

IDB WORKING PAPER SERIES N° IDB-WP-01051

Do multiple school jobs affect teacher performance? Evidence from Brazil

Gregory Elacqua
Luna Marotta

Inter-American Development Bank
Education Division

September 2019

Do multiple school jobs affect teacher performance? Evidence from Brazil

Gregory Elacqua
Luna Marotta

Felipe Herrera LibraryCataloging-in-Publication data provided by the
Inter-American Development Bank

Felipe Herrera Library

Elacqua, Gregory M., 1972-

Do multiple school jobs affect teacher performance?: evidence from Brazil / Gregory
Elacqua, Luana Marotta.

p. cm. — (IDB Working Paper ; 1051)

Includes bibliographic references.

1. Teachers-Employment-Brazil. 2. Teachers-Workload-Brazil. 3. Teacher
effectiveness-Brazil. I. Marotta, Luana. II. Inter-American Development Bank.
Education Division. III. Title. IV. Series.

IDB-WP-1051

<http://www.iadb.org>

Copyright © 2019 Inter-American Development Bank. This work is licensed under a Creative Commons IGO 3.0 Attribution-NonCommercial-NoDerivatives (CC-IGO BY-NC-ND 3.0 IGO) license (<http://creativecommons.org/licenses/by-nc-nd/3.0/igo/legalcode>) and may be reproduced with attribution to the IDB and for any non-commercial purpose, as provided below. No derivative work is allowed.

Any dispute related to the use of the works of the IDB that cannot be settled amicably shall be submitted to arbitration pursuant to the UNCITRAL rules. The use of the IDB's name for any purpose other than for attribution, and the use of IDB's logo shall be subject to a separate written license agreement between the IDB and the user and is not authorized as part of this CC-IGO license.

Following a peer review process, and with previous written consent by the Inter-American Development Bank (IDB), a revised version of this work may also be reproduced in any academic journal, including those indexed by the American Economic Association's EconLit, provided that the IDB is credited and that the author(s) receive no income from the publication. Therefore, the restriction to receive income from such publication shall only extend to the publication's author(s). With regard to such restriction, in case of any inconsistency between the Creative Commons IGO 3.0 Attribution-NonCommercial-NoDerivatives license and these statements, the latter shall prevail.

Note that link provided above includes additional terms and conditions of the license.

The opinions expressed in this publication are those of the authors and do not necessarily reflect the views of the Inter-American Development Bank, its Board of Directors, or the countries they represent.



Do multiple school jobs affect teacher performance? Evidence from Brazil

Gregory Elacqua & Luana Marotta
Education Division
Social Sector Department
Inter-American Development Bank

Abstract

Low salaries, a limited amount of full-time teaching positions, and alternative systems of allocating teaching hours lead teachers to look for additional jobs in other schools. Although this is a more common phenomenon of teacher labor markets in developing countries, teachers who teach specific subject areas are in general more likely to hold positions in more than one school. Yet, little is known about the impact of multiple school jobs on teachers' productivity. This paper sheds some light on this issue by examining whether students' outcomes are affected when their teachers work in more than one school. We use longitudinal data of students and teachers from the municipality of Rio de Janeiro, Brazil, over a period of 7 years and exploit within teacher-school-grade variation in the number of school jobs over time. We found consistent patterns suggesting that an increase in the number of school jobs lead to a decrease in student test scores. The negative effect of multiple school jobs ranges from 0.03 to 0.06 standard deviations. The effects are much larger for female teachers, ranging from 0.05 to 0.11 standard deviations. Low income students are also more negatively affected when their teachers teach in more than one school at a time. Lastly, results suggest that an increase in the number of non-teaching hours, which include time for lesson preparation, is a more important mechanism for explaining the effect of multiple school jobs than an increase in the amount of teaching hours spent inside the classroom.

Keywords: Multiple school jobs, teacher workload, teacher contract, teacher effectiveness.

JEL Codes: I20, I21, I25.

Multiple school jobs are a phenomenon that exists to some extent in most teacher labor markets. Across the countries that participated in the Teaching and Learning International Survey (TALIS) 2013, around five percent of lower secondary teachers worked in more than one school—the percentage of multiple-school teachers is higher among those who teach specific subject areas such as art and physical education (about 7 percent) and across non-OECD countries (10 percent). Survey data from Latin America show that nearly 20 percent of the lower secondary teachers in the region teach in more than one school (TERCE, 2013). The share of multiple-school teachers is likely to be higher in upper secondary education, when the number of specific subject areas increases. Yet, the patterns and implications of multiple school jobs are often overlooked by policy makers and researchers.

In some school systems, low salaries and the scarcity of full-time positions lead teachers to seek additional teaching opportunities at other schools to supplement their salaries (Vegas, 2007; Nusche et al., 2018). This is more common in developing countries where schools operate by shifts and teachers can hold positions in different schools during the morning, afternoon, and night sessions. Teachers may also be required to work in multiple schools as a result of government policies to address imbalances in supply and demand for teaching staff. For instance, regular full-time teachers might be assigned to teach in multiple schools by the local authority whenever they cannot complete their contract hours in a single institution (Canaz and Aslan, 2015). Moreover, school clustering, a policy that fosters cooperation between remote schools that have limited access to resources, may also require teachers to share their time across small rural schools (Armstrong, 2008; COSLA, 2018).

However, little is known as to whether holding multiple school jobs affects teachers' performance. Teachers might have longer teaching hours when they work in multiple schools,

resulting in greater fatigue and loss of productivity. Moreover, multiple-school teachers might spend a greater amount of time working outside the classroom, with lesson preparation and grading, if they are assigned to teach multiple grade levels, subject areas, and a larger number of students. Marotta (2019) compared student test scores of single- and multiple-school teachers and did not find significant differences in effectiveness between these two groups of teachers. Her study, however, was not able to isolate the effect of multiple school jobs from other teacher characteristics that might influence the effectiveness of a typical multiple-school teachers, such as teacher quality.

This paper aims to address this gap in the literature by following teachers over time and examining if student achievement is different when they work in more than one school. By doing this, we are able to hold constant time-invariant teacher characteristics. We examine the phenomenon of multiple school jobs in Rio de Janeiro's municipal school system. In Rio, most teachers are hired on a part-time basis and may work in more than one school to fill-up their schedule. Alternatively, some teachers can hold a full-time position in a school during the day and work at another school in the evening to increase their earnings. Rio de Janeiro's teacher labor market provides a unique opportunity for evaluating the effect of multiple school jobs on student outcomes.

To estimate the effects of multiple school jobs, we use longitudinal data of students and teachers over a period of 7 years, between 2011 and 2017. This study seeks to answer the following research questions. First, are students' test scores lower when their teachers work in more than one school? Second, is the effect of multiple school jobs larger for teachers and students with different characteristics? Third, does the effect of multiple school jobs remain the same when we hold constant the number of teaching hours, subject areas, grades, and students taught. The last three

variables can potentially impact teachers' workload beyond the number of teaching hours. If multiple-school teachers are more likely to teach different grades, subjects, and students, such an increase in job differentiation might be associated with an increase in the amount of time preparing lessons outside the classroom.

To answer these research questions, we exploit within teacher-school-grade variation in which teachers have a different number of school jobs in different years. In other words, we see if teachers' performance in a specific school and grade level is affected when they work in two or more schools. By controlling for teacher-school-grade fixed effects, we control for biases that could be introduced by the nonrandom distribution of teachers and students and by time-invariant differences in unobserved teacher characteristics, such as teacher quality.

We found consistent patterns suggesting that an increase in the number of school jobs lead to a decrease in student test scores. The negative effect of multiple school jobs ranges from 0.03 to 0.06 standard deviations. Moreover, the negative impact of multiple school jobs is particularly larger for poorer students who participate in conditional cash transfer programs. Female teachers are also much less effective than male teachers when working multiple school jobs, probably because women invest significantly more time in household labor than men. The negative effect of multiple school jobs on the performance of female teachers ranges from 0.05 to 0.11 standard deviations.

Interestingly, the effect of multiple school jobs does not decrease considerably when we hold the number of teaching hours constant. In Rio, multiple school jobs are not necessarily associated with longer teaching hours: for example, a teacher who holds a part-time position in two schools may teach the same number of hours than a teacher who works full-time in a single institution. However, the effect of multiple school jobs decreases and becomes non-significant when we

control for the number of different grades and students taught by the teacher. These results suggest that teachers are less effective when they work in multiple schools because they might experience burnout from dealing with greater diversity in job tasks.

This paper has important policy implications. Results indicate that multiple school jobs do not necessarily lead to negative student outcomes. This is relevant because multiple school jobs may be an effective strategy to address imbalances in supply and demand for staff when teachers' work hours are more optimally distributed across different schools. However, it is important that additional jobs do not lead to substantial increases in teachers' workload. Although this evidence is based on data from multiple school jobs, this may also apply for teachers who work other jobs outside the education field.

Evidence on multiple job holding

In the labor economics literature, the standard approach for explaining multiple job holding focuses on the premise that individuals work a second job because they are constrained on the number of hours that they can work on their primary job (Moses, 1962; Perlman, 1966; Shishko and Rostker, 1976; Krishnan, 1990). According to the "hours-constraints" framework, the number of hours on the primary job is often non-negotiable and, therefore, individuals must take a second job in order to work more and increase their earnings. Alternatively, individuals may decide to work two or more types of jobs because they have a personal preference for job differentiation (Renna and Oaxaca, 2006) or because they want to gain new skills and expertise outside their current position (Heineck, 2003; Panos et al., 2009). Evidence from teacher labor markets indicates that teachers' motives for working in multiple schools are more strongly associated with the hours-constraints on the primary job (Barbosa, 2011). This is particularly true in developing contexts where full-time and well-paid teaching positions are scarce (Nusche et al., 2018).

We know little about the implications of multiple school jobs in education. Few studies have examined the phenomenon of teacher moonlighting, which involves teachers who work second jobs outside of education. This literature indicates that teachers who moonlight spend less time and effort on their teaching duties (Johnson, 1990; Farber 1991; Winters 2010) and that teachers who work a second job outside education tend to report higher levels of burnout (Fitchett et al., 2016). This suggests that working different jobs might be more detrimental than working multiple *school* jobs.

However, the potential impact of multiple school jobs on teachers' productivity should not be neglected. Teachers who teach in more than one school might work longer hours. Empirical evidence suggests that longer working hours tend to decrease workers' productivity. In a recent study, Pencavel (2015) used data from the production of munitions in Britain during the First World War and found that employees working long hours experienced fatigue and were less productive. Similarly, Collewet and Sauermann (2017) studied the productivity of call center agents and found that an increase in their working hours led to an increase in the average handling time for calls. Lastly, there is also evidence that the number of working hours influence workers' health (Caruso et al., 2004).

In addition to increased working hours, multiple school jobs may also impact teachers' workload outside the classroom, including an increase in the time and effort spent on lesson preparation. Multiple-school teachers might be more likely to teach more diverse curricula, including a greater number of grade levels and subjects. In this paper, we will explore whether longer teaching hours as well as a greater number of grades, subjects, and students taught are important mechanisms through which multiple school jobs affect teachers' productivity.

Most of the evidence on multiple school jobs comes from descriptive reports showing the prevalence of this type of work arrangement among teachers in the developing world (Santiago et al., 2016; Nusche et al., 2018). Using data from Sao Paulo, Brazil, Marotta (2019) found that multiple-school teachers are less involved in school activities such as participation in school councils and preparation of the school's pedagogical program. Moreover, multiple-school teachers provide students with less academic support than single-school teachers. But the author did not find a difference in effectiveness between multiple- and single-school teachers. Her study, however, was not able to isolate the effect of multiple school jobs from other teacher characteristics that might influence the effectiveness of a typical multiple-school teacher. This current paper aims to address this gap in the literature by measuring the impact of multiple-school jobs on teachers' productivity while controlling for time-invariant differences in unobserved teacher characteristics, such as teacher quality.

Multiple school jobs in Rio de Janeiro

The Brazilian education system is composed of public and private schools. According to the country's Census of Basic Education in 2017, the public sector enrolled 82 percent of students and the private sector 18 percent. The public sector share is distributed among state, municipal, and federal school systems, which account for approximately 38%, 61%, and 1% of the total number of enrollments in basic public education. This paper focuses on municipal public schools from the city of Rio de Janeiro, Brazil's second-most populous municipality. Municipal school students represent 51% of the total enrollment in the city of Rio de Janeiro.

In 2017, about 30 percent of all municipal-school teachers in Rio de Janeiro worked in more than one school. This is equivalent to Latin American countries that also have a large percentage of multiple-school teachers in middle school, including Argentina, Uruguay, and Mexico. The

percentage of multiple-school teachers in these countries are, respectively, 34, 30, and 28 percent (TERCE, 2013). However, compared with non-Latin American countries that participated in the OECD Teaching and Learning International Survey (TALIS, 2013), Rio has a higher percentage of multiple-school teachers than Romania (18 percent), Serbia (16 percent), and Croatia (14 percent), where multiple school jobs are also common.

Most teachers in Rio are hired on a part-time basis and may hold multiple school jobs in order to fill up their schedule. Because Brazilian school hours are divided into shifts, a teacher could work part-time in a school in the morning and hold a part-time position at another school in the afternoon, working a number of hours equivalent to a full-time contract. However, teachers can also work overtime by holding a full-time position during the day at one school and working part-time in another school during the night shift. In 2008, Brazil's federal government enacted a law to establish a national minimum wage for public school teachers and determined that 1/3 of the contract hours should be used for class preparation and other tasks such as grading. Anecdotal evidence suggests that some teachers use their class preparation time to work additional teaching hours in other schools to supplement their income.

In most cases, the decision to work in multiple schools is at the discretion of the teacher. If teachers want to work additional teaching hours, they can apply for positions in the municipal, state, and private school systems. Our data accounts for teachers' total number of school jobs in these different systems. However, few teachers (less than 3 percent in 2017) are assigned to multiple schools by the municipal government when their contract hours are greater than the number of teaching hours needed by a single institution. This process is referred to as *complementação*—"complementation"—and occurs when the government has to intervene to address imbalances in supply and demand for teaching staff. According to interviews with

administrators in Rio, these adjustments are not made very often because there is resistance among teachers towards splitting their contract hours between different schools.

Data

This study uses administrative and longitudinal data from Rio de Janeiro's municipal school system as well as the Brazilian Census of Basic Education, which provides individual level data on all primary and secondary school students and teachers in Brazil. The Census data allow us to follow the same teacher over time and observe at which schools she teaches—including schools in the state and private sectors.

This study examines the impact of multiple school jobs on student test score on a municipal-wide standardized assessment, which measures subject- and grade-level proficiency of all primary and middle school students at the end of every quarter. These assessments are low-stakes and have no consequences to students' grades in school. Because the test scores are not vertically equated, inferences about student achievement growth over grades are not possible. Therefore, our outcome of interest is the average of students' test scores in all school quarters. Students are assessed in mathematics, reading, writing, and sciences. We only use math test scores because in Rio de Janeiro's middle schools the other subjects can be taught by multiple teachers, making it difficult to link student performance with teacher characteristics.

Analyses include most math teachers from municipal schools in Rio de Janeiro who taught grades 6 through 9 from 2011 to 2017. We focus on middle school teachers because they teach subject specific classes and are two times more likely to work in multiple schools than primary school teachers. The analytical sample consists of 3,021 teachers and excludes teachers for whom classroom information is not available (about 10 percent of population). Teachers who were excluded from the analytical sample had, on average, similar credentials and sex as those teachers

included in the analysis. Moreover, analyses are based on data from 540,118 students. This sample excludes approximately 14 percent of municipal school students who did not have outcomes and for whom classroom information was not available. Students with missing data had, on average, lower levels of poverty than students in the analytical sample. However, these missing data are unrelated to the variation in the number of teachers' school jobs overtime.

In addition to the number of schools at which teachers work and student performance, we use other student and teacher characteristics to estimate heterogenous effects and explore some mechanisms that might explain the impact of multiple school jobs on teacher effectiveness. Administrative data contain information on whether students participate in either one of the two conditional cash transfer programs available for families in Rio de Janeiro, *Bolsa Familia* and *Bolsa Carioca*. These programs target families who live below the poverty line or extreme poverty and, therefore, serve as a good proxy for students' socioeconomic background. Moreover, teachers' characteristics include their sex and credentials (whether they attended graduate school and participated in professional development activities). Moreover, to control for endogenous sorting of students and teachers within schools, we use two measures of classroom peer composition: the percentage of repeaters and the percentage of students receiving conditional cash transfers in the classroom. In this study, we also examine four mechanisms that might explain the effect of multiple school jobs: number of teaching hours, different grades, subject areas and students taught by the teacher. These data come from Brazil's Census of Basic Education.¹

Method

¹ The Census provides data on the total number of weekly hours associated with each classroom. A typical classroom in middle school, for example, has a total of 22.5 hours a week. Using Rio's standards for class time by subject area, we estimated the number of hours assigned to each teacher.

One challenge of measuring the effect of multiple school jobs on student outcomes is the possibility that the number of schools could be related to other teacher characteristics, such as teacher qualifications. In this case, the variable “multiple school jobs” would capture the effect of the combination of attributes found in a typical multiple-school teacher—instead of capturing the effect of working in multiple schools per se. To account for biases due to omitted variables correlated with multiple school jobs, we use a specification that explores within teacher variation on the number of school jobs over time (Miller et al., 2006; Clotfelter et al., 2007). This is a powerful strategy because the teacher fixed effects control for all time-invariant teacher characteristics that could bias the results.

Another challenge of measuring the effect of multiple-school teachers on student outcomes is the bias associated with the nonrandom sorting of students and teachers across schools and classrooms. For example, if teachers are more likely to teach low-income students when they take on additional teaching opportunities, the effect of multiple school jobs would be potentially negative and biased upwards. Therefore, our preferred model employs teacher-school-grade fixed effects to mitigate the selection bias. In other words, we evaluate if teachers’ performance in a specific school and grade level is affected when they work in multiple schools.

The endogeneity problem could also arise from the nonrandom sorting of students and teachers *within* a school and grade. For example, teachers may try to teach easier classes when they work at multiple schools in order to reduce their workload. If this is the case, the effect of multiple school jobs would be downwardly biased. We address this endogeneity problem by adding two classroom peer characteristics—the percentage of low-income students and repeaters in the classroom—to the specification. The model is described in equation 1.

$$(1) \quad Y_{ijkst} = \beta_1 \text{Two_Schools}_{jt} + \beta_2 \text{Three_more_schools}_{jt} + \beta_4 C_{kt} + \beta_5 \text{year}_t + \delta_{js} + e_{ijkst}$$

Where Y_{ijkst} refers to the test scores of student i taught by teacher j in classroom k and school s in year t . Two_Schools_{jt} and $\text{Three_more_schools}_{jt}$ are the predictors of interest and indicate whether teacher j teaches in two or three or more schools in year t . C_{kt} is a vector of classroom characteristics—the percentage of repeaters and low income students in classroom k in year t . Lastly, we add year fixed effects (year_t) to control for unobserved time-series determinants, such as test differences over time, and teacher-school-grade fixed effects (δ_{js}).

Although powerful, the teacher-school-grade fixed effects do not account for the potential bias that could emerge from time-varying confounders that may be correlated with the number of jobs teachers have. For example, if the household income of a teacher decreases because her partner is unemployed, she is more likely to look for a second job at another school. Moreover, her performance as a teacher could be affected by the stress caused by her partner's unemployment (and not by the fatigue of working in multiple schools). An example of this phenomenon is the “added worker effect,” which refers to the labor supply responses of individuals to their partners' unemployment (Lundberg, 1985). To address potential bias due to added worker effect, we estimate equation 1 separately for single and married teachers. If our estimates are influenced by confounders related to the labor supply of teachers' partner, we will find that multiple school effects are larger among married teachers and null among single teachers. A caveat with such data is that they include the most up-to-date record of teachers' marital status, which could have changed overtime.

We also investigate whether the effect of multiple school jobs varies by students' socioeconomic background—that is, whether they participate or not in conditional cash transfer

programs—and by teachers’ sex and qualifications—whether they have participated in professional development or have a graduate degree. Moreover, we examine whether the effect of multiple school jobs remains constant when we hold constant the number of teaching hours, different grades, subject areas, and total number of students.

Findings

Table 1 provides the results for the main research question, which asks whether students have lower test scores when their teachers teach in more than one school. The first model looks at the association between multiple-school teachers and student achievement without controlling for teacher-school-grade fixed effects. The second model adds these fixed effects, the third controls for the percentage of repeaters in the classroom—which we refer to as “classroom peer quality”—and the fourth adds the percentage of students in the classroom who participate in conditional cash transfer programs—which is referred to as “classroom peer SES.” The outcome is normalized by grade level and by year with a mean of zero and a standard deviation equal to one.

Table 1. Multiple school jobs and students’ test scores

	Model 1	Model 2	Model 3	Model 4
2 schools	-0.172*** (0.020)	-0.030 (0.017)	-0.030 (0.016)	-0.032* (0.016)
3 schools or more	-0.272*** (0.022)	-0.0509* (0.022)	-0.055** (0.021)	-0.058** (0.021)
Teacher-school-grade FE	No	Yes	Yes	Yes
Classroom peer quality	No	No	Yes	Yes
Classroom peer SES	No	No	No	Yes
Num. of groups	-	9063	9063	9063
Num. of observations	1220272	1220272	1220272	1220272

Note: Standard errors (in parentheses) are clustered at the teacher level.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Without controlling for teacher-school-grade fixed effects, students' test scores are negatively associated with teachers who work in more than one school. However, the first model is likely to be biased because students and teachers are not randomly distributed across schools and classrooms. To minimize this sort of selection bias and to better isolate the impact of changes in the number of school jobs, model 2 uses within teacher-school-grade variation to identify the effect of multiple school jobs and models 3 and 4 also control for classroom characteristics to minimize potential biases resulted from the non-random assignment of teachers and students within schools. The effect of multiple school jobs is larger when we control for classroom peer composition, indicating that teachers might be assigned to more advantaged classrooms when they work in multiple schools.²

The findings reveal that students' test scores are 0.03 standard deviations lower when their teachers work in two schools rather than one. The same negative effect of 0.03 standard deviations is found when we compare students' performance when their teachers work in three or more schools as opposed to two schools (not shown). However, such a change in effectiveness between two and three or more school jobs is not statistically significant. Lastly, working in three schools or more as opposed to one leads to a larger decrease in student test scores of 0.06 standard deviations.

In table 2, we examine if students from different socioeconomic (SES) backgrounds are equally affected when their teachers work in multiple schools. The measure of SES is based on whether students participate in conditional cash transfer programs (lower SES) or not (higher SES). In tables 3 and 4, we see if working in multiple schools affects teachers differently depending

² We also tried controlling for students' socioeconomic characteristics, more specifically parents' education level and participation in conditional cash transfer programs. The coefficients do not change, but our sample reduces by 25 percent. These results are available upon request.

on their sex and qualifications. Teachers are considered more qualified if they attended graduate school or participated in professional development activities.

Table 2. Heterogenous effects on test scores by student characteristics

	Model 5 Higher SES	Model 6 Lower SES
2 schools	-0.029 (0.016)	-0.040* (0.019)
3 schools or more	-0.050* (0.020)	-0.071** (0.025)
Teacher-school-grade FE	Yes	Yes
Classroom peer quality	Yes	Yes
Classroom peer SES	Yes	Yes
Num. of groups	9061	9048
Num. of observations	754134	466138

Note: Standard errors (in parentheses) are clustered at the teacher level.

The SES measure indicates whether students participate in conditional cash transfer programs (low SES) or not (high SES).

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 3. Heterogenous effects on test scores by teacher characteristics

	Model 7 Male	Model 8 Female	Model 9 Less qualified	Model 10 More qualified
2 schools	-0.008 (0.020)	-0.053* (0.025)	-0.040 (0.020)	-0.030 (0.027)
3 schools or more	-0.018 (0.023)	-0.114** (0.040)	-0.061* (0.026)	-0.044 (0.035)
Teacher-school-grade FE	Yes	Yes	Yes	Yes
Classroom peer quality	Yes	Yes	Yes	Yes
Classroom peer SES	Yes	Yes	Yes	Yes
Num. of groups	4517	4689	5451	3996
Num. of observations	638481	581791	720050	500222

Note: Standard errors (in parentheses) are clustered at the teacher level.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 2 shows that low income students are more affected when their teachers work in more than one school. Moreover, the impact of having multiple school jobs is much larger for female

teachers: the negative effect of two school jobs as opposed to one school job is 0.05 standard deviations; three or more school jobs as opposed to two school jobs is 0.06 standard deviations (not shown); and three or more school jobs as opposed to one school job is 0.11 standard deviations. Multiple school jobs have, however, a small and nonsignificant impact on the performance of male teachers. We found a small difference between teachers with and without higher levels of qualifications: multiple school jobs have a larger and negative effect on the performance of teachers with fewer credentials. However, these heterogeneous effects are not statistically significant.

In table 4, we examine some of the mechanisms that explain the association between multiple school jobs and teachers' effectiveness. More specifically, we explore the hypothesis that working in multiple schools affects teachers' productivity because of an increase in the number of teaching hours, different grades, subjects, and students taught. To see how these variables mediate the effect of multiple school jobs, we compare our main results before and after holding constant the number of teaching hours (model 11), the number of grades taught (model 12), the number of subjects taught (model 13), the log of the total number of students taught by the teacher (model 14), and all mediators together (model 15).

Table 4. Mechanisms of the effect of multiple schools on test scores

	Original model ^a	Model 11	Model 12	Model 13	Model 14	Model 15
2 schools	-0.031 (0.018)	-0.025 (0.019)	-0.006 (0.017)	-0.037* (0.018)	-0.011 (0.020)	-0.008 (0.019)
3 schools or more	-0.058** (0.022)	-0.052* (0.025)	-0.023 (0.021)	-0.067** (0.023)	-0.027 (0.026)	-0.029 (0.025)
(20, 30] teaching hours		-0.048** (0.015)				-0.020 (0.016)
(30, 40] teaching hours		-0.022 (0.017)				0.021 (0.020)
> 40 teaching hours		-0.033 (0.021)				0.020 (0.025)
Teach 2 grades			-0.054** (0.020)			-0.042* (0.021)
Teach 3 grades			-0.075** (0.023)			-0.062* (0.027)
Teach 4 or more grades			-0.101*** (0.024)			-0.093** (0.031)
Teach 2 subjects				0.035* (0.015)		0.044** (0.015)
Teach 3 or more subjects				0.025 (0.027)		0.030 (0.027)
Log of total # of students					-0.054** (0.017)	-0.038 (0.023)
Teacher-school-grade FE	Yes	Yes	Yes	Yes	Yes	Yes
Classroom peer quality	Yes	Yes	Yes	Yes	Yes	Yes
Classroom peer SES	Yes	Yes	Yes	Yes	Yes	Yes
Num. of groups	8523	8523	8523	8523	8523	8523
Num. of observations	1094652	1094652	1094652	1094652	1094652	1094652

Note: Standard errors (in parentheses) are clustered at the teacher level.

^a Original model 4 with a restricted sample that excludes data from 2011, in which the variable “number of teaching hours” is not available.

* p<0.05; ** p<0.01; *** p<0.001

The effect of multiple school jobs does not change considerably when we hold the number of teaching hours constant—the results are similar when we use a continuous variable of teaching hours. Student performance is higher when teachers they teach multiple subjects, probably because

they likely spend more time with the same group of students and get to know better their learning needs. The effect of multiple school jobs is higher when we control for the number of subjects taught because multiple-school teachers are more likely to teach more than one subject area. The factors that play a more important role in explaining the effect of multiple school jobs are the total number of students and grades taught by the teacher. The latter has a larger and negative impact on students' test scores, even when all mediators are added to the model. Teachers who teach in multiple schools are more likely to teach different grade levels and, as a result, they might have a heavier workload to prepare lessons for students at different learning levels. A heavier workload seems to have a negative impact on their productivity.

Lastly, we conduct a robustness check of our results. By controlling for teacher-school-grade fixed effects, we look at students' outcomes of the same teacher in the same school and grade over time. This is a powerful strategy to avoid the potential bias that could be introduced by the nonrandom distribution of teachers and students and by time-invariant differences in unobserved teacher characteristics. However, these fixed effects do not account for the potential bias that could emerge from time-varying confounders that may be correlated with the number of jobs teachers have. As explained above, one important confounder is the added worker effect, which refers to an increase in individuals' labor supply when their partner become unemployed. To assess this potential bias, we estimate our main model separately for married and single teachers.

Table 5. The effect of multiple school jobs by teachers' marital status

	Model 14 Single	Model 15 Married
2 schools	-0.060* (0.027)	-0.012 (0.022)
3 schools or more	-0.070* (0.032)	-0.052 (0.027)
Teacher and school FE	Yes	Yes

Classroom peer quality	Yes	Yes
Classroom peer SES	Yes	Yes
Num. of groups	3473	4476
Num. of observations	461724	612720

Note: Standard errors (in parentheses) are clustered at the teacher level.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

If the added worker effect was biasing our results, we would expect the effect of multiple school jobs to be larger for married teachers, who might be more likely to take on additional work if their partner becomes unemployed. However, we found the opposite. The negative effect of working in multiple schools is larger and more significant for single teachers. These results remain the same if we control for teachers' age.

Discussion

Low salaries, a limited amount of full-time teaching positions, and alternative systems of allocating teaching hours lead teachers to look for additional jobs in other schools. Although this is a more common phenomenon of teacher labor markets in developing countries, teachers who teach specific subject areas are in general more likely to hold positions in more than one school. Yet, little is known about the impact of multiple school jobs on teacher productivity. This paper aims to address this gap in the literature by examining the impact of teachers' work in more than one school on student learning. We use unique longitudinal data of students and teachers from the municipality of Rio de Janeiro, Brazil, over a period of 7 years and exploit within teacher-school-grade variation in the number of school jobs over time. We found consistent patterns suggesting that an increase in the number of school jobs leads to a decrease in student test scores. The negative effect of multiple school jobs ranges from 0.03 to 0.06 standard deviations. The effects are much larger for female teachers, ranging from 0.05 to 0.11 standard deviations. Considering that women are more likely than men to engage in domestic chores, holding multiple jobs can become a

significant workload burden for female teachers (Bianchi et al., 2000; Hochschild and Machung, 2012, Pinheiro and Medeiros, 2015). Moreover, low income students are also more negatively affected when their teachers teach in more than one school at a time. This is consistent with previous research that shows that disadvantaged students are more influenced by their teachers' characteristics (Araujo et al., 2016; Marotta, 2019).

Lastly, the effect of multiple school jobs does not decrease considerably when we hold the number of teaching hours constant. In Rio, multiple school jobs are not necessarily associated with longer teaching hours: a teacher who holds a part-time position in two schools may have similar teaching time than a teacher who works full-time in a single institution. However, the effect of multiple school jobs decreases and becomes non-significant when we control for the number of different grades and students taught by the teachers. These results suggest that teachers are less effective when they work in multiple schools because they might be more burned out from dealing with a greater diversity of job tasks. This is consistent with evidence showing that teacher moonlighting leads to higher teacher burnout if teachers hold a second job outside of education probably because of the increase in tasks required by different workplaces (Farber and Wechsler, 1991; Fitchett et al., 2016).

In this study, we estimated the causal impact of multiple-school jobs using a powerful identification strategy that controls for the non-random allocation of teachers and students and that absorbs all time-invariant teacher characteristics such as qualification and effort levels. We also provided evidence that our results may not be driven by “added worker effects,” an important time-varying confounder that could bias our estimates. Most empirical studies find small or null added worker effects, which refers to the labor supply responses of married teachers to their partners' unemployment (Maloney 1987; Lundberg 1985; Spletzer 1992; Gruber and Cullen 1996).

Moreover, our coefficient of interest is smaller and less significant for married teachers, showing that unemployment of their partner (and the stress associated with it) does not explain the negative effect of multiple school jobs.

This paper provides original and robust evidence of the impact of multiple school jobs on teachers' performance. Although analyses focus on multiple teaching jobs inside the education system, our findings can also inform the discussion about multiple job holding among teachers outside the education system. Results suggest that an increase in job diversification and the workload associated with it can decrease teachers' productivity and lower student achievement. We also found that multiple school jobs per se are not detrimental if they do not lead to an increase in teachers' workload—for example, if teachers combine part-time jobs and if they do not have to teach multiple grades levels. This is an important policy implication because some school systems might address imbalances in supply and demand for staff more efficiently if they allow greater teacher mobility between schools.

Budget constraints have pushed countries, especially from the developing world, to try alternative forms of teacher hiring, including part-time contracts and employments based on teaching hours (Vegas, 2007; Nusche et al., 2018). Moreover, school systems may have to adjust to demographic changes by increasing teacher mobility between schools in case their teaching hours cannot be completed in a single institution. The current paper aims to inform policy makers to design more effective and efficient policies to address teacher allocation issues.

References

Armstrong, E. G. (2008). School Clusters and Teacher Resource Centers. *International Institute for Educational Planning, Paris: UNESCO*.

Ballou, D. (1995). Causes and consequences of teacher moonlighting. *Education Economics*, 3(1), 3-18.

Barbosa, A. (2011). Os salários dos professores brasileiros: implicações para o trabalho docente.

Bianchi, S. M., Milkie, M. A., Sayer, L. C., & Robinson, J. P. (2000). Is anyone doing the housework? Trends in the gender division of household labor. *Social forces*, 79(1), 191-228.

Bray, Mark. 2008. *Double-shift schooling: Design and operation for cost-effectiveness*. Vol. 90. Commonwealth Secretariat.

Canaz, A. K., & Aslan, G. (2015). An Analysis on the Neoliberal Transformation Created by Flexible Work in Public Schools. *International Review of Social Sciences*, 3(1), 1-15.

Caruso, C. C. (2004). Overtime and extended work shifts; recent findings on illnesses, injuries, and health behaviors.

Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2009). Are teacher absences worth worrying about in the United States?. *Education Finance and Policy*, 4(2), 115-149.

Collewet, M., & Sauermann, J. (2017). Working hours and productivity. *Labour Economics*, 47, 96-106.

Convention of Scottish Local Authorities (COSLA), corp creators. (2018) Headteacher Recruitment Working Group : report and next steps.

Farber, Barry A. 1991. *Crisis in education: Stress and burnout in the American teacher*. Jossey-Bass.

Fitchett, P. G., Heafner, T. L., & Harden, S. (2016). Characteristics and working conditions of moonlighting teachers: Evidence from the 2011-2012 Schools and Staffing Survey. *Current Issues in Education*, 19(1).

García-Prado, A., & González, P. (2011). Whom do physicians work for? An analysis of dual practice in the health sector. *Journal of health politics, policy and law*, 36(2), 265-294.

Gimenez-Nadal, J. I., Molina, J. A., & Velilla, J. (2018). *Commuting Time and Sick-Day Absence of US Workers* (No. 11700). IZA Discussion Papers.

Gruber, J., & Cullen, J. B. (1996). *Spousal Labor Supply as Insurance: Does Unemployment Insurance Crowd Out the Added Worker Effect?* (No. w5608). National Bureau of Economic Research.

Gustafsson, M., & Morduchowicz, A. (2008). What we can learn from a comparison of the schooling systems of South Africa and Argentina. *IIEP (International Institute for Educational Planning, Unesco), Buenos Aires*.

Hanushek, E. A., & Rivkin, S. G. (2010). Generalizations about using value-added measures of teacher quality. *American Economic Review, 100(2)*, 267-71.

Heineck, G. (2003). New estimates of multiple jobholding in the UK. *Department of Economics, University of Bamberg, Feldkirchenster, 21*.

Hipple, S. F. (2010). Multiple jobholding during the 2000s. *Monthly Labor Review, 133(7)*, 21-32.

Hochschild, A., & Machung, A. (2012). *The second shift: Working families and the revolution at home*. Penguin.

Johnson, Susan Moore. 1990. *Teachers at work: Achieving success in our schools*. Basic Books.

Kimmel, J., & Smith Conway, K. (2001). Who moonlights and why? Evidence from the SIPP. *Industrial Relations: A Journal of Economy and Society, 40(1)*, 89-120.

Kingdon, G., & Banerji, R. (2009). Addressing school quality: Some policy pointers from rural north India. *Research Consortium on Education Outcomes and Poverty Policy Briefs, (5)*.

Krishnan, P. (1990). The economics of moonlighting: A double self-selection model. *The review of economics and statistics, 361-367*.

Lundberg, S. (1985). The added worker effect. *Journal of Labor Economics, 3(1, Part 1)*, 11-37.

Maloney, T. (1987). Employment constraints and the labor supply of married women: A reexamination of the added worker effect. *Journal of Human Resources, 51-61*.

Marotta, L. (2019). Teachers' Contractual Ties and Student Achievement: The Effect of Temporary and Multiple-School Teachers in Brazil. *Comparative Education Review, 63(3)*, 000-000.

Miller, R. T., Murnane, R. J., & Willett, J. B. (2008). Do teacher absences impact student achievement? Longitudinal evidence from one urban school district. *Educational Evaluation and Policy Analysis, 30(2)*, 181-200.

Moses, L. N. (1962). Income, leisure, and wage pressure. *The Economic Journal, 320-334*.

Muralidharan, K., & Sundararaman, V. (2015). The aggregate effect of school choice: Evidence from a two-stage experiment in India. *The Quarterly Journal of Economics*, 130(3), 1011-1066.

Nusche, D., Boeskens, L., & Radinger, T. (2018). OECD Review of Policies to Improve the Effectiveness of Resource Use in Schools.

Panos, G. A., Pouliakas, K., & Zangelidis, A. (2009). The inter-related dynamics of dual job holding, human capital and occupational choice.

Pencavel, J. (2015). The labor supply of self-employed workers: the choice of working hours in worker co-ops. *Journal of Comparative Economics*, 43(3), 677-689.

Perlman, R. (1966). Observations on overtime and moonlighting. *Southern Economic Journal*, 237-244.

Pinheiro, L., & Medeiros, M. (2015). Desigualdades de Gênero em Tempo de Trabalho Pago e Não-Pago no Brasil, 2013 (Gender Inequalities in Paid and Unpaid Work in Brazil, 2013). Available at SSRN 2671490.

Propper, C., & Green, K. (2001). A larger role for the private sector in financing UK health care: the arguments and the evidence. *Journal of Social Policy*, 30(4), 685-704.

Raffel, J. A., & Groff, L. R. (1990). Shedding light on the dark side of teacher moonlighting. *Educational Evaluation and Policy Analysis*, 12(4), 403-414.

Renna, F., & Oaxaca, R. L. (2006). The economics of dual job holding: A job portfolio model of labor supply.

Santiago, P. et al. (2016), *OECD Reviews of School Resources: Slovak Republic 2015*, OECD Reviews of School Resources, OECD Publishing, Paris,

Shishko, R., & Rostker, B. (1976). The economics of multiple job holding. *The American Economic Review*, 66(3), 298-308.

Startz, Dick. 2018. Why are teachers more likely than others to work second jobs? Brookings. Retrieved from <https://www.brookings.edu/blog/brown-center-chalkboard/2018/03/23/why-are-teachers-more-likely-than-others-to-work-second-jobs/>

Van Ommeren, J. N., & Gutiérrez-i-Puigarnau, E. (2011). Are workers with a long commute less productive? An empirical analysis of absenteeism. *Regional Science and Urban Economics*, 41(1), 1-8.

Vegas, E. (2007). Teacher labor markets in developing countries. *The future of children*, 219-232.

Winters, John V. 2010. Teacher moonlighting: evidence from the US Current Population Survey. *Applied Economics Letters*, 17(11), pp.1111-1114.

Wisniewski, R., & Kleine, P. (1984). Teacher moonlighting: An unstudied phenomenon. *The Phi Delta Kappan*, 65(8), 553-555.