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

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December 1, 2006

Abstract

One reason for low quality of education in developing countries is that teachers lack strong performance incentives. This paper focuses on a widespread phenomenon that appears to give teachers especially bad incentives. Government teachers routinely 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. Teachers might also misuse their authority over students (e.g., fail them at will) to coerce students to take tutoring. We model and present empirical evidence on these effects, using survey and test score data from Sri Lanka. One implication is that reducing entry barriers for third-party tutors could increase student achievement, even for non-participants in tutoring.

JEL codes: O12, O15, I20, J45

*We are grateful to Liran Einav and Michael Kremer for helpful comments and to Harsha Aturupane and Suzanne Wisniewski for answering questions about the data.

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1 Introduction

Many young children in low-income countries receive tutoring in addition to their regular school instruction. In Bangladesh, over 40% of primary school students attend tutoring. In Kenya, the figure is over 65%; in Cambodia, over 30%; in West Bengal, India, 45%; and in rural Egypt 50% (Bray, 2005). In the Sri Lankan data we analyze, 78% of fifth-graders are enrolled in tutoring, and the average amount spent on tutoring a child is 7% of total expenditures per capita. Most often tutoring is done in groups rather than one on one. A particularly prevalent form of tutoring, which is the focus of this paper, are classes taught by the student's regular schoolteacher, which usually take place at school after hours.

The popularity of tutoring suggests that regular schooling fails to meet families' demand for education. The existence of a market for tutoring expands education choices. Wealthier families may be able to spend more on tutoring, so tutoring will in all likelihood increase inequality of education compared to a scenario where all education is publicly funded. But tutoring, at first blush, also increases the e□ciency of the education system, taking school quality as given, since households are no longer constrained to consume the amount of education that school provides.

Schoolteacher-provided tutoring raises thornier issues that are the focus of this paper. Anecdotally, tutoring distorts teacher incentives during the regular school day. Teachers might refrain from teaching some of the curriculum during school in order to generate demand for their fee-generating extra classes.[1] Another complaint one hears is that teachers sometimes coerce students to take their extra classes by threatening to fail the students on exams or otherwise punish them (Bray, 2003).

Students who purchase tuition are made worse o□ by a teacher intentionally teaching less during school. Those whose academic achievement su□ers most are the students who cannot a□ord (or otherwise do not demand) tutoring. As a result, rather than making the education sector more e□cient, the market for tutoring might impose externalities and create ine□ciencies. In such a setting, reducing the barriers to third-party private tutoring would

[1] Biswal (1999) also makes this point.

be welfare-enhancing for students, even those who never take tutoring.

This paper is related to an emerging literature on education in developing countries that emphasizes the poor quality of education and identifies inadequate teacher effort as one important cause. For example, Chaudhury et al. (2006) and Duflo and Hanna (2005) have highlighted teacher absenteeism. Other research examines whether explicit performance incentives for teachers improve student achievement (Lavy, 2002; Glewwe, Ilias, and Kremer, 2003; Duflo and Hanna, 2005). Like those papers, this paper argues that educational quality is related to teacher incentives. We study a phenomenon that in fact may give teachers an incentive to teach *poorly*. If school instruction and tutoring are substitutes, then teachers who teach less during the school day might be rewarded with higher tutoring profits. The paper is also related to a literature on red tape and corruption insofar as lowering the amount taught in class is analogous to a bureaucrat creating inefficient obstacles so that he can extract bribes (Banerjee, 1997).

In developing countries, tutoring given by one's own teacher is common, while in rich countries it is rare. In part, this may reflect a higher opportunity cost of time of rich-country teachers and a larger supply of educated non-teachers who can serve as tutors. Also, whereas parents often help their children with homework in rich countries, parents in developing countries are typically less educated and need to use an outside tutor. In addition, better monitoring of teachers by officials or by parents in rich countries might result in less scope for rent-seeking by teachers, which in turn would reduce their interest in providing tutoring. Private tutoring is prevalent in East Asia, and while there is debate about the pressure on young children and the inequality of opportunities, distortions in teachers' incentives are not seen as a major problem. Rich countries also have been more effective at placing legal restrictions on tutoring by teachers. Hong Kong and Singapore ban teachers from tutoring their own students. The bans are apparently effective, which is consistent with the higher opportunity cost of teachers' time and better enforcement (Bray, 2003, 2005). In contrast, policymakers and newspaper editorials in developing countries routinely call for a ban on tutoring, but most initiatives have either not come to fruition or

have been ine□ective (Foondun, 2002).[2] In fact, some countries ban $private$ tutors and grant government teachers the exclusive right to o□er tutoring. Such policies seem to be driven by the political clout of teachers, the government's desire to boost the income of teachers, and in some cases skepticism about private provision of education.

This paper models teacher incentives and student achievement in the presence of a market for tutoring. We then uses survey and test score data from fifth-grade students in Sri Lanka to empirically assess the e□ects of tutoring. First, we estimate the individual-level e□ect of tutoring on student achievement. Second, we examine whether the existence of teacher-provided tutoring results in less learning in school. Third, we test for signatures of teachers extorting students, specifically whether the subjective assessment of a student, conditional on an objective test score, is lower for non-tutored students.

Section 2 presents the model. Section 3 provides background on education in Sri Lanka and discusses the data. Section 4 describes the empirical strategy and presents the results. Section 5 concludes.

2 Model

The agents in the model are households and a teacher. (Later we introduce private tutors, though we do not model their decisions.) 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 their child's achievement, denoted by s, it can spend money on tutoring t which raises s. There are a continuum of households indexed by i which have identical preferences but vary in income.

The teacher provides the regular school-day instruction to the children and also o□ers for-profit tutoring. The teacher decides how much material to teach during the regular school day, denoted m. The maximum amount it is feasible to teach during the school day is $\overline{m}$.

[2]Militants can take credit for one possible exception. In 2003, rebels in the state of Manipur, India, as part of their crackdown on corruption in schools, decreed that teachers and professors in the state would no longer be permitted to offer private, for-profit classes. "The rebels have no official status, but since they shot and wounded seven people last year for helping students cheat on exams, it is considered unlikely that anyone will defy the ban," according to the news report (Chronicle of Higher Education, 2003).

The teacher also chooses the price p of tutoring.

Student achievement $s(m,t)$ is an increasing function of the amount of material taught during school and the amount of tutoring. Extra tutoring improves achievement more when less material is taught during the regular school day, or

$$\frac{\partial^2 s}{\partial t \partial m} < 0. \tag{2.1}$$

For example, the teacher might lower m by skipping certain modules of the curriculum during the school day, and then teach those modules in the tutoring sessions. If, as seems reasonable, there is more benefit from being taught material the first time than the second time, then t is more valuable when m is lower. This is a critical assumption. It implies that a teacher can raise demand for tutoring by teaching less during the school day. If tutoring and school instruction instead were complements rather than substitutes, tutoring would have opposite effects: it would lead teachers to teach more than they otherwise would and would have a positive externality on non-tutored students.[3]

The teacher's objective function is increasing in profits from tutoring and in the amount m he teaches during school. The fact that the teacher's utility increases in m reflects psychic costs of teaching poorly, or monitoring by households or supervisors that imposes a penalty for low m. To focus on the incentive effects, we do not model an effort cost of providing higher m, so the teacher's only reason to choose a lower level of m is that doing so increases households' demand for tutoring. Alternatively, one can interpret the assumption as allowing for an effort cost, but the effort cost is outweighed by other benefits of raising m.[4]

Classes are taught for a fixed amount of time, and the supply cost to the teacher is the opportunity cost of his time. Extra instruction is taught in groups, and we assume the group size can be scaled up freely, so that the marginal cost of providing t is 0. We abstract from the fact that quality might decline with the size of the tutoring group.[5] For the household,

[3] One scenario in which tutoring and school instruction might be complements in households' utility is when there is a threshold achievement that students are aiming for, for example to obtain admission into a prestigious secondary school. For levels of student achievement near but shy of the threshold, there are convex returns to improving achievement.

[4] In the model, if the net cost were decreasing in m, teachers would choose the lowest possible m.

[5] If quality declines with class size, this leads to one natural interpretation of why private tutors, introduced

whether to sign up for tutoring is a discrete choice of either no tutoring or a single unit of tutoring, $t_i \in \{0, 1\}$. We denote the total demand for tutoring from the teacher as T, that is, $T \equiv \sum_i \mathbb{1}(t_i = 1)$.

We make the simplifying assumptions that the teacher's utility is additively separable between profits and the cost of teaching less during school, and that utility is linear in profits. We can write the teacher's objective function as

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

W is the opportunity cost of time which is incurred if a non-zero quantity of tutoring is supplied in equilibrium. The term $\phi(m)$ is increasing in m and represents the costs of lowering m. We assume $\phi'(m) \to \infty$ as $m \to 0$.

Since the cost of supplying m is 0, the socially optimal level is $m = \overline{m}$. It is worth noting that if there were no other way to transfer money from households to the teacher and if the marginal utility of income were higher for the teacher, then the lower level of m could a second-best outcome when direct transfers from households to the teacher are not possible.[6]

This problem differs from the standard monopolist's problem. First, the seller (teacher) has an additional way to raise demand besides by lowering prices: he can lower m. Second, the teacher's maximand is not profits. He also values m, so faces a tradeoff between this cost of lowering m and the benefit of higher profits induced by lowering m.

We now model household utility more specifically using a vertical product differentiation setup. The household has two options: tutoring or no tutoring. It spends its income net of tutoring expenses on the consumption good c. A household receives $u = s(m, t) + v(c)$ where $v''(c) < 0$. Households vary in income y_i. The household's utility is $u = s(m, 1) + v(y_i - p)$ if $t_i = 1$ and $u = s(m, 0) + v(y_i)$ if $t_i = 0$.

below, offer a higher quality service: they cannot use school facilities so have a smaller tutoring group size.

[6]The government of Zanzibar allows schoolteachers to tutor and has banned private tutors for the express purpose of raising teachers' incomes. The government presumably believes that income taxation combined with higher government salaries, or other ways to tax wealthier households and transfer money to teachers, are either not feasible or would have higher efficiency costs.

A higher-income household will have a higher willingness to pay for tutoring because of the diminishing marginal utility of the consumption good. A household will make the following choice.

$$t_i = \begin{cases} 0 \text{ (no tutoring)} & \text{if } \; y_i < y^*(m,p) \\ 1 \text{ (tutoring from teacher)} & \text{if } \; y_i \geq y^*(m,p) \end{cases}$$

where y^* is the level of income such that $s(m,1) - s(m,0) = v(y^*) - v(y^* - p)$. Let $F(\cdot)$ be the cumulative distribution function for y_i, with $F(\cdot)$ twice differentiable over its finite support. The teacher's problem is now to choose p and m,

$$\max_{p,m \leq \overline{m}} \; p \cdot [1 - F(y^*(m,p))] + \phi(m) \tag{2.2}$$

where we have focused on the interior solution where tutoring is offered. An equilibrium can be characterized by the (m^*, p^*) choice of the teacher which in turn gives the threshold y^* above which households consume tutoring.

Proposition 1. *The amount taught during the school day will be below the socially optimal amount, or $m^* < \overline{m}$, if the cost of lowering m ($\phi'(\overline{m})$) is sufficiently low.*

Proof. Let $\overline{p}$ be the value of p that maximizes (2.2). Abusing notation, let $\phi'(\overline{m}) \equiv \lim_{m \to \overline{m}^-} \phi'(m)$. A sufficient condition for there to be an interior solution $m^* < \overline{m}$ is that $-\overline{p} \cdot F_m(y^*(\overline{m}, \overline{p})) + \phi'(\overline{m}) < 0$. Since $s_{mt} < 0$ and $u_s > 0$, demand for tutoring will be higher when m is lower, or $y^*_m > 0$. Combined with the fact that $F' > 0$, this implies $F_m > 0$ (fewer people take tutoring when more is taught in the regular school day). Rearranging terms, the sufficient condition is $\phi'(\overline{m}) < \overline{p} \cdot F_m(y^*(\overline{m}, \overline{p}))$. ∎

This result is straightforward. Teachers will withhold material during the school day to generate demand for tutoring as long as the higher profits this generates outweigh the costs of doing so.

This behavior 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).[7]

The important way that 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, $s(m, 0)$. For simplicity, suppose $s = m + t$ (the reasoning here does not depend on this assumption). Then the difference in utility from consuming one bundle versus the other is fixed at 1 util (m + 1 versus m.) In setting the two bundles, the monopolist has only one degree of freedom rather than two. Classroom instruction is a pure public good. The teacher teaches all students together during the school day and cannot give some students a different level of m than others.

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 $s = \overline{m} + 1$. The marginal cost of providing tutoring is 0 and the marginal cost of providing m is in fact negative because of $\phi(m)$, so the efficient level of s would be the maximum level. However, providing $s = \overline{m} + 1$ implies that the lower-value bundle is $s = \overline{m}$; then at a given price p, choosing the high-value bundle will not be incentive compatible for some individuals who would choose the high-value bundle at $m = m^* < \overline{m}$. Providing more to the high types by raising m simultaneously weakens their incentives to choose the high bundle.

In addition, there is no participation constraint for the low-demand customers and the price charged to them is fixed at 0. There is no free disposal of public education in the model, and there is no fee for it. 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 low m (represented by $\phi(m)$) prevents the monopolist from offering the lowest possible amount of instruction to them.

While the typical result for two-part tariffs set by a monopolist is that customers at the bottom receive 0 surplus, here the combination of no participation constraint and zero price makes it possible that the services of the teacher provide positive surplus (participation con-

[7]The monopolist can only offer two choices; his time is an input into tutoring, and he can only offer one bundle with tutoring. (In principle, teachers could offer multiple tutoring classes of shorter duration, but in practice they do not.) The restriction to two bundles is not the important feature of this problem for our purposes.

straint would not bind and monopolist cannot extract rents because of zero price) or negative surplus (participation constraint would be binding) to the lowest-demand households.[8] In either case, the low-demand students are worse off when the teacher can offer tutoring.

Proposition 2. *If $m^* < \overline{m}$, then a ban on teachers offering for-profit tutoring to their own students would*

1. *Increase the amount taught during the regular school day.*
2. *Increase the child's achievement and welfare for low-demand households (that is, those who do not consume tutoring under the status quo).*
3. *Have an ambiguous effect on the child's achievement for high-demand households (that is, those who do consume tutoring under the status quo).*
4. *Raise the welfare of high-demand households if their child's achievement increases under the ban.*
5. *Have an ambiguous effect on the welfare of high-demand households in which the child's achievement is lower under the ban.*

Proof.

1. Under a ban, the teacher's objective function is $\phi(m)$ which is increasing in m so the maximum feasible level $m = \overline{m}$ is chosen.
2. This follows from the increase in m 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.
3. If $s(\overline{m}, 0) > s(m^*, 1)$ where m^* is the level of m without the ban, then the ban will increase achievement of this group. Otherwise it will decrease it.
4. The reasoning from part 2 applies, with the additional gain to this group that their consumption also increases by p^* units.
5. If $s(\overline{m}, 0) < s(m^*, 1)$, there is a decrease in utility from lower achievement that may or may not be outweighed by the increased utility from higher consumption. If $s(\overline{m}, 0) + v(y_i) < s(\overline{m}, 0) + v(y_i - p)$, utility decreases for these households under a ban; otherwise their utility increases. ■

[8] To illustrate the case with negative surplus, suppose there were a binding participation constraint at $\overline{m}$ and 0 price for a non-participant in tutoring. If the teacher lowers m, the standard problem would require a reduction in price to someone consuming the lower-value product, or in this case a payment to the non-participant in tutoring. The teacher does not need to provide that compensation in the absence of a participation constraint, however. Similarly, if there is positive surplus for a low type, lower m reduces her surplus.

We do not model entry and exit into the teaching profession, and if a ban on tutoring lowers the effective wage for a government teacher, another potential effect, detrimental to households, would be that fewer or lower quality individuals enter the teaching profession.

An alternative reason that the amount taught might increase if teachers cannot moonlight is that 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 total hours. One different implication of this alternative story is that it is immaterial whether the teacher is teaching specifically his own students.

Competition from private tutors

Now consider a second supplier in the tutoring market, a private tutor. The private tutor serves a market that encompasses several schools so that the private tutor sets her price P as a function of the average of the several teachers' choices of p and m, but for any one teacher, P is exogenous.

The private tutor offers a higher quality service than tutoring by teachers. Private tutoring provides θ units of tutoring, where $\theta > 1$. It follows that $P > p$ in order for anyone to consume tutoring from the teacher. The higher quality service can be thought of as lower class size. Private tutors are constrained to offer smaller classes (in their homes) than schoolteachers (in classrooms), and the value of tutoring declines with class size. For simplicity, we are treating the cap on class size as a binding constraint on the private tutor that implies she offers a higher quality product and, in turn, sets a higher price than does the schoolteacher, who faces a less stringent and non-binding constraint.

Now the consumer has three mutually exclusive choices of tutoring: $t_i \in \{0, 1, \theta\}$. If the household chooses the new option of private tutoring, its utility is $u = s(m, \theta) + v(y_i - P)$. There will be a threshold $y^P > y^*$ above which households will choose private tutoring.

$$t_i = \begin{cases} 0 \text{ (no tutoring)} & \text{if } y_i < y^* \\ 1 \text{ (tutoring from teacher)} & \text{if } y^P > y_i \geq y^* \\ \theta \text{ (private tutoring)} & \text{if } y_i \geq y^P \end{cases}$$

The teacher's problem is

$$\max_{p,m\leq\overline{m}} \; p\cdot\left[F\left(y^P(m,p)\right)-F\left(y^*(m,p)\right)\right]+\phi(m)$$

Proposition 3. *Competition from private tutors raises m^* and lowers p^*.*

Proof. Compared to the maximand in (2.2), there is an extra term $-p[1-F(y^P)]$ which is increasing in m and decreasing in p, and therefore m^* will be higher and p^* will be lower when there is competition. To see this, note that the cutoff y^P is decreasing in p since to the left of the cutoff, households pay price p. The cutoff y^P is increasing in m because $s_{mt}<0$, and to the right of the cutoff the amount of tutoring $\theta>1$ exceeds that on the left. $F(y^P)$ has the same derivatives with respect to p and m as y^P does, and $F'(y^P)>0$. Therefore, the derivative with respect to m of the additional term is $pF_m>0$, and the optimal m^* for the teacher will be higher than in the case without competition. The derivative with respect to p of the additional term is $-[1-F(y^P)]+pF_p(y^P)<0$, and the optimal p^* for the teacher is lower with competition. ■

Competition will lead to lower prices and higher quality which is welfare improving for households. For those who consume tutoring, competition adds choice and lowers prices. More households consume tutoring, and those that consume tutoring enjoy more consumer surplus from it. In addition, everyone—both those who do and those who do not consume tutoring—enjoys the benefit that teachers will not downgrade the school-day instruction as much. 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 private tutoring by lowering m. Private tutoring becomes relatively more valuable when m is lower, given the assumption that $\partial^2 s/\partial m\partial t<0$.

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]

[9] If teachers care about student achievement rather than how much they teach (e.g., $\phi(m)$ is replaced with $\phi(\overline{s})$) and raising m entails costly effort by teachers, then even the existence of private tutoring exclusively provided by others might lower teacher effort.

A possible extension we do not model here is that m might signal the quality of tutoring if there is heterogeneity across teachers, for example, in the cost of e□ort. In general, this would give teachers a reason to raise m, and competition might heighten this e□ect.

Quid pro quo

Suppose that instead of caring about objective student achievement s, the household cares about a subjective assessment of the student's achievement made by the teacher, $\hat{s}$. The teacher observes s and gives the student a rating $\hat{s}$ where $|\hat{s} - s| \leq \delta$. The parameter δ measures the degree of latitude the teacher has over the student's grade. In practice, teachers often grade exams that determine who gains admission to top schools or wins scholarships, and they decide whether to promote a student to the next grade.

Proposition 4.

(i) The teacher will give a lower subjective rating to a student, all else equal, if the student does not sign up for his tutoring ($t_i \neq 1$), at least if the student is on the margin of taking tutoring from him (shifting from either no tutoring or private tutoring).

(ii) There is higher demand for tutoring when the teacher has more latitude over grades, or $\frac{\partial T}{\partial \delta} > 0$.

Proof.

(i) Consider households on the margin between $t_i = 0$ and $t_i = 1$. Let $s(0)$ denote the value of s (objective achievement) when $t_i = 0$, and $\hat{s}(0)$ denote the value of $\hat{s}$ (subjective rating) given $s(0)$ and $t_i = 0$, with analogous notation for $t = 1$. Towards contradiction, suppose $\hat{s}(1) - s(1) \leq \hat{s}(0) - s(0)$. Let y^* be the value of y such that $t_i = 0$ for $y_i < y^*$. For an individual with $y_i = y^* - \delta y$, where $\delta y > 0$, utility $u(\hat{s}_i(0)) = u(\hat{s}_i(1)) + \epsilon$ with $\epsilon > 0$ since household utility is increasing in $\hat{s}_i$. If instead the teacher sets $2\delta \geq (\hat{s}_i(1) - s(1)) - (\hat{s}_i(0) - s(0)) = \Delta > 0$, then the household will now prefer $t_i = 1$ as long as $\frac{\partial u}{\partial \hat{s}} \cdot \Delta > \epsilon$. This inequality will hold for a su□ciently small ϵ, and because $\epsilon \to 0$ as $\delta y \to 0$ and $F''()$ is well defined on the support of $F()$, there exists a household corresponding to or near any arbitrarily small ϵ. A similar argument applies to those on the margin of switching from private tutoring to teacher tutoring.

(ii) The extortion reduces the shadow price of tutoring from the teacher since the student's assessment increases if she takes tutoring from the teacher. A weakly dominant strategy

for the teacher is to o□er every student the following:

$$\hat{s}_i = \begin{cases} s_i - \delta & \text{if} \quad t_i \neq 1 \\ s_i + \delta & \text{if} \quad t_i = 1. \end{cases}$$

From the proof of the part (i), as $\Delta = 2\delta$ increases, the set of individuals choosing $t_i = 1$, at any given m and p, will become larger. ■

One question this raises is why teachers cannot directly sell grades. There are several reasons direct bribes may be less appealing to a teacher. He might be able to rationalize to himself this kind of extortion more than a direct bribe. Whether a household signed up for tutoring freely or whether it was coerced might be less verifiable than whether a bribe was paid.[10] Another explanation is that if the cost of providing tutoring is 0 and households value tutoring, then coercing people on the margin to take tutoring might entail gains from trade relative to a cash bribe. As a result, households might be less likely to balk and complain to authorities about teachers coercing them to take tutoring than if the teacher demanded a straight bribe of p. Also note that, in the model, competition from private tutors exacerbates this form of coercion since now teachers are attracting tutoring customers not just from the tutoring-or-not margin but also from the teacher-provided-or-private margin, and with competition they now have a need to coerce this second group who previously were captive customers.

Incentive contracts

Suppose the education ministry cannot observe m but can observe s. It might be quite hard to monitor what teachers do in the classroom, but o□cials can use test scores on standardized exams as a proxy for how well the teacher is performing. One question that arises is whether it would reduce the inequality in schooling outcomes if the o□cials incentivized teachers to raise the value of s for poor students, or whichever students have the lowest willingness to

[10]Recently, the issue gained attention in India, after the suicide of college student, Richa Mishra. In her suicide note, Mishra said she was driven to suicide by the enormous pressure her teachers were placing on her join their tutoring classes and by their threats to ruin her career if she refused. Teachers wrote and graded the exams at her college, so they had scope to lower a student's score at will. After her death, education authorities re-graded her exams and verified that she had been marked much lower than she deserved. The teachers she named in her suicide note were arrested. (Bisoi, 2005).

pay for tutoring. Interestingly, this step could end up being harmful for the low-demand students.

Proposition 5. *Suppose the teacher's pay is increasing in the achievement of low-demand students, for example, such that its objective function is*

$$p \cdot \left[F\left(y^P\right) - F\left(y^*\right)\right] + \phi(m) + \frac{\int_{y_i<\underline{y}} s_i(y_i)dy_i}{\int_{y_i<\underline{y}} dy_i}.$$

The welfare of a household with $y_i < \underline{y}$ may fall.

Proof. The new term is the average achievement of children in households with $y_i < \underline{y}$. The case that is of interest is where, without the performance pay, $\underline{y} < y^*$. This is the case where the performance pay is intended to raise the welfare of students who do not partake in tutoring. The teacher will respond to the new pay incentives in one of two ways. He could raise m and raise p in which case the households with $y_i < \underline{y}$ will be weakly less likely to consume tutoring and will be better off because of the higher m. This follows because $s_m > 0$. However, it is also possible that the teacher will adjust m down and p down so that some or all of these households consume tutoring. Consider a household with $y_i < \underline{y}$ that consumes tutoring under the new equilibrium. Call the original choices of the teacher (m_0, p_0) and the new values under the performance pay (m_1, p_1). The household's utility changes from $u_0 = s(m_0, 0) + v(y_i)$ to $u_1 = s(m_1, 1) + v(y_i - p_1)$. By revealed preference for the household $u_1 > s(m_1, 0) + v(y_i)$ and by revealed preference for the teacher, $s(m_1, 1) > s(m_0, 0) = u_0 - v(y_i)$. Combining these, $u_1 > u_0 + (s(m_1, 0) - s(m_0, 0))$. The term $s(m_1, 0) - s(m_0, 0)$ is negative, but we have made no restrictions on its magnitude, so when this quantity is sufficiently large, it is possible that $u_0 > u_1$, or that the household's welfare declines. ∎

The assumption is that the teacher cannot charge different households a different price for tutoring or give extra attention to certain students in class. If teachers could set a household-specific p, then presumably they would be doing so even without the incentive pay. If they could set a household-specific m, then incentive pay of this form would be more likely to improve the welfare of the low-demand households because teachers could give extra attention to these students.[11,12]

[11] Giving more attention to some students during school would also be another way that teachers could coerce students to take tutoring; less attention during school could be a punishment for not taking tutoring.

[12] Other unintended consequence that may arise with performance incentives tied to student scores are teaching to the test or teacher cheating (Jacob and Levitt, 2003).

An alternative motive teachers might have for giving lower grades to students who do not take their tutoring is to misinform parents about their student's likely score on the consequential tests. If parents update their beliefs based on the teacher's rating of their child, then a low rating might induce them to sign their child up for tutoring. Working backwards, this might lead teachers to falsify grades. With rational expectations, parents would account for the teacher's behavior, but it would be possible to have a model in which it was still beneficial to the teacher to engage in this behavior. This behavior will have many of the same observable patterns as the extortion story. One different implication is that this type of downgrading should be targeted at those not taking tutoring but probably not those taking tutoring from a private tutor. Another comparative static would be that if parents are more informed about their child's progress in school, then this behavior should be diminished.

3 Background and Data

Education system in Sri Lanka

Sri Lanka has a very high level of school enrollment compared to most countries with comparable per capita income (about $4000 a year in purchasing parity terms). Children enter primary school at age 5, and primary school runs through grade 5. The net primary school enrollment rate is estimated at 100% for both boys and girls. Over 95% of both girls and boys who enroll in primary school complete grade 5 (UNICEF, 2002). Secondary school runs from grade 6 to 11.[13] Prior to 1997, schooling through grade 5 was compulsory, and now the first 9 grades are compulsory.

The government is overwhelmingly the provider of primary education in Sri Lanka. Of the 11,272 primary and secondary schools operating in Sri Lanka in 1998, only 629 were non-government schools (Perera, 2000). At the primary school level, 2% of children attend private schools. Sri Lanka's limited private education has its roots in the Sinhalese nation-

[13] After grade 11 students sit for O-level exams which determine eligibility for two more years of study during which students specialize. Then they take A-Levels which determine university admissions. (Ranasinghe and Hartog, 1997)

alist movement of the late 1950's and early 1960's. Private schools were anathema to the (Buddhist) nationalists because they felt that the Christian missionaries were controlling the country's education system. In 1960 the private provision of school education in Sri Lanka was prohibited by the Assisted Schools and Training Colleges Act, and over 2700 privately owned but government subsidized schools were taken over by the government. Fifty schools were given special dispensation to continue as private schools but with no financial assistance from the government. The private schools today comprise the original 50 schools plus spino□s that were allowed to form.

Fifth grade, the point at which we observe students, is the final year of primary school. At the end of the year, students take the national Grade 5 Scholarship Examination. A good performance on that exam (above the 90th percentile) makes students eligible to apply to the best junior secondary schools and may also lead to a government-funded school scholarship.

Partly for this reason, tutoring is very common among Sri Lankan fifth graders. Of students in our sample, 78% receive some type of tutoring. There are 3 main venues for tutoring. First, group classes are o□ered after school by the school's teachers. Second, group classes are taught elsewhere by educated individuals, often former teachers. Third, and less frequently, instructors come to the students' home for individual tutoring (perhaps with one or two other students). We refer to the second and third types as private tutoring, though tutoring at school is not an o□cial government service. As discussed below, school tutoring is sometimes provided for free by schools, and in other cases it is a for-profit activity.

Data and descriptive statistics

The data come from two related surveys which sampled students who were in grade 4 in 2002 and then tested and surveyed them in 2003 when they were in grade 5. The first survey, conducted by Sri Lanka's National Education Research and Evaluation Center (NEREC), is of 16,383 students in 939 randomly selected public schools. In each of Sri Lanka's nine regions, roughly 100 schools were sampled, and 20 students were sampled per school or 10 students for schools with fewer than 20 fourth graders. Students who had completed grade

4 in December 2002 were tested in math, English and first language (Sinhala or Tamil) near the beginning (March) of the 2003 school year, at which time most of them were in grade 5 (students who had repeated grade 4 were also tested, but not students who repeated grade 5). NEREC also administered questionnaires to students, parents, teachers, and principals in March 2003.

The second source of data is from Sri Lanka's National Education Commission (NEC), which collected detailed information in the summer of 2003 from a random sub-sample of the NEREC schools: 2653 students in 140 schools (about 16 schools per province). The NEC survey used a household questionnaire to collect data on each child and his or her household. A school questionnaire was completed at each child's school, focusing on teachers who taught grade 4 in 2002. The data unfortunately do not identify the student's grade 4 teacher, and the teachers are the students' teachers from the previous school year. Therefore, our unit of analysis on the supply-side of tutoring is the school, and we aggregate data on teachers within a school. This will introduce some measurement error, but conceptually it is not a misrepresentation of the provision of tutoring, since tutoring tends to be organized by the school and not by individual teachers.

Neither the NEREC nor the NEC data were collected for the purpose of examining tutoring, but both surveys asked several questions on the topic. We restrict our analysis to the NEC subsample because of its higher quality data and greater detail. In particular, it contains information, broken down by subject, on whether a student took tutoring, and on the school's subjective assessment of the student, both of which play central roles in our analysis. Our full sample comprises 2556 students for whom the school identifier and sampling weight are available. Some regressions have fewer students due to missing data.

Table 1 presents descriptive statistics on tutoring, beginning with participation in the different types of tutoring, by subject. About one fourth of students take math and about one fourth take Sinhala classes at schools (almost always their own school). English and Tamil classes are less commonly taken at school. Group classes away from the home are even more popular, with between 31 and 40 percent of student taking English, math and

Sinhala classes in groups. Tamil is less common in groups, primarily because it is the local language of only about one fourth of Sri Lanka's population. Finally, individual classes are relatively rare, but they are most common in English and math.

Panel A also reports the amount of tutoring by income group. Even among the poorest third of the population, nearly two thirds of the students report participating in tutoring classes, with 41% taking classes in groups away from home and 29% taking classes at school. Participation in tutoring is higher among the wealthiest third of the population, at about 87%. Almost all of the increase comes from taking private group classes, which apparently are the preferred type of tutoring class among better o Sri Lankan households. One possible reason is that group classes at school have a larger class size than private group classes, which may make them lower quality. This is seen at the bottom of Panel A; the mean and especially the median class size is much larger in school classes than in private group classes.

As shown in Panel B, for most students, tutoring takes only a few hours per week. Approximately 52% of students report spending 1 to 5 hours per week in tutoring classes, while another 19% report 6 to 10 hours per week and 7% report more than 10 hours per week (and 23% report not participating in tutoring). Hours spent on tutoring increases with income. One limitation of the data is that only the total hours the child spent in tutoring is available, and not hours broken down by subject or type of tutoring. The same is true of the data on tutoring expenses.

About 9% of students spend less than 50 Sri Lankan Rupees (Rs.) per month, another 22% spend 51-100 Rs. per month, 21% spend 101-200 Rs. and 23% spend more than 200 Rs. per month (and 26% report no spending on tutoring). On average households spend 139 Rs. per month on tutoring for their fifth-grader. This figure is 7% of total expenditures per capita which averages Rs. 1600 per month. Not surprisingly, wealthier households spend more on tutoring. The share of expenditures allocated to tutoring (for the one sampled child) rises slightly across the per capita expenditure distribution, from 6.6% for the bottom tercile to 7.3% for the top tercile. This implies that the bottom tercile spends on average 51 Rs. a month, the middle tercile spends 88 Rs. a month, and the top tercile, 208 Rs. a month.

As a point of comparison, a primary school teacher's salary is about 4000 Rs. per month.

Table 2 presents other descriptive statistics. Panel A shows that students who are enrolled in tutoring score about 0.5 to 0.6 standard deviations higher on the NEREC tests than students not enrolled in tutoring, but of course many other factors may explain these differences. There were tests in three subjects, math, English, and the student's mother tongue, either Sinhalese and Tamil. This breakdown of test scores does not take into account which subjects the student took tutoring in or the type of tutoring, but the regression analysis will.

Another measure of student achievement is how many of the competencies in a subject the student meets. This is the assessment of a student that the school gave the student at the end of grade 4, and is available for math and literacy (which incorporates performance in English and the student's mother tongue). This pass rate, which has a mean of about 80% for both literacy and math, is again higher for tutored students. The pass rate is the subjective measure of achievement we use, while the NEREC test score is the objective measure.

Finally, Panel B of Table 2 presents the mean of other variables that characterize the sample or are used in the regression analysis. A little over half of students are female. Tamils comprise 11% and Moors, 12% of students; the omitted group are the Sinhalese majority group, plus a small number ($<$ 1%) of Burghers. The mother tongue of Tamils and Moors is Tamil, while the Sinhalese speak Sinhala. The height-for-age z-score has a mean of -.98 and a standard deviation of .94 (using the height distribution of U.S. children as a reference group). Eighty-two percent of households have electricity, and average education of parents is about 10 years, consistent with the description earlier of Sri Lanka's high educational attainment, relative to most developing countries. In 73% of households, the parents report that they never discuss schoolwork with their fifth-grader.

Another variable we use is whether the school offers any tutoring in a subject. This measure is constructed by summing over the hours each teacher reported tutoring after school, by subject, and creating a dummy variable for whether the total is positive. The mean is .71 in math, .59 in Sinhala or Tamil, and .08 in English. One explanation for the low incidence of schools offering English tutoring is that private tutors have a skill advantage over

many government teachers in teaching English; English-medium education was more common among the older now-retired generation than among the current generation of teachers, so retired teachers provide much of the English tutoring today.

The official stance in Sri Lanka is that school tutoring is gratis, and that schools and teachers provide it on a volunteer basis. This claim is dubious, but it seems to be true sometimes, and in other cases non-governmental organizations might compensate teachers for their time, with the service being free to students. Our crude estimate is that schools charge for tutoring a little over half the time, though this is very likely an underestimate. We have to make this calculation indirectly, since tutoring expenses are not broken down by type of tutoring (or subject). Using only students who take some school tutoring but no private tutoring, we calculate the median tuition expenses of such students in a school. In some schools such students do not exist, so the variable is only available for 1241 of the 2556 students. We construct a dummy variable that equals 1 if the median expenditures are greater than 0. The mean value of this measure of whether the school charges for tutoring is .55. The variable is probably an underestimate of fee-based tutoring since some schools might offer free tuition to poorer students but charge wealthier students, and the poorer students are more likely to be the ones not taking private tutoring in other subjects, whom we use in our calculation. If we use instead whether the mean tutoring expenses of school-tutoring-only students is 0, it appears that 85% of schools charge for tutoring.

Finally, using data for each teacher on whether he is native to the district in which he teaches, we calculate the proportion of teachers in the school who are not locals, which we use as a measure of lower altruism among teachers. The sample mean of this variable is .15.

4 Empirical strategy and results

Empirical strategy

Our empirical analysis aims to answer three questions. First, what is the effect of tutoring on academic achievement? Previous research has shown that tutoring is associated with higher

test scores (Ha and Harpham, 2005; Dang, 2006). Our contribution is to address some of the endogeneity problems that have made a causal estimate of the effect of tutoring difficult. Second, do teachers downgrade school quality to induce demand for teaching? Third, do teachers give lower subjective assessments to students who are not their tutoring classes? The last two questions test the hypotheses laid out in the model that teachers misuse their authority to increase their profits from private tutoring, by teaching less in school or by manipulating the grades they assign.

Effect of tutoring on test scores

The measure of student achievement is the score on a test administered with the survey. Linearizing the student achievement production function assumed in the model, where achievement is increasing in tutoring, we estimate the following equation to measure the effect of tutoring (Tut) on test scores ($TScore$):

$$TScore_{ijk} = \beta_1 \cdot Tut_{ijk} + \phi_1 \cdot X_{ijk} + \eta_i + \epsilon_{ijk} \tag{4.1}$$

The subscript i denotes the student, j denotes the school, and k is the subject such as math or English. Ideally j would denote the teacher, but we can only match a student to her school. The coefficient β_1 is the effect of tutoring on test scores (the subscripts refer to the equation number). We also estimate equations that allow β_1 to vary by type of tutoring or by subject.

The control variables X_{ijk} include school and subject or school-subject fixed effects as well as individual-level covariates. The term η_i is an individual-level unobservable term. The unobserved part of income plus other aspects of family background such as taste for education contribute to η_i. This component is likely to be positively correlated with both tutoring and test scores, which would lead to an upward bias in $\hat{\beta}_1$. Another component of η_i is the student's ability which also might be correlated with tutoring, for example, if low-ability students seek remedial tutoring. This reverse causality would lead to a downward bias in $\hat{\beta}_1$. The unobservables also could have the opposite patterns, with higher-ability students

being more likely to take tutoring. The final term in the regression equation is an error term ϵ_{ijk} which reflects the subject-specific ability of the student or other subject-specific educational inputs such as help from parents, as well as measurement error in how well the test score measures student achievement.

We use two main approaches to address endogeneity bias. First, we include a rich set of control variables X_{ijk}. These variables include measures of family income and student height-for-age which might be correlated with cognitive ability (Aturupane, Glewwe, and Wisniewski, 2005). In addition, we include tutoring in $other$ subjects as regressors. If tutoring in each subject has the same correlation with unobserved family background or individual ability, then controlling for other tutoring, which should not affect knowledge in the subject of interest, should address unobserved heterogeneity.[14] For similar reasoning, we also control for test scores in other subjects.

Controlling for tutoring and test scores in other subjects gets us close to an individual fixed-effect model. Not surprisingly, then, our second approach is to use individual fixed effects and to measure the within-student effect of tutoring on test scores, using variation across subjects. While this approach solves many sources of bias, it remains possible that the child's subject-specific ability is correlated with tutoring. If students get tutored in their weaker subjects, this would imply that we underestimate β_1.[15]

Spillovers of teacher-provided tutoring

The second part of the empirical analysis tests whether the amount taught in school is lower when the school is offering tutoring. Here we are interested in the average achievement in a subject within a school, not a comparison between students who do and do not participate in tutoring. The theoretical result is that the amount taught should be lower when teachers are trying to boost tutoring profits and when the cost of teaching less is low, all else equal.

[14] Literacy arguably could improve math scores. The math exam was written in the student's mother tongue, so this should be true of literacy in one's mother tongue.

[15] In primary school, there does not seem to be much return to being excellent in one subject while mediocre in others. Most students who excel on the Grade 5 Scholarship Exam, which is scored as a simple mean of test scores in different subjects, do well in all subjects. Moreover, group classes, the dominant form of tutoring, seem better suited to shoring up one's weaknesses than to becoming highly advanced in a subject.

We observe the student's academic achievement (test score) inclusive of tutoring, and downgrading of school instruction might induce more tutoring (this is the hypothesized motive for downgrading). Therefore, we condition on the amount of tutoring.

We make comparisons across subjects that the school does and does not o□er tutoring in. Using data on how many hours teachers in the school conducted tutoring in a subject, we construct a dummy variable for whether the teachers o□er any tutoring.[16] While the quantity taught might reflect supply and demand factors, we consider the intensive margin—whether the teachers o□er any tutoring—as more likely to be an exogenous supply-side choice. Some schools might choose not to tutor in certain subjects, for example, because of the principal's preferences or the teachers' opportunity cost of time. The variable $SchTutSupply_{jk}$ equals 1 if school j o□ers tutoring in subject k, and 0 otherwise. The simplest regression one might estimate is the following.

$$TScore_{ijk} = \gamma_2 \cdot SchTutSupply_{jk} + \beta_2 \cdot Tut_{ijk} + \phi_2 \cdot X_{ijk} + \eta_i + \epsilon_{ijk} \tag{4.2}$$

The prediction is $\gamma_2 < 0$. However, one factor that might a□ect supply is the skill level of the teachers. Schools might not o□er tutoring in subjects where the teachers are not well trained, which would bias $\hat{\gamma_2}$ upward. Instead, we use a di□erence in di□erences approach and examine the interaction of $SchTutSupply$ and a variable that indicates when the cost of strategically teaching poorly is lower for teachers. The measure we use is the fraction of teachers who are not native to the district (%$OutsiderTchrs$), on the view that non-local teachers will be less altruistic toward their students. The equation becomes,

$$\begin{aligned} TScore_{ijk} \;=\; & \gamma_3 \cdot SchTutSupply_{jk} + \delta_3 \cdot SchTutSupply_{jk} \times \%OutsiderTchrs_j \\ & + \beta_3 \cdot Tut_{ijk} + \phi_3 \cdot X_{ijk} + \eta_i + \epsilon_{ijk} \end{aligned} \tag{4.3}$$

and the prediction is that $\delta_3 < 0$, or teachers teach less in a subject when they are o□ering tutoring and are less altruistic. The control variables X includes whether the school o□ers

[16] These are fourth grade teachers and we observe students in fifth grade, so we are making the assumption that these outcomes are correlated across grades with a school-subject.

tutoring interacted with the school's distance from the seat of local government, to correct for the fact that a higher proportion of non-local teachers could be measuring remoteness.

As discussed above, sometimes school tutoring is free. Teachers are unlikely to encourage tutoring take-up in this case, and in fact, might want to discourage it. This would be true of teachers who receive a fixed compensation from an NGO or who provide tutoring at the behest of their superiors, but even if teachers are benevolent, and, ceteris paribus, want to encourage tutoring take-up so that students learn more, it likely would defeat their purpose if they downgraded their regular teaching as a means of encouraging tutoring take-up. Therefore, downgrading of school instruction should occur when $fee\text{-}based$ school tutoring is o□ered. We reestimate the regression focusing on subjects in which school tutoring is o□ered and the school charges for tutoring. The indicator variable $SchTutFee_j$ equals 1 if the school charges fees for tuition. The triple interaction coe□cient λ_4 is the coe□cient of interest when we estimate the following regression.

$$\begin{aligned} TScore_{ijk} = {} & \gamma_4 \cdot SchTutSupply_{jk} + \delta_4 \cdot SchTutSupply_{jk} \times \%OutsiderTchrs_j \\ & + \lambda_4 \cdot SchTutSupply_{jk} \times SchTutFee_j \times \%OutsiderTchrs_j \\ & + \kappa_4 \cdot SchTutSupply_{jk} \times SchTutFee_j + \beta_4 \cdot Tut_{ijk} + \phi_4 \cdot X_{ijk} + \eta_i + \epsilon_{ijk} \end{aligned} \tag{4.4}$$

The prediction is that λ_4 is negative. Teachers who tutor for money have an incentive to reduce how much they teach in school, implying that the amount learned in school will be lower. For evol, ive to

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alternative mechanism has many of the same welfare implications; teachers' moonlighting reduces student achievement.

Another concern might be that $SchTutSupply \times SchTutFee \times \%OutsiderTchrs$ is picking up low teacher quality, perhaps because non-local teachers have a lower threshold skill level at which they begin offering fee-based tutoring. To test for this alternative explanation, we examine test scores for students in school-based tutoring. Their test scores should be relatively lower if they are taking tutoring from a teacher who is less skilled in a subject.

Giving lower grades to induce tutoring

The third part of the empirical analysis aims to detect whether teachers extort students by lowering their grades. The outcome variable is a subjective assessment by the teacher, whether the teacher passes the student in a subject. More specifically, students are tested in several competencies per subject, and the pass rate we use is the fraction of tests within a subject that the student passes. Conditional on the objective test score, is a student's pass rate lower if she does not take tutoring from the teacher? The simplest regression one might use to test this is

$$Pass_{ijk} = \delta_5 \cdot TScore_{ijk} + \gamma_5 \cdot PrivTut_{ijk} + \kappa_5 \cdot NoTut_{ijk} + \phi_5 \cdot X_{ijk} + \eta_i + \epsilon_{ijk} \qquad (4.5)$$

The prediction is that $\gamma_5, \kappa_5 < 0$ since relative to the omitted category of students who take tutoring from the school, students who take no tutoring or get private tutoring should receive lower marks. However, the test administered with the survey is not a perfect measure of what students are expected to learn, so tutoring likely improves the pass rate for the innocuous reason that students learn through tutoring, including important material not covered on the survey's test. We expect at least κ_5, the effect of not taking tutoring, to be negative relative to the omitted category of tutoring from the teacher. Even γ_5 might be negative for legitimate reasons if the teacher tutors on topics especially pertinent to the school exams.

To avoid this type of omitted variable bias, we use the same empirical strategy as above,

focusing on cases where the teachers are most likely to engage in coercion, namely when they are earning money from tutoring and are outsiders to the district.[17] We use the following estimating equation.

$$\begin{aligned} Pass_{ijk} = {} & \delta_6 TScore_{ijk} + \lambda_6 \cdot SchTutSupply_{jk} \times SchTutFee_j \times \%OutsiderTchrs_j \\ & + \psi_6 \cdot PrivTut_{ijk} \times SchTutSupply_{jk} \times SchTutFee_j \times \%OutsiderTchrs_j \\ & + \tau_6 \cdot NoTut_{ijk} \times SchTutSupply_{jk} \times SchTutFee_j \times \%OutsiderTchrs_j \\ & + \phi_6 \cdot X_{ijk} + \eta_i + \epsilon_{ijk} \end{aligned} \quad (4.6)$$

We interpret a negative coefficient for ψ_6 and τ_6 as evidence of extortionary behavior: teachers punish those who take private tutoring or forgo tutoring, if the teachers themselves are offering tutoring services and are less altruistic toward their students.

An alternative reason teachers could manipulate scores is to misinform parents so that parents think their child needs remedial tutoring. One different prediction is that misinformation would likely be targeted at non-participants in tutoring rather than those enrolled in private tutoring. Also, ψ_6 and τ_6 then should vary with how informed parents are about their child's academic achievement.

Results

Effect of tutoring on test scores

Table 3 presents results on the effect of tutoring on test scores using school fixed effects and individual-level controls. First we present the results for math. Column 1 controls for gender, ethnic group, whether the household has electricity, parents' education, height for age, and income category, in addition to school fixed effects. Taking tutoring in math is associated with a highly significant .24 standard deviation increase in the test score. In column 2 we add

[17] Another empirical approach is to determine which students should be targeted for extortion. For students on the margin of signing up for tutoring from the teacher, are their pass rates especially low, all else equal? We conducted such an analysis using a two-step estimation in which we first estimated the probability of taking tutoring from the teacher. The second step examined whether students who did not take tutoring from the teacher but who had a high predicted likelihood of doing so were punished. The statistical power of this exercise was prohibitively low, due to the low explanatory power in our first-stage equation.

whether the student took tutoring in English and whether she took tutoring in Sinhala or Tamil. Tutoring in math remains positive and significant, but tutoring in English has an even larger positive coefficient, suggesting that tutoring is correlated with individual heterogeneity in ability or family background. Column 3 adds test scores in the other 2 subjects, English and mother tongue, and these are highly significant; there is a very strong within-student correlation in test scores. The coefficients on tutoring are now insignificant. Columns 4 to 9 show analogous results for English and Sinhala/Tamil. The only coefficient on same-subject tutoring that remains significant once we control for other test scores is English tutoring, but this may reflect that English tutoring is strongly correlated with family background. The results of this table suggest that even a wide range of individual control variables make it hard to isolate the effect of tutoring.

The estimates of the effect of tutoring with student fixed effects are shown in Table 4. There are three observations per student, one for each subject. In the regressions without school-subject fixed effects, standard errors allow for clustering within a school-subject since the classroom instruction is the same for this group. As shown in column 1, taking tutoring in a subject raises test scores by .145 standard deviations. This is a quite large effect, equivalent to the improvement in test scores if a child's father has 3 more years of education or if the child is 2 standard deviations taller (based on the unreported coefficients on the control variables used in the regressions in Table 3). Note that the identifying variation comes from the 46% of students who take tutoring in some but not all subjects. Column 2 included school-subject fixed effects, and the coefficient falls to .104 and remains statistically significant at the 1% level. Column 3 estimates separate the effects for group tutoring at school, private group tutoring, and private individual tutoring; the three coefficients are similar. With school-subject fixed effects, there remains a strong effect of private tutoring, both in groups and one-on-one. However, the effect of school tutoring is not statistically different from zero. Finally, columns 5 and 6 estimate the effects of tutoring by subject, and there are no significant differences by subject.

Spillovers of teacher-provided tutoring

Next we examine whether teachers o□ering tutoring has negative spillovers on student achievement. Table 5, column 1 shows the relationship between test scores and whether the school o□ers tutoring in a subject, controlling for whether the student took any tutoring. The test scores are higher by .06 standard deviations, but the coe□cient is not significant. The regression includes student fixed e□ects, subject fixed e□ects, and subject fixed e□ects interacted with the number of 4th grade teachers in the school. The last control is because the school o□ering tutoring is (almost mechanically) correlated with the number of teachers in the school, and di□erentially so by subject since the tutoring prevalence varies by subject. Since the regressor of interest only varies between school-subjects, standard errors are corrected for clustering at this level.

As described above, other factors might be correlated with the school o□ering tutoring, so our empirical test is whether test scores are lower when the school o□ers tutoring and the teachers are outsiders. Column 2 adds this interaction of o□ering tutoring and the proportion of teachers who are non-native to the district. The interaction coe□cient is negative but insignificant. This regression adds subject fixed e□ects interacted with the proportion of non-local teachers as well as the interaction of whether the school o□ers tutoring and distance from the seat of local government, since more remote schools might have more non-local teachers.

The rest of the table incorporates whether the school charges for tutoring. This is a very relevant factor in what the teachers' strategic behavior will be. We are only able to construct this variable for half the sample (and our measure is crude). Column 4 shows that in subjects where a fee-charging school o□ers tutoring, when teachers are non-locals, test scores are lower on average. The e□ect is significant at the 10% level. The coe□cient of -.77 implies that when there is a one standard deviation increase in the proportion of non-local teachers (.35), fee-based school tutoring leads to a .27 standard deviation decline in test scores. Note that whether the school charges for tutoring is positively correlated with average per capita total expenditures of households, so we add the relevant interactions with

this variable to control for income.

The regressions have included all 3 subjects, but the subjects vary in the price of tutoring. While we cannot break down the costs of tuition rigorously, in a regression of total tutoring expenses on types of tutoring, school-provided English tutoring is associated with a large increase in tutoring expenses and Sinhala/Tamil with a small increase, suggesting that tutoring prices are highest for English, then math, then Sinhala/Tamil. Column 5 shows the results using only math and English observations, the two subjects where teacher incentives should be most distorted. The negative effect on test scores when less altruistic teachers offer fee-based tutoring increases in magnitude by 50%. The coefficient is statistically significant at the 1% level.

The motive for downgrading school instruction is to induce tutoring, so column 6 repeats the estimate but without conditioning on whether the student took tutoring. As expected, the negative effect is diminished; for some students, the lower amount taught in class is compensated with a higher likelihood of taking tutoring.

One type of omitted variable that could explain these results is if the outsider teachers who offer tutoring are less skilled; perhaps the propensity to offer tutoring is increasing in skill, and this is more true for altruistic teachers. This would generate the negative interaction coefficient we observe. To test for this alternative explanation, we look for another implication, namely that school-based tutoring from these teachers, if they are low-skilled, should be less valuable. Column 7 shows these results. We do not find this pattern and in fact find the opposite. School tutoring appears, if anything, more valuable in these cases.

Giving lower grades to induce tutoring

Table 6 presents the results on whether teachers give lower grades to induce students to sign up for their tutoring. The dependent variable is the proportion of competencies that the teacher passes the student in. The prediction is that since the teacher has latitude over these grades, the wedge between the grades and the objective test score will be lower when teachers are trying to raise the student's demand for their tutoring. There is a grade for math and one

for literacy. Because literacy combines mother tongue and English, for observations where the dependent variable is the literacy grade, we average over the independent variables (e.g., NEREC test score, whether student took tutoring) for English and Sinhala/Tamil for that student. There are thus two observations per student rather than three.

As a preliminary step, column 1 shows that without individual fixed effects, grades are strongly correlated with the objective test score. The standard deviation of grades within a school-subject is 16, so a one standard deviation higher test score is associated with a .5 standard deviation higher grade. However, as column 2 shows, with individual fixed effects, the effect of the test score on grades drops considerably. This suggests that the within-student variation in grades may be extremely noisy, or the grades are based on material orthogonal to what is on the NEREC tests.

Column 3 shows the main results. The prediction is that for students taking private tutoring or no tutoring, when the school offers for-profit tutoring and more teachers are non-local, their grades should be lower. The interaction for students in private tutoring is positive and close to 0. The coefficient for student taking no tutoring, on the other hand, is negative and significant at the 1% level. The point estimate of -43 means that when there is a one standard deviation increase in the proportion of non-local teachers (.35), fee-based school tutoring leads to a one standard deviation decline in grades, conditional on the objective test score.

One alternative explanation is that rather than extorting students, teachers are trying to misinform parents that their student is not doing adequately in school, again in order to induce tutoring take-up. The pattern that the effects are for non-tutored students rather than those taking tutoring from third parties is consistent with this story. To test this, column 4 restricts the sample to households where the parents report never discussing schoolwork with their children. The effects are the same for this subsample, not larger in magnitude as the misinformation hypothesis would suggest.

Finally, column 5 adds school-by-subject fixed effects. Now the identification is strictly within a school-subject, making comparisons across students who take different types of

tutoring or no tutoring. While the point estimates remain negative, the results are not statistically significant in this specification.

To summarize, we first examine the effects of tutoring on test scores and find that taking tutoring raises achievement by .1 standard deviation, at least for private tutoring. Second, we test for whether schools offering for-profit tutoring leads to overall lower achievement for students. We find evidence consistent with this type of spillover, particularly for tutoring in English and math, the more lucrative subjects for tutors. Finally, we look for signatures of teachers manipulating grades to induce tutoring. We find patterns suggestive of this effect, though the results are sensitive to the specification.

5 Conclusion

One reason for low quality of education in developing countries is that teachers lack strong performance incentives. This paper focuses on a widespread phenomenon that may give teachers especially bad incentives. Government teachers routinely 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. We model and test for this phenomenon using survey data and test scores from Sri Lanka. First, we present evidence that attending tutoring classes improves a student's academic achievement, as measured by tests administered with the survey. Second, the existence of teacher-provided tutoring seems to have negative spillovers on student achievement. Third, there is suggestive evidence that teachers might lower students' grades at will as a coercive tactic to encourage tutoring take-up. If teachers offer tutoring, their assessment of a student, conditional on the student's objective achievement, is lower if the student does not sign up for their tutoring, though this pattern is not found in all cases.

An implication of our findings is that banning teachers from tutoring their own students or reducing entry barriers for private tutors might increase student achievement, even for non-participants in tutoring. Whether such policies are well-advised also depends on whether they would have beneficial or detrimental effects on sorting into the teaching profession, an

issue not addressed in this paper. In addition, many of the implications of the paper would be reversed in situations where tutoring and school instruction are complements rather than substitutes, that is, where by teaching well, teachers push more students into a region of achievement where tutoring is valuable to them.

We 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 (Banerjee, Deaton, and Duflo, 2004; Das and Hammer, 2005). 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 exceptionally brazen given that tutoring usually takes places 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 foot traffic, so to speak. With near universal attendance at government primary schools, at least in Sri Lanka, teachers automatically meet and interact with their potential tutoring customers. Patients in need of health care often bypass the government health clinic, and go straight to a private provider, particularly if quality is low or they expect the clinic to be unstaffed (World Bank, 2001). One reason why private practice might improve a worker's performance in his government job is that it gives him an incentive to show up in order to meet and attract clients for his private clinic (Chawla, 1996). This could hold even if public and private health care are substitutes at the individual level, with a doctor steering certain patients to his private clinic while serving others in the public clinic, an improvement over his being absent. Another important difference is that, whereas in the education sector, private tutors are often as qualified as government teachers, many private health workers are unqualified and the care they give

can be detrimental (Banerjee, Deaton, and Duflo, 2004; Bennett, McPake, and Mills, 1997). A ban on private care by government doctors and nurses would quite likely do more harm than good if it shifted patient care toward untrained health workers.

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Table 1: Descriptive Statistics on Tutoring

Panel A	Classes at School	Group classes	Individual classes	Any type of class
Students taking classes, by subject (%)				
English	6.2	37.0	3.6	44.8
Math	27.8	40.1	3.1	65.5
Sinhalese	24.6	31.0	1.6	51.7
Tamil	4.3	11.6	1.4	17.2
Students taking classes in any subject (%)				
Bottom third of expend. distribution	30.1	37.3	3.8	64.2
Middle third of expend. distribution	26.5	50.4	5.5	73.8
Top third of expend. distribution	33.8	68.8	6.3	86.3
Median (mean) of class size				
English	40 (36.8)	25 (30.3)	-	-
Math	40 (35.4)	18 (20.6)	-	-
Sinhalese	40 (35.6)	25 (31.0)	-	-
Tamil	30 (30.6)	15 (15.3)	-	-

Panel B		By total per capita expenditure tercile		
	All	Bottom third	Middle third	Top third
Hours per week in tutoring (%)				
0	22.6	33.9	25.0	13.7
1-5	51.8	16.5	17.1	19.7
6-10	18.5	26.4	22.3	31.4
> 10	7.1	23.2	35.6	35.3
Expenditure per month on tutoring (%)				
0	25.6	31.6	27.7	21.6
< 50 Rupees	8.7	14.9	8.6	5.9
50 – 100 Rupees	21.9	32.1	24.2	15.8
101 – 200 Rupees	21.3	14.5	22.0	24.0
> 200 Rupees	22.6	7.0	17.5	32.7
Monthly tutoring expenditure, mean (sd)	139 (190)	51 (76)	88 (110)	208 (233)
Tuition expenditure relative to per capita expenditure, mean (sd)	.070 (.086)	.066 (.102)	.068 (.083)	.073 (.086)

Notes: Data is from the Sri Lankan National Education Survey, 2003. N=2556. Calculations use the survey sampling weights.

Table 2: Descriptive Statistics on Test Scores and Other Variables

Panel A

	Mean (std deviation) for Students in any tutoring	Mean (std deviation) for Students not in tutoring
Test score (administered with survey)		
English test score	0.13 (0.92)	-0.40 (0.96)
Math test score	0.11 (0.98)	-0.44 (1.13)
Sinhalese or Tamil test score	0.14 (0.91)	-0.49 (1.15)
% of competencies passed (school's assessment)		
Literacy (local language and English)	86.0 (21.5)	80.9 (25.3)
Math	86.8 (21.6)	82.9 (24.5)

Panel B

	Mean (Std deviation)
Student characteristics	
Female	.56
Tamil	.11
Moor	.12
Height-for-age z-score	-.98 (.94)
Household has electricity	.82
Father's years of education	9.7 (3.5)
Mother's years of education	10.0 (3.3)
Parents never discuss schoolwork w/ child	.73
School × Subject characteristics	
English tutoring offered by school	.08
Math tutoring offered by school	.71
Sinhala/Tamil tutoring offered by school	.59
School characteristics	
Number of 4th grade teachers	2.51 (.81)
School charges for tutoring*	.55
Proportion of teachers who are not native to the district	.15 (.35)

Notes: Data is from the Sri Lankan National Education Survey and National Education Research and Evaluation Center, 2003. N=2556. For height-for-age, N=2367. Calculations use the survey sampling weights.
* School charges for tuition equals 1 if the median student who takes some school tutoring and no other type of tutoring reports positive tuition expenditures. The variable is only available for 1241 of the 2556 students because in some schools, no or few students take only school tutoring; we calculate the variable for schools where at least 3 students fit the criterion.

Table 3: Effect of Tutoring on Test Scores

	Dependent variable: Test score								
	Math			English			Sinhala/Tamil		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tutoring in Math	**.241****	**.177***	**.050**		.003	-.119*		.176*	.066
	.042	***.082***	***.048***		*.077*	*.057*		*.078*	*.044*
Tutoring in English		.146**	-.029	**.260****	**.251****	**.136****		.178**	.025
		.037	*.022*	***.035***	***.035***	***.026***		*.035*	*.020*
Tutoring in Sinhala/Tamil		.050	.004		.084	.052	**.220****	**.042**	**-.010**
		.083	*.048*		*.079*	*.057*	***.041***	***.037***	***.045***
Test score in Math						.269**			.617**
						.024			*.014*
Test score in English			.187**						.253**
			.017						*.015*
Test score in Sinhala/Tamil			.718**			.423**			
			.017			*.025*			
No. of observations	2516	2516	2516	2516	2516	2516	2516	2516	2516
School fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: ** indicates p<.01, * indicates p<.05, + indicates p<.10. Standard errors are reported in italics below the coefficients. Regressions include dummy variables for female, Tamil, Moor, Burgher, whether the household has electricity, height-for-age and a dummy for missing height-for-age, mother's years of education, father's years of education, and dummy variables for 6 of the 7 income categories. Data is from the Sri Lankan National Education Commission and National Education Research and Evaluation Center surveys, 2003.

Table 4: Effect of Tutoring on Test Scores with Student Fixed Effects

	Dependent variable: Test score					
	(1)	(2)	(3)	(4)	(5)	(6)
Any tutoring	.145**	.104**			.153**	.147**
	.030	*.019*			*.048*	*.052*
Group tutoring at school			.101*	.039		.016
			.044	*.044*		*.051*
Private group tutoring			.121**	.095**		
			.029	*.027*		
Individual tutoring			.125+	.123*		
			.067	*.060*		
Any tutoring * Math					-.007	.008
					.038	*.042*
Any tutoring * English					-.012	.002
					.062	*.066*
Group tutoring at school * Math						-.035
						.048
Group tutoring at school * English						-.063
						.072
No. of observations	7668	7668	7668	7668	7668	7668
Student & subject FEs	Yes	Yes	Yes	Yes	Yes	Yes
School×Subject FEs	No	Yes	No	Yes	No	No

Notes: ** indicates p<.01, * indicates p<.05, + indicates p<.10. Standard errors, which are reported in italics below the coefficients, allow for clustering within a school×subject in columns 1, 3, 5, and 6. Each observation is a student×subject. Regressions weight the observations using the survey sampling weights. Data is from the Sri Lankan National Education Commission and National Education Research and Evaluation Center surveys, 2003.

Table 5: Effect of Teacher-Provided Tutoring on Student Test Scores

	Dependent variable: Test score						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
School offers tutoring	.042	.062	-.084	-.097	-.137	-.097	.057
	.039	*.041*	*.119*	*.116*	*.138*	*.120*	*.101*
School offers tutoring * % non-local teachers		-.144		.483+	.689**	.412	.630+
		.112		*.265*	*.232*	*.263*	*.332*
School offers tutoring * School charges			.161	.221	.249	.222	.310*
			.152	*.151*	*.190*	*.154*	*.134*
School offers tutoring * School charges * % non-local teachers				-.769+	-1.016**	-.640	-1.04*
				.402	*.373*	*.403*	*.481*
School offers tutoring * School charges * % non-local teachers * Student in school tutoring							.432
							.374
School offers tutoring * School charges * % non-local teachers * Student in private tutoring							-.251
							.405
Student in any tutoring	.142**	.120**	.144**	.115**	.123**		.252**
	.028	*.035*	*.029*	*.035*	*.044*		*.086*
No. of observations	7668	7668	3723	3723	2482	3723	3723
Subjects included	All	All	All	All	Math, English	All	All
Student and subject fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	No	Yes	Yes	Yes	Yes	Yes	Yes

Notes: ** indicates p<.01, * indicates p<.05, + indicates p<.10. Standard errors, which are reported in italics below the coefficients, allow for clustering within a school×subject. Each observation is a student×subject. Regressions weight the observations using the survey sampling weights. Columns 2 to 7 include subject fixed effects interacted with % non-local teachers and all regressions include subject fixed effects interacted with number of 4th grade teachers. All regressions with variables interacted with *% non-local teachers* also include analogous interactions with distance to the seat of the local government as control variables. All regressions with variables interacted with *School charges* also include analogous interactions with school-average log per capita expenditures as control variables. Column 7 controls for all other variables interacted with *Student in private tutoring* and *Student in school tutoring*. Data is from the Sri Lankan National Education Commission and National Education Research and Evaluation Center surveys, 2003.

Table 6: Effect of Teacher-Provided Tutoring on Subjective Grades

	Dependent variable: % of competencies passed				
	(1)	(2)	(3)	(4)	(5)
NEREC test score	8.0**	.4	1.3+	1.1	.7
	.5	*.5*	*.7*	*1.0*	*.6*
School offers tutoring * School charges * % non-local teachers			35.3	40.1+	
			22.5	*20.4*	
School offers tutoring * School charges * % non-local teachers * Student in private tutoring			3.4	1.9	-3.6
			15.6	*17.8*	*24.3*
School offers tutoring * School charges * % non-local teachers * Student in no tutoring			-43.0**	-43.8+	-18.5
			16.2	*24.1*	*23.8*
No. of observations	4821	4821	2363	1641	2363
Student fixed effects, Subject fixed effects	No, Yes	Yes, Yes	Yes, Yes	Yes, Yes	Yes, Yes
Other notes				Subsample that never discusses homewk	School× Subject fixed effects

Notes: ** indicates p<.01, * indicates p<.05, + indicates p<.10. Standard errors, which are reported in italics below the coefficients, allow for clustering within a school×subject, except in column 5. There are 2 observations per student, with the independent variables for mother tongue and English averaged within a student for the literacy test observation. Regressions weight the observations using the survey sampling weights. See the notes to Table 5 for other control variables. Any control variable is also interacted with student in private tutoring and student in no tutoring for columns 3 to 5. Data is from the Sri Lankan National Education Commission and National Education Research and Evaluation Center surveys, 2003.