Not Just Food but the Workers Behind: What does district spending for food service workers do for student performance?

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Abstract

The importance of school food is widely known, but the literature is silent on the impact of food service workers who make meals possible in schools. This study analyzes the link between districts' spending on food workers and students' academic performance, based on two nationally representative datasets. I use the district fixed effects model to examine the relationship between district spending on the compensation of food service workers and student test scores. I find a positive relationship between spending on food service workers and English test scores, and this association is greater and more significant among lower than upper grades. Students from all racial/ethnic groups benefit from increased spending on food service workers, although the results are significant for white, Black, and Hispanic students. The results of this study shed light on a new way of improving student outcomes by calling for more investment in school food and the food service workers.

Keywords: School Spending, District Expenditure, Food Service Workers, Student Test Scores

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1 Introduction

It is well-known that school food significantly impacts students' health, learning readiness, academic outcomes, and overall well-being. Students rely on school food for half their daily energy intake (Cullen and Chen, 2017). School meals offer nutritional resources, alleviate the financial burden on children with disadvantaged backgrounds, and enhance student academic performance, attendance rate, diet quality, and food insecurity (Vik et al., 2019; Yamaguchi et al., 2018; Imberman and Kugler, 2012; Dotter, 2012; Bartfeld et al., 2019; Kleinman et al., 2002; Schwartz and Rothbart, 2020; Dunifon and Kowaleski-Jones, 2004; Frisvold, 2015; Ruffini, 2021; Bhattacharya et al., 2006; Anderson et al., 2017).

Despite these advantages of school food provision, the role of school food service workers has been largely overlooked in policy considerations. School food workers are responsible for a wide range of duties, including preparing and serving food and beverages to students, maintaining a clean and safe working environment, and creating a positive atmosphere in school cafeterias.

During the COVID-19 pandemic, school meals have received increased attention, but there has been a persistent lack of recognition of school food workers responsible for preparing and distributing them. Anecdotal evidence suggests that these workers came to school districts' kitchens physically, without adequate support and safety gear from the government amid the pandemic, to prepare grab-and-go meals and ensure that students were being fed while learning from home (Gaddis and Rosenthal, 2020; Heyward, 2020). This heroic image highlights the importance of the workers who make the school meals function every day.

The prevailing discussion regarding school food in the American education system often focuses on food availability, food safety, and the adjustment of the nutritional standard. However, these features of school food are contingent upon the workers' skills and expertise.

This study aims to fill this knowledge gap by being the first to examine the link between food service workers and student outcomes. In particular, the research questions this study

attempts to answer are the following: What is the relationship between district spending on food service workers and student academic achievement? Does this relationship remain consistent across all student grade levels? Moreover, does the relationship differ by students' race/ethnicity?

I combine district-level data from two nationally representative datasets and employ the district fixed effects model to examine whether better compensation for food service workers translates into positive student achievement. To examine the heterogeneity of this relationship, I conduct a separate analysis by students' grades. In addition, I investigate if higher district spending on school food workers contributes to reducing educational inequality across different races/ethnicities of students.

I find that an increase in salary for school food workers is associated with higher English test scores. I also find that this association varies by student grade level. Students from lower grades benefit more from the higher salary of food service workers than students from higher grades. Stratified by ethnicity, spending on food worker salaries is positively associated with English test scores for students from all ethnicities, and the results are statistically significant for white, Black, and Hispanic students.

This study contributes in several ways to the growing literature examining the impact of school meals on student outcomes. First and foremost, it is the first rigorous study to offer evidence on the importance of school food workers underrecognized by society. This study reveals that there exist significantly positive returns to investment in labor for food preparation and the care of the school cafeteria. Second, the study utilizes nationally representative data to establish the connection between school food workers and student outcomes, offering high degrees of external validity. Relying on two rich datasets, this study controls for various district-level characteristics as well as community features, which were unavailable in previous studies. Lastly, this study discusses the potential mechanisms through which school food workers can influence students' outcomes, paving the way for future research opportunities.

2 Literature Review

This study underscores the importance of school food service workers and the channels through which those workers can ultimately influence student outcomes. However, the literature on the role of school food workers in public education is limited. To shape the conceptual frame, I bridge three fields of study: school funding, school food programs, and school food service workers. I also rely on labor economics to emphasize the relationship between worker compensation and productivity.

2.1 School Funding and Allocation of Funds

The current notions about school funding and school food programs are well established in the field. The question of whether money matters for schools has been under discussion since the release of the report *Equality if Educational Opportunity* (Coleman, 1968). The survey evaluates the inequality of educational opportunity through several factors, including school inputs. The conclusion of this report is discursive, as the authors suggest that educational equality can only be partially explained by these inputs. The report raises concerns among educational researchers since it contradicts the logical understanding that additional resources allocated to schools ensure a stronger foundation for high-quality education and better student outcomes.

Jackson (2018) claims that the evidence of input-based policies in the past could not establish a consistent connection between school spending and student achievement due to obsolete research designs and limited computational methodology. More recent studies have adopted external variation, such as school finance reform, to claim a causality for this connection. In national and multi-state studies, they come to the consensus that higher school spending positively impacts student outcomes. These studies use different indicators to measure student achievement, such as test scores (Lafortune et al., 2018; Brunner et al., 2020; Miller, 2018), graduation rate (Candelaria and Shores, 2019; Johnson, 2015), and

educational attainment (Johnson and Jackson, 2019). Almost all the existing literature focuses either on the effect of total school spending or spending per pupil. The mechanisms for this positive result are relatively similar as a part of the school reforms, spending increases, which, in turn, improves students' outcomes.

Another branch of studies on school spending focuses on how the resources are allocated. Available evidence examines different types of spending category, such as textbook spending (Holden, 2016), construction spending (Conlin and Thompson, 2017; Hong and Zimmer, 2016; Cellini et al., 2010; Goncalves, 2015), Title I spending[1] (Matsudaira et al., 2012), and overall spending (Papke, 2008; Gigliotti and Sorensen, 2018). Most studies find the positive impacts of these spending, but some of the results are not statistically significant, implying that the returns to educational spending are not universal across different kinds of school spending categories. For example, Goncalves (2015) examines the effect of Ohio's state-subsidized program of rebuilding K-12 public schools on test scores and finds no supportive evidence for academic advancement during or after the completion of construction. Cellini et al. (2010) find ambiguous evidence for the positive impacts of school bond referenda in California schools on student achievement. Similarly, Matsudaira et al. (2012) find no effects of Title I on overall test scores, including subgroups of students most likely to be targeted by the program.

The existing evidence indicates the importance of understanding the heterogeneous effect of each spending category. Although total spending plays a crucial role in student advancement, it is equally critical to identify which types of spending advance educational outcomes. At the current state of research, regardless of the study's scope, no study examines the effect of spending on food service workers. This paper is the first attempt to fill this gap and extend the existing body of knowledge.

[1]Title I spending is a Federal program that supports low-income students throughout the nation.

2.2 School Food Programs

The objectives of school food programs are to alleviate childhood hunger and to provide healthy meals for students, promoting their health outcomes and academic readiness. There are two long-standing meal programs operating in US public schools: the National School Lunch Program (NSLP) and the School Breakfast Program (SBP). Children in families with incomes below 130 percent of the federal poverty level are qualified for free meals, and those with family incomes between 130 to 185 percent of the poverty line are eligible for reduced-price meals from food programs. The recent modification to these programs, such as the Community Eligibility Provision (CEP), allows schools in low-income areas to offer breakfasts and lunches to all students at no charge, regardless of their family income. The CEP aims to reduce administrative burdens by automatically registering students whose households receive the Supplemental Nutrition Assistance Program (SNAP) and increases school meal participation by removing the stigma associated with school meals.

Literature in this area focuses on assessing the effectiveness of federally assisted-school meal programs. The government and nutritional researchers find that school meals are beneficial for students, especially for those who are in need. For example, the Food Research and Action Center (FRAC), a nonprofit organization working to improve public policies on eradicating hunger and undernutrition, finds that the benefits of school foods fall into four categories: i) an alleviation of food insecurity, ii) a provision of nutritious foods, iii) an improvement in mental and physical outcomes, and iv) an enhancement in academic performance and achievement (Food Research & Action Center, 2021). In additions, Cohen et al. (2021) systematically review the effectiveness of universal school food policy in economically developed countries and find the positive connection between free school meals and student outcomes, such as diet quality and school attendance.

In terms of academic performance, a substantial amount of research has agreed that school meals improve students' test scores (Imberman and Kugler, 2012; Dotter, 2012; Bartfeld

et al., 2019; Kleinman et al., 2002; Schwartz and Rothbart, 2020; Dunifon and Kowaleski-Jones, 2004; Frisvold, 2015; Ruffini, 2021). At the national level, Ruffini (2021) uses district-level data to assess the impact of universal access to school meals to find that the program increases math scores by 0.02 standard deviation (SD), and the effect can be as large as 0.07 SD when scaling the result by the share of newly qualified student. Frisvold (2015) finds the positive impact of the availability of the School Breakfast Program on student achievement in math, reading, and science. Dunifon and Kowaleski-Jones (2004) show that receiving lunch through NSLP is associated with improving boys' reading scores.

On a smaller scale, several other studies also use the test scores to study the impact of school meals. Imberman and Kugler (2012) use test scores from large urban school districts in the southwestern states and find that providing free breakfast in a classroom raises math and reading scores by 0.09 SD and 0.06 SD, respectively. Dotter (2012) finds that implementing an in-classroom breakfast program in San Diego raises math and reading scores by 0.1 SD and 0.15 SD, and the nutritional intervention's effect persists after the program's first year. Bartfeld et al. (2019) use state-level test scores from Wisconsin schools and find that participating in school breakfast programs is associated with an increase of 0.08 SD in reading scores among boys. Kleinman et al. (2002) find a significant improvement in math scores for students receiving a universal-free breakfast in Boston public schools. Schwartz and Rothbart (2020) evaluate the impact of universal free meals in New York City schools and find positive impacts on math and reading test scores.

2.3 School Food Workers

School food service workers receive a dearth of attention in the discussion of public education and labor market outcomes. The available evidence utilizes population surveys to analyze the general characteristics of the workforce. For instance, Billings et al. (2022)use the data from the American Community Survey (ACS) between 2015 and 2019 to study the demographic

of school food workers. They find that public school food service workers are more likely to be seniors, females, and minorities compared to the general workforce. The composition of the workforce is not uniformly distributed, as the food service supervisors are prone to be white males compared to frontline workers who are more likely to be female, widely known as "lunch ladies."

Many frontline workers are economically disadvantaged. Approximately 10% of the frontline workers live below the federal poverty line, and 16% rely on the SNAP. Jacobs and Graham-Squire (2010) find that a significant portion of these workers has a part-time position with lower opportunity to qualify for health insurance and pension funds than those working full-time. Cooper and Martinez Hickey (2022) show that school food service workers have the lowest pay among other school support services, such as bus drivers, teaching assistants, and custodians.

The lack of sufficient compensation and benefits explains why some schools cannot retain skilled workers, leading to negative consequences ranging from short-staffed cafeterias to food contamination (Heil, 2023; Kaplan, 2022; Lieberman, 2021). For example, Venuto and Garcia (2015) use state-reported school food-borne outbreak data to show that half of food safety errors in schools came from the improper practices of food workers.

The classic theory of efficiency wage posits that higher wages help attract skilled labor, reduce turnover, and increase productivity. The higher wage works as a disciplinary device to incentivize workers not to shirk when the cost of observing workers is non-zero (Stiglitz, 1974; Shapiro and Stiglitz, 1984). Jacobs and Graham-Squire (2010) find that an improvement in labor standards and workers' benefits, such as paid sick days, can reduce food-borne illness and the spread of seasonal flu. Moreover, an increase in wages can reduce the cost of replacing new employees with less reliance on government assistance programs.

School food workers are acknowledged as care workers who are physically and emotionally invested (Gaddis, 2019; Vancil-Leap, 2016). Tsui et al. (2022) conceptualize school food

workers as institution-based care workers responsible for the dirty work of reproductive labor. This type of work has been socially, economically, and culturally tied to the unpaid labor of females who maintain society without being recognized. Feminist economists suggest that an improvement in the wages of care workers will result in an excellent benefit for both workers and consumers as both agents share the same objective of sustaining high-quality care (Folbre, 2006; Nelson and Folbre, 2006). For instance, Woo et al. (2023) show that a higher wage for low-wage workers in the healthcare sector can alleviate the difficulties faced by these workers. In the childcare field, Kestel (2022) shows that pay reduces worker turnover, lowering the hiring costs involving training and background checks.

2.4 From School Food Workers to Student Outcomes

Literature from various disciplines suggests three potential mechanisms through which food service workers can affect student academic outcomes. First , higher salaries for food workers can influence student well-being through health-related channels. Higher compensation may increase the morale of food workers, which facilitates better food preparation practices, resulting in the provision of more nutritious meals for students. School food workers have the power to influence what is served in the school, and this power varies by the characteristics of food service settings, such as the use of preprocessed or proportioned foods. Even if the preprocessed foods meet their manufactured standard, there still needs to be some preparation at the school level, and food service workers can influence the quality of foods through this process. For example, Feldman et al. (2009) conducted a study in New Jersey middle schools by comparing nutritional information on the menu and the actual food served. They found that the food served had a fat content that was five times higher than the total fat documented on the menu. Schwartz (2007) demonstrates that a simple yet effective verbal prompt – such as offering a choice between fruit or juice during lunch – can substantially enhance fruit consumption among elementary students. These studies raise awareness about

the range of actions food workers can adopt to enhance student health outcomes.

The effect is more pronounced in schools that utilize scratch cooking techniques, a cooking method that utilizes minimally processed ingredients to offer a greater nutrient, than processed and ultra-processed food options. However, skilled food workers with appropriate training and knowledge are required to implement scratch cooking successfully. Thus, higher compensation and advancement in school food worker career may be a vital criterion for enhancing the overall quality of school food. The Chef Ann Foundation[2], a national nonprofit group, has been promoting scratch cooking techniques, enabling schools to provide the healthiest, tastiest, and least processed foods. Without compensating for the workers' hardships properly, the new initiatives could add to an already heavy workload, preventing them from performing more labor-intensive and complex tasks (Rosenthal and Caruso, 2019).

Second, more productive food workers may be able to reduce the time required for serving lunch. The literature indicates a positive association between the duration of lunchtime and the nutritional intake of students (Cohen et al., 2016). Students with less time to eat tend to exhibit a reduced intake of nutrients, such as Vitamin C and fiber, compared to their counterparts who enjoy more time for lunch (Hildebrand et al., 2018). Given the absence of a standardized national lunch break duration, food workers can expedite the processing of meals to minimize waiting time in the lunch line. A survey of student perspectives shows that those facing time constraints prefer faster service from their educational institutions. Moreover, the time limitations significantly influence their food choices (Sharma et al., 2017).

Last, food workers can influence students through the provision of enhanced care. The relationship between care quality and compensation has been comprehensively discussed in Feminist Economics (Folbre, 2006). Qualitative research has also shed light on the significance of food workers' interactions in nurturing a satisfactory environment within educational institutions. For example, Gaddis (2019) demonstrates an example of a school food worker in Arizona who uses her money to procure food outside the cafeteria solely for a child who

[2]The website can be accessed by this link.

had tragically witnessed the homicide of their parents. Similarly, Delacour (2023) highlights another compelling case in Florida, where a food worker's inability to provide optimal care to students was directly connected to financial hardships due to inadequate compensation.

These studies suggest that increasing the pay of food service workers may help recruit and retain more productive and skilled workers who pay attention to handling ingredients, cooking nutritious meals, and caring for students, ultimately contributing to better student outcomes. Using the variation in districts' spending on compensation of school food workers, I investigate if higher school spending promotes food service worker's productivity assessed with student performance.

3 Data

To examine the between school food workers and student performance, I merge two nationally representative datasets from the 2008-2009 to 2017-2018 school years: the Local Education Agency Finance Survey (also known as School District Finance Survey or F-33) (Cornman et al., 2020) and the Stanford Education Data Archive (SEDA) (Fahle et al., 2021).

Annual financial data at the school district level come from the School District Finance Survey (or F-33), administered by the National Center for Education Statistics (NCES). Every year, the Local Education Agency (school district) that provides free public elementary and secondary education is responsible for reporting the school's financial information to the NCES. The F-33 provides comprehensive revenue and expenditure information for all school districts. The expenditure data covers details of school spending on instructional and non-instructional occupations, including food service workers. The record is broken down into salaries, benefits, and current expenditures[3].

To measure district spending on food service workers, I use four different variables: district

[3]On top of salaries and employees' benefits, the current operation expenditure also includes other subsidies, i.e., rent, insurance utilities, purchase of food, supplies, and materials.

spending on food services salaries, district spending on food services total compensation[4], the ratio of salary and total compensation to the current expenditure[5] on school food service, and the ratio of total compensation to the current expenditure.

The gross district spending on food services salaries and total compensation is in the logarithmic term. These two variables shed light on the correlation between overall district spending on food service workers and student outcomes.

The benefit of using ratio variables in this study is twofold. First, it demonstrates the allocation of funds that food service workers obtain within the food service budget that school districts allocate. Second, it partially addresses the concern of the difference in the cost of living and the number of students enrolled across school districts. For example, the dollars spent on food service workers in rural school districts area can be different than those districts in town, urban, or suburban areas. Using the ratio of food worker's remuneration to the total spending on foodservice workers gives more nuance results for this study.

I use test scores to measure students' academic performance at the district level. In the past, it was challenging to compare district-level academic performance nationwide due to different evaluation standards and exam designs in each state. However, the Stanford Education Data Achieve (SEDA) made it possible by normalizing state achievement tests to a common scale obtained from the National Assessment of Education Profess (NAEP). SEDA provides standardized test scores in math and English for third through eighth graders from different racial subgroups, namely white, Black, Hispanic, and Asian students. SEDA's test scores are reported in standard deviation relative to average scores of the national reference cohort in the same grade[6]. In addition, SEDA offers districts and communities characteristics compiled from the American Community Survey (ACS), the Common Core

[4]Total compensation for food service workers is a summation of workers' salaries and benefits.

[5]The current expenditure reflects the total cost of operating food services in each school district. The variable includes the purchase of foods and services but excludes the value of donated commodities and the purchase of food service equipment. Further explanation of this variable can be founded in the survey form Cornman et al. (2020).

[6]See Fahle et al. (2021) for technical detail of data construction and restriction.

of Data (CCD), and the Civil Rights Data Collection (CRDC). The richness of this data allows for the capability of disentangling the effect of school food workers from other potential factors affecting students' test scores.

I restrict the dataset in several ways. First, I drop any grade-district-year observations if 1) test scores are missing, 2) food service expenditures are missing or non-applicable[7] , 3) the school's status and/or charter code are not determined, and 4) district characteristics are missing. Second, as the study objective is to establish the connection between the spending on food service/food workers, I exclude observations with zero value for current food service expenditure, salary, or benefits for foodservice workers[8].

The financial data and student enrollment fluctuate greatly year by year, particularly in small school districts. To tackle this problem, I follow Lafortune et al. (2018) and Brunner et al. (2020) to exclude small districts with inconsistent data. I begin by omitting district-year observations with a total enrollment of less than 100. I also make three additional exclusions to decrease the volatility in the per-pupil foodservice current expenditure[9]. I start by calculating the average enrollment for each district based on the dataset. I drop any grade-district-year observation that meets the following criteria: 1) has an enrollment greater than two times the district's average enrollment, or 2) has an enrollment that is more than 15% higher or lower than the enrollment in the previous year, or 3) has per-pupil food service expenditure at least five times higher or five times lower than state-by-year average. Overall, the analyzed data contains 992,513 grade-district-year observations comprising 10,669 school districts.

Figure 1 shows the ratio of school food worker salary to total spending on food service

[7]The observation is flagged as non-applicable if a district does not spend on a specific type of expenditure.

[8]Although students within these districts can perform well academically, the effect does not come from the investment in food service workers. Although there is no clear explanation from the official document regarding the zero values of food service expenditure, some explanations can be conjectured. It is possible that there is only limited number of schools located in the district, especially when the district's size is small. Food service operations can be solely handled at the school level, and the central kitchen in not profitable for school districts to operate.

[9]The summation of food service salary and benefit does not equal to the total food service expenditure since the total amount also includes other elements, such as other benefit of worker or purchase of foods.

category for the whole nation. Between 2009 and 2018, the resources allocated to food worker salaries dropped from 34.2% to 32.1%. The drop partially came from the decline of district spending after the withdrawal of the American Recovery and Reinvestment Act (ARRA) after the economic downturn during the Great Recession (Anglum et al., 2021). Despite the rise in the ratio from the latest year, the trend of outsourcing school food casts doubts on the future direction of resources allocated to school foodservice workers, raising concerns about the capability of retaining skilled workers in the school cafeteria (Williams et al., 2021).

[INSERT FIGURE 1]

Figure 2 , which illustrates the ratio at the state level, reveals that the ten-year average ratio of food worker salaries to total spending on food service varies considerably across states. On average, the entire nation allocated approximately 32.4% of its budget to school food workers' salaries. Massachusetts allotted half of its spending in the food service category, which is the highest among other states. On the other hand, the District of Columbia and Rhode Island devoted the least percentage to their food service workers.

[INSERT FIGURE 2]

Figure 3 demonstrates the variation in food service salary per student across school districts nationwide for 2018. There exists a sizeable within-state variation in the spending for food workers' salaries. For example, school districts in Texas allocate the budget for school food workers, ranging from the lowest at $5.63 per student to the highest at $441 per student. Depending on the cafeteria setting and the responsibility of school food workers, school districts have the authority to decide how much they want to pay their workers.

[INSERT FIGURE 3]

4 Empirical strategy

Relying on the district-level panel data, I estimate the following fixed effects model to investigate the relationship between school food workers' compensation and students' test scores:

$$Y_{git} = \beta_0 + \beta_1 S_{it} + \beta_2 X_{git} + \alpha_g + \delta_i + \gamma_t + \epsilon_{git} \quad (1)$$

where Y_{git} is a standardized test score (either math or English) of grade g in district i at year t for each grade. S_{it} represents district spending on food service workers in district i at year t. All financial variables are log-transformed.

X_{git} is a vector of grade-district-year district and community control variables. The district characteristics include the ratio of students of different race/ethnicity, the number of enrollments, the percentage of students who are English Language Learners (ELL), the percentage of students in Special Education, the percentage of students participating in free or reduced lunch programs, and the percentage of economically disadvantage students. I also control for the community's attributes, such as the percentage of students participating in the districts located in urban, suburb, town, or rural locations, the median income of the household, the percentage of adults who got a Bachelor's Degree or above, the percentage of students in the household living below the poverty line, the percentage of unemployed individuals; the percentage of households receiving the SNAP, and the percentage of households with a female head of household[10].

Despite controlling for confounding factors that may correlate with spending on school food workers and student academic performance, there may be other omitted variables that are unobserved in the data. The unique characteristics of each district could influence the connection. For instance, different student grades may have distinctive settings that are constant over time. The responsibilities and the working environment of food service workers can differ in each school district but are relatively steady over time. The exogeneous shocks can also induce dissimilar impacts across school districts each year and potentially influence the results. To deal with these issues, I include grade, district, and year-fixed effects in the model. α_g is grade fixed effect accounting for commonly unobservable traditions within

[10]Only students' racial composition, number of enrollments, percent of free and reduced lunch, and percent of economically disadvantaged student are available at the grade-district-year level.

the grade, δ_i is district fixed effects accounting for unobserved time-invariant components in the school district, and γ_t is year-fixed effects accounting for time-varying factors that are common across all school districts. ϵ_{git} depicts the error terms clustered at the district level to accord with the district spending on school food workers. The clustering allows for the possibility of residual to correlate within each district. The coefficient of interest, β_1, represents the correlation of district spending on food services workers and students' academic performance.

Regression analyses were conducted separately for math and English by grade and race/ethnicity. This regression strategy has two primary purposes. First, it is widely recognized that young children tend to benefit more from access to nutritious food and high-quality care (Ruffini, 2021; Vandell et al., 2010). By analyzing the data at the grade level, I can examine whether the investment in food workers disproportionately affects students in different grades. Second, examining the heterogeneity of the relationship ensures that students in each subgroup share common social values and behaviors, which are consistent over time but challenging to quantify. By considering each subgroup separately, I can account for the unique characteristics and experiences of each subgroup.

5 Results

Table 1 presents information on financial variables for food service workers, the variables of interest in this study, as well as district and community characteristics. Between 2009 and 2018, school districts spent about $2 million, on average, on food service operations . Less than half of the investment flows to food service workers, as the total compensation of workers is documented at $0.93 million. Approximately 33% of the food service expenditure (or $0.66 million) is for salaries and 13% ($0.28 million) for benefits for food service workers. The ratio between salary and current expenditure shows that some districts allocate more than half the budget to school food workers.

The district characteristics reveal that the majority of students are white (73%), and about 14% of the students are Hispanics. Approximately half of the students benefit from free- and reduced-price lunch programs or are economically disadvantaged. Less than 5% of students are English language learners, and 14% receive special education services. The district's total enrollment at the grade level is 356 students, and the total expenditures amount to $55.4 million.

The community characteristics greatly vary by location. The majority of the community is in rural areas (50.6%), whereas 6% of the community is in Urban areas. The household median income is about $50,161[11]. Approximately 20% of the community has at least one adult who obtained a bachelor's degree or higher. The poverty rate for those living in poverty who are school-aged is 13.5%, signifying the prevalence of economic challenges these communities face. In addition, 11.1% of the communities receive SNAP benefits, and 15.7% of households are led by females.

[INSERT TABLE 1]

Table 2 shows the descriptive statistics on students' academic performances. Among these races and ethnicities, Asian and white students perform better than the average in both subjects. Average scores for white students are about 0.14-0.15 SD above average scores for all students. The average scores for Asian students are about half of a standard deviation above average. On the contrary, the average score for Black students is half of a standard deviation below average for both math and English scores for all students. The average math score for Hispanic students is 0.27 SD below the average math score for all students, and the average English score for Hispanic students is 0.30 SD below the average English score for all students.

[INSERT TABLE 2]

Table 3 presents the estimated coefficients from regressions with grade, district, and year

[11]I used natural log to convert this number to integer value for the descriptive statistic. However, the logarithmic terms for the median household income are used in the analysis.

fixed effect for average scores in math and English. There are four variables of interest related to the district's spending on foodservice workers: salary, total compensation, the ratio of salary to the current expenditure, and the ratio of total compensation to the current expenditure. The estimated coefficients and standard errors in a total of 8 models – 4 for math score and 4 for English score – are shown separately by the subject. The first two variables are in logarithmic terms, and the other two are the ratios. I control for various district and community characteristics. To compare districts with similar financial status and to control for the association between district financial status and other spending categories, I also control the total expenditure for school districts[12].

The salary of food service workers and total compensation for school foodservice workers are positively associated with English test scores for all students, and the results are significant at the 1% significance level. The coefficient of district spending on food workers' salaries is 0.008, which implies that a 10% increase in food service operation is correlated with improved test scores in English by 0.0008 SD. Similarly, a 10% increase in food workers' compensation is correlated with improved test scores in English by approximately 0.0006 SD.

The relationship between ratio variables and English test scores shows a consistent pattern, highlighting the benefits of increased investment for school foodservice workers. For example, a 10% increase in the ratio between salary for school foodservice workers and current expenditure correlates with improved English test scores by 0.006 SD. Relatedly, a 10% increase in the ratio between total compensation and current expenditure is positively correlated with improved test scores in English by 0.003 SD.

Although the relationships between food service financial variables and math scores are generally not statistically significant, all of them are positive. For instance, the coefficients of district spending on total expenditure on food services are positive with the size of 0.0004

[12]I run three models in the analysis plan: The first model controls for school's total expenditure, and three fixed effects including district, grade, and year. The second model controls for district characteristic on top of the first model. The third model controls for community characteristics on top of the second model. The details of these specifications can be found in the Appendix section.

SD. The relationship between the ratio of food worker salary to the total expenditure for food service and math test scores is positive and statistically significant, implying that the higher allocation of resources to workers' salaries would benefit students' academic performance.

[INSERT TABLE 3]

In Table 4, I summarize the results by grade for mathematics in panel A and English in panel B[13]. Overall, lower graders gain more benefits from higher salaries of school food workers compared to upper graders. In Panel A, there exists some evidence of a positive relationship between food worker compensation and math test scores. For instance, the salary positively and significantly correlates with average math test scores in grade 5, but the results for other grade levels are insignificant.

Panel B shows that the relationships between food service worker salary and English test scores are positive and statistically significant for students in grades 3 to 6, with a magnitude around 0.01SD. The coefficient of a ratio between the salary of a food worker and the total expenditure on food service shows a similar pattern, as the correlation is positive and statistically significant for students in grades 3 to 6 . The magnitude of this relationship ranges from 0.06 to 0.08 SD. The results in Table 4 are consistent with the findings in the literature (Ruffini, 2021), which shows a greater return from school food programs for younger students in school.

[INSERT TABLE 4]

Table 5 presents results by students' race and ethnicity for mathematics in Panel A and English in Panel B. Overall, the significant results are more pronounced in English test scores than in math test scores. For white students, district spending on foodservice workers shows a positive association with their test scores, with greater magnitude for English than for mathematics. Particularly, the ratio between food worker salaries and current expenditure is positively associated with test scores in statistically meaningful ways.

[13]Grade-fixed effect is taken out before the analysis.

For Black students, the results are also positive. The ratio between food worker salaries and current expenditure shows a statistically significantly positive association with test scores for both math and English. The magnitude of this association is the largest among all racial/ethnic groups. A 10% increase in this ratio is associated with an enhancement of 0.009 SD in math and 0.01 SD in English test scores. This suggests that black students show the highest rate of returns to investment on food service workers.

The relationship between food service spending and Asian students' performance shows mixed results, but the statistical significance only materializes when the association is positive. One possible reason for the insignificant and mixed result may be the lower number of observations for Asian students, as hinted by the larger SD of the coefficients.

Hispanic students' positive gains are detected only in English test scores. However, all four food service spending variables show statistically significant relations, and the magnitudes of the coefficients are more prominent than that for white students.

The findings in Table 5 imply that the greater resource towards food service workers tends to benefit minority students more than white students, potentially reducing the performance gaps between white and Black and between white and Hispanic students.

[INSERT TABLE 5]

I perform two robustness checks to ensure that my results are invariant to model specifications and data restrictions. First, I use district spending on teacher salaries for a regular program as a control variable instead of district total expenditure. Furthermore, I strictly control for both teacher salary and total expenditure in another specification. These checks alleviate concerns about whether other major categories are driving my results. The results are shown in the Appendix. Tables A3 - A5 present the results in the first specification, and Tables A6 - A8 show the results for the second specification with stricter conditions for control variables. Overall, I find the connection between foodservice worker salary and English test scores robust to these specifications. The alternative results are more noticeable for the

ratio between the salary of foodservice workers and current expenditure on food service. For example, the correlation coefficient between the salary ratio and English test score is 0.0515 in Table A3 and 0.0509 in Table A6 (compared to 0.0565 in the main finding). The statistical significance of these variables is also consistent, although it becomes less significant in the race/ethnicity sub-group analysis.

Second, I restrict the data by excluding the top and bottom 1% and 5% of test scores, respectively, from the entire sample. This check helps attenuate the concerns related to potential outliers that might influence the observed positive correlation. Results are reported in Table A9 - A11. The sign and statistical significance of coefficients for foodservice worker's salary and the salary ratio are robust to the data truncation, though the magnitude becomes slightly smaller.

As a sensitivity check, I compare the correlation of school foodservice workers by estimating several models using salaries of other school support occupations as variables of interest. These additional occupations include pupil support, instructional staff, general administration, school administration, maintenance, student transportation, and business support. The correlation coefficients between support workers' salaries and student test scores in math and English are shown in Table 6. For English test scores, the result shows that the correlation coefficient for food service workers is comparable to instructional support staff and close to pupil support and maintenance workers. This result emphasizes the significant role of food service workers and the importance of retaining these skilled workers in the schools' cafeterias.

[INSERT TABLE 6]

6 Discussion and Conclusion

Despite the extensive body of research on school food programs, previous studies have been silent on the role of school food workers in improving student outcomes. This study examines

the relationship between district spending on school food workers and student outcomes, relying on two nationally representative datasets. I employ district fixed effects models to examine the relationship between spending on compensation for food service workers and student test scores.

Controlling for various district and community characteristics, I find a positive association between the compensation of food service workers and students' test scores. Analyzing the data by grade level reveals that younger cohorts, particularly those in grades 3 to 6, receive greater benefits from higher salaries of food workers compared to older cohorts. The salary of food service workers demonstrates a positive association with English test scores across all ethnicities, with a greater impact size for Black and Hispanic students. The ratio of food service salary to total expenditure also resonates with the idea that allocating greater resources to food workers' salaries positively impacts students' academic performance. The findings of this study highlight the importance of increased spending for food service workers in advancing students' academic performance while reducing the achievement gap between white and minority students.

An increase in pay for school food workers faces challenges because of the *cheapness* of the U.S. school lunch programs (Gaddis, 2019). The official report reveals that more than half of the school district's food-related revenue comes from federal subsidies (U.S. Department of Agriculture, Food and Nutrition Service, Office of Policy Support, School Nutrition and Meal Cost Study, 2019). However, the federal government provides only limited subsidies to support the subsistence of children and school food service workers. For example, school districts can claim the maximum free lunch and breakfast reimbursement of $4.18 and $2.52, respectively, during the school year 2022-2023.[14]. Given the tight budget constraint, school districts must adopt cost-saving strategies, including cutting school food workers' salaries and benefits and outsourcing school operations to food service management companies. As

[14]These rates base on the contiguous states. Federal reimbursement rates in Alaska and Hawaii are greater due to a higher cost of living.

a result, these food workers must take up multiple part-time jobs, making it difficult for schools to retain skilled workers and for school food workers to care for their jobs well.

It is noteworthy that improving the salary of foodservice workers can enhance student performance, even in schools that have already implemented school food programs. Schools and districts are already aware of the importance of providing school meals, as evident from the 74.3 percent participation rate in the CEP programs (Food Research & Action Center, 2022). However, simply providing school meals may not be sufficient to maximize the benefits of those meal programs. The food quality and service school food workers offer also play an essential role in influencing student outcomes. Improving the salary of food workers may be one of the strategies for attracting and retaining highly skilled workers and raising the overall quality of school food programs. By enhancing worker's compensation, schools can encourage motivated workers to provide better service to students, ultimately improving their academic performance.

There are two main drawbacks of this study due to data limitations. First, the datasets cover only public schools in the United States. The study cannot generalize this relationship to private schools in the United States. I expect a stronger correlation between spending on food workers and student test scores in private schools because those schools tend to have a more significant variance regarding resources and financial capabilities to invest in foodservice category. Another limitation is that there is no clear definition of the school food service workers from the data source. The Federal regulation outlines three types of nutritional staff[15]. school nutrition program directors, school nutrition program managers, and school nutrition program staff. The data source does not provide a breakdown of these positions within the school's nutritional workforce. Hence, the estimates presented in this study pertain to the several nutritional positions within the scope of food workers.

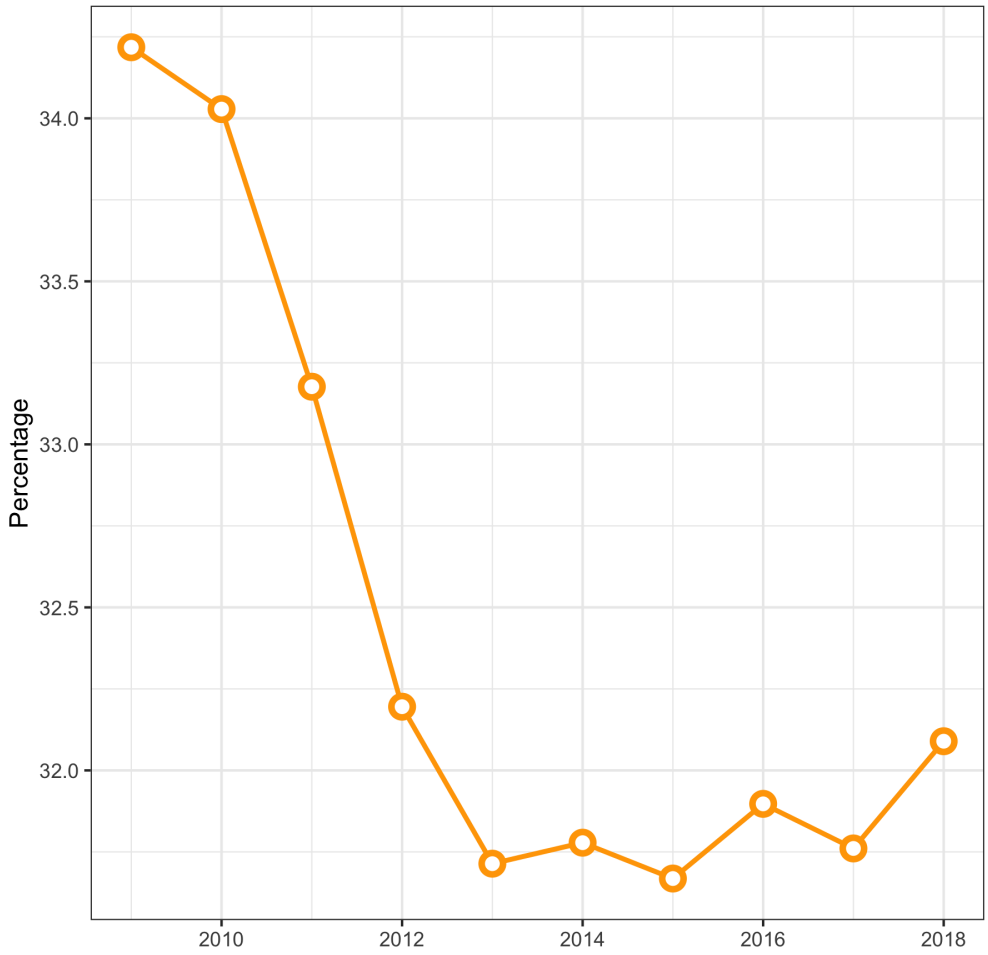
This study provides new evidence that underlines the significant role of school food workers within public schools, highlighting the need for increased public recognition and attention.

[15]Details can be found in 7 CFR § 210.2.

The results from this study cannot be interpreted as a suggestion that an increase in school food workers' salaries should replace other categories of school funding. Rather, this research shows that policymakers need to reconsider the importance of labor costs when deciding the reimbursement of school food programs to attract skilled food workers to school. This study paves the way to explore unexplored avenues in this sphere.

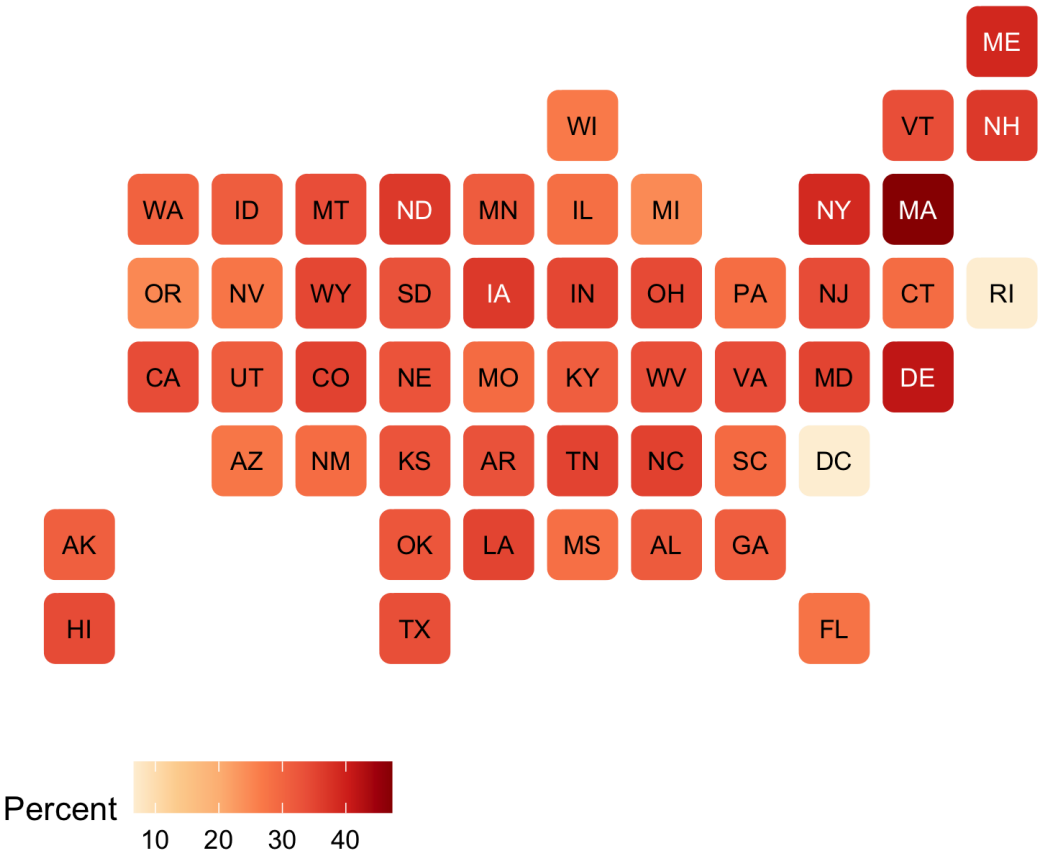
7 Figures and Tables

Figure 1: The share of school food worker salary in total spending on food service, 2009-2018



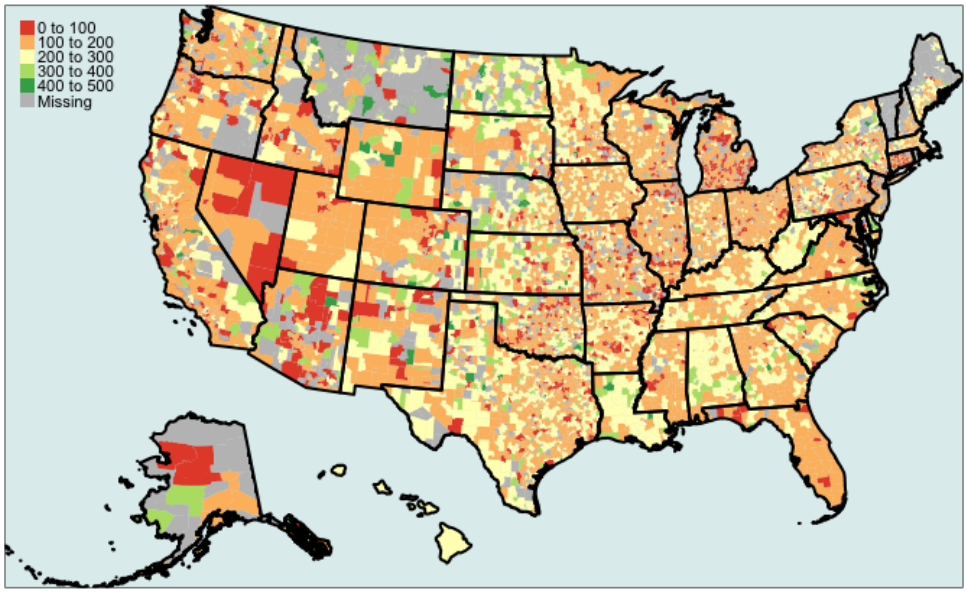
Note: The data is restricted by dropping out: 1) missing and non-applicable observations, 2) observations contain zero value of the total spending on food service, salary of food workers, and benefits of food workers, and 3) district-year observations with total enrollment less than 100 students.
Source: Author's calculation based on *School District Finance Survey* (F-33), 2009 to 2018.

Figure 2: Average ratio between food worker salary and total spending on food service from 2009-2018, by states



Note: The data is restricted by dropping out: 1) missing and non-applicable observations, 2) observations contain zero value of the total spending on food service, salary of food workers, and benefits of food workers, and 3) district-year observations with total enrollment less than 100 students.
Source: Author's calculation based on *School District Finance Survey* (F-33), 2009 to 2018.

Figure 3: District's spending on food worker salary per student in 2018



Note: The data is restricted by dropping out the following observations: 1) missing and non-applicable observations, 2) observations contain zero value of the total spending on food service, salary of food workers, benefits of food workers, and the number of students, and 3) district-year observations with total enrollment less than 100 students. The data was trimmed by one percent from both tails of the distribution to remove outliers.
Source: Source: Author's calculation based on School District Finance Survey (F-33), 2009 to 2018.

Table 1: Descriptive statistics for district and community characteristics

Variables	Mean	SD	Min	Max
Foodservice Spending ($ million)				
Current expenditure	2.037	6.877	0.018	463.537
Salary	0.655	2.134	0.001	208.253
Benefit	0.275	1.157	0.001	93.904
Total compensation	0.930	3.214	0.002	212.035
Ratio to current expenditure (%)				
Salary	32.727	9.200	0.027	98.721
Benefit	13.034	5.979	0.005	95.362
Total compensation	45.776	12.375	0.005	102.083
Districts Characteristics				
Student composition (%)				
White	0.730	0.279	0.000	1.000
Black	0.087	0.173	0.000	1.000
Asian	0.020	0.049	0.000	0.800
Native American	0.025	0.101	0.000	1.000
Hispanic	0.138	0.209	0.000	1.000
% Free- and Reduced-price lunch	0.499	0.221	0.004	1.000
% Economically disadvantaged	0.503	0.226	0.002	1.000
% English language learners	0.044	0.084	0.000	1.000
% Special education	0.137	0.043	0.000	0.957
Total enrollment (grade-level)	356	1105	1	79,184
Total expenditures ($ million)	55.39	190.55	1.03	26,009.86
Neighborhood Characteristics				
Location (%)				
Urban	0.064	0.223	0.000	1.000
Suburban	0.216	0.381	0.000	1.000
Town	0.214	0.366	0.000	1.000
Rural	0.506	0.443	0.000	1.000
Log (Median household income)	10.823	0.303	9.421	12.233
Adults with at least a bachelor's degree rate	0.220	0.122	0.001	0.869
Poverty rate (age 6-17)	0.135	0.064	0.002	0.483
Unemployment rate	0.074	0.028	0.001	0.293
SNAP receipt rate	0.111	0.064	0.000	0.524
Female-headed household rate	0.157	0.062	0.002	0.615
Observations		922,513		

Notes: EDFacts defines poor students as economically disadvantaged students. Only student composition, percent of free and reduced lunch price, and total enrollment are available in grade-district-year level. Other variables are recorded in district-year level.

Source: Author's calculation based on district-level panel data from *Stanford Education Data Archive* (SEDA) combined with *School District Finance Survey* (F-33), 2009 to 2018.

Table 2: Student test scores, by race/ethnicity

	Panel A: Math				
	N	Mean	SD	Min	Max
All	483,075	0.015	0.401	-3.735	3.147
White	433,125	0.142	0.361	-2.027	2.259
Black	112,681	-0.488	0.328	-2.764	1.503
Asians	53,350	0.657	0.564	-3.332	4.721
Hispanic	141,310	-0.267	0.335	-2.279	2.066
	Panel B: English				
	N	Mean	SD	Min	Max
All	509,438	0.013	0.362	-2.737	2.349
White	454,768	0.150	0.316	-1.963	3.566
Black	120,551	-0.425	0.303	-2.682	1.396
Asians	55,107	0.470	0.494	-3.365	2.712
Hispanic	151,640	-0.304	0.319	-2.436	1.977

Source: Author's calculation based on district-level panel data from Stanford Education Data Archive (SEDA) combined with School District Finance Survey (F-33), 2009 to 2018.

Table 3: Relationship between food service spending variables and district performance, by subject

Variables	Math	English
Log (Salary)	0.0041	0.0080***
	(0.0031)	(0.0024)
Log (TC)	0.0022	0.0064***
	(0.0031)	(0.0024)
Salary/CE	0.0490**	0.0565***
	(0.0197)	(0.0149)
TC/CE	0.0135	0.0250**
	(0.0147)	(0.0113)
Observations	483,026	509,392
Adjusted R^2	0.704	0.740

Notes: Robust standard errors in parentheses (clustered at school district level). *** p<0.01, ** p<0.05, * p<0.1, Current expenditure (CE) denotes the total district spending on food services activities. Salary denotes the total district spending on school food services workers. Total compensation (TC) denotes the total district spending on financial and non-financial benefits for school food services workers. The covariates include percentage of Blacks, Hispanic, Asian, and Native American students in the district, percentage of students with free and reduced-price lunch, percentage of economically disadvantaged students in the grade, percentage of all students in district that are English-language learners, percentage of all students in district that are in Special Education, total enrollment for grades 3-8, proportion of students in urban, suburban, and town locale schools, log of median household income, percentage of adults with at least Bachelor's degree, percentage of children (6-17 years old) living below the poverty line, percentage of unemployed, percentage of households receiving Supplemental Nutrition Assistance Program benefits, percentage of female headed households, and school's total expenditure. Grade, district, and year-fixed effect are included.
Sources: Author's calculation based on district-level panel data from *Stanford Education Data Archive* (SEDA) combined with *School District Finance Survey* (F-33), 2009 to 2018.

Table 4: Relationships between food service spending variables and district performance, by subject and grade level

Variables	G3	G4	G5	G6	G7	G8
Panel A: Math						
Log (Salaries)	0.0021	0.0028	0.0081*	0.0040	0.0014	0.0010
	(0.0042)	(0.0041)	(0.0042)	(0.0042)	(0.0039)	(0.0046)
Log (TC)	-0.0014	-0.0004	0.0062	0.0020	0.0002	0.0023
	(0.0042)	(0.0041)	(0.0043)	(0.0044)	(0.0041)	(0.0047)
Salary/CE	0.0118	0.0343	0.0780***	0.0736***	0.0327	0.0165
	(0.0285)	(0.0279)	(0.0281)	(0.0278)	(0.0273)	(0.0307)
TC/CE	-0.0231	-0.0119	0.03347	0.0304	-0.0008	0.0220
	(0.0213)	(0.0207)	(0.0211)	(0.0209)	(0.0201)	(0.0225)
Observations	85,409	85,486	84,235	83,391	73,809	68,697
Adjusted R^2	0.727	0.741	0.751	0.766	0.792	0.787
Panel B: English						
Log (Salaries)	0.0098**	0.0110***	0.0114***	0.0112***	0.0041	0.0016
	(0.0039)	(0.0033)	(0.0032)	(0.0033)	(0.0030)	(0.0030)
Log (TC)	0.0068*	0.0079**	0.0098***	0.0106***	0.0036	0.0019
	(0.0039)	(0.0033)	(0.0033)	(0.0034)	(0.0032)	(0.0031)
Salary/CE	0.0818***	0.0605***	0.0729***	0.0679***	0.0313	0.0220
	(0.0246)	(0.0223)	(0.0211)	(0.0218)	(0.0216)	(0.0214)
TC/CE	0.0257	0.0129	0.0359**	0.0456***	0.0124	0.0190
	(0.0186)	(0.0167)	(0.0159)	(0.0167)	(0.0161)	(0.0160)
Observations	85,446	85,578	85,499	84,760	83,832	82,629
Adjusted R^2	0.756	0.730	0.784	0.779	0.777	0.768

Notes: Robust standard errors in parentheses (clustered at school district level). *** p<0.01, ** p<0.05, * p<0.1, Current expenditure (CE) denotes the total district spending on food services activities. Salary denotes the total district spending on school food services workers. Total compensation (TC) denotes the total district spending on financial and non-financial benefits for school food services workers. The covariates include percentage of Blacks, Hispanic, Asian, and Native American students in the district, percentage of students with free and reduced-price lunch, percentage of economically disadvantaged students in the grade, percentage of all students in district that are English-language learners, percentage of all students in district that are in Special Education, total enrollment for grades 3-8, proportion of students in urban, suburban, and town locale schools, log of median household income, percentage of adults with at least Bachelor's degree, percentage of children (6-17 years old) living below the poverty line, percentage of unemployed, percentage of households receiving Supplemental Nutrition Assistance Program benefits, percentage of female headed households, and school's total expenditure. District, and year-fixed effect are included.

Sources: Author's calculation based on district-level panel data from *Stanford Education Data Archive* (SEDA) combined with *School District Finance Survey* (F-33), 2009 to 2018.

Table 5: Relationships between food service spending variables and district performance, by subject and race/ethnicity

Variables	White	Black	Asian	Hispanic
		Panel A: Math		
Log (Salaries)	0.0047	0.0047	0.0004	-0.0002
	(0.0033)	(0.0052)	(0.0113)	(0.0043)
Log (TC)	0.0032	0.0008	0.0052	-0.0028
	(0.0034)	(0.0053)	(0.0119)	(0.0045)
Salary/CE	0.0487**	0.0860*	0.0244	0.0228
	(0.0210)	(0.0450)	(0.0859)	(0.0338)
TC/CE	0.0144	0.0123	0.1223*	-0.0027
	(0.0157)	(0.0342)	(0.0706)	(0.0256)
Observations	433,015	112,583	53,267	141,156
Adjusted R^2	0.633	0.590	0.817	0.601
		Panel B: English		
Log (Salaries)	0.0057**	0.0056	0.0089	0.0072*
	(0.0025)	(0.0044)	(0.0095)	(0.0039)
Log (TC)	0.0048*	0.0041	0.0127	0.0069*
	(0.0025)	(0.0046)	(0.0099)	(0.0041)
Salary/CE	0.0435***	0.1154***	-0.0143	0.0607**
	(0.0158)	(0.0387)	(0.0638)	(0.0279)
TC/CE	0.0222*	0.0605**	0.0613	0.0439**
	(0.0120)	(0.0293)	(0.0529)	(0.0213)
Observations	454,664	120,454	55,021	151,489
Adjusted R^2	0.643	0.620	0.816	0.654

Notes: Robust standard errors in parentheses (clustered at school district level). *** p<0.01, ** p<0.05, * p<0.1, Current expenditure (CE) denotes the total district spending on food services activities. Salary denotes the total district spending on school food services workers. Total compensation (TC) denotes the total district spending on financial and non-financial benefits for school food services workers. The covariates include percentage of Blacks, Hispanic, Asian, and Native American students in the district, percentage of students with free and reduced-price lunch, percentage of economically disadvantaged students in the grade, percentage of all students in district that are English-language learners, percentage of all students in district that are in Special Education, total enrollment for grades 3-8, proportion of students in urban, suburban, and town locale schools, log of median household income, percentage of adults with at least Bachelor's degree, percentage of children (6-17 years old) living below the poverty line, percentage of unemployed, percentage of households receiving Supplemental Nutrition Assistance Program benefits, percentage of female headed households, and school's total expenditure. Grade, district, and year-fixed effect are included.
Sources: Author's calculation based on district-level panel data from *Stanford Education Data Archive* (SEDA) combined with *School District Finance Survey* (F-33), 2009 to 2018.

Table 6: Relationship between district spending on support service occupations and district performance, by subject

Variables	Math	English
Food service worker	0.0041	0.0080***
	(0.0031)	(0.0024)
Pupil support	0.0106***	0.0140***
	(0.0032)	(0.0027)
Instructional staff	0.0103***	0.0076***
	(0.0022)	(0.0018)
General administration	0.0040	0.0034
	(0.0031)	(0.0026)
School administration	0.0408***	0.0279***
	(0.0055)	(0.0047)
Maintenance	0.0040	0.0100***
	(0.0035)	(0.0027)
Student transportation	0.0056***	0.0045**
	(0.0021)	(0.0018)
Business support	0.0044	0.0041*
	(0.0028)	(0.0024)
Observations	430,111-483,026	454,739-509,392

Notes: Robust standard errors in parentheses (clustered at school district level). *** p<0.01, ** p<0.05, * p<0.1, The covariates include percentage of Blacks, Hispanic, Asian, and Native American students in the district, percentage of students with free and reduced-price lunch, percentage of economically disadvantaged students in the grade, percentage of all students in district that are English-language learners, percentage of all students in district that are in Special Education, total enrollment for grades 3-8, proportion of students in urban, suburban, and town locale schools, log of median household income, percentage of adults with at least Bachelor's degree, percentage of children (6-17 years old) living below the poverty line, percentage of unemployed, percentage of households receiving Supplemental Nutrition Assistance Program benefits, percentage of female headed households, and school's total expenditure. Grade, district, and year-fixed effect are included.

Sources: Author's calculation based on district-level panel data from *Stanford Education Data Archive* (SEDA) combined with *School District Finance Survey* (F-33), 2009 to 2018.

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Appendix

Table A1: Three specification of the relationships between spending on food service personnel and district performances for math test score

Variables	Model 1	Model 2	Model 3
	Panel A: Math		
Log (Salaries)	0.0025	0.0041	0.0041
	(0.0032)	(0.0031)	(0.0031)
Log (TC)	-0.0003	0.0021	0.0022
	(0.0032)	(0.0032)	(0.0031)
Salary/CE	0.0754***	0.0559***	0.0490**
	(0.0200)	(0.0198)	(0.0197)
TC/CE	0.0269*	0.0176	0.0135
	(0.0150)	(0.0148)	(0.0147)
Observations	483,026	483,026	483,026
Adjusted R^2	0.699	0.703	0.704
Expenditure Controls	Y	Y	Y
District Controls	N	Y	Y
Neighborhood Controls	N	N	Y
District FE	Y	Y	Y
Year FE	Y	Y	Y
Grade FE	Y	Y	Y

Notes: Robust standard errors in parentheses (clustered at school district level). *** p<0.01, ** p<0.05, * p<0.1, Current expenditure (CE) denotes the total district spending on food services activities. Salary denotes the total district spending on school food services workers. Total compensation (TC) denotes the total district spending on financial and non-financial benefits for school food services workers. The covariates include percentage of Blacks, Hispanic, Asian, and Native American students in the district, percentage of students with free and reduced-price lunch, percentage of economically disadvantaged students in the grade, percentage of all students in district that are English-language learners, percentage of all students in district that are in Special Education, total enrollment for grades 3-8, proportion of students in urban, suburban, and town locale schools, log of median household income, percentage of adults with at least Bachelor's degree, percentage of children (6-17 years old) living below the poverty line, percentage of unemployed, percentage of households receiving Supplemental Nutrition Assistance Program benefits, percentage of female headed households, and school's total expenditure. Grade, district, and year-fixed effect are included. *Sources:* Author's calculation based on district-level panel data from *Stanford Education Data Archive* (SEDA) combined with *School District Finance Survey* (F-33), 2009 to 2018.

Table A2: Three specification of the relationships between spending on food service personnel and district performances for English test score

Variables	Model 1	Model 2	Model 3
	Panel B: English		
Log (Salaries)	0.0070***	0.0079***	0.0080***
	(0.0024)	(0.0024)	(0.0024)
Log (TC)	0.0045*	0.0064***	0.0064***
	(0.0025)	(0.0046)	(0.0024)
Salary/CE	0.0790***	0.0593***	0.0565***
	(0.0153)	(0.0149)	(0.0149)
TC/CE	0.0346***	0.0270***	0.0250**
	(0.0115)	(0.0113)	(0.0113)
Observations	509,392	509,392	509,392
Adjusted R^2	0.735	0.740	0.740
Expenditure Controls	Y	Y	Y
District Controls	N	Y	Y
Neighborhood Controls	N	N	Y
District FE	Y	Y	Y
Year FE	Y	Y	Y
Grade FE	Y	Y	Y

Notes: Robust standard errors in parentheses (clustered at school district level). *** p<0.01, ** p<0.05, * p<0.1, Current expenditure (CE) denotes the total district spending on food services activities. Salary denotes the total district spending on school food services workers. Total compensation (TC) denotes the total district spending on financial and non-financial benefits for school food services workers. The covariates include percentage of Blacks, Hispanic, Asian, and Native American students in the district, percentage of students with free and reduced-price lunch, percentage of economically disadvantaged students in the grade, percentage of all students in district that are English-language learners, percentage of all students in district that are in Special Education, total enrollment for grades 3-8, proportion of students in urban, suburban, and town locale schools, log of median household income, percentage of adults with at least Bachelor's degree, percentage of children (6-17 years old) living below the poverty line, percentage of unemployed, percentage of households receiving Supplemental Nutrition Assistance Program benefits, percentage of female headed households, and school's total expenditure. Grade, district, and year-fixed effect are included.
Source: Author's calculation based on district-level panel data from *Stanford Education Data Archive* (SEDA) combined with *School District Finance Survey* (F-33), 2009 to 2018.

Table A3: Relationship between food service spending variables and district performance, by subject (control for teacher salary)

Variables	Math	English
Log (Salary)	0.0000	0.0045*
	(0.0033)	(0.0025)
Log (TC)	-0.0010	0.0025
	(0.0031)	(0.0026)
Salary/CE	0.0386*	0.0515***
	(0.0214)	(0.0160)
TC/CE	0.0137	0.0130
	(0.0161)	(0.0121)
Observations	399,560	425,160
Adjusted R^2	0.712	0.747

Notes: Robust standard errors in parentheses (clustered at school district level). *** p<0.01, ** p<0.05, * p<0.1, Current expenditure (CE) denotes the total district spending on food services activities. Salary denotes the total district spending on school food services workers. Total compensation (TC) denotes the total district spending on financial and non-financial benefits for school food services workers. The covariates include percentage of Blacks, Hispanic, Asian, and Native American students in the district, percentage of students with free and reduced-price lunch, percentage of economically disadvantaged students in the grade, percentage of all students in district that are English-language learners, percentage of all students in district that are in Special Education, total enrollment for grades 3-8, proportion of students in urban, suburban, and town locale schools, log of median household income, percentage of adults with at least Bachelor's degree, percentage of children (6-17 years old) living below the poverty line, percentage of unemployed, percentage of households receiving Supplemental Nutrition Assistance Program benefits, percentage of female headed households, and teacher salary for regular program. Grade, district, and year-fixed effect are included.
Sources: Author's calculation based on district-level panel data from *Stanford Education Data Archive* (SEDA) combined with *School District Finance Survey* (F-33), 2009 to 2018.

Table A4: Relationships between food service spending variables and district performance, by subject and grade level (control for teacher salary)

Variables	G3	G4	G5	G6	G7	G8
Panel A: Math						
Log (Salaries)	-0.0031	0.0006	0.0050	-0.0006	-0.0031	-0.0026
	(0.0045)	(0.0044)	(0.0046)	(0.0044)	(0.0042)	(0.0052)
Log (TC)	-0.0050	-0.0009	0.0047	-0.0023	-0.0035	-0.0009
	(0.0047)	(0.0045)	(0.0048)	(0.0047)	(0.0043)	(0.0051)
Salary/CE	-0.0089	0.0432	0.0836***	0.0527*	-0.0018	0.0115
	(0.0307)	(0.0298)	(0.0307)	(0.0303)	(0.0300)	(0.0347)
TC/CE	-0.0219	-0.0150	0.0532**	0.0198	-0.0189	0.0179
	(0.0231)	(0.0225)	(0.0231)	(0.0227)	(0.0222)	(0.0225)
Observations	71,100	71,163	69,866	69,060	59,664	55,147
Adjusted R^2	0.735	0.749	0.761	0.776	0.798	0.794
Panel B: English						
Log (Salaries)	0.0074*	0.0075**	0.0098***	0.0060*	0.0006	-0.0019
	(0.0042)	(0.0036)	(0.0035)	(0.0035)	(0.0033)	(0.0033)
Log (TC)	0.0054	0.0050	0.0073**	0.0036	-0.0012	-0.0030
	(0.0043)	(0.0037)	(0.0036)	(0.0037)	(0.0034)	(0.0034)
Salary/CE	0.0788***	0.0643***	0.0919***	0.0621***	0.0149	-0.0010
	(0.0267)	(0.0241)	(0.0229)	(0.0235)	(0.0233)	(0.0236)
TC/CE	0.0308	0.0212	0.0378**	0.0187	-0.0164	-0.0139
	(0.0203)	(0.0181)	(0.0172)	(0.0180)	(0.0172)	(0.0175)
Observations	70,997	71,120	71,013	70,306	69,513	68,893
Adjusted R^2	0.766	0.780	0.791	0.788	0.788	0.776

Notes: Robust standard errors in parentheses (clustered at school district level). *** p<0.01, ** p<0.05, * p<0.1, Current expenditure (CE) denotes the total district spending on food services activities. Salary denotes the total district spending on school food services workers. Total compensation (TC) denotes the total district spending on financial and non-financial benefits for school food services workers. The covariates include percentage of Blacks, Hispanic, Asian, and Native American students in the district, percentage of students with free and reduced-price lunch, percentage of economically disadvantaged students in the grade, percentage of all students in district that are English-language learners, percentage of all students in district that are in Special Education, total enrollment for grades 3-8, proportion of students in urban, suburban, and town locale schools, log of median household income, percentage of adults with at least Bachelor's degree, percentage of children (6-17 years old) living below the poverty line, percentage of unemployed, percentage of households receiving Supplemental Nutrition Assistance Program benefits, percentage of female headed households, and teacher salary for regular program. District, and year-fixed effect are included.

Sources: Author's calculation based on district-level panel data from *Stanford Education Data Archive* (SEDA) combined with *School District Finance Survey* (F-33), 2009 to 2018.

Table A5: Relationships between food service spending variables and district performance, by subject and ethnicity (control for teacher salary)

Variables	White	Black	Asian	Hispanic
		Panel A: Math		
Log (Salaries)	0.0008	0.0024	0.0015	-0.0030
	(0.0036)	(0.0060)	(0.0129)	(0.0050)
Log (TC)	0.0005	-0.0007	0.0042	-0.0058
	(0.0037)	(0.0063)	(0.0134)	(0.0053)
Salary/CE	0.0356	0.0706	0.0441	0.0331
	(0.0230)	(0.0504)	(0.0821)	(0.0377)
TC/CE	0.0171	0.0128	0.1003	0.0012
	(0.0172)	(0.0392)	(0.0655)	(0.0289)
Observations	358,752	98,461	46,183	118,442
Adjusted R^2	0.637	0.590	0.819	0.615
		Panel B: English		
Log (Salaries)	0.0011	0.0018	0.0102	0.0057
	(0.0026)	(0.0051)	(0.0109)	(0.0043)
Log (TC)	0.0000	-0.0014	0.0111	0.0038
	(0.0027)	(0.0054)	(0.0114)	(0.0045)
Salary/CE	0.0293*	0.1037**	-0.0108	0.0765**
	(0.0170)	(0.0428)	(0.0645)	(0.0307)
TC/CE	0.0076	0.0304	0.0240	0.0333
	(0.0128)	(0.0327)	(0.0519)	(0.0234)
Observations	379,674	106,337	48,183	128,878
Adjusted R^2	0.650	0.623	0.819	0.666

Notes: Robust standard errors in parentheses (clustered at school district level). *** p<0.01, ** p<0.05, * p<0.1, Current expenditure (CE) denotes the total district spending on food services activities. Salary denotes the total district spending on school food services workers. Total compensation (TC) denotes the total district spending on financial and non-financial benefits for school food services workers. The covariates include percentage of Blacks, Hispanic, Asian, and Native American students in the district, percentage of students with free and reduced-price lunch, percentage of economically disadvantaged students in the grade, percentage of all students in district that are English-language learners, percentage of all students in district that are in Special Education, total enrollment for grades 3-8, proportion of students in urban, suburban, and town locale schools, log of median household income, percentage of adults with at least Bachelor's degree, percentage of children (6-17 years old) living below the poverty line, percentage of unemployed, percentage of households receiving Supplemental Nutrition Assistance Program benefits, percentage of female headed households, and teacher salary for regular program. Grade, district, and year-fixed effect are included.
Sources: Author's calculation based on district-level panel data from *Stanford Education Data Archive* (SEDA) combined with *School District Finance Survey* (F-33), 2009 to 2018.

Table A6: Relationship between food service spending variables and district performance, by subject (control for total expenditure and teacher salary)

Variables	Math	English
Log (Salary)	-0.0002	0.0042*
	(0.0033)	(0.0025)
Log (TC)	-0.0013	0.0021
	(0.0035)	(0.0026)
Salary/CE	0.0383*	0.0509***
	(0.0214)	(0.0160)
TC/CE	0.0131	0.0122
	(0.0161)	(0.0121)
Observations	399,560	425,160
Adjusted R^2	0.712	0.747

Notes: Robust standard errors in parentheses (clustered at school district level). *** p<0.01, ** p<0.05, * p<0.1, Current expenditure (CE) denotes the total district spending on food services activities. Salary denotes the total district spending on school food services workers. Total compensation (TC) denotes the total district spending on financial and non-financial benefits for school food services workers. The covariates include percentage of Blacks, Hispanic, Asian, and Native American students in the district, percentage of students with free and reduced-price lunch, percentage of economically disadvantaged students in the grade, percentage of all students in district that are English-language learners, percentage of all students in district that are in Special Education, total enrollment for grades 3-8, proportion of students in urban, suburban, and town locale schools, log of median household income, percentage of adults with at least Bachelor's degree, percentage of children (6-17 years old) living below the poverty line, percentage of unemployed, percentage of households receiving Supplemental Nutrition Assistance Program benefits, percentage of female headed households, school's total expenditure, and teacher salary for regular program. Grade, district, and year-fixed effect are included.

Sources: Author's calculation based on district-level panel data from *Stanford Education Data Archive* (SEDA) combined with *School District Finance Survey* (F-33), 2009 to 2018.

Table A7: Relationships between food service spending variables and district performance, by subject and grade level (control for total expenditure and teacher salary)

Variables	G3	G4	G5	G6	G7	G8
Panel A: Math						
Log (Salaries)	-0.0031	0.0006	0.0048	-0.0010	-0.0032	-0.0028
	(0.0045)	(0.0044)	(0.0046)	(0.0044)	(0.0042)	(0.0052)
Log (TC)	-0.0049	-0.0009	0.0044	-0.0028	-0.0036	-0.0011
	(0.0047)	(0.0045)	(0.0048)	(0.0047)	(0.0044)	(0.0054)
Salary/CE	-0.0088	0.0432	0.0832***	0.0520*	-0.0019	0.0113
	(0.0307)	(0.0298)	(0.0307)	(0.0303)	(0.0300)	(0.0347)
TC/CE	-0.0218	0.0150	0.0537**	0.0190	-0.0192	0.0174
	(0.0231)	(0.0225)	(0.0232)	(0.0228)	(0.0222)	(0.0225)
Observations	71,100	71,163	69,866	69,060	59,664	55,147
Adjusted R^2	0.735	0.749	0.761	0.776	0.798	0.794
Panel B: English						
Log (Salaries)	0.0069	0.0072**	0.0091***	0.0056	0.0003	-0.0021
	(0.0042)	(0.0036)	(0.0034)	(0.0035)	(0.0033)	(0.0033)
Log (TC)	0.0049	0.0047	0.0066*	0.0031	-0.0015	-0.0032
	(0.0043)	(0.0036)	(0.0036)	(0.0037)	(0.0034)	(0.0034)
Salary/CE	0.0780**	0.0638***	0.0906***	0.0614***	0.0144	-0.0013
	(0.0267)	(0.0241)	(0.0229)	(0.0235)	(0.0233)	(0.0236)
TC/CE	0.0298	0.0205	0.0362**	0.0177	-0.0170	-0.0144
	(0.0203)	(0.0181)	(0.0172)	(0.0180)	(0.0172)	(0.0175)
Observations	70,997	71,120	71,013	70,306	69,513	68,893
Adjusted R^2	0.766	0.780	0.791	0.788	0.788	0.776

Notes: Robust standard errors in parentheses (clustered at school district level). *** p<0.01, ** p<0.05, * p<0.1, Current expenditure (CE) denotes the total district spending on food services activities. Salary denotes the total district spending on school food services workers. Total compensation (TC) denotes the total district spending on financial and non-financial benefits for school food services workers. The covariates include percentage of Blacks, Hispanic, Asian, and Native American students in the district, percentage of students with free and reduced-price lunch, percentage of economically disadvantaged students in the grade, percentage of all students in district that are English-language learners, percentage of all students in district that are in Special Education, total enrollment for grades 3-8, proportion of students in urban, suburban, and town locale schools, log of median household income, percentage of adults with at least Bachelor's degree, percentage of children (6-17 years old) living below the poverty line, percentage of unemployed, percentage of households receiving Supplemental Nutrition Assistance Program benefits, percentage of female headed households, school's total expenditure, and teacher salary for regular program. District, and year-fixed effect are included.

Sources: Author's calculation based on district-level panel data from *Stanford Education Data Archive* (SEDA) combined with *School District Finance Survey* (F-33), 2009 to 2018.

Table A8: Relationships between food service spending variables and district performance, by subject and ethnicity (control for total expenditure and teacher salary)

Variables	White	Black	Asian	Hispanic
		Panel A: Math		
Log (Salaries)	0.0006	0.0020	0.0025	-0.0026
	(0.0036)	(0.0060)	(0.0129)	(0.0051)
Log (TC)	0.0002	-0.0013	0.0053	-0.0054
	(0.0037)	(0.0063)	(0.0134)	(0.0053)
Salary/CE	0.0351	0.0694	0.0494	0.0345
	(0.0230)	(0.0503)	(0.0825)	(0.0377)
TC/CE	0.0165	0.0113	0.1050	0.0021
	(0.0172)	(0.0392)	(0.0658)	(0.0289)
Observations	358,752	98,461	46,183	118,442
Adjusted R^2	0.637	0.590	0.819	0.615
		Panel B: English		
Log (Salaries)	0.0011	0.0016	0.0097	0.0047
	(0.0026)	(0.0051)	(0.0110)	(0.0043)
Log (TC)	-0.0001	-0.0016	0.0105	0.0028
	(0.0027)	(0.0054)	(0.0114)	(0.0045)
Salary/CE	0.0292*	0.1031**	-0.0133	0.0730**
	(0.0170)	(0.0427)	(0.0643)	(0.0306)
TC/CE	0.0074	0.0297	0.0221	0.0309
	(0.0128)	(0.0326)	(0.0518)	(0.0234)
Observations	379,674	106,337	48,183	128,878
Adjusted R^2	0.650	0.623	0.819	0.666

Notes: Robust standard errors in parentheses (clustered at school district level). *** p<0.01, ** p<0.05, * p<0.1, Current expenditure (CE) denotes the total district spending on food services activities. Salary denotes the total district spending on school food services workers. Total compensation (TC) denotes the total district spending on financial and non-financial benefits for school food services workers. The covariates include percentage of Blacks, Hispanic, Asian, and Native American students in the district, percentage of students with free and reduced-price lunch, percentage of economically disadvantaged students in the grade, percentage of all students in district that are English-language learners, percentage of all students in district that are in Special Education, total enrollment for grades 3-8, proportion of students in urban, suburban, and town locale schools, log of median household income, percentage of adults with at least Bachelor's degree, percentage of children (6-17 years old) living below the poverty line, percentage of unemployed, percentage of households receiving Supplemental Nutrition Assistance Program benefits, percentage of female headed households, school's total expenditure, and teacher salary for regular program. Grade, district, and year-fixed effect are included.

Sources: Author's calculation based on district-level panel data from *Stanford Education Data Archive* (SEDA) combined with *School District Finance Survey* (F-33), 2009 to 2018.

Table A9: Relationship between food service spending variables and district performance, by subject (truncation at test score for 1% and 5%)

Variables	Math			English		
	0%	1%	5%	0%	1%	5%
Log (Salary)	0.0041	0.0021	0.0008	0.0080***	0.0063***	0.0057***
	(0.0031)	(0.0029)	(0.0027)	(0.0024)	(0.0023)	(0.0021)
Log (TC)	0.0022	0.0004	-0.0008	0.0064***	0.0044*	0.0036*
	(0.0031)	(0.0030)	(0.0028)	(0.0024)	(0.0023)	(0.0021)
Salary/CE	0.0490**	0.0302	0.0113	0.0565***	0.0482***	0.0375***
	(0.0197)	(0.0189)	(0.0174)	(0.0149)	(0.0142)	(0.0131)
TC/CE	0.0135	0.0019	-0.013	0.0250**	0.0147	0.0035
	(0.0147)	(0.0142)	(0.0131)	(0.0113)	(0.0108)	(0.0099)
Observations	483,026	473,361	434,685	509,392	499,195	458,389
Adjusted R^2	0.704	0.680	0.614	0.740	0.715	0.646

Notes: Robust standard errors in parentheses (clustered at school district level). *** p<0.01, ** p<0.05, * p<0.1, Current expenditure (CE) denotes the total district spending on food services activities. Salary denotes the total district spending on school food services workers. Total compensation (TC) denotes the total district spending on financial and non-financial benefits for school food services workers. The covariates include percentage of Blacks, Hispanic, Asian, and Native American students in the district, percentage of students with free and reduced-price lunch, percentage of economically disadvantaged students in the grade, percentage of all students in district that are English-language learners, percentage of all students in district that are in Special Education, total enrollment for grades 3-8, proportion of students in urban, suburban, and town locale schools, log of median household income, percentage of adults with at least Bachelor's degree, percentage of children (6-17 years old) living below the poverty line, percentage of unemployed, percentage of households receiving Supplemental Nutrition Assistance Program benefits, percentage of female headed households, school's total expenditure, and teacher salary for regular program. Grade, district, and year-fixed effect are included. The data is trimmed by 1% and 5% from both tails.
Sources: Author's calculation based on district-level panel data from *Stanford Education Data Archive* (SEDA) combined with *School District Finance Survey* (F-33), 2009 to 2018.

Table A10: Relationships between food service spending variables and district performance, by subject and ethnicity (Truncation at test score for 1%)

Variables	White	Black	Asian	Hispanic
		Panel A: Math		
Log (Salaries)	0.0032	0.0036	-0.0066	-0.0025
	(0.0031)	(0.0049)	(0.0108)	(0.0041)
Log (TC)	0.0021	-0.0002	-0.0027	-0.0050
	(0.0032)	(0.0050)	(0.0112)	(0.0042)
Salary/CE	0.0352*	0.0569	-0.0791	0.0166
	(0.0198)	(0.0424)	(0.0726)	(0.0325)
TC/CE	0.0089	-0.0045	0.0371	-0.0062
	(0.0149)	(0.0324)	(0.0590)	(0.0245)
Observations	424,351	110,338	52,202	138,323
Adjusted R^2	0.614	0.573	0.810	0.580
		Panel B: English		
Log (Salaries)	0.0051**	0.0042	0.0059	0.0044
	(0.0023)	(0.0041)	(0.0090)	(0.0036)
Log (TC)	0.0042*	0.0020	0.0091	0.0045
	(0.0024)	(0.0042)	(0.0094)	(0.0038)
Salary/CE	0.0363*	0.1004**	-0.0550	0.0543**
	(0.0149)	(0.0359)	(0.0564)	(0.0264)
TC/CE	0.0157	0.0403	0.0281	0.0406**
	(0.0113)	(0.0271)	(0.0452)	(0.0202)
Observations	440,270	118,043	53,918	148,452
Adjusted R^2	0.620	0.602	0.805	0.631

Notes: Robust standard errors in parentheses (clustered at school district level). *** p<0.01, ** p<0.05, * p<0.1, Current expenditure (CE) denotes the total district spending on food services activities. Salary denotes the total district spending on school food services workers. Total compensation (TC) denotes the total district spending on financial and non-financial benefits for school food services workers. The covariates include percentage of Blacks, Hispanic, Asian, and Native American students in the district, percentage of students with free and reduced-price lunch, percentage of economically disadvantaged students in the grade, percentage of all students in district that are English-language learners, percentage of all students in district that are in Special Education, total enrollment for grades 3-8, proportion of students in urban, suburban, and town locale schools, log of median household income, percentage of adults with at least Bachelor's degree, percentage of children (6-17 years old) living below the poverty line, percentage of unemployed, percentage of households receiving Supplemental Nutrition Assistance Program benefits, percentage of female headed households, and school's total expenditure. Grade, district, and year-fixed effect are included.
Sources: Author's calculation based on district-level panel data from *Stanford Education Data Archive* (SEDA) combined with *School District Finance Survey* (F-33), 2009 to 2018.

Table A11: Relationships between food service spending variables and district performance, by subject and ethnicity (Truncation at test score for 5%)

Variables	White	Black	Asian	Hispanic
		Panel A: Math		
Log (Salaries)	0.0022	0.0003	-0.0055	-0.0054
	(0.0028)	(0.0043)	(0.0110)	(0.0037)
Log (TC)	0.0013	-0.0029	-0.0034	-0.0077**
	(0.0028)	(0.0044)	(0.0113)	(0.0039)
Salary/CE	0.0192	0.0311	-0.0865	-0.0041
	(0.0175)	(0.0360)	(0.0664)	(0.0286)
TC/CE	0.0026	-0.0155	0.0159	-0.0223
	(0.0133)	(0.0278)	(0.0546)	(0.0218)
Observations	389,686	101,307	47,928	127,006
Adjusted R^2	0.551	0.515	0.770	0.520
		Panel B: English		
Log (Salaries)	0.0046**	0.0029	0.0050	0.0029
	(0.0021)	(0.0033)	(0.0087)	(0.0032)
Log (TC)	0.0034	-0.0001	0.0083	0.0030
	(0.0022)	(0.0034)	(0.0091)	(0.0034)
Salary/CE	0.0273**	0.0874***	-0.0299	0.0522**
	(0.0134)	(0.0302)	(0.0520)	(0.0230)
TC/CE	0.0065	0.0232	0.0435	0.0406**
	(0.0102)	(0.0228)	(0.0416)	(0.0176)
Observations	390,209	108,386	49,507	136,303
Adjusted R^2	0.566	0.545	0.757	0.571

Notes: Robust standard errors in parentheses (clustered at school district level). *** p<0.01, ** p<0.05, * p<0.1, Current expenditure (CE) denotes the total district spending on food services activities. Salary denotes the total district spending on school food services workers. Total compensation (TC) denotes the total district spending on financial and non-financial benefits for school food services workers. The covariates include percentage of Blacks, Hispanic, Asian, and Native American students in the district, percentage of students with free and reduced-price lunch, percentage of economically disadvantaged students in the grade, percentage of all students in district that are English-language learners, percentage of all students in district that are in Special Education, total enrollment for grades 3-8, proportion of students in urban, suburban, and town locale schools, log of median household income, percentage of adults with at least Bachelor's degree, percentage of children (6-17 years old) living below the poverty line, percentage of unemployed, percentage of households receiving Supplemental Nutrition Assistance Program benefits, percentage of female headed households, and school's total expenditure. Grade, district, and year-fixed effect are included.
Sources: Author's calculation based on district-level panel data from *Stanford Education Data Archive* (SEDA) combined with *School District Finance Survey* (F-33), 2009 to 2018.