofsted rating of your child’s school?
    - Outstanding
    - Good
    - Satisfactory/requires improvement
    - Inadequate
    - I don’t know
- What is your child’s academic performance? Rank your child on a scale of 1 to 100 relative to other children in the same age group. An answer of 50 means that the child has a higher academic performance than 50% of the children in his/her age group, 1 means that he/she’s the worst student and 100 that he/she’s the top student.

- Is your child's class organized in different sets for English and Math? If so, is your child in the higher set? *Obs: we asked this question separately for English and Math.*
  - He/she's in the higher set
  - He/she's not in the higher set
  - His/her class is not organized in sets
  
- Does your child have special education needs or disability (SEND)?
  - Yes
  - No
  
- Do you believe it's unimportant/important for your child's future that he/she achieves good levels of learning at this age?
  - Not at all important
  - Slightly important
  - Moderately important
  - Very important
  - Extremely important

---

In this section, we will ask you about your education and employment. As a reminder, **all of your answers on this survey are confidential and anonymous.**

- What is the highest level of education you completed?
  - No formal education
  - Primary school
  - Secondary school
  - Higher qualification below degree level
  - University
  - Postgraduate or more advanced
  
- What was your academic performance when you were studying? Ranking yourself on a scale of 1 to 100 relative to other people from your age group. An answer of 50 means that you had a higher academic performance than 50% of the people

in your age group, 1 means that you were the worst student and 100 that you were the top student.

- What grade did you achieve in your GCSE examinations in Math and English?

*Obs: we asked this question separately for English and Math.*

- A+
- A
- B
- C
- D
- E
- F
- G
- U
- I don't remember
- I didn't take the GCSE examinations

- During the last seven days, did you work? Where?

- Worked from home
- Worked away from home
- Worked partly from home and partly away from home
- I did not work

- During the last seven days, did your partner work? Where? *Obs: we only asked this question to respondents who were married or cohabiting with a partner.*

- Worked from home
- Worked away from home
- Worked partly from home and partly away from home
- My partner did not work

- During the last seven days, how many days did you work? *Obs: we only asked this question to respondents who currently work.*

- 1

- 2
- 3
- 4
- 5
- 6
- 7

- During the last seven days, how many hours did you work **per day** (on average)?  
*Obs: we only asked this question to respondents who currently work.*
- In which sector do you work? *Obs: for respondents who do not currently work but were employed at some point, we asked them this question about their last job.*
  - Agriculture forestry and fishing
  - Mining and quarrying
  - Manufacturing
  - Electricity gas steam and air conditioning supply
  - Water supply; sewerage waste management and remediation activities
  - Construction
  - Wholesale and retail trade; repair of motor vehicles and motorcycles
  - Transportation and storage
  - Accommodation and food service activities
  - Information and communication
  - Financial and insurance activities
  - Real estate activities
  - Professional scientific and technical activities
  - Administrative and support service activities
  - Public administration and defence; compulsory social security
  - Education
  - Human health and social work activities
  - Arts entertainment and recreation
  - Other service activities

- What is your annual income (before taxes)? *Obs: we only asked this question to respondents who currently work.*
  - Less than £9,600
  - Between £9,601 and £15,571
  - Between £15,572 and £20,224
  - Between £20,225 and £23,946
  - Between £23,947 and £27,756
  - Between £27,757 and £32,259
  - Between £32,260 and £37,753
  - Between £37,754 and £44,680
  - Between £44,681 and £56,981
  - More than £56,981
  
- What is the total annual income of your household (before taxes)? Take into account all sources of income (salary, pensions, etc.).
  - Less than £14,034
  - Between £14,035 and £24,882
  - Between £24,883 and £30,494
  - Between £30,495 and £36,487
  - Between £36,488 and £44,663
  - Between £44,664 and £52,514
  - Between £52,515 and £61,315
  - Between £61,316 and £71,152
  - Between £71,153 and £86,662
  - More than £86,662

---

*After the elicitation questions, we provided the following attention check question:*

- As you probably know, sometimes surveys are filled out by bots. Please excuse this simple check to make sure you are human. Choose the current year from the following options:

## Appendix B.2 Elicitation questions

Below, we provide an example of the elicitation questions shown to a respondent who reported making between £27,757 and £32,259 per year, who works 5 days per week and 8 hours per day, whose child has a class size of between 26 and 30 students, and who report that the child's teachers make low effort when preparing homework activities.

In this **last section**, we will ask you a few questions about the time you would spend helping your child with schoolwork under some hypothetical scenarios.

- You currently work 40 hours per week, and earn between £27,757 and £32,259 per year (before taxes). This means you get paid between £13.34 and £15.5 per hour. You also spend Z hours per week helping your child with his/her schoolwork.

Suppose instead that you had a job with a different hourly pay, and could choose how many hours to work. Under the following hypothetical salaries, **how many hours per week would you work (if any)? And how many hours per week would you spend helping your child with his/her schoolwork?**

	Hours per week working	Hours per week helping child with schoolwork
£12.01 per hour	<input type="text"/>	<input type="text"/>
£17.06 per hour	<input type="text"/>	<input type="text"/>

- You stated that your child's teacher(s) make Low effort when preparing homework activities. Imagine that your child's school has a new principal, and as a result the **teacher(s) change the effort they put into preparing homework activities (either increase or decrease it).**

For each of the following hypothetical scenarios, **how many hours per week would your child spend doing schoolwork on his/her own outside of school hours? And how many hours per week with your help?** Assume everything else about the school remains the same. (Reminder: your child currently spends H hours per week doing school work on his/her own, and Z hours per week doing schoolwork with your help)

	Schoolwork <b>on his/her own</b> (hours per week)	Schoolwork <b>with your help</b> (hours per week)
Very low effort	<input type="text"/>	<input type="text"/>
Moderate effort	<input type="text"/>	<input type="text"/>

- There are currently between 26 and 30 students in your child’s class. Imagine that your child’s school has a new principal, and as a result there is a **change in the number of students per class (either increases or decreases)**.

For each of the following hypothetical scenarios, **how many hours per week would your child spend doing schoolwork on his/her own outside of school hours? And how many hours per week with your help?** Assume everything else about the school remains the same. (Reminder: your child currently spends H hours per week doing school work on his/her own, and Z hours per week doing schoolwork with your help)

	Schoolwork <b>on his/her own</b> (hours per week)	Schoolwork <b>with your help</b> (hours per week)
21 to 25 students	<input type="text"/>	<input type="text"/>
31 to 35 students	<input type="text"/>	<input type="text"/>