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**Article**

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Born and raised in India, Muralidharan earned an AB in economics from Harvard, an M.Phil. in economics from Cambridge, and a PhD in economics from Harvard. His research spans development, public, and labor economics with a focus on improving the effectiveness of public spending in the social sector — education, health, and social protection programs — in developing countries. His research program is characterized by large-scale randomized experiments conducted in partnership with governments to study the impact of programs and policies at scale. He is actively involved in policy advising and capacity building in India, and teaches a course on the Indian Economy at UCSD.

## Public Sector Personnel Management in Developing Countries

**Karthik Muralidharan**

Government effectiveness in the provision of basic services like education and health directly affects the quality of life of poor people in developing countries. Yet, the quality of such service delivery is quite weak.<sup>1</sup> Understanding ways of improving service delivery in developing countries has been a focus of my research over the past 15 years. In this piece, I summarize the main insights from this body of work and discuss implications for both policy and research.

My work has focused on public-sector personnel management both because front-line workers are a critical link in service delivery, and because salaries are the largest component of public spending on service delivery. The best evidence comes from education for two reasons. First, it is a setting where public-sector employee productivity can be credibly measured using value-added estimates.<sup>2 3</sup> Second, the sharp increase in the number of randomized experiments in education has allowed researchers to credibly study the causal effects of various policy options to improve education.<sup>4</sup>

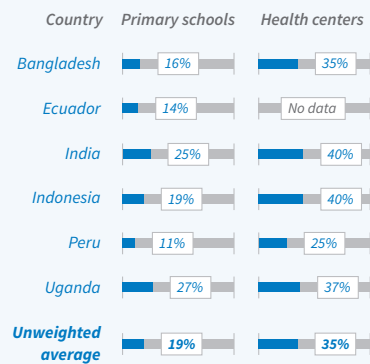
Further, the evidence summarized below typically comes from randomized experiments carried out in samples that are representative of tens of millions of people, and thus provide greater external validity than smaller-scale studies.<sup>5</sup>

### Teacher and Health Worker Absence

A striking indicator of weak service delivery in developing countries is the high rate at which front-line service providers are simply absent from work. In a cross-country study using nationally-representative data collected during unannounced visits to schools and health clinics in 2002-03, Nazmul Chaudhury, Jeff Hammer, Michael Kremer, Halsey Rogers, and I found that around 19 percent of teachers and 35 percent of health workers were absent.<sup>6</sup> In India, where we have the most detailed data, the absence rates were 25 percent and 40 percent respectively. The absence was not concentrated among a subset of “ghost” workers on the payroll, but was instead widely distributed among workers.

Unfortunately, the challenge of provider absence does not seem to have improved much over time. In a follow-up study in India conducted in 2010, Jishnu Das, Alaka Holla, Aakash Mohpal, and I visited the same villages that were visited in 2002–03 and found that teacher absence rates had only fallen modestly and were still nearly 24 percent.<sup>7</sup> We estimate that the fiscal cost of teacher absence — measured as salaries paid for days of work that were not done — was \$1.5 billion each year. In the sections below, I consider the evidence on potential ways of improving teacher motivation and performance.

**Employee Absenteeism in Schools and Health Centers**



Source: Chaudhury, Hammer, Kremer, Muralidharan, and Rogers, “Missing in Action: Teacher and Health Worker Absence in Developing Countries”, *Journal of Economic Perspectives*, 20(1), 2006, pp. 91–116

**Figure 1**

## Unconditional Salary Increases

Several global policy reports on education suggest that increasing teacher salaries may improve teacher motivation and student learning outcomes. For instance, UNESCO's Education for All Global Monitoring Report states that "low salaries reduce teacher morale and effort" and "teachers often need to take on additional work — sometimes including private tuition — which can reduce their commitment to their regular teaching jobs and lead to absenteeism."<sup>8</sup> In Indonesia, a World Bank report stated that "low pay is likely to be one of the main reasons why teachers perform poorly, and have low morale," and another report said that "teachers often have a high rate of absenteeism because they take second jobs to make ends meet. This reality reduces their motivation and effectiveness in the classroom."<sup>9</sup>

Joppe de Ree, Menno Pradhan, Rogers, and I were able to test the impact of unconditional teacher salary increases on student learning outcomes using a large-scale randomized experiment in Indonesia. The study was conducted in the context of a policy change in Indonesia that permanently doubled the base pay of eligible civil-service teachers and was phased in over a period of time. Working in partnership with the government, we implemented an experimental design that accelerated the doubling of pay for *all* teachers in 120 randomly selected schools across the country.<sup>10</sup> We evaluated the impact of this pay increase by comparing test scores in the 120 treated schools with those in 240 control schools.

We found that teachers in treated schools had higher income, were more likely to be satisfied with their income, and were less likely to report financial stress. They also were less likely to hold a second job and worked fewer hours on second jobs they did have. However, despite this improvement in teachers' pay, satisfaction, and time available to focus on their main job due to a reduction in second jobs, the large pay

increase did not improve either their effort or student learning. After two and three years of the pay increase, we find no difference in student test scores in language, mathematics, or science across treatment and control schools. The point estimates are close to zero and precisely estimated, allowing us to rule out even very small effects on student learning. Thus, the evidence suggests that higher pay improves the well-being of incumbent teachers but does not improve their effectiveness.

Of course, increasing teacher salaries can be expected to improve teacher quality over the long run by attracting stronger candidates to the profession. However, civil-service teachers in developing countries are typically paid much more than similarly qualified workers in the private sector,<sup>11</sup> and almost no one quits such a job. Thus, any positive effects on teacher quality will only be seen very gradually as incumbent teachers retire and new cohorts enter teaching. However, the costs of unconditional salary increases are borne immediately and are mostly incurred on incumbent teachers. Since there was no impact on performance, we calculate that at reasonable discount rates unconditional salary increases are a very inefficient way of improving service delivery in developing countries.

## Performance-Linked Pay

In contrast to the disappointing results from unconditional salary increases, there is considerable evidence of positive impacts on student learning from interventions that link even a small component of teacher pay to objective measures of performance. Venkatesh Sundararaman and I studied the impacts of teacher performance pay using a large-scale randomized experiment across 300 public schools in the Indian state of Andhra Pradesh.<sup>12</sup> We studied two types of teacher performance pay — group bonuses based on school performance and individual bonuses based on teacher performance — with the average bonus cal-

ibrated to be around 3 percent of a typical teacher's annual salary.

After two years, students in incentive schools performed significantly better than those in comparison schools by 0.27 and 0.17 standard deviations in math and language tests respectively. The gains were broadly distributed with students at all levels of the initial test-score distribution benefiting equally from the program. School-level group incentives and teacher-level individual incentives performed equally well in the first year, but individual incentive schools outperformed the group incentive schools after two years of the program.

We found no evidence of any adverse consequences as a result of the incentive programs. Students in incentive schools did significantly better not only in math and language, for which there were incentives, but also in science and social studies, for which there were no incentives), suggesting positive spillover effects. There was no difference in student attrition between incentive and control schools, and no evidence of any adverse gaming of the incentive program by teachers. Our data also suggest that the main mechanism for the impact of the incentive program was not increased teacher attendance, but greater and more effective teaching effort conditional on being present.

Finally, we found that performance-based bonus payments to teachers were a significantly more cost effective way of increasing student test scores compared to spending a similar amount of money unconditionally on additional schooling inputs.

In a follow-up study that tracked the impact of teacher performance pay over a five-year period, I continue to find robust positive effects of teacher performance pay on student learning outcomes.<sup>13</sup> The cohort of students entering in grade one who experienced the entire five years of primary school in a setting where their teachers were paid bonuses based on improvements in student learning scored 0.54 and 0.35 standard deviation higher in

math and language tests than their peers in the control group. These are large effects and among the largest effect sizes seen in experimental studies of education in developing countries in the past 15 years.

Further evidence on the positive effects of performance linked pay for teachers comes from a study by Esther Duflo, Rema Hanna, and Stephen Ryan, who use a randomized evaluation to study the impact of a program that recorded

teacher attendance using cameras and paid teacher salaries on the basis of number of days attended.<sup>14</sup> They find that the program reduced teacher absence in the treatment group by 21 percentage points, and increase student test scores by .17 standard deviations.

### Selection Effects

The two main margins of improving teacher quality are improving the effectiveness of incumbent teachers and hiring and retaining more effective teachers. As shown above, performance-pay is likely to be much more cost-effective than across-the-board salary increases for improving the performance of incumbent teachers

Performance-pay may also be a more effective way of improving the quality of new entrants into the profession. This is because increasing the spread of worker pay to more closely reflect productivity is also likely to attract higher-ability candidates, compared with an across-the-board increase in salaries on a compressed schedule with no links to performance.<sup>15</sup> In the context of education, Sundararaman and I find that teachers in India who are *ex ante* more willing to accept a

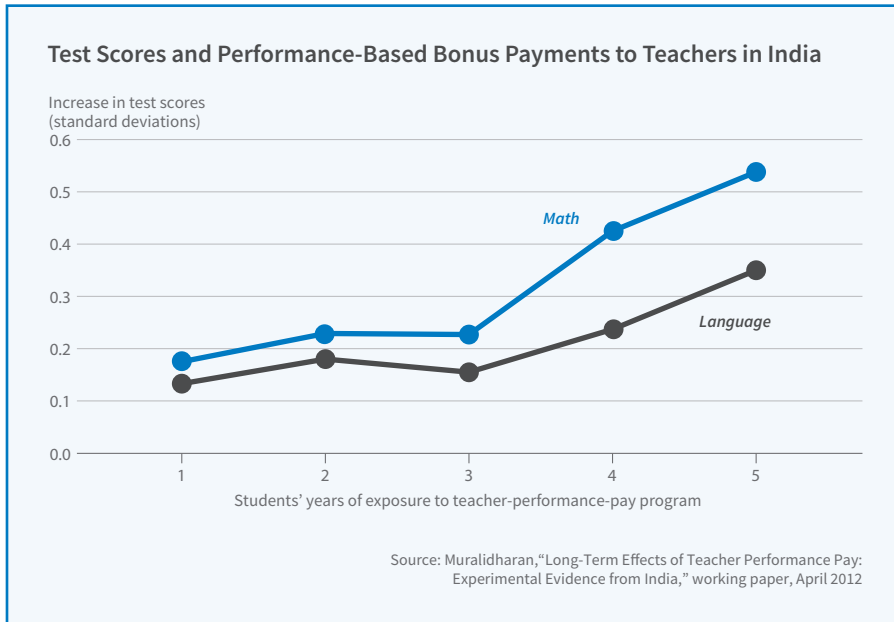


Figure 2

mean-preserving spread in pay linked to their performance are the ones who are more effective *ex post*.<sup>16</sup> This suggests that effective teachers know who they are, and are likely to be more attracted to a compensation schedule that rewards performance than to one that does not differentiate across high and low performing teachers.

### Complementarities between School Inputs and Teacher Incentives

Finally, there is suggestive evidence in the studies above that providing teachers with incentives based on improvements in student learning can also help improve the productivity of existing resources in the school. For instance, we find that teachers with formal teacher-training credentials do not appear to be any more effective than those without these credentials in the control schools. However, these teachers are significantly more effective in the incentive schools. In other words, if teaching quality depends on both teacher knowledge and effort, then an intervention that improves effort will be more effective among teachers with greater knowledge. However,

this evidence is only suggestive because we only have randomized variation in the incentives and not in the inputs.

In a recent study, Isaac Mbiti, Mauricio Romero, Youdi Schipper, Constantine Manda, Rakesh Rajani and I found robust evidence that teacher incentives can increase effectiveness of school inputs. The study, in Tanzania, featured a randomized evaluation conducted across 350 schools, and over

120,000 students.<sup>17</sup> We randomly allocated schools to four groups: 70 received unconditional school grants, 70 received a teacher performance pay program, 70 received *both* programs, and 140 were assigned to a control group.

We report four sets of results. First, the school grant had no impact on student test-scores in math, Swahili, or English after two years. Second, there was some evidence that teacher performance pay improved student learning. Third, students in schools that received both inputs and incentives had significantly higher test scores in all subjects.

Fourth, and most important, we found strong evidence of complementarities between inputs and incentives. At the end of two years, test score gains in the schools that received both programs were significantly greater in all subjects than the sum of the gains in schools that received grants and incentives. In short, school inputs appear to be effective when teachers have incentives to use them effectively, but not otherwise. Conversely, better-motivated teachers can be much more effective with additional educational inputs.

## Policy Implications

A vexing challenge for the global development community is that economically disadvantaged places also tend to have weaker governance. A robust pattern we see in the data is that teacher absence rates are higher in countries and states with lower per-capita income. Thus, places that are most in need of additional resources to provide basic services like education and health are also places that are likely to be the least efficient at converting additional spending into improved outcomes.

The results presented above suggest that performance-based pay for teachers and other frontline service providers may help improve the effectiveness of spending on public services in developing countries. In particular, the evidence suggests that it would have larger effects on student learning than unconditional salary increases. The evidence suggests that teacher incentives may also improve the effectiveness of other school inputs and spending.

It may be both fiscally and politically possible to implement teacher incentive programs by replacing scheduled across-the-board salary increases with a revenue-neutral alternative with a lower base increase but greater performance-linked pay. In such a scenario, the main long-term cost of a teacher incentive program would be the administrative cost of implementation, including maintaining integrity in test administration and grading, rather than the cost of performance-linked bonuses *per se*. The estimates of cost effectiveness in the papers summarized above all suggest that these costs will be a small fraction of the total salary bill, and that implementing performance-pay in practice can be quite cost effective.

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[Return to Text](#)

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[Return to Text](#)