Incentives to Teach Badly: After-School Tutoring in Developing Countries*

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Abstract

Schools in developing countries frequently offer for-profit tutoring to their own students. This potentially gives teachers a perverse incentive to teach less during school to increase demand for their tutoring. Through this mechanism, the market for tutoring can adversely affect how much students learn, particularly those who do not participate in tutoring. I model and present empirical evidence on these effects, using survey and test score data from Nepal. I find that when schools offer for-profit tutoring, teachers teach less during the regular school day. I also find that, as a consequence, performance on the national secondary-school exam suffers among students with a low propensity to enroll in tutoring. Discouraging teachers from tutoring their own students or reducing entry barriers for third-party tutors could increase student achievement.

JEL codes: O12, O15, I20, J45

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1 Introduction

Many students in developing countries receive tutoring in addition to their regular school instruction. In Bangladesh, over 40 percent of primary school students attend tutoring sessions; in Kenya, the figure is 65 percent (Bray, 2005). In Egypt, 54 percent of fifth graders and 74 percent of eighth graders receive tutoring (Fergany, 1995). In Sri Lanka, 80 percent of sixth graders and 75 percent of eleventh graders do so (Bray, 2007). Among the Nepali secondary school students studied in this paper, over 50 percent take tutoring classes.

One likely reason for the prevalence of tutoring in developing countries (as well as developed countries in East Asia) is that there are high-stakes end-of-year exams that determine whether a student can continue her studies and the caliber of school she can attend. In addition, because parents in developing countries are less educated on average, they may be less able to help their children with homework and need to rely on outside tutoring instead.

A first-blush view of tutoring is that it will increase student achievement and welfare. Its popularity suggests that the demand for education is not being adequately met by government schools, and extra services like tutoring allow for greater choice and efficiency in the market for education. Analogous to the case of private schools, this efficiency might come at the cost of equity if poorer families are less likely to take up tutoring, but is also possible that tutoring is most helpful for the weakest students, enabling them to catch up to their peers.

However, it is far from clear that tutoring as currently configured increases efficiency in the educational system. One key feature of tutoring in developing countries motivates this paper: The student's own teacher often serves as the tutor. Tutoring is usually done in groups rather than one-on-one, and schools usually are the ones offering the tutoring. Classes are held on campus after the regular school day, and fees are charged. If not the student's own teacher, then another teacher in her school typically leads the after-school tutoring.

Why is tutoring by the student's regular teacher the norm in poor countries but uncommon in rich countries? First, there may be a smaller supply of educated non-teachers who can serve as tutors in developing countries. Second, teachers may have a stronger desire to supplement their regular salary because they are poorer. Third, less monitoring of teachers by supervisors and parents might result in more scope for rent-seeking by teachers, which in turn would increase their interest in providing tutoring. Fourth, banning tutoring by teachers, which rich countries such as Singapore have done, might be less feasible in poor countries, perhaps because of stronger political clout of government teachers or the inability to enforce regulation.[1] Fifth, governments sometimes view tutoring as a way to boost the income of

[1]After-school tutoring is prevalent in East Asia, and while there is debate about the pressure on young

teachers. In fact, a few countries have banned *other* tutors and granted government teachers the exclusive right to offer tutoring for this reason.[2]

Regardless of the explanation, the fact that the child's schoolteacher is very often the one providing the tutoring creates a potential distortion in teacher incentives. Anecdotal evidence suggests that teachers sometimes refrain from teaching some of the curriculum during school in order to generate demand for their fee-generating tutoring classes. Teachers say, in not so many words or sometimes even explicitly, "You need to know X, Y, and Z to pass the exam. We'll cover X and Y in class. If you want to learn Z, come to tutoring." When the teacher intentionally teaches less during school, all students are made worse off, and the students whose academic achievement suffers most are those who cannot afford (or otherwise do not demand) tutoring. As a result, rather than making the education sector more efficient, the market for tutoring might create inefficiencies. In such a setting, a ban on tutoring one's own students or policies that reduce entry barriers for third-party tutors could be welfare-enhancing for students, even those who never take tutoring.[3]

The anecdotal evidence suggests that teachers' incentives are worse rather than better when they offer for-profit tutoring. I show that in the context I study empirically, this is indeed the case. However, it is important to note that the incentive effect theoretically could go either way. If school instruction and tutoring are substitutes, then teachers who teach less during the school day are rewarded with higher tutoring profits. But, conversely, if the demand for tutoring is higher when students learn *more* during the regular school day, then being able to offer tutoring could give teachers the incentive to do a better job during the regular school day. Tutoring and regular school instruction could be complementary, for example, if students face a high-stakes pass-or-fail exam and unless the regular school instruction is better than normal, then even with tutoring, students could not pass the exam. Alternatively, teachers might have an incentive to improve their teaching style, as opposed to the amount they teach, in order to attract tutoring clients. In this scenario, allowing teachers to offer tutoring could improve the quality of schooling.

children and the inequality of opportunities, distortions in teachers' incentives are not seen as a major problem. The bans on tutoring by teachers in Singapore and Hong Kong are apparently effective, which is consistent with the higher opportunity cost of teachers' time and better enforcement (Bray, 2003, 2005). In contrast, policy makers and newspaper editorials in developing countries often call for a ban on tutoring, but most initiatives have either not come to fruition or have been ineffective (Foondun, 2002).

[2]For example, the government of Zanzibar allows schoolteachers to tutor and has banned private tutors for the express purpose of raising teachers' incomes.

[3]There is anecdotal evidence that teachers also sometimes coerce students to take their tutoring classes by threatening to fail them on exams or otherwise punish them. A previous version of this paper modeled this effect as well, but as the predictions are not testable with the data set I use, I have excluded discussion of this quid-pro-quo effect.

This paper models teacher incentives and student achievement in the presence of school-provided tutoring. It then uses survey and test score data from secondary-school students in Nepal to empirically assess the effects of tutoring. As a preliminary step, I first show that tutoring and school instruction are substitutes in this setting. I then examine the effects of school-provided tutoring on teachers' choices during the school day—specifically, the amount they teach in class. The outcome measures are students' assessments of teacher performance. For example, students are asked whether their teacher typically teaches for the entire class period. I find that offering tutoring classes causes teachers to teach for less time. Through various specification tests, I am able to rule out several alternative explanations of the results. Teachers appear to be distorting their effort in order to generate demand for tutoring classes.

The identification strategy uses variation across subjects (math, science, and English) within a school as well as a comparison between government and private schools. The scope for downgrading teaching is likely more limited in private schools, where parental monitoring is typically stronger. In addition, the school's incentive to compromise the quality of its regular school instruction is weaker in private schools: They charge tuition fees for regular school instruction so would be penalized financially if they downgraded it. Thus, I test for incentive effects of tutoring in government schools, using private schools as a comparison group.

I also use the same difference-in-differences approach to examine the consequences of teachers' actions for student achievement. The outcome measure is whether the student passes the national exams taken at the end of secondary school. The analysis measures the externality of tutoring, or the effect of the school *offering* tutoring, rather than the individual-level effect of *taking* tutoring. I find evidence that tutoring has a negative effect on exam performance, particularly for those students with a low propensity to participate in tutoring (who, in this setting, are the poorer children). The exam results are consistent with the classroom-teaching effects whereby serving as tutors for their students gives teachers perverse incentives to teach less material in school.

This paper is related to the literature on quality of education in developing countries, in which an emerging theme is that low teacher effort is a central problem. For example, Chaudhury et al. (2006) and Duflo, Hanna, and Ryan (forthcoming) have highlighted teacher absenteeism. Other research has examined whether explicit performance incentives for teachers improve student achievement (Lavy, 2002; Glewwe, Ilias, and Kremer, 2010; Muralidharan and Sundararaman, 2011; Duflo, Hanna, and Ryan, forthcoming). The paper is also related to work on red tape and corruption; a teacher lowering the amount taught

during class in order to boost tutoring profits is analogous to a bureaucrat creating inefficient obstacles so that he can extract bribes (Banerjee, 1997). Finally, there is a growing literature on tutoring in developing countries. Previous work examines the prevalence and reasons for tutoring (Foondun, 2002; Bray, 2005); the adverse consequences of it (Biswal, 1999; Bray, 2003); and its effectiveness at improving student achievement (Ha and Harpham, 2005; Dang, 2007).

The remainder of the paper is organized as follows. Section 2 presents the model. Section 3 provides background on education in Nepal, describes the data, and presents descriptive statistics. Section 4 describes the empirical strategy used to estimate the effects of school-provided tutoring. Section 5 presents the empirical results. Section 6 concludes.

2 Model

Consider a model with two types of agents, households and a government schoolteacher. There is one teacher and a population of households indexed by i. Each household has one child, and a household's utility is increasing in consumption and the child's academic achievement. While the household cannot directly choose the child's achievement, denoted by s, it can spend money on tutoring t which raises s.

The teacher provides the regular school-day instruction to the children and also offers for-profit tutoring. The teacher decides how much material to teach during the regular school day, denoted m, where $m \geq 0$. The teacher also chooses the price p of tutoring. The regular school day is free.

Note that I refer to this agent as the teacher, but the terminology is shorthand for the teacher and the school jointly making decisions. I treat the teacher and school's interests as aligned, an assumption that seems to hold in the setting I examine empirically.[4] Modeling a principal-agent problem between the school and the teacher in cases where they have unaligned interests is beyond the scope of this paper.

Student achievement $s(m, t)$ is an increasing function of the amount of material taught during school and the amount of tutoring. Depending on the shape of the function $s()$, tutoring could improve achievement more when *less* material is taught during the regular school day ($s_{mt} < 0$), or when *more* material is taught ($s_{mt} > 0$). (The notation s_{mt} denotes $\partial^2 s / \partial m \partial t$.) Suppose $s_{mt} < 0$, or tutoring and school are substitutes (which is the case in the empirical application). If there is more benefit from being tutored when you have learned

[4] A teacher's income from tutoring is often a salary rather than a piece rate per student, in which case the school is the residual claimant on tutoring revenues. In addition, the head teacher (principal) often teaches regular school classes and tutoring classes in addition to his administrative duties.

less material in regular class, then t is more valuable when m is lower. An implication is that a teacher can raise demand for tutoring by teaching less during the school day. A teacher might lower m by skipping certain modules of the curriculum during the school day and then teaching those modules in the tutoring sessions.

Suppose instead that tutoring and school instruction are complements ($s_{mt} > 0$). This assumption might hold if students absorb material best when it is presented to them twice; the more material the teacher covers in school, the more he can reinforce in tutoring. Or, it might apply if there is is a threshold test score that students are aiming for, e.g., the score needed to obtain admission at a prestigious school for the next year. For someone just shy of the threshold, there are convex returns to acquiring more knowledge.[5] Tutoring then would have opposite effects: It would lead teachers to teach more than they otherwise would.

The cost of supplying tutoring is the opportunity cost of the teacher's time. I denote the total demand for teacher-provided tutoring as $T(p, m)$. In practice, tutoring might be less valuable to students as class size grows or the teacher may get disutility from teaching a larger class, but I abstract from these considerations since they do not change the basic results that are of interest; I assume that neither the costs of providing tutoring nor the value to students depend on total demand.

The teacher's objective function depends on profits from tutoring, effort costs of teaching, and penalties for teaching too little during the school day. I make the simplifying assumptions that the teacher's utility is additively separable between profits and other terms, and that profits enter linearly. One can write the teacher's objective function as:

$$V(p, m) = \begin{cases} p \cdot T(p, m) + \phi(m) & \text{if} \quad T > 0 \\ \phi(m) + W & \text{if} \quad T = 0 \end{cases}$$

W is the value of the time that would be spent supplying tutoring. The term $\phi(m)$ encompasses both effort costs that increase in m and penalties or psychic costs that decrease in m. For example, if the teacher teaches next to nothing (low m), parents might complain and he could be demoted. I assume that $\phi'(m) \to \infty$ as $m \to 0$ and $\phi'(m) \to -\infty$ as $m \to \infty$, which ensures an interior solution or that $\phi(m)$ is maximized at some intermediate value of m.

The teacher's decision problem differs from the standard monopolist's problem in that the seller (teacher) has an additional way to raise demand besides by lowering prices: He can

[5]Note that s is expressed in terms of utility. Acquiring more knowledge could have non-linear returns to s near such a threshold while having linear returns to, say, test scores.

lower (raise) m if m and t are substitutes (complements) in the household's utility function. In addition, the teacher's maximand has other considerations besides profits. His utility also depends on m not just through its effects on profits, and he may face a tradeoff between higher profits induced by changing m and effort costs or penalties from changing m.

A household receives utility $u = s(m,t) + v(c)$ where $v''(c) < 0$. Households vary in their income y, and a household spends its income net of tutoring expenses on the consumption good c. Tutoring is a discrete good; household i chooses $t_i \in \{0,1\}$. Thus, total demand for teacher-provided tutoring is $T = \sum_i t_i$. A higher-income household will have a higher willingness to pay for tutoring because of the diminishing marginal utility of the consumption good. (It is not essential that income is the dimension along which households differ; households could instead vary in how much they value their child's education s, for example.)

The teacher's problem is to choose p and m:

$$\max_{p,m \geq 0} \; p \cdot T(p,m) + \phi(m), \tag{2.1}$$

where I have focused on the interior solution where tutoring is offered.

The choice variable of interest is m, so it is convenient to abstract from the choice of p. As long as households' demand for tutoring is weakly decreasing in price, there is a well-defined $p^*(m)$. (Note that this setup generalizes beyond the teacher setting a uniform price; it also encompasses price discrimination whereby $p^*(m)$ is a vector defined over each household i.) By substituting in $p^*(m)$, one can express the teacher's revenue from tutoring as a function of m, which I denote $R_t(m)$. Thus, the teacher's problem can also be written as follows:

$$\max_{m \geq 0} \; R_t(m) + \phi(m), \tag{2.2}$$

$R_t(m)$ is decreasing in m if $s_{mt} < 0$ (substitutes case) since household utility and therefore willingness to pay for tutoring is decreasing in m. Conversely, $R_t(m)$ is increasing in m if $s_{mt} > 0$ (complements case).

Results

To compare outcomes when teachers do offer tutoring and when they do not, consider a policy that bans tutoring by teachers. Equivalently, the result can be thought of as a comparison of when the teacher's opportunity cost is high versus low.

Proposition 1. *If tutoring and school instruction are substitutes (complements) in the household's utility, then the amount taught during the school day will be lower (higher) when*

teachers are allowed to offer for-profit tutoring to their students compared to when they are banned from doing so (or they opt not to because of high opportunity costs).

Proof. Let the parameter λ equal 1 if tutoring is permitted and 0 if it is banned. Then the teacher's problem is:

$$\max_{m \geq 0} \ \lambda R_t(m) + \phi(m), \tag{2.3}$$

and we are interested in how m^* differs between the case with tutoring ($\lambda = 1$) and the case without tutoring ($\lambda = 0$). Alternatively, $\lambda = 1$ could correspond to the opportunity cost of tutoring $W = 0$, and $\lambda = 0$ to $W \to \infty$.

The derivative with respect to λ of the maximand in (2.3) is $R_t(m)$. When $s_{mt} < 0$ (substitutes case), $R_t(m)$ is decreasing in m, and therefore the maximand has increasing differences (is supermodular) in $(-m, \lambda)$. By Topkis's theorem, m^* is decreasing in λ, or a ban on tutoring increases m^*. Conversely, if $s_{mt} > 0$ (complements case), then maximand has increasing differences in (m, λ) and a ban on tutoring decreases m^*. ∎

If tutoring is more valuable when m is lower, then teachers will withhold material during the school day to generate demand for tutoring.[6] If, instead, increasing m raises the demand for tutoring, then tutoring will have the opposite effect on m.[7] For the remainder of this section, for brevity I focus on the (empirically relevant) case where school instruction and tutoring are substitutes, or $s_{mt} < 0$ and tutoring lowers m.

The teacher's problem is closely related to second-degree price discrimination by a monopolist. The monopolist will offer a lower value product (bundle of m and no tutoring) to the low-demand consumers in order to induce the high-demand consumers to choose the higher value product (bundle of m and tutoring). A way in which this problem differs from the standard price discrimination problem is that there is a constraint on the gap between the value of the high-value bundle, $s(m, 1)$, and the low-value bundle, $s(m, 0)$. In setting the two bundles, the monopolist has only one degree of freedom rather than two. This is due to classroom instruction being a public good: The teacher teaches all students together during

[6] An alternative reason that the amount taught might increase if teachers cannot moonlight is that they might be less tired during the school day. In other words, tutoring might reduce m not because it is a choice variable of a teacher but because m mechanically decreases when he is working more hours. Note that this mechanism would reduce m regardless of whether tutoring and regular school are substitutes or complements. Many of the same welfare implications as strategic downgrading of m would apply; teachers' moonlighting would still lower student achievement. One different implication is that it would be immaterial whether the teacher was teaching specifically his own students.

[7] The model assumes that the function s is identical across households. If for some households m and t are complements and for other households they are substitutes, then what is relevant for the equilibrium effect on m is the shape of s for the marginal tutoring customers.

the school day and cannot give some students a different level of m than others.[8]

One implication is that "efficiency at the top" does not hold. Efficiency at the top here would mean that the high-value bundle is set at $s = s(m_0, 1)$, since the marginal cost of providing tutoring is zero (m_0 is the level of m when tutoring is banned). However, providing $s = s(m_0, 1)$ implies that the lower-value bundle is $s = s(m_0, 0)$, and at a given price p, there will be some individuals for whom choosing the high-value bundle is not incentive compatible but who would choose the high-value bundle at $m = m^* < m_0$. Providing more teaching to the high types by raising m weakens their incentives to choose the high bundle.

In addition, the price charged for the low-demand customers is fixed at zero. There is no fee for government schooling. Since the monopolist cannot extract rents from the low-demand types, he has no incentive to improve their bundle (raise m) in exchange for charging a higher price to them. Only the cost of providing very low m (represented by $\phi(m)$) prevents the monopolist from offering the lowest possible amount of instruction to them.

The next result describes the effects on student achievement and welfare when the teacher offers tutoring.

Proposition 2. *If tutoring and school instruction are substitutes in the household's utility, then a ban on teachers offering for-profit tutoring to their own students would*

1. *Increase student achievement and welfare for households that do not take up tutoring when it is offered.*

2. *Have an ambiguous effect on student achievement and welfare for households who take up tutoring when it is offered.*

Proof. 1. This result follows from the increase in m shown in Proposition 1 and the fact that utility is increasing in s, and s is increasing in m. The ban does not affect c or t for this group.

2. Since $m_0 > m_1$, $s(m_0, 0)$ can be larger or smaller than $s(m_1, 1)$, where m_0 is the level of m under a ban and m_1 is the level without the ban. If $s(m_0, 0) > s(m_1, 1)$, then the ban will increase achievement of this group and raise welfare since c also increases. If $s(m_0, 0) < s(m_1, 1)$ then a ban will decrease student achievement. Welfare could increase or decrease depending on whether the value of this achievement decline is larger or smaller than the utility gained from additional consumption, since c increases.

■

[8]The teacher could give more attention to some students during school, but the scope for teaching students different amounts is limited, especially when the class size is large.

I do not model entry and exit into the teaching profession. If a ban on tutoring lowers the effective wage for schoolteachers, then another potential welfare effect, detrimental to households, is that fewer or lower quality individuals would enter the teaching profession. In addition, even without effects on entry or exit, a full welfare calculation would want to allow for the possibility that the marginal utility of income could be higher for teachers than for households. If there were no other way to transfer money from wealthier households to the teacher (for example, if raising taxes and using the money to raise teacher salaries is too costly), then tutoring might be a second-best way to make redistributive transfers from households to teachers.

Comparison of government schools and private schools

Thus far, I have considered government schools. Private schools differ in that the amount taught by the teachers is monitored more closely, which constrains teachers' ability to downgrade their teaching. First, the parents of private-school students are more educated on average and, by revealed preference, value education more, so they have both a greater ability and a stronger desire to monitor the teacher's activities. Second, private schools can charge for the school day, and because households' willingness to pay for regular schooling is increasing in m, private schools incur a loss to school fees revenue if they downgrade m. This gives the owner of the school an incentive to monitor the teachers and principal and ensure that m is sufficiently high.

As a simple way to model private schools, I assume that teachers have a contract in which they are fired if they do not teach at least some amount M. The school administrators or parents can monitor and enforce this teaching level, and teaching M gives the teacher higher utility than his outside option.

Proposition 3. *If tutoring and school instruction are substitutes, then the decline in the amount taught during the school day caused by offering for-profit tutoring will be smaller in private schools than in government schools.*

Proof. The private school teacher's maximization can be thought of as similar to the government school teacher's but with a constraint that $m \geq M$. Assume that the constraint is binding for the case without tutoring ($\lambda = 0$), or $M > m_0$. It follows that the constraint is also binding with $m^* = M$ when $\lambda = 1$. The presence of tutoring does not affect the amount taught in private schools. In contrast, Proposition 1 shows that in government schools, the presence of tutoring causes m^* to decline when tutoring and school instruction are substitutes. ■

This result follows closely from the way private schools are modeled. The purpose of laying out the assumptions about how government and private schools differ and drawing out the implications for the amount taught in school is that this forms the basis of the identification strategy I use to estimate the incentive effects of school-offered tutoring. I compare government schools to private schools and test the hypothesis that school-tutoring leads to a relatively larger decline in the amount taught during school in government schools.

Competition from third-party tutors

In addition to a ban on school-provided tutoring, another potential policy is to reduce barriers to entry for third-party tutors. In Appendix 1, I introduce to the model a third-party tutor. Here I give an overview of this extension.

The third-party tutor does not teach students during the regular school day, but just offers after-school tutoring. She offers a higher-valued tutoring service than the teacher, that is, one that raises s by more. In practice, outside tutoring is often in smaller groups, which may lead to higher quality.

Competition alters the teacher's behavior. If a teacher downgrades the regular school day, he will increase total demand for tutoring, but will also drive a greater proportion of tutoring customers away from teacher-provided tutoring toward third-party tutoring. Thus, competition dampens the downgrading of regular school induced by school-provided tutoring.

Proposition 4. *If tutoring and school instruction are substitutes, competition from third-party tutors raises the amount taught during school relative to when the schoolteacher has a monopoly on tutoring.*

Proof. See Appendix 1. ■

Competition will lead to higher quality (and lower prices) which is welfare improving for households, for the case where tutoring and school instruction are substitutes. For those who consume tutoring, competition adds choice and lowers prices. More households consume tutoring, and those who consume tutoring enjoy more consumer surplus from it. In addition, everyone—both those who do and do not consume tutoring—enjoys the benefit that teachers will not downgrade the school-day instruction as much.

The intuition for the result is that teachers have less incentive to manipulate m when only some of those who are induced by lower m to purchase more tutoring will purchase tutoring from *them*. Third-party tutoring becomes relatively more valuable when m is lower, given the assumption that $s_{mt} < 0$. Therefore, teachers will drive some of their customers

away to third-party tutoring by lowering m. Thus, even a student who has no willingness to pay for tutoring (e.g., $y_i = 0$) benefits from competition in the tutoring market because of the externality that the demand for tutoring has on quality of instruction during the regular school day.[9]

3 Background and Data

Background on education in Nepal

The setting in which I test the model is Nepal. Education in Nepal is divided into primary school (grades 1 to 5), lower secondary school (grades 6 to 8) and secondary school (grades 9 to 10). About 50 percent of children complete primary school, and of these, about two thirds continue through the end of secondary school. At the end of grade 10, students sit a national School Leaving Certificate (SLC) exam. The certificate is the analogue of a high school diploma in the United States, both a terminal credential with value in the labor market and a prerequisite for continuing one's education.[10]

There were 3,850 government secondary schools and 890 private secondary schools in Nepal in 2004 (the year the data were collected). Of the 511,000 secondary school students that year, 79,000, or 15 percent, attended private schools. In the sample I use, median annual fees in private schools were 7,960 rupees. Per capita gross domestic product (GDP) was 20,800 rupees in 2004, so private-school fees were about 40 percent of per capita GDP. (The 2004 exchange rate was 76 Rupees per US dollar.) Median government school fees (administrative fees, since tuition is free) were 640 rupees.

This paper focuses on students who have recently completed grade 10 and sat the national SLC exam. Students sit the national exam at exam centers around the country over a ten-day period each March. The exam is scored on an absolute scale and measures "the extent to which she has acquired the knowledge and skills prescribed by the curriculum," (Bhatta, 2005, page 19). Each student takes tests in several subjects: math, science, English, Nepali, social studies, and HPE (health, population and environment), as well as two optional subjects. Students receive a numerical score and pass or fail status for each subject. To pass the overall exam, a student must pass the exam in every subject. In addition, the scores are added together across subjects, and the student's total score must be sufficiently high. In

[9] Another possible effect arises if the teacher's utility depends on student achievement. There could be a free-riding effect, and the existence of tutoring exclusively provided by others might lower teacher effort.

[10] Grades 11 and 12, which previously were part of the university system, are now called higher secondary school, and are outside of the Ministry of Education's system of government education. After grade 12, students attend university.

2004, 175,000 students took the exam and 46 percent passed (Government of Nepal, 2005).

Largely because of the importance of the SLC exam, tutoring is common in secondary school. By far the most typical format is group classes offered in the afternoon or evening by the school. The school's regular teachers teach these after-school tutoring sessions. There are also some group classes organized by outside agencies, and students can also get private tutoring, either one-on-one or few-on-one. (These correspond to the third-party tutoring described in the model.) Tutoring is most common in math, science, and English. These are the subjects with the most challenging SLC exams, as measured by low pass rates.

Overview of the data set

The data I use are from a large nationwide survey of students, schools, teachers, and families conducted in Nepal in late 2004 and early 2005. The survey was commissioned by the Ministry of Education to assess student- and school-level determinants of success on the SLC exam. The sample frame is students who were in grade 10 and took the exam in 2002, 2003, or 2004 (the years 2058, 2059, and 2060 in the Nepali calendar). Because the data on whether the school offers tutoring are only collected for 2004, I restrict the sample to this cohort, which comprises 50 percent of the survey's total sample.

Using stratified random sampling, 28 districts and then 450 schools within these districts were selected to be surveyed. The sample was stratified on geographic zones (that vary in terrain and level of development) and the school's government-or-private status. The survey set out to interview 11,250 students in the 2004 cohort. In 2004 about 16,400 students from the sampled schools took the exam, so within the schools, a high proportion of students, roughly 70 percent, were sampled. The sampling strategy is described in detail by Bhatta (2005).

I use the data collected from the school and from students. The school questionnaire asked the head teacher about demographics of the school and also whether the school offered tutoring in each of math, science, English and Nepali (as well as several other questions not relevant to this study). The student questionnaire asked the student whether she took tutoring in each subject and who provided the tutoring.[11] Students were also asked for their

[11]There are some inconsistencies between the school data and student data. To reconcile them, if the proportion of students reporting that they took tutoring organized by the school is above the median proportion reported in schools that do say they offer tutoring (which is 60 percent) yet the school says they do not offer tutoring in that subject, I reclassify that case as the school offering tutoring. Similarly, if the proportion of students reporting that they took tutoring is below the median reported in schools that say they do not offer tutoring (which is 4 percent), I reclassify the school as not offering tutoring. Because there may be some stigma attached to offering tutoring, misreporting by schools seems likely to mainly be in the direction of not reporting tutoring. This procedure results in more overrides of the school reporting not offering tutoring (6 percent of cases) than the opposite (2 percent of cases). Using this adjusted value for

subjective assessments of their teachers in each subject and about the socioeconomic status of their family. In addition, I use SLC test score data for the student that the survey team collected from the school records. The teacher questionnaire, unfortunately, is of limited use since few of the teachers were surveyed. I also do not use the family questionnaire since only a quarter of students' families were sampled.

The data set includes 294 government schools with 7,659 students and 106 private schools with 1,891 students. The sample excludes surveyed schools for which the student and school data cannot be matched or the school cannot be classified as government or private. In addition, student-level observations are dropped if any of the main outcome or explanatory variables (whether the school offers tutoring, SLC exam performance, assessment of the teacher) are missing for any subject, resulting in a balanced panel.

Descriptive statistics by subject

Table 1 presents descriptive statistics by subject. The first row shows how often tutoring is offered by the school. Each observation (student) is weighted equally, so, for example, for 70 percent of the sample of students, the school offers math tutoring. For science, the number is 63 percent; for English, it is 59 percent. Note that the school questionnaire also asked about tutoring in a fourth subject, Nepali. I exclude Nepali tutoring from the analysis since it is significantly different from math, science, and English tutoring. First, Nepali tutoring is offered only 14 percent of the time, a much lower rate than the 60 to 70 percent rate for math, science, and English. Second, in contrast to the other subjects, government schools are much less likely to offer Nepali tutoring than private schools. This pattern is likely due the fact that private schools are often English-medium, so students need to improve their Nepali more.[12] The analysis focuses on math, science, and English. The proportion of students passing the exam in each subject is between 66 and 82 percent.

The student questionnaire asked the student to rate each teacher on several dimensions. These subjective assessments are what enable me to examine whether the teacher taught less in class when the school offered tutoring in his subject.[13] The first question is whether

whether the school offers tutoring, I then define all students as not taking tutoring from the school if the school is not offering it. As shown in an appendix table, the results are robust to an alternative method of reconciling the inconsistencies in which if more than 20 percent of students report taking tutoring organized by the school, I consider the school as offering tutoring, and if none do, I consider the school as not offering tutoring.

[12]This fact suggests that tutoring falls into the substitutes case described in the model, aimed at fixing weaknesses rather than building on strengths.

[13]There are no data on which teacher teaches the tutoring classes, so I cannot know if the student's own teacher taught the tutoring classes. In larger schools, there may be more than one, say, math teacher. The analysis pools students to the school-subject level.

the teacher taught for the entire class period. This question is close to an ideal outcome because it captures the quantity taught. Whether or not the teacher uses the allotted time in class is his choice. Also, teachers have less of an incentive to reduce the *quality* of their teaching (for example, their clarity or knowledgeability) because students may be less likely to take tutoring from an unclear or unknowledgeable teacher if they infer that these are his fixed traits. The question was asked on a 4-point scale and because the scale has no natural cardinal interpretation, I construct a dummy variable for whether the answer was a 3 or 4, or whether the teacher taught for the entire period "over half the time" or "almost always," rather than "never" or "only sometimes." The mean is 0.82.

The second measure of the amount taught in class is a yes-no question asking whether the teacher completed the curriculum required for the SLC exam (mean of 0.64). The interpretation of this question is a bit less straightforward; on the one hand, it captures a teacher intentionally not completing the curriculum, but on the other hand, the student's answer may not isolate whether *during regular school*, the teacher completed the curriculum; the teacher may have finished the syllabus because some modules were covered in after-school tutoring.

I use four other variables to test alternative hypotheses. These were also asked on 4-point scales, and I convert the answers to a dummy for whether one of the highest two scores was given. I use two subjective assessments of the quality of teaching, as opposed to the quantity taught. The first asks whether the teacher has good command of the subject matter and the second asks whether his teaching style is clear and understandable. In addition, I use two subjective measures of the teacher's time and effort outside the classroom: whether the teacher is well prepared for class and whether he is available outside of class. I use these variables to probe an alternative interpretation that moonlighting as a tutor takes away teachers' time from class preparation and that while teaching less in class is indeed an effect of offering tutoring, it is not a strategic choice.

The last rows of the table show variable means conditional on the school offering tutoring. The unconditional mean of the private school dummy is 0.20, so private schools are as likely to offer math and science tutoring as government schools and less likely to offer English tutoring.

Descriptive statistics for government versus private schools

As described in the next section, the identification strategy compares government and private schools. Table 2 shows the descriptive statistics separately by school type. Government schools offer tutoring 66 percent of the time, and private schools 58 percent of the time, with

the take-up rate somewhat higher in government schools. Not surprisingly, private-school students perform better on the SLC exam, and students in private schools generally give higher ratings to their teachers.

Private and government schools of course differ in several ways, not just the fact that private schools charge tuition for the regular school day so face greater repercussions if they intentionally degrade their regular teaching. To make the two groups more comparable, I adjust for the propensity score for being a government school. I estimate a probit model, reported in Appendix Table 1, in which the dependent variable is a binary variable that equals 1 for government schools and 0 for private schools and the independent variables are average student- and school-level characteristics. The regression analysis conditions on the propensity score (i.e., predicted value from the probit model) and makes comparisons between government and private schools that are similar on observables. Appendix Figure 1 depicts the distribution of the propensity score for government and private schools. The mean propensity score is 0.84 for government schools and 0.28 for private schools. In robustness checks, I also show the results without any propensity-score adjustment, when schools in the tails of the propensity-score distribution are excluded, and with propensity-score weighting.

A final helpful background fact is how much tutoring costs. While the survey did not collect reliable data on tutoring fees, there is a question on total tutoring fees per month. The median tutoring fees, conditional on taking tutoring in at least one of the three subjects, is 300 Nepali rupees (measured in 2004 terms) per month for government schools and 400 rupees for private schools. These statistics are shown in Appendix Table 2. GDP per capita in 2004 was 20,800 rupees per year, or 1,735 per month, so tutoring expenses were about 15 to 20 percent of GDP per capita. Unfortunately, the survey lacks good household income or expenditure data to measure tutoring expenses as a proportion of total spending at the household level. Appendix Table 2 also presents additional summary statistics about tutoring by subject and type of school, as well as for test scores on the grade 9 exam, data that I use to assess selection into tutoring but which were collected for only a subset of the sample.

4 Empirical strategy

This section lays out the empirical strategy used to test for the effects of school-provided tutoring on teacher effort during the regular school day and, in turn, the effects on student achievement. I use student ratings of their teachers' effort during the school day to examine how teachers' regular job performance is affected when they offer tutoring. I then examine student achievement using performance on the national secondary exam as an outcome. Note

that I am considering the teacher and the school as jointly making decisions, with aligned interests (at least in government schools). In practice, the teachers and the school usually share the profits from tutoring. Thus, I use the language that "the teacher" or "the school" offers tutoring interchangeably.

Selection into offering tutoring

The first step in the empirical analysis is to assess whether tutoring and regular school are substitutes or complements. To do so, I examine whether selection into offering tutoring based on student ability is negative or positive. Negative selection would suggest that tutoring and school instruction are substitutes: If tutoring is remedial, as evidenced by its being offered when initial student achievement is lower, then it is likely more valuable when less is taught in school and the gaps in students' knowledge need to be filled.[14] The purpose of assessing selection into offering tutoring (*Offers*), thus, is to determine the direction of teacher incentives, and whether spillovers in the classroom should be negative or positive.

I estimate the following equation where *Offers* is the outcome, and the independent variable is a measure of the student's earlier exam score.

$$Offers_{jk} = \pi \cdot PriorExamScore_{ijk} + \eta_i + \rho_k + \epsilon_{ijk} \tag{4.1}$$

The subscript i denotes the student, j denotes the school and k is the subject (such as math or English). The equation includes student fixed effects (η_i) and subject fixed effects (ρ_k). The unit of observation at which tutoring is or is not offered is a subject within a school. Standard errors are clustered at the school level.

If $\pi < 0$, then selection into tutoring is negative, and the hypothesis is that teachers and schools have an incentive to downgrade regular school instruction. The data I have to test for selection, test scores from grade 9, are not perfect, but they provide some evidence on this question. A first limitation is that the data are collected for only a small subset of the sample, since few schools kept these records, and the subsample is non-random. Whether the student passed the exam is available more often then the numerical exam score. Second, the exam is not a national exam, but is specific to a school. I normalize the test scores within a school to make them more comparable across schools; the test scores have a mean of 0 and a

[14]This step can be understood as a modification of the model in which student achievement is a function of not just what is taught in school and tutoring, but also the student's initial knowledge k_0. Student achievement is $s(k,t)$, where knowledge acquired outside of tutoring, k, is increasing in both m and k_0. Thus, if tutoring is more valuable when students have less initial knowledge, then tutoring is in general remedial and will also be more valuable when less is taught in school. By determining the sign of $s_{k_0 t}$, one has signed s_{mt}. I will sign $s_{k_0 t}$ by examining whether schools are more likely to offer tutoring when students are academically weaker or stronger.

standard deviation of 1 for each school-subject. With these caveats in mind, the results are shown in the first two columns of Table 3. Using both the grade 9 test score and whether the student passed the grade 9 test, I find negative coefficients on *Offers*. The coefficient is marginally significant using pass-fail status as the independent variable and statistically significant at the 5 percent level using the exam score. This evidence suggests that tutoring is remedial and that is it more valuable to students when their knowledge level is lower.

The identification strategy compares government and private schools, and given that tutoring appears more valuable when students are less advanced, the prediction is that there should be more negative effects of tutoring in government schools, where schools and teachers face fewer costs if they downgrade their teaching. It is therefore important to assess whether there is any differential selection into offering tutoring in government schools. If tutoring were a stronger substitute with regular school in government schools, then we might see larger negative "effects" of tutoring in government schools, as predicted, but it would be due to selection bias. Columns 3 and 4 of Table 3 examine how selection varies by school type by including the interaction of the past test score with $GovtSch$, an indicator for being a government school. The interaction term is positive and significant, suggesting more positive selection into offering tutoring in government schools. In private schools, tutoring is more targeted toward subjects where students are weaker. In short, to the extent that there is differential selection into tutoring between government and private schools, it biases the analysis *against* finding more negative effects of tutoring in government schools.

Based on the patterns of selection into offering tutoring, I conclude, first, that tutoring and incoming knowledge are substitutes, so negative effects of *Offers* are the applicable hypothesis to test in the context I study. Offering tutoring gives schools incentives to cover less material in the regular school day. Second, selection into tutoring is, if anything, more negative in private schools. Thus, any selection bias should lead to underestimates of the negative consequences of government teachers' distorted incentives. I now turn to describing the identification strategy I use to estimate the effects of *Offers*.

Difference-in-differences strategy

The primary empirical objective is to test the hypothesis that when the school offers tutoring, teachers cover less material during the school day in order to induce demand for tutoring. The basic equation to estimate the effect of *Offers* on how much the teacher covers in school ($AmountTaught$) would be as follows:

$$AmountTaught_{ijk} = \alpha + \beta \cdot Offers_{jk} + \epsilon_{ijk} \tag{4.2}$$

If the coefficient β is negative, then teachers teach less when the school offers tutoring.

Whether to offer tutoring is, however, a choice the school makes, so the estimate of β using equation (4.3) would suffer from endogeneity bias. The first step I take to address this problem is to compare subjects within a school:

$$AmountTaught_{ijk} = \beta \cdot Offers_{jk} + \eta_i + \rho_k + \epsilon_{ijk} \tag{4.3}$$

Including student fixed effects controls for all fixed characteristics of the school (and the student). Making comparisons within a school helps solve the problem that, for example, schools with more resources may be more able to offer tutoring (positive bias in the estimate of β) or that schools with strong students may not need to offer tutoring (negative bias).

However, even within a school, there is likely selection: Whether the school offers tutoring in a subject could be correlated with unobserved (positive or negative) factors such as teacher quality or students' subject-specific ability. A negative estimate of β could still reflect either negative spillover effects of tutoring or negative selection into *Offers* (that is, the tendency of schools to offer tutoring in their weakest subjects). Because of this potential selection problem within a school (evidence of which was seen in Table 3), I use a difference-in-differences strategy with private schools as a comparison group. Both types of schools should exhibit selection into offering tutoring, and the goal of using the comparison group is to condition out this selection.

The comparison of government and private schools allows one to test hypotheses about the effects of offering tutoring because the incentives to distort teaching during the regular school day differ between government and private schools. If the quality of the regular school day falls, parents' willingness to pay for it will fall. This fact is less relevant to government schools since they cannot charge for regular school instruction; their only lever to raise revenue is to offer tutoring. Private schools are different. They charge tuition for the regular school day, so they will suffer financial consequences in the form of lower school fees if they reduce the quality of the school day.[15] Another reason that the moral hazard problem should be smaller in private schools is that the parents likely keep a closer watch on teachers and prevent them from lowering quality. Both of these differences suggest that the negative incentive effects on teachers from offering tutoring should be stronger in government schools.[16]

[15]Private schools might still choose a two-part tariff to price discriminate, but since they are not constrained to charge zero for the regular school day, they will not have as strong an incentive to drive its quality down.

[16]Determining that we are in the substitutes not complements case was a needed first step because the difference-in-differences strategy does not allow one to distinguish between the two cases. If tutoring and school instruction are complements, then both government and private schools have the incentive to improve school instruction when they offer tutoring. The effect is likely to be stronger among private schools since they are rewarded not just with more demand for tutoring, but also with higher revenue from regular school

I estimate a difference-in-differences equation where the variable of interest is the interaction of offering tutoring and being a government school.

$$\begin{aligned} AmountTaught_{ijk} &= \beta \cdot Offers_{jk} + \gamma \cdot Offers_{jk} \times GovtSch_j + \\ &\quad \eta_i + \rho_k + \omega_j \times Offers_{jk} + \epsilon_{ijk} \end{aligned} \tag{4.4}$$

The coefficient γ is the differential effect in government schools when the school offers tutoring. The interpretation of $\gamma < 0$ is that offering tutoring has stronger negative incentive effects on teachers in government schools. Student fixed effects absorb the main effect of *GovtSch*. In order to make a comparison between government and private schools that are similar, the regression includes the interaction of *Offers* with the propensity score for being a government school, specifically with dummy variables, ω_j, for whether the propensity score is below 0.25, between 0.25 and 0.50, between 0.50 to 0.75, and above 0.75.

The identification assumption is that omitted factors that cause there to be tutoring in one subject but not another are the same between government and private schools (more specifically, between government and private schools with a similar propensity score). One might expect private schools to be more responsive and better at targeting their tutoring classes to students' needs. This would bias the estimate of γ toward zero, since private schools' decision to tutor would be more responsive to unobserved factors causing low student exam scores (e.g., low student ability). As seen in Table 3, the differential selection, if anything, goes in this direction which would lead me to underestimate the magnitude of tutoring's spillover effects.

One can use the same identification strategy to examine the effect of *Offers* on student test performance. Note that the aim of the estimation is to measure the spillover effects that the market for tutoring has on student learning, not to measure the (presumably positive) effect of taking tutoring on one's performance.

5 Empirical results

Effects of school-offered tutoring on amount taught in school

The main results on how offering tutoring affects the amount taught in school are shown in Table 4. The outcome variables are students' subjective assessments of their teachers. Panel A presents the results when the outcome is whether the teacher taught for the entire class period. This variable reflects a choice the teacher makes to not use all of the allotted

fees. Thus, the positive effects of tutoring should be weaker in government schools, so both cases imply that the differential effect on school instruction in government schools should be negative.

class period. The prediction is that when the school offers tutoring, there should be a differentially more negative effect on teacher effort in government schools, or the coefficient on *Offers*×*GovtSch* should be negative. The regression includes student fixed effects, subject fixed effects, and fixed effects for propensity score bins interacted with *Offers*. Standard errors are corrected for clustering at the school level.

The coefficient on *Offers*×*GovtSch* in Column 1 is -0.071 and significant at the 5 percent level. Offering tutoring makes government-school teachers 7.1 percentage points less likely to teach for the whole class period, which is about a 9 percent effect. In columns 2 and 3, there is no adjustment for the propensity score. With the full sample, the coefficient is -0.053 and again significant at the 5 percent level. Excluding the tails of the propensity-score distribution, the coefficient is -0.063 and significant at the 5 percent level.[17] In column 4, the specification is similar to column 1 but allows the subject fixed effects to vary between government and private schools to ensure that the results are not confounded by tutoring having different effects in different subjects and one type of school being more likely to offer tutoring in some subjects versus others. The coefficient of interest is similar between columns 1 and 4.

In Panel B, the outcome is whether the teacher completed the curriculum covered on the SLC exam. This outcome also should capture intentional withholding of material, but a caveat is that students might report whether the teacher finishes the curriculum inclusive of the modules covered in tutoring. In all four specifications, the interaction coefficient small, positive, and insignificant. There do not appear to be any effects on the extensive margin of completing the curriculum. Unfortunately there is no continuous measure of how much material was covered in class.

In Appendix Table 3, I report the results for three other robustness checks. First, I estimate the model aggregating the data to the school-subject level (400 schools and 3 subjects per school); the key regressors vary only at this level. For the main outcome of teaching for the entire class period, the interaction coefficient is similar to that in the main specification (-0.069). The coefficient is not identical to the main specification since the number of students in the data varies by school, and the aggregated regression weights each school rather than each student equally. Second, I use the trimmed sample while also controlling for the propensity score fixed effects and, third, I use propensity-score weighting whereby govern-

[17]Specifically, the trimmed sample excludes schools with a propensity score above 0.95, which drops mainly very poor government schools, and schools with a propensity score below 0.05, which drops rich private schools. It is the high-propensity-score (poor) schools to which the results are somewhat sensitive. One possible reason is that in these very poor schools, English tutoring classes are sometimes sponsored by international NGOs rather than being a fee-generating activity for the school.

ment schools receive a weight equal to the inverse of their propensity score (more weight on more "private-like" government schools), and private schools receive a weight equal to the inverse of one minus the propensity score (more weight on "government-like" private schools). The results are quite similar across these alternative specifications in addition to being similar to the main specification; the coefficient of interest is significant at the 5 percent level in all three cases. For the outcome of whether the teacher completed the SLC curriculum, the coefficients remain small, positive, and insignificant.

In addition, in Appendix Table 4, I show the main table using an alterative rule to resolve discrepancies between student and school survey responses about whether the school offers tutoring that, in essence, puts more weight on the student reports, yielding a higher rate of school-offered tutoring. The effects on whether the teacher teaches the entire period are similar to those in Table 4. For whether the teacher completes the SLC curriculum, with this alterative classification there is suggestive evidence that the teacher is less likely to complete the curriculum if the school offers tutoring.[18]

To summarize, the main results are robust to several checks, and the evidence suggests that offering tutoring has a negative effect on how much is taught in school. I next probe alternative explanations of the negative effects of offering tutoring on teacher performance.

Testing alternative hypotheses

I use students' assessments of their teachers on other dimensions to test alternative interpretations of the results. One potential omitted variable concern is that schools are more likely to provide tutoring in a subject if the teacher's exogenous quality is low. Using private schools as a comparison group helps address this concern, but one might worry that the pattern is especially true in government schools (though it is as plausible that the opposite is true), generating the negative association between test performance and *Offers*×*GovtSch*. To rule out this story, I estimate an analogous model using measures of teacher ability rather than effort as the outcome (with the caveat that even teaching ability is partly a choice).

The results are presented in Table 5. The first measure is the teacher's command of the subject matter (Panel A), which captures the teacher's knowledge; the second is how clear and understandable the teacher is (Panel B), which captures his pedagogical ability.[19] The sign of the coefficient on *Offers*×*GovtSch* varies across specification, but in all cases is

[18]Using the alternative classification does not change the results shown in Tables 5 or 6. For Table 7, the coefficients are unchanged but are less precisely estimated.

[19]Note that one could imagine that there would actually be positive effects on these outcomes insofar as they are choices the teacher makes; for example, a teacher might be clearer in class, while still teaching very little, so that students like him more and want to take the tutoring classes. Alternatively, preparing for tutoring classes might increase a teacher's command of the material.

statistically insignificant and small in magnitude. Thus, it does not appear that the results reflect government schools offering tutoring when the teacher is weak.

Another interpretation of the results is that they are indeed causal effects of offering tutoring, but the lower amount taught in school is not a strategic choice by the teacher to increase demand for tutoring. Instead, the effects on effort could be a fatigue effect; teachers who moonlight may not have the time and energy needed to prepare lectures. The difference-in-differences design limits this concern, but perhaps the fatigue effect differs between government and private schools. Table 6 tests for this possibility by examining teacher effort outside the classroom as the outcome.[20] The first measure is whether the teacher is available outside of class, and the second is how well-prepared he is for class. There is no significant relationship between these outcomes and *Offers*×*GovtSch*. Thus, the effects on teacher effort seem largely to be a strategic choice by the teacher, not a fatigue effect.[21]

Effects of school-offered tutoring on passing the school-leaving exams

I next use the same difference-in-differences approach to examine the consequences for student test performance. The results are shown in Table 7. The outcome is whether the student passed the national exam in a subject. The four columns use the same specifications as in earlier tables. The coefficient on *Offers*×*GovtSch* is negative in all cases, ranging from -0.08 to -0.12, and ranging in significance from the 1 percent level to the 10 percent level. These point estimates are large in magnitude; a coefficient of -0.10 suggests that offering tutoring reduces the passing rate by 10 percentage points, or by about 13 percent.

It is also worth noting that the main effect of *Offers* is positive (although insignificant); given that selection into offering tutoring is negative, this positive coefficient suggests that in private schools, tutoring improves average performance. This finding is not too surprising since, without distortionary effects, offering extra instruction should increase student knowledge and exam performance.

Thus, school-provided tutoring suggestively has a more negative effect on test performance in government schools than in private schools. The results are consistent with the earlier findings that when teachers offer tutoring, they cover less material in the classroom: Their distorted behavior leads to a decline in student test performance. These effects of school-provided tutoring on student test scores and teacher effort seem to be caused by teachers

[20] Another way to test for the fatigue effect would be using data on tutoring conducted by teachers for students outside their own school. For the fatigue explanation, it is immaterial whether teachers are specifically tutoring their own students. Unfortunately, I do not have data that enable me to pursue this test.

[21] It might seem surprising that there are not stronger effects on effort outside the classroom. However, many teachers report that they also help out with a family farm or business, so time spent conducting tutoring classes could crowd out other employment rather than preparation for class.

intentionally teaching less in school rather than more innocuous explanations. I now turn to examining how these effects vary across students.

Heterogeneity in the externality effects of school-offered tutoring

When the school offers tutoring, there are two potentially offsetting effects on students' achievement: The quality of school instruction appears to decline, but the student can also learn more by taking the tutoring classes. Thus, school-offered tutoring likely has a worse net effect on learning for those who do not take tutoring.

It is difficult to solve the identification problem that unobservably weaker students take tutoring. When examining the average incentive effects of offering tutoring, I could make use of the dampened incentives to downgrade school teaching in private schools, but a similar strategy does not help solve the problem that within a school, weaker students are more likely to enroll. Thus, I gauge heterogeneity in the spillover effects by identifying the observable characteristics of students that make them more likely to take tutoring, and then examining how the effects of the school offering tutoring on test performance differ accordingly.

There are two broad hypotheses about who will take tutoring. First, wealthier students will have a higher ability to pay for tutoring. Second, academically weaker students should be more likely to take tutoring since tutoring is generally remedial. Table 8, Panel A tests for these patterns, where the outcome is whether the student takes tutoring in a subject and the sample is conditioned on the school offering tutoring in that subject. The regression includes school-subject fixed effects, so the comparisons are made across classmates. Standard errors are clustered by student. As seen in columns 1 to 3, students from better off families, as measured by a more educated father or mother or having electricity at home, are more likely to enroll in tutoring. Column 4 shows that the relationship between failing lower secondary school and taking tutoring is weak; lower-performing students are more likely to take tutoring, but the relationship is not very strong, presumably because of families' financial considerations. Indeed, these determinants of taking tutoring are all correlated with one another, so column 5 examines them simultaneously; father's education and having electricity appear to be the strongest predictors of taking tutoring. Finally, I calculate the first principal component of the three wealth measures (father's education, mother's education, and electricity) as a more parsimonious way to measure the various family background dimensions. A higher wealth index is associated with higher take-up of tutoring.

These findings suggest that the existence of school-offered tutoring should be most harmful for poorer students. Panel B re-examines the effects of the school offering tutoring on students' test performance, allowing for heterogeneous effects. In column 1, the key regressor

is the triple interaction, *Offers*×*GovtSch*×*Father'sEduc*. The effects of the school offering tutoring are more positive as father's education increases, consistent with students with more educated parents being more likely to enroll in tutoring.[22] When the student's father has one less year of education, school-offered tutoring makes the student 1.2 percentage points less likely to pass the national exam, presumably because of the distorted regular-school-day teaching. In column 2, I examine heterogeneous effects by whether the household has electricity. Here the triple interaction point estimate is imprecise and wrong-signed, though there is very little variation among private school students in household electricity to estimate this model precisely. Finally, column 3 uses the principal-components wealth index; the point estimate suggests that the net effects of school-offered tutoring are worse for students who come from less well-off families, but the results are imprecise.

Thus, there is some suggestive but not terribly strong evidence that when the school offers tutoring, students who can afford to enroll are better off, despite the distortion created during the regular school day. Meanwhile, school-offered tutoring hurts achievement among students who experience the downside of downgraded regular schooling without the upside of enrolling in and learning from the tutoring classes.

Competition from third-party tutors

The final analysis I conduct is to test whether competition from third-party tutors mitigates the negative effects of school-provided tutoring. While there are no survey questions on whether third-party tutoring is available (supply), students are asked whether they take tutoring not organized by their school. The mean of taking third-party tutoring is quite low, 0.03. I use this variable to construct a proxy for third-party tutoring supply. I construct the variable in two ways. The first is whether any student in the school-subject reports taking third-party tutoring. This measure will have few false negatives but is prone to false positives. The second measure, which is less prone to false positives, is a dummy for whether at least 10 percent of students report taking third-party tutoring, restricted to school-subject cells with at least 10 students. The mean of the first measure is 0.44, and the mean of the second measure is 0.11.

The results are reported in Appendix Table 8. The variable of interest is the triple interaction of the school offering tutoring, being a government school, and there being a third-party tutoring market available to students. The outcome is whether the teacher teaches for the entire period, and the two columns differ in how "third-party tutoring market" is

[22] Another potential reason for these heterogeneous effects by family background is that educated parents can more readily help their children with school work, compensating for the drop in school quality.

measured. In both cases, the point estimate on the triple interaction is small and insignificant. The prediction is that the coefficient should be positive since competition should dampen the negative effects of school-offered tutoring; in the first column it is negative and in the second it is positive. Thus, there is no evidence in support of the hypothesis that competition from third-party tutors dampens schools' incentive to downgrade their regular school instruction. One speculative explanation for this surprising (non-)result is that the extent of third-party tutoring is so low in this context, even for cases coded up as having competition, that the third-party tutors do not pose much of a competitive threat so do not put much of a check on schools' behavior.

6 Conclusion

One reason for low quality of education in developing countries that has gained attention in recent years is that teachers lack strong performance incentives. This paper focuses on a widespread practice that may give teachers especially bad incentives, at least in some settings. It is common for government teachers to offer for-profit tutoring to their own students. Teachers have an incentive to teach *less* during school in order to increase demand for tutoring, if tutoring and school instruction are substitutes. I modeled and tested for this phenomenon using survey data and test scores from Nepal. The existence of teacher-provided tutoring was found to cause negative spillovers on teachers' effort in the classroom. Using students' assessments of their teachers' classroom performance, I showed that teachers who offer tutoring teach less during the school day. There were no corresponding effects for measures of teacher ability, which helped rule out alternative explanations. In addition, there is some evidence that the distorted incentives could have important consequences for student learning: Student performance on the national secondary exam appears to fall when the school offers tutoring, concentrated among the students from poorer families who are less likely to take up tutoring. The identification used within-school comparisons across different subjects and used private schools—where both the incentives and the latitude to downgrade teaching are smaller—as a comparison group.

An implication of the findings is that discouraging teachers from tutoring their own students or reducing entry barriers for third-party tutors could be welfare-improving. These policies could increase student achievement, particularly for non-participants in tutoring. Whether such policies are well-advised also depends on how they would affect sorting into the teaching profession, an issue not addressed in this paper. In addition, many of the policy implications would be reversed in other settings where tutoring and school instruction are

complements rather than substitutes, that is, when the way to induce more students to take tutoring is to teach more during school.

I conclude by speculating on a related phenomenon: government health care providers who have private practices on the side. As with education, government health care is plagued by low quality in developing countries (Banerjee, Deaton, and Duflo, 2004; Das and Hammer, 2007). Just as teachers might teach less during school, health care workers might steer patients who come to the government clinic to visit their private practice instead. A particular problem in the health setting is that workers might be at their private clinic during the hours when they are supposed to be at their government job (Chaudhury and Hammer, 2004; Chaudhury, Hammer, Kremer, Muralidharan, and Rogers, 2006). Tutoring by teachers during school hours is uncommon; doing so would be brazen given that tutoring usually takes place in the school's classrooms. As a result, moonlighting in the health care sector might have especially negative effects on the provision of government services.

However, another important difference between government teachers and health workers is that teachers selling their tutoring services have plenty of foot traffic, so to speak. Schoolteachers automatically meet and interact with their potential tutoring customers. In contrast, patients in need of health care often bypass the government health clinic and go straight to a third-party provider, particularly if they expect the clinic to be unstaffed (World Bank, 2001). Therefore, one way that private practice might improve a health worker's performance in his government job is if it gives him an incentive to show up in order to meet and attract clients for his private clinic (Chawla, 1997). This could hold even if government and private health care are substitutes at the individual level: A doctor might steer certain patients to his private clinic (e.g., wealthier ones) while serving others in the government clinic, which would be an improvement over his simply being a no-show at the government clinic. Another very important difference between education and health is that, whereas third-party tutors are often as qualified or nearly as qualified as government teachers to tutor students, many private health workers are unqualified, and the care they give can be detrimental to patients' health (Banerjee, Deaton, and Duflo, 2004; Bennett, McPake, and Mills, 1997). A ban on private care by government doctors and nurses could do more harm than good if it shifted patient care toward untrained quacks.

Appendix 1: Modeling competition from third-party tutors

Consider an additional supplier in the tutoring market, a third-party tutor. The third-party tutor serves a market that encompasses several schools so that she sets her price P as a function of the average of the several teachers' choices of p and m, and for any one schoolteacher, P is exogenous.

Assume the third-party tutor offers a (weakly) higher quality service than tutoring by teachers. Third-party tutoring provides $\theta \geq 1$ units of tutoring. The higher quality service can be thought of as lower class size. In practice, third-party tutors are constrained to offer smaller classes (in their homes) than schoolteachers (in classrooms), and the value of tutoring declines with class size. In essence, I am treating the cap on class size as a binding constraint on the third-party tutor that implies she offers a higher quality service than does the schoolteacher, who faces a less stringent and non-binding constraint.

The new revenue function from tutoring is $\widehat{R}_t(m) \equiv \gamma(m)R_t(m)$. Competition will reduce the revenue for a monopolist, so $\forall m, \gamma(m) < 1$. Also, given that the third-party tutoring, as modeled, is relatively more valuable when m is lower, $\gamma'(m) \geq 0$.

The teacher's problem is:

$$\max_{m \geq 0} \ \gamma(m)R_t(m) + \phi(m), \tag{6.1}$$

which gives the following result.

Proposition 4. *If tutoring and school instruction are substitutes, competition from third-party tutors raises the amount taught during school relative to when the schoolteacher has a monopoly on tutoring.*

Proof. The extra term in the maximand relative to the case without competition given in (2.2) is $(\gamma(m) - 1)R(m)$. Since $\gamma() < 1$ and $\gamma'(m) \geq 0$, this term is increasing in m. Thus m^* is higher than the case without competition. ■

Competition will lead to lower prices and higher quality which is welfare improving for households. Teachers have less incentive to manipulate m when only some of those who are induced by lower m to purchase more tutoring will purchase tutoring from *them*, and in fact teachers will drive some of their customers away to third-party tutoring by lowering m.[23] As modeled, third-party tutoring becomes relatively more valuable when m is lower, given the assumption that $s_{mt} < 0$. However, the above result also holds if γ is a constant. Suppose the competitor draws a random subset of the tutoring clients away from school-provided tutoring. Because the schoolteacher now receives less benefit from lower m (γ is analogous to a tax on tutoring revenues), he does not lower m by as much.

[23] Another possible effect arises if teachers also care about student achievement per se. Then the existence of third-party tutoring exclusively provided by others might lower teacher effort.

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Table 1
Descriptive statistics by subject

	Math	Science	English
School offers tutoring	0.70	0.63	0.59
	(0.46)	(0.48)	(0.49)
Student passes SLC exam	0.66	0.82	0.78
	(0.47)	(0.38)	(0.41)
Teacher teaches for entire class period	0.83	0.81	0.82
	(0.38)	(0.39)	(0.38)
Teacher completes curriculum	0.62	0.64	0.65
	(0.48)	(0.48)	(0.48)
Teacher has good command of subject	0.80	0.78	0.77
	(0.40)	(0.41)	(0.42)
Teacher is clear and understandable	0.80	0.80	0.77
	(0.40)	(0.40)	(0.42)
Teacher is available outside of class	0.68	0.64	0.68
	(0.47)	(0.48)	(0.47)
Teacher is well prepared for class	0.81	0.78	0.77
	(0.39)	(0.41)	(0.42)
Conditional on school offering tutoring…			
Private school	0.22	0.22	0.09
	(0.41)	(0.42)	(0.28)
Student takes tutoring from school	0.67	0.60	0.64
	(0.47)	(0.49)	(0.48)

Notes: Each observation is a student-subject (N = 9550 students * 3 subjects = 28,650). 22,977 observations (80%) are for government schools and 5673 (20%) are for private schools. The variables assessing teachers are dummy variables based on survey questions asked of students.

Table 2
Descriptive statistics by type of school

	Govt schools	Private schools
School offers tutoring	0.66	0.58
	(0.48)	(0.49)
Student takes tutoring from school	0.43	0.34
	(0.49)	(0.48)
Student passes SLC exam	0.70	0.95
	(0.45)	(0.23)
Teacher teaches for entire class period	0.80	0.92
	(0.40)	(0.28)
Teacher completes curriculum	0.59	0.83
	(0.49)	(0.37)
Teacher has good command of subject	0.76	0.86
	(0.42)	(0.35)
Teacher is clear and understandable	0.77	0.88
	(0.42)	(0.32)
Teacher is available outside of class	0.63	0.81
	(0.48)	(0.40)
Teacher is well prepared for class	0.77	0.87
	(0.42)	(0.34)
Propensity score for being government school	0.84	0.28
	(0.19)	(0.29)
Number of observations	22,977	5,673
Number of schools	294	106

Notes: Mean (standard deviation) of variables. Each observation is a student-subject.

Table 3

Selection into offering tutoring based on initial student achievement

Dependent variable = Offers tutoring

	(1)	(2)	(3)	(4)
Passed 9th Grade Exam	-0.036*		-0.308***	
	[0.020]		[0.091]	
Score on 9th Grade Exam		-0.037**		-0.164***
		[0.014]		[0.055]
Passed 9th Grade Exam * Govt School			0.298***	
			[0.093]	
Score on 9th Grade Exam * Govt School				0.171***
				[0.057]
Observations	19,963	6,743	19,963	6,743
R-squared	0.840	0.841	0.841	0.851

Notes: Each observation is a student-subject. There are 3 subjects: math, science, and English. All regressions include student and subject fixed effects. Standard errors are clustered within a school. *** p<.01, ** p<.05, * p<.10.

Table 4

Effect of offering tutoring on amount taught in class

Panel A: Dependent variable = Teacher teaches for entire period

Sample	Full	Full	Trimmed	Full
Propensity score adjustment	Fixed effects	None	None	Fixed effects
	(1)	(2)	(3)	(4)
Offers Tutoring * Govt School	-0.071**	-0.053**	-0.063**	-0.064**
	[0.032]	[0.027]	[0.030]	[0.030]
Offers Tutoring	0.026	0.010	0.007	0.003
	[0.022]	[0.018]	[0.020]	[0.023]
Subject fixed effects	Yes	Yes	Yes	Yes, school-type specific
Observations	28,650	28,650	22,791	28,650
R-squared	0.650	0.650	0.651	0.650

Panel B: Dependent variable = Teacher completes the curriculum

Sample	Full	Full	Trimmed	Full
Propensity score adjustment	Fixed effects	None	None	Fixed effects
	(1)	(2)	(3)	(4)
Offers Tutoring * Govt School	0.030	0.013	0.008	0.033
	[0.074]	[0.030]	[0.034]	[0.076]
Offers Tutoring	-0.008	-0.018	-0.018	0.000
	[0.016]	[0.015]	[0.016]	[0.020]
Subject fixed effects	Yes	Yes	Yes	Yes, school-type specific
Observations	28,650	28,650	22,791	28,650
R-squared	0.713	0.713	0.711	0.713

Notes: Each observation is a student-subject. There are 3 subjects: math, science, and English. Regressions include student fixed effects and subject fixed effects. Column 4 also includes subject*government school fixed effects. Columns 1 and 4 include the interaction of Offers Tutoring with dummies for the propensity score for being a government school being in the range 0 to 0.25, 0.25 to 0.50, 0.50 to 0.75, and 0.75 to 1.00. Column 3 excludes observations with a propensity score below 0.05 or above 0.95. Standard errors are clustered within a school. *** p<.01, ** p<.05, * p<.10.

Table 5

Placebo test examining teacher ability

Panel A: Dependent variable = Teacher has a good command of material

Sample	Full	Full	Trimmed	Full
Propensity score adjustment	Fixed effects	None	None	Fixed effects
	(1)	(2)	(3)	(4)
Offers Tutoring * Govt School	-0.012	0.022	0.028	-0.005
	[0.049]	[0.034]	[0.037]	[0.050]
Offers Tutoring	0.004	-0.014	-0.016	-0.005
	[0.019]	[0.019]	[0.021]	[0.024]
Subject fixed effects	Yes	Yes	Yes	Yes, school-type specific
Observations	28,650	28,650	22,791	28,650
R-squared	0.586	0.586	0.589	0.586

Panel B: Dependent variable = Teacher teaches in an understandable way

Sample	Full	Full	Trimmed	Full
Propensity score adjustment	Fixed effects	None	None	Fixed effects
	(1)	(2)	(3)	(4)
Offers Tutoring * Govt School	-0.027	0.049	0.048	-0.035
	[0.043]	[0.030]	[0.034]	[0.045]
Offers Tutoring	-0.044*	-0.048**	-0.053**	-0.022
	[0.022]	[0.020]	[0.022]	[0.026]
Subject fixed effects	Yes	Yes	Yes	Yes, school-type specific
Observations	28,650	28,650	22,791	28,650
R-squared	0.569	0.569	0.569	0.569

Notes: Each observation is a student-subject. There are 3 subjects: math, science, and English. Regressions include student fixed effects and subject fixed effects. Column 4 also includes subject*government school fixed effects. Columns 1 and 4 include the interaction of Offers Tutoring with dummies for the propensity score for being a government school being in the range 0 to 0.25, 0.25 to 0.50, 0.50 to 0.75, and 0.75 to 1.00. Column 3 excludes observations with a propensity score below 0.05 or above 0.95. Standard errors are clustered within a school. *** p<.01, ** p<.05, * p<.10.

Table 6

Effect of offering tutoring on teacher effort outside of class

Panel A: Dependent variable = Teacher is available outside of class

Sample	Full	Full	Trimmed	Full
Propensity score adjustment	Fixed effects	None	None	Fixed effects
	(1)	(2)	(3)	(4)
Offers Tutoring * Govt School	0.044	-0.013	0.007	0.051
	[0.029]	[0.028]	[0.032]	[0.033]
Offers Tutoring	0.037*	0.010	-0.002	0.026
	[0.019]	[0.017]	[0.020]	[0.023]
Subject fixed effects	Yes	Yes	Yes	Yes, school-type specific
Observations	28,604	28,604	22,752	28,604
R-squared	0.676	0.676	0.670	0.676

Panel B: Dependent variable = Teacher Is well-prepared for class

Sample	Full	Full	Trimmed	Full
Propensity score adjustment	Fixed effects	None	None	Fixed effects
	(1)	(2)	(3)	(4)
Offers Tutoring * Govt School	-0.008	-0.010	-0.004	0.001
	[0.041]	[0.039]	[0.044]	[0.044]
Offers Tutoring	0.031	-0.002	-0.011	0.014
	[0.028]	[0.025]	[0.028]	[0.030]
Subject fixed effects	Yes	Yes	Yes	Yes, school-type specific
Observations	28,636	28,636	22,779	28,636
R-squared	0.578	0.577	0.576	0.578

Notes: Each observation is a student-subject. There are 3 subjects: math, science, and English. Regressions include student fixed effects and subject fixed effects. Column 4 also includes subject*government school fixed effects. Columns 1 and 4 include the interaction of Offers Tutoring with dummies for the propensity score for being a government school being in the range 0 to 0.25, 0.25 to 0.50, 0.50 to 0.75, and 0.75 to 1.00. Column 3 excludes observations with a propensity score below 0.05 or above 0.95. Standard errors are clustered within a school. *** p<.01, ** p<.05, * p<.10.

Table 7

Effect of offering tutoring on student achievement

Dependent variable = Student passes school-leaving exam in subject

Sample	Full	Full	Trimmed	Full
Propensity score adjustment	Fixed effects	None	None	Fixed effects
	(1)	(2)	(3)	(4)
Offers Tutoring * Govt School	-0.124**	-0.117***	-0.107**	-0.081*
	[0.052]	[0.045]	[0.047]	[0.045]
Offers Tutoring	0.018	0.020	0.021	0.017
	[0.022]	[0.019]	[0.021]	[0.024]
Subject fixed effects	Yes	Yes	Yes	Yes, school-type specific
Observations	28,650	28,650	22,791	28,650
R-squared	0.585	0.585	0.573	0.587

Notes: Each observation is a student-subject. There are 3 subjects: math, science, and English. Regressions include student fixed effects and subject fixed effects. Column 4 also includes subject*government school fixed effects. Columns 1 and 4 include the interaction of Offers Tutoring with dummies for the propensity score for being a government school being in the range 0 to 0.25, 0.25 to 0.50, 0.50 to 0.75, and 0.75 to 1.00. Column 3 excludes observations with a propensity score below 0.05 or above 0.95. *** p<.01, ** p<.05, * p<.10.

Table 8
Heterogeneity in tutoring take-up and the externality effects of offering tutoring

Panel A: Determinants of tutoring take-up

Dependent variable = Student takes tutoring from the school						
	(1)	(2)	(3)	(4)	(5)	(6)
Father's education	0.004***				0.004***	
	[0.001]				[0.001]	
Mother's education		0.003**			0.001	
		[0.002]			[0.002]	
Has electricity at home			0.090***		0.083***	
			[0.016]		[0.016]	
Failed a grade in lower sec school				0.000	0.004	0.004
				[0.016]	[0.016]	[0.016]
Wealth index (principal component)						0.023***
						[0.005]
Observations	18,005	18,235	18,312	18,278	17,777	17,777
R-squared	0.257	0.256	0.258	0.256	0.261	0.259

Panel B: Heterogeneous effects of the school offering tutoring

Dependent variable = Student passes school-leaving exam in subject			
	(1)	(2)	(3)
Offers Tutoring * Govt School	-0.195***	-0.093	-0.117***
	[0.062]	[0.093]	[0.045]
Offers Tutoring * Govt School * Father's educ	0.012**		
	[0.006]		
Offers Tutoring * Govt School * Electricity		-0.045	
		[0.082]	
Offers Tutoring * Govt School * Wealth index			0.028
			[0.024]
Offers Tutoring	0.010	0.055	0.019
	[0.028]	[0.052]	[0.024]
Offers Tutoring * Father's educ	0.001		
	[0.001]		
Offers Tutoring * Electricity		-0.038	
		[0.048]	
Offers Tutoring * Wealth index			0.001
			[0.004]
Observations	28,152	28,551	27,933
R-squared	0.587	0.585	0.586

Notes: Each observation is a student-subject. There are 3 subjects: math, science, and English. Specifications in Panel A include school-subject fixed effects and specifications in Panel B include student fixed effects, subject fixed effects, and the interaction of Offers Tutoring with dummies for the propensity score for being a government school being in the range 0 to 0.25, 0.25 to 0.50, 0.50 to 0.75, and 0.75 to 1.00. Standard errors are clustered by student in Panel A and by school in Panel B. *** p<.01, ** p<.05, * p<.10.

Appendix Table 1

Propensity to be a government school

	Probit regression	*Mean and std deviation for independent variables*	
	Dep. Var = Dummy for Govt School	Govt schools	Private schools
	(1)	(2)	(3)
Mother's years of education (mean)	-0.055***	2.01	5.31
	[0.020]	(1.21)	(2.58)
Father's years of education (mean)	-0.031**	5.85	9.14
	[0.014]	(1.69)	(2.16)
Household has electricity (mean)	-0.301**	0.71	0.96
	[0.124]	(0.31)	(0.12)
Failed a grade in lower secondary (mean)	0.451*	0.14	0.06
	[0.268]	(0.09)	(0.07)
Located in district capital	-0.156**	0.21	0.55
	[0.064]	(0.40)	(0.50)
Missing value for Located in district capital	-0.558*	0.00	0.05
	[0.287]	(0.06)	(0.22)
Market within 1 hour walk	-0.109*	0.83	0.97
	[0.061]	(0.37)	(0.18)
Missing value for Market within 1 hour walk	-0.065	0.02	0.02
	[0.203]	(0.13)	(0.14)
Observations	400	294	106

Notes: Marginal effects are reported in column 1. Each observation is a school. *** p<.01, ** p<.05, * p<.10.

Appendix Table 2
Additional descriptive statistics on tutoring

	Govt schools	Private schools
Student takes any of math, science, or English tutoring from school	0.49	0.51
Conditional on student taking math, science or English…		
Monthly tutoring fees - Mean	359	566
Monthly tutoring fees - Median	300	400
Monthly tutoring fees - Standard deviation	391	646
Student takes math tutoring from school	0.47	0.49
Student takes science tutoring from school	0.37	0.43
Student takes English tutoring from school	0.44	0.12
Grade 9 test score in subject - Mean	0.00	0.00
Number of non-missing observation for Grade 9 test score	5,082	1,661
Passes Grade 9 test in subject	0.87	0.94
Number of non-missing observation for Passes Grade 9 test	16,539	3,424

Notes: Each observation is a student-subject. Students who reported taking any tutoring were asked their monthly tutoring expenses. This variable is not broken down by subject, and may include expenses for tutoring in subjects other than math, science, or English. The Grade 9 test scores are available for only a subset of the data. They are normalized to mean 0, standard deviation 1 for each school for comparability across schools.

Appendix Table 3

Robustness checks: Effects on amount taught in class

Dependent variable	Teacher teaches for entire period			Teacher completes the curriculum		
Propensity score adjustment	Fixed effects	Fixed effects, trimmed sample	Prop. score weighting	Fixed effects	Fixed effects, trimmed sample	Prop. score weighting
	(1)	(2)	(3)	(4)	(5)	(6)
Offers Tutoring * Govt School	-0.069**	-0.078**	-0.055**	0.031	0.028	0.016
	[0.033]	[0.031]	[0.025]	[0.090]	[0.075]	[0.036]
Offers Tutoring	0.020	0.027	-0.000	0.009	-0.002	-0.021
	[0.017]	[0.026]	[0.016]	[0.018]	[0.017]	[0.025]
Observations	1,200	22,791	28,650	1,200	22,791	28,650
R-squared	0.788	0.651	0.649	0.850	0.711	0.718

Notes: Each observation is the school-subject mean in columns 1 and 4 and a student-subject in columns 2, 3, 5, and 6. There are 3 subjects: math, science, and English. Regressions include school fixed effects in columns 1 and 4 and student fixed effects in columns 2, 3, 5, and 6. All regressions include subject fixed effects. Columns 1,2, 4, and 5 include the interaction of Offers Tutoring with dummies for the propensity score for being a government school being in the range 0 to 0.25, 0.25 to 0.50, 0.50 to 0.75, and 0.75 to 1.00. In columns 3 and 6, government school observations are weighted by the inverse of the propensity score and private school observations are weighted by the inverse of 1 minus the propensity score. Standard errors are clustered within a school. *** p<.01, ** p<.05, * p<.10.

Appendix Table 4

Alternative classification of whether the school offering tutoring

Panel A: Dependent variable = Teacher teaches for entire period

Sample	Full	Full	Trimmed	Full
Propensity score adjustment	Fixed effects	None	None	Fixed effects
	(1)	(2)	(3)	(4)
Offers Tutoring * Govt School	-0.085**	-0.062*	-0.118***	-0.080**
	[0.040]	[0.038]	[0.043]	[0.039]
Offers Tutoring	0.027	0.016	0.010	0.011
	[0.017]	[0.015]	[0.016]	[0.024]
Subject fixed effects	Yes	Yes	Yes	Yes, school-type specific
Observations	28,650	28,650	22,791	28,650
R-squared	0.650	0.650	0.651	0.650

Panel B: Dependent variable = Teacher completes the curriculum

Sample	Full	Full	Trimmed	Full
Propensity score adjustment	Fixed effects	None	None	Fixed effects
	(1)	(2)	(3)	(4)
Offers Tutoring * Govt School	-0.071	-0.065**	-0.078**	-0.070
	[0.050]	[0.029]	[0.032]	[0.050]
Offers Tutoring	-0.011	-0.016	-0.012	-0.005
	[0.016]	[0.015]	[0.015]	[0.018]
Subject fixed effects	Yes	Yes	Yes	Yes, school-type specific
Observations	28,650	28,650	22,791	28,650
R-squared	0.713	0.713	0.711	0.713

Notes: This table is identical to Table 4 except that an alternative method is used to reconcile the student and school reports about school offered tutoring. If there are more than 20 students in the sample from a school, then if the school reports not offering tutoring yet more than 20 percent of students report taking tutoring organized by the school, the school is re-classified as offering tutoring, and if none do, the school is re-classified as not offering tutoring. *** p<.01, ** p<.05, * p<.10.

Appendix Table 5

Robustness checks: Placebo test examining teacher ability

Dependent variable	Teacher has a good command of material			Teacher teaches in an understandable way		
Propensity score adjustment	Fixed effects	Fixed effects, trimmed sample	Prop. score weighting	Fixed effects	Fixed effects, trimmed sample	Prop. score weighting
	(1)	(2)	(3)	(4)	(5)	(6)
Offers Tutoring * Govt School	-0.054	-0.008	0.011	-0.059	-0.027	0.025
	[0.070]	[0.051]	[0.038]	[0.056]	[0.044]	[0.030]
Offers Tutoring	0.004	0.008	-0.024	-0.039	-0.047*	-0.035*
	[0.019]	[0.021]	[0.021]	[0.024]	[0.025]	[0.020]
Observations	1,200	28,650	28,650	1,200	28,650	28,650
R-squared	0.689	0.586	0.579	0.630	0.569	0.566

Notes: Each observation is the school-subject mean in columns 1 and 4 and a student-subject in columns 2, 3, 5, and 6. There are 3 subjects: math, science, and English. Regressions include school fixed effects in columns 1 and 4 and student fixed effects in columns 2, 3, 5, and 6. All regressions include subject fixed effects. Columns 1,2, 4, and 5 include the interaction of Offers Tutoring with dummies for the propensity score for being a government school being in the range 0 to 0.25, 0.25 to 0.50, 0.50 to 0.75, and 0.75 to 1.00. In columns 3 and 6, government school observations are weighted by the inverse of the propensity score and private school observations are weighted by the inverse of 1 minus the propensity score. Standard errors are clustered within a school. *** p<.01, ** p<.05, * p<.10.

Appendix Table 6

Robustness checks: Effects on teacher effort outside of class

Dependent variable	Teacher is available outside of class			Teacher is well-prepared for class		
Propensity score adjustment	Fixed effects	Fixed effects, trimmed sample	Prop. score weighting	Fixed effects	Fixed effects, trimmed sample	Prop. score weighting
	(1)	(2)	(3)	(4)	(5)	(6)
Offers Tutoring * Govt School	0.035	0.051	0.015	-0.004	-0.008	-0.007
	[0.041]	[0.032]	[0.027]	[0.054]	[0.044]	[0.036]
Offers Tutoring	0.035	0.027	-0.010	0.044	0.030	-0.003
	[0.024]	[0.023]	[0.019]	[0.029]	[0.034]	[0.025]
	1,200	22,752	28,604	1,200	22,779	28,636
R-squared	0.802	0.670	0.677	0.676	0.576	0.578

Notes: Each observation is the school-subject mean in columns 1 and 4 and a student-subject in columns 2, 3, 5, and 6. There are 3 subjects: math, science, and English. Regressions include school fixed effects in columns 1 and 4 and student fixed effects in columns 2, 3, 5, and 6. All regressions include subject fixed effects. Columns 1,2, 4, and 5 include the interaction of Offers Tutoring with dummies for the propensity score for being a government school being in the range 0 to 0.25, 0.25 to 0.50, 0.50 to 0.75, and 0.75 to 1.00. In columns 3 and 6, government school observations are weighted by the inverse of the propensity score and private school observations are weighted by the inverse of 1 minus the propensity score. Standard errors are clustered within a school. *** p<.01, ** p<.05, * p<.10.

Appendix Table 7

Robustness checks: Effects on student achievement

Dependent variable	Student passes the school-leaving exam in the subject		
Propensity score adjustment	Fixed effects	Fixed effects, trimmed sample	Prop. score weighting
	(1)	(2)	(3)
Offers Tutoring * Govt School	-0.099*	-0.117**	-0.134***
	[0.054]	[0.048]	[0.047]
Offers Tutoring	0.024	0.019	0.056**
	[0.018]	[0.027]	[0.024]
Observations	1,200	22,791	28,650
R-squared	0.729	0.574	0.589

Notes: Each observation is the school-subject mean in column 1 and a student-subject in columns 2 and 3. There are 3 subjects: math, science, and English. Regressions include school fixed effects in column 1 and student fixed effects in columns 2 and 3. All regressions include subject fixed effects. Columns 1 and 2 include the interaction of Offers Tutoring with dummies for the propensity score for being a government school being in the range 0 to 0.25, 0.25 to 0.50, 0.50 to 0.75, and 0.75 to 1.00. In column 3, government school observations are weighted by the inverse of the propensity score and private school observations are weighted by the inverse of 1 minus the propensity score. Standard errors are clustered within a school. *** p<.01, ** p<.05, * p<.10.

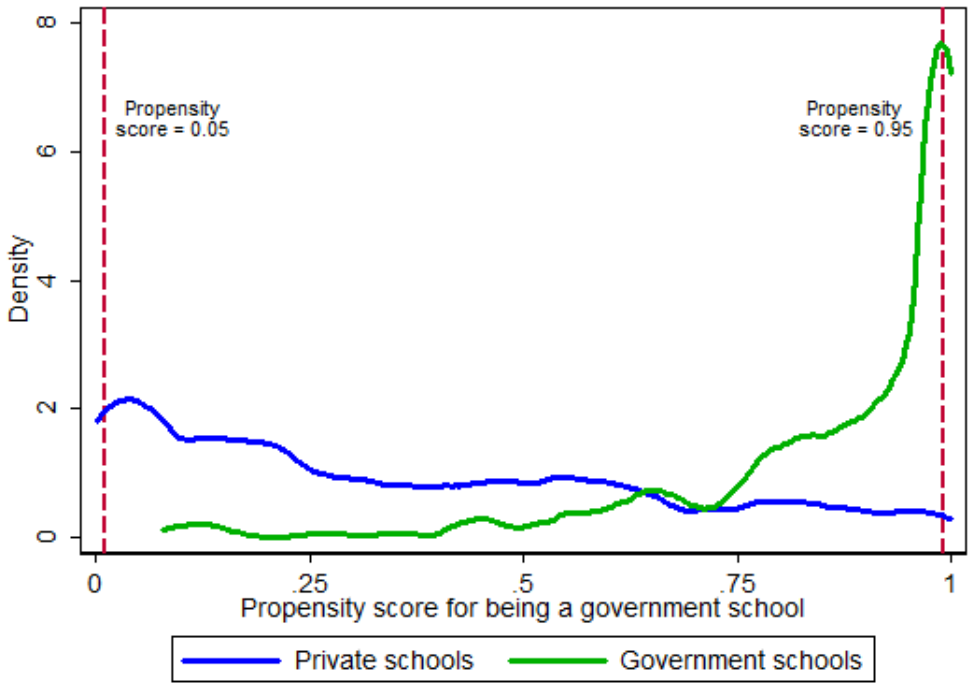
Appendix Table 8

Effect of competition from third-party tutors

Dependent variable	*Teacher teaches for entire period*	
Definition of Private Tutoring Market	At least 1 student taking	At least 10% of students taking
	(1)	(2)
Offers Tutoring * Govt School	-0.0460*	-0.0653**
	[0.026]	[0.030]
Offers Tutoring * Govt School * 3rd Party Tutoring Mkt	-0.0238	0.0336
	[0.039]	[0.054]
Offers Tutoring	0.0031	0.0186
	[0.016]	[0.021]
Offers Tutoring * 3rd Party Tutoring Mkt	0.0232	-0.0397
	[0.026]	[0.036]
Offers Tutoring * Govt School	0.0072	-0.0280
	[0.030]	[0.036]
3rd Party Tutoring Mkt	-0.0109	-0.0013
	[0.017]	[0.022]
Observations	28,650	27,099
R-squared	0.650	0.647

Notes: Each observation is a student-subject. There are 3 subjects: math, science, and English. Regressions include student fixed effects, subject fixed effects, and the interaction of Offers Tutoring with dummies for the propensity score for being a government school being in the range 0 to 0.25, 0.25 to 0.50, 0.50 to 0.75, and 0.75 to 1.00. In column 1, a school-subject is defined as having a third-party tutoring market if at least 1 student reports taking third-party tutoring. In column 2, to reduce false positives, a school-subject is defined as having a third-party tutoring market if at least 10% of students report taking third-party tutoring and there are at least 10 students in the sample for the school. Standard errors are clustered within a school. *** p<.01, ** p<.05, * p<.10.

Appendix Figure 1: Distribution of propensity score for being a government school



This figure plots the kernel density of the propensity score for being a government school. The propensity score is calculated using school- and aggregated individual-level predictors of socioeconomic status and characteristics that differ by type of school (probit regression results reported in Appendix Table 1).