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# Paying for Free Lunch: The Impact of CEP Universal Free Meals on Revenues, Spending, and Student Health

Michah W. Rothbart, Amy Ellen Schwartz, and Emily Gutierrez

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SYRACUSE UNIVERSITY
Maxwell School
Center for Policy Research

426 Eggers Hall
Syracuse University
Syracuse, NY 13244-1020
(315) 443-3114/email: ctrpol@syr.edu
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## Abstract

The Community Eligibility Provision (CEP) of the Healthy, Hunger-Free Kids Act of 2010 allows school districts to provide free meals to all students if more than 40 percent of students are individually eligible for free or reduced-price lunch. While emerging evidence documents positive effects on student behavior and academics (Gordon and Ruffini, 2019; Schwartz and Rothbart, 2020), critics worry that Universal Free Meals (UFM) has unintended consequences, including exacerbating student obesity and adding financial burden onto school districts. We use school and district level data from New York State (NYS) and a difference-in-differences design to test whether concerns over negative effects for district finances (both revenues and expenditures) and student weight are justified. We exploit the staggered adoption of CEP across NYS school districts, and explore differences between metro, town, and rural districts. We delve into potential mechanisms, such as lunch and breakfast participation, and use a non-parametric event study model to assess pre-adoption trends and dosage effects. We find that, while local food service revenues decline, as expected, Federal dollars more than compensate through increased reimbursement revenues. Districts increase total food expenditures after CEP adoption (consistent with serving more meals) but spend less per meal. Indeed, while some worry that expanding free meals will crowd out education spending, we find CEP has no effect on instructional expenditures. Furthermore, while CEP increases participation in school lunch and breakfast, there is no deleterious effect on obesity, but, instead, some evidence of decreases in obesity in secondary grades. Rural districts experience larger impacts on revenues, expenditures, and student obesity than both metro and town districts, suggesting rural locations might be the most responsive to CEP. Unlike other districts, however, rural districts experience a food service funding gap from the CEP.

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**Authors**: Michah W. Rothbart, Center for Policy Research, Maxwell School of Citizenship and Public Affairs, Syracuse University, mwrothba@syr.edu; Amy Ellen Schwartz, Center for Policy Research, Maxwell School of Citizenship and Public Affairs, Syracuse University; Emily Gutierrez, Center for Policy Research, Maxwell School of Citizenship and Public Affairs, Syracuse University

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# I. Introduction

The vast majority of US schools – approximately 95 percent – serve subsidized meals to over 30 million students on an average day (FRAC, 2019). Under the National School Lunch program (NSLP) and School Breakfast Program (SBP), meals are free for eligible low-income students, with higher prices charged to families with higher incomes. Adopted in 2010, the Community Eligibility Provision (CEP) of the Healthy, Hunger-Free Kids Act (HHFKA) allows schools or districts to adopt Universal Free Meals (UFM), a program that provides free meals to all students, regardless of household income, if at least 40 percent of students are "directly certified" for free meals.[1] Advocates claim UFM reduces stigma, food insecurity, hunger, and administrative burden while improving student nutrition and readiness to learn. Recent research finds UFM increases participation in school food, reduces suspension rates, and improves academic achievement and perceptions of school climate (Schwartz & Rothbart, 2020; Gordon & Ruffini, 2019; Ruffini, forthcoming; Kho, 2018-working paper; Gutierrez, 2020-working paper).

Critics, on the other hand, worry UFM may have unintended consequences such as increased financial burdens for school districts – even while it may reduce the parental burden of providing meals. While CEP's reimbursement structure appears more generous than other UFM provisions, federal reimbursements may not fully cover CEP-induced gaps in school district budgets due to loss of local food revenues (i.e., lunch and breakfast fees) and/or changes in price or costs of production for school meals,

[1] Students are directly certified eligible if they participate in specific means-tested programs, including Supplemental Nutrition Assistance Program (SNAP), Temporary Assistance for Needy Families (TANF), or Medicaid. Students are also eligible if they are in foster care or Head Start, are homeless, are migrant, or participate in the Food Distribution Program on Indian Reservations benefits (FRAC, 2017).

among others. Furthermore, if CEP induces school food programs to run deficits, do districts reallocate instructional expenditures to make up the difference?

Critics also worry that UFM may exacerbate student obesity. UFM's effect on student health can depend on a number of factors, including the nutritional value of school food, availability of alternatives, student responses to price changes, changes in participation, and whether students increase total caloric consumption by doubling up on meals. There is, unfortunately, little empirical evidence of the effect of UFM on student health. Schwartz & Rothbart (2020) investigate school-level UFM programs in New York City (NYC) offered under an alternative provision, Provision 2. They find UFM increases participation in school lunch and improves test scores, with suggestive but statistically insignificant evidence of beneficial effects on weight. And, Davis and Musaddiq (2019) find that UFM implemented in Georgia under CEP increases the share of students in the healthy BMI weight range.

To be sure, UFM may deliver other unintended consequences or, more broadly, social welfare costs (or benefits). For example, students might benefit from homemade lunches, say, by strengthening family bonds or encouraging self-sufficiency - benefits which might be foregone under UFM. Or, UFM might decrease sales at neighborhood eateries. We leave those questions for a future study, focusing here on whether - and how much - CEP affects school district finances and student weight outcomes.

This paper uses data on New York State (NYS) districts and schools to estimate the effects of CEP on student weight outcomes, explore the potential mechanisms through which CEP may affect obesity (including meal participation and attendance), and estimate novel effects of CEP on district revenues and expenditures. We use data on 698 school districts for 2010-2017 including demographics, enrollment, school food revenues and expenditures, and new data on school meal participation and obesity rates for primary and secondary grade students.

We explore heterogeneity along three dimensions: (1) grades served (primary vs. secondary), (2) urbanicity (metro, town, and rural communities), and (3) differential implementation (selective vs. districtwide) for the following reasons. First, since younger students are more likely than older students to participate in school meals, districts may selectively implement CEP in primary schools first. At the same time, older students may be more responsive than younger students to prices and consume less healthy alternatives to school food. Therefore, increasing participation among older students may have larger effects on weight outcomes.

Second, urban districts may differ from rural districts in a variety of ways. Urban districts are likely to face higher costs (especially wages) while rural locations offer fewer convenient alternatives to school meals. Rural districts have higher school meal participation rates, higher shares of students paying full price for school meals, and lower shares who are free lunch eligible. Thus, rural school districts may see larger losses in revenues from fees and lower reimbursements than urban districts. Moreover, since rural districts are typically smaller, they are more likely to implement CEP districtwide rather than selectively in a subset of schools, suggesting larger estimated district-level effects.

We use a difference-in-differences approach with district fixed effects and compare early to late CEP-adopting districts, exploiting the staggered adoption of CEP to estimate the impact on revenues, spending, and weight outcomes. While districts that adopt CEP may be systematically different from those that do not, the precise timing of adoption is plausibly exogenous among those that adopt CEP at some point in our study period - the "Ever CEP" districts. District fixed effects and time-varying control variables further adjust for time invariant differences between districts and time varying differences between and within districts over time. We then use non-parametric event study models to test the

parallel trends assumption and explore the evolution of the effects in the years following the adoption of UFM under CEP.

To preview the results, we find CEP does, indeed, increase school meal participation in lunch by as much as 8.5 percentage points and breakfast by 11.5 percentage points, with effects varying by urbanicity and grade span. There is, however, no meaningful effect on attendance, suggesting any effects on district or student outcomes are not driven by changes in attendance. CEP also improves weight outcomes for secondary school students who are, perhaps, more sensitive to prices and more likely to eat unhealthy substitutes for school meals; effects on elementary school students are not significant. We find local food revenues decline (perhaps mechanically due to the elimination of meals fees), while federal food revenues and total food expenditures grow. Overall, federal revenues more than compensate for changes in school food revenues and expenditures, with no effect on instructional expenditures. CEP, as a result, helps close the school food services gap, on average.

As expected, the effects differ across settings. The impacts of CEP are larger in rural districts - specifically, the increase in breakfast participation and decrease in obesity among secondary school students are larger. Unlike metro and town districts, reductions in school meal fees and increases in food expenditures in rural districts are not fully offset by federal subsidies. We find expenditures increase with expanded CEP implementation. Moreover, we find the declines in the percentage overweight and obese students are larger in districts with wider CEP implementation and occur in both primary and secondary grades. There is little evidence that expansion of CEP leads to the unintended consequence of increased weight; in fact, quite the opposite appears to be true.

In summary, we derive credibly causal estimates of CEP's effect on student weight and district financial outcomes, informing the debate on whether - and how much - the benefits of UFM are coupled

with unintended negative consequences for school district finances and/or student weight outcomes. We see little evidence of deleterious effects on the prevalence of obesity or overweight students, or on instructional expenditures. We see large increases in federal reimbursements that, in most districts, trump the size of increased food expenditures. Thus, the "price" of UFM seems to be largely paid by the federal government, with a notable exception for rural districts.

## II. Background

The NSLP and SBP provide free and low-cost meals to tens of millions of children in over 100,000 schools and childcare institutions each year - making the NSLP the second largest food and nutrition assistance program in the US (behind the Supplemental Nutrition Assistance Program (SNAP)). These school meal programs cost the Federal government $18.2 billion annually and provide subsidized meals to students based on household income (USDA, 2019). Specifically, students in households earning incomes less than 185 percent of the federal poverty line pay a reduced price, while students with household incomes less than 130 percent receive school meals for free. Students not certified as eligible for free or reduced-price meals - which includes both students with family incomes above the threshold and those who have not obtained the requisite certification - pay the "full" price.

The Community Eligibility Provision (CEP) of the Healthy, Hunger-Free Kids Act (HHFKA) of 2010 allows certain schools and districts to provide free meals to all students. Under CEP, a school, cluster of schools within the same district, or entire district can adopt UFM if at least 40 percent of students are free-lunch eligible. Participating schools or districts use "direct certification" to determine the percent of free-lunch eligible students, also known as the Identified Student Percentage (ISP). Direct certification matches students to administrative records indicating student household participation in

SNAP, Temporary Assistance for Needy Families (TANF), or Medicaid, among others.[2] Though introduced in 2010, CEP was piloted in eleven states from 2012-2014 and became available nationwide in 2015. CEP expanded quickly, reaching over 14,000 schools in 2,200 districts in 2015 to 28,400 schools in 4,600 districts in 2019. As of 2019, almost 65 percent of eligible schools across the nation had implemented UFM via CEP (FRAC, 2019).

Schools or districts may be more likely to adopt UFM under CEP than under other UFM provisions due to CEP's relatively generous reimbursement structure.[3] Under CEP, schools' and districts' reimbursements are the product of four terms: (1) the federal subsidy for free-lunch, (2) the number of meals served, (3) the ISP, and (4) a multiplier of 1.6. Mechanically, this means schools or districts with ISPs greater than or equal to 62.5 percent are reimbursed at the federal free-lunch rate for all meals served (because 62.5 percent x 1.6 = 100 percent). Under Provision 2, for example, schools would be reimbursed at the federal free-lunch rate *only* for the share of meals served to otherwise "free-eligible" students as of some base year - a much less generous reimbursement if free lunch eligibility rates are high.

## III. Prior Literature

School meal participation rates are lower than one might expect, especially among certified income eligible students for whom meals are free (Gleason, 1995). A number of factors may affect students' likelihood of participating in the school meals programs. For example, higher school food prices

[2] Medicaid was added to the NY list of programs certifiable through direct certification in academic year 2014.
[3] Since 1980, schools in which at least 80 percent of enrolled children are eligible for free or reduced-price meals can also implement UFM under Provision 1. Since 1995, schools can also offer UFM under Provision 3, which sets reimbursement levels based on the average number of meals served by eligibility group in the most recent year in which the school tracked individual lunch utilization - rather than the average percentages by eligibility group, the method used under Provision 2. Under Provision 3, reimbursements are adjusted for inflation and enrollment, but not for changes in the number of meals served (Schwartz & Rothbart, 2020).

and income are correlated with low participation rates (Akin et al., 1983; Gleason, 1995; Maurer, 1984). Moreover, participation varies by race - with black students participating at higher rates than white students (Akin et al., 1983; Dunifon & Kowaleski-Jones, 2003; Mirtcheva & Powell, 2009). Other factors that influence participation decisions include the quality and variety of school meals and the stigma associated with school food (Glantz, Berg, Porcari, Sackoff, & Pazer, 1994; Mirtcheva & Powell, 2009; Poppendieck, 2010). Mirtcheva and Powell (2009) find poor students' participation rates are lower in schools with fewer poor students, and older students are less likely to participate compared to younger students. These considerations may explain why, in some districts, over 10 percent of income eligible students are not certified for free or reduce-priced meals (Domina et. al., 2018). However, recent research finds that expanding the availability of free meals, through programs such as UFM, increases participation (Leos-Urbel, Schwartz, Weinstein, & Corcoran, 2013; Schwartz & Rothbart, 2020; Ruffini, forthcoming).

According to the USDA, participation in school food - and the HHFKA (2010), in particular - "improves nutrition and focuses on reducing childhood obesity" (The White House Task Force on Childhood Obesity, 2010). Empirical evidence on the nutrition of school food programs is largely positive: the nutritional quality of school meals is usually higher than alternatives (Caruso & Cullen, 2015; Cohen et al., 2014; Farris et al., 2015; Smith 2017) and expanding availability of school meals improves child nutrition (Bhattacharya, Currie, & Haider, 2006; Gundersen, Kreider, & Pepper, 2012). However, evidence on child obesity, a central public health concern, is mixed. Some find that participation in NSLP increases primary school student obesity (Millimet, Husain, & Tchernis, 2010; Schanzenbach, 2009). Those that have examined the impacts of expansions in the availability of free school meals, however, mostly find null effects (Corcoran, Elbel, & Schwartz, 2016; Kitchen et al., 2013; Schwartz & Rothbart,

2020). One potential explanation for the mixed evidence is that some students experience nutritional improvements, while others may double up on meals, increasing total caloric intake and exacerbating childhood obesity. Another explanation is that context matters, particularly as it relates to the availability and nutritional quality of alternatives to school food.

There is growing evidence on the relationship between schools, environment, and student weight outcomes. As an example, existing research finds school food programs have null if not beneficial impacts on student obesity (Corcoran, Elbel, & Schwartz, 2016; Kitchen et al., 2013; Schwartz & Rothbart, 2020; Davis & Mussadiq, 2019). As for CEP in particular, Davis and Musaddiq (2019) find CEP adoption in Georgia schools increases the share of students in the "healthy" BMI range. Using NYS Student Weight Status Category Reporting System (SWSCRS) – data which we also use – Dwicaksono, et al. (2018) explore the environmental and policy correlates of district-level obesity rates, finding suggestive evidence that the obesity of secondary school students is more sensitive than primary school students. The authors offer descriptive evidence that rural districts have higher primary school obesity rates than metropolitan districts and that obesity is more strongly correlated with fast-food restaurant density among secondary students than primary students (perhaps due to differences in food consumption patterns).

Recent research documents positive effects of CEP on a range of student academic and disciplinary outcomes (Ruffini, forthcoming, Gordon & Ruffini, 2019; Kho, 2018-working paper; Comperatore & Fuller, 2018). Kho (2018) utilizes CEP adoption in South Carolina to find a 0.03-0.04 standard deviation improvement in elementary student math scores. Ruffini (forthcoming) utilizes the cross-state variation in the timing of CEP eligibility and finds math performance increases by 0.02 standard deviations in districts with the largest shares of students with CEP. Gordon and Ruffini (2019)

similarly investigates the effects of CEP but on suspension rates from the Civil Rights Data Collection and finds modest reductions in elementary and middle but not high school suspensions. Overall, research finds null or modest decreases in student absences post CEP adoption (Comperatore & Fuller, 2018; Kho, 2018).

The growing research on academic outcomes has not, however, been matched by evidence on what school districts pay for UFM, much less CEP. One notable exception is Leos-Urbel et al. (2013) which estimates the user fee revenue lost from providing roughly 3.5 million free breakfasts at approximately $300,000 in 2004. They did not, however, examine any costs or savings due to changes in administrative costs associated with the collection and processing of breakfast fees, the economies of scale, or changes in costs of providing a larger number of meals.

A technical report from the NYC Independent Budget Office (IBO) sheds some light on the monetary implications of adopting CEP. The IBO examined the NYC school lunch program's current costs, as well as the cost of expanding UFM under Provision 2 and CEP from stand-alone middle schools to all elementary schools in NYC (NYCIBO, 2017). Using the citywide ISP rate, the IBO finds expanding CEP to elementary schools at the given participation rates and prices would cost NYC $5.2 million - an amount greater than the cost of traditional NSLP but less than other provisions, such as Provision 2.

## IV. Conceptual Issues and Hypotheses

Eliminating school lunch fees through CEP is likely to affect student weight and district finances through two key mechanisms. First, eliminating school food fees may spur participation in both breakfast and lunch, as families choose school food over alternatives that they would have to pay for. Second, the promise of consistent and free meals may increase attendance as students attend school to participate in

lunch and/or breakfast. That said, high baseline attendance rates leave little room for improvement, and it may not be possible to identify a meaningful effect.

If school meals are more nutritious than the average alternative, as indicated by previous research (Caruso & Cullen, 2015; Cohen et al., 2014; Farris et al., 2015), then an increase in participation in school food induced by CEP should reduce the incidence of obesity (or overweight), with the magnitude of the effect varying with the change in participation and the characteristics of the foregone alternative food. This suggests effects will vary with the district/school context and characteristics of the students. Thus, effects are likely to vary by age: older students are likely to be more sensitive to price changes and the stigma associated with free school food and more likely to rely on unhealthy alternatives (like fast food) in the absence of school food. Therefore, effects are likely to be larger in districts implementing CEP in schools serving older grades. Notice that student weight outcomes will also depend upon the change in participation rates in both breakfast and lunch.

As for finances, the direct effect of eliminating school meal fees will be a reduction in local school food revenues (i.e., meal fees previously collected from paying students) and increases in federal school food revenues (i.e., reimbursements). Further, if participation increases, as expected, food expenditures should increase – both overall and per pupil. That said, there may be reductions in food expenditures per meal, consistent with economies of scale. Finally, increases in breakfast and lunch participation will increase federal subsidy revenues per pupil (due to increased meals served).

The impact of CEP on revenues and expenditures, therefore, will depend upon the share of students eligible for free lunch (ISP); the user fees (prices) paid for breakfast and lunch by reduced price and "full price" students; the change in participation/utilization for each of these groups in breakfast and lunch; the federal reimbursement rates (which vary by meal type); and changes to the costs of inputs used

(ex. less expensive ingredients or lower prices). For example, as noted previously, changes in total food revenues per pupil will depend on federal reimbursements per meal, which under CEP is a direct function of the reimbursement price (one for lunch and another for breakfast) and the ISP rate (multiplied by a factor of 1.6).[4] Mathematically, districts with ISPs greater than 62.5 percent get reimbursed at the full federal rate for each breakfast and lunch served. Districts with ISPs below that ISP rate, however, are essentially only reimbursed for a fraction of each meal. The size of the revenue gap to be filled will also depend, in part, on lost user fees previously charged to students paying "full" and reduced prices for breakfast and lunch, the federal reimbursement rate for free and reduced meals, and the participation rate in breakfast and lunch. In fact, even districts with ISPs above 62.5 might lose net revenues, because they might have previously set the full price lunch (or breakfast) above the federal subsidy for free meals (which was $3.40 per lunch in 2019). If, for any of the above reasons, lost user fee revenues are greater than additional revenues from federal reimbursements, some worry districts will fill these gaps by reallocating funds previously used for classroom instruction.

There could, however, be unintended consequences of CEP's reimbursements. First, school districts may respond to the more generous increases in federal reimbursement revenues by reducing local or state support (as Gordon (2004) found that increases in federal Title I funding crowded out state and local revenues). Second, the switch to direct certification required under CEP may undercount the share of economically disadvantaged students in the district since direct certification identifies only those eligible for free lunch while missing those that would have been eligible for reduced-price meals. Further, direct certification's reliance on SNAP and TANF data may undercut a district's ability to count

[4] Algebraically, under the CEP, federal food revenue per pupil, *R*, is: $R = (FRS \times ISP \times 1.6) \times M$, where *FRS* is the Free Rate Subsidy, *ISP* is the identified student percentage, and *M* is the meal participation rate. Since *FRS* and *M* differ for breakfast and lunch, we estimate separate effects on participation rates for breakfast and lunch.

economically disadvantaged undocumented immigrants. If, post-CEP, districts use direct certification instead of traditional meal forms to count the share of students who are economically disadvantaged, districts may undercount the share of economically disadvantaged students in the district, reducing their Title I funding.

Urbanicity is likely to influence the impact of CEP on fiscal and weight outcomes. Rural districts have higher overall participation rates, fewer certified poor students, higher participation rates among full-price students, and fewer alternatives to school food. Therefore, rural districts may experience greater reductions in local school food revenue, as well as greater reductions in student obesity. Moreover, food preparation costs likely vary with labor costs, which are typically higher in urban areas. Thus, food expenditures are likely to be greater in urban area districts. Weight outcomes will, again, vary based on the nutritional quality of alternatives to school meals, which may very well vary between urban settings (where students have ready access to commercial vendors like restaurants) and rural settings (where these options may be far away).

Lastly, effect sizes likely depend on the extent to which CEP is implemented across schools within a district. While some districts implement district wide, affecting all students, others selectively implement CEP in only some of their schools. We expect larger effects in districts that implement CEP districtwide, compared to those that selectively implement CEP.

## V. New York State and CEP

As shown in Figure 1, CEP became available in NYS in 2013 and expanded rapidly across the state. By 2018, 97 of the 698 districts in NYS had at least one CEP school (Figure 2), and as of 2019, over 90 percent of eligible NYS schools offered UFM under CEP (FRAC, 2019). Not only did CEP

expand across the state, Figure 3 demonstrates how implementation spreads within NYS districts. NYS districts implement CEP in one of three ways. Some districts implement CEP districtwide, in which all schools in the district adopt CEP in the same year. Other districts selectively implement CEP in some but not all schools within the district. These districts often target schools serving primary grades where school food participation rates are already relatively high compared to secondary grades. Still, other districts begin with selective implementation and gradually adopt CEP districtwide over time.

NYS districts from all urbanicities - metro, town, and rural - adopt CEP. Rural districts serve fewer students and therefore have fewer schools. Consequently, rural districts are more likely to implement CEP districtwide. It is likely that districts in which more students are exposed to CEP experience larger impacts, whereas districts that selectively implement CEP will display attenuated effects. For example, we anticipate smaller district-level effects in districts that opt for selective implementation (e.g., 50 percent of its students) compared to districts with districtwide implementation (100 percent of its students).

## VI. Data, Measures, and Samples

*Data*

We use longitudinal, district- and school-level data from the NYS Education Department (NYSED) spanning 2010-2018. These data include enrollment by grade, attendance rates, student characteristics such as percent of students with disabilities (*SWD*), English language learners (*ELL*), free lunch certified eligible (*FL*), and students by race/ethnicity (*black*, *white*, *Hispanic*, or *Asian/Other*).[5] We link this panel to new school meal data provided by the NYSED's Child Nutrition Knowledge Center,

[5] Students with disabilities data are unavailable at the school level.

including year of each district's (school's) CEP adoption and the number of breakfasts and lunches served by school and year. [6]

We match these data to new, biannual, district-level measures of student obesity surveillance data from the NYS Department of Health (NYSDOH) Student Weight Status Category Reporting System (SWSCRS). Maintained by NYSDOH's Center for Community Health, Division of Chronic Disease Prevention, SWSCRS was created to support state and local efforts to monitor long-term trends in childhood obesity in NYS school districts, excluding NYC (Dwicaksono et al, 2018). These weight outcome measures follow the Centers for Disease Control's guidelines and track the proportion of students who are overweight (BMI exceeding 85$^{th}$ percentile for the same age and sex nationally) and obese (BMI exceeding 95$^{th}$ percentile nationally). SWSCRS reports the proportions of overweight and obese students, aggregated by school district, based on schools' reports on student counts in each weight status category by grade group and sex (Dwicaksono et al, 2018). Since 2010, districts report biannual BMI measures based on mandatory student health forms for selected grades (i.e., "primary:" Pre-Kindergarten, Kindergarten, 2nd, and 4th, and "secondary:" 7th and 10th).[7]

Finally, we link this to district financial data from the Common Core of Data Financial (F33) surveys. The F33 surveys include local, state, and federal school food revenues, personnel and total school food expenditures, instructional expenditures, Title I revenues, and NCES urbanicity

[6] The NYSED's Child Nutrition Knowledge Center data includes public schools, nonpublic schools, schools that opened/closed, and childcare centers. We use CEP schools that match SRC school data, including 2,890 NYS public schools in 97 public school districts.

[7] Students' health forms are completed by a physician and then submitted to the school. In the absence of submitted health forms, the school nurse completes it. The school nurse then tallies counts of students overweight and obese by grade (i.e. primary and secondary grades) and sends the information to the district office. The district office, using a tally system, counts the share of students who are obese and/or overweight.

classifications. These classifications use Census definitions to divide districts into four categories: city, suburban, town, and rural.[8]

*Measures*

Our binary treatment indicator, *CEP*, takes a value of one if any school within the district offers UFM through CEP. In our analyses that use school level data, *CEP* equals one if the school offers UFM through CEP. A continuous measure of treatment, *PCT_CEP*, is the percentage of students in the district enrolled in a school offering UFM through CEP. This variable captures the degree of CEP implementation - from selective to districtwide - within a district. We define *Districtwide* which takes a value of 1 if the district has CEP in every school (100 percent implementation) and 0 if the implementation is selective, that is, *PCT_CEP* is less than 100.

District characteristics include the percentage of students who are SWD, ELL, FL, black, Hispanic, and Asian/other.[9] We create three indicator variables capturing district urbanicity as *Metro* (cities and suburban districts), *Town*, or *Rural* based upon NCES district locale designations. We combine cities and towns due to similarities between the two in our sample.[10]

[8] "Urbanized area," have populations of 50,000 or more, and "urbanized clusters," have populations between 5,000 and 50,000. City school districts are located inside both an urbanized area and a principal city. Suburb school districts are located inside an urbanized area, but outside of a principal city. Town school districts are located inside urban clusters, and Rural school districts are located outside of urban clusters.

[9] We use the share of students certified for free meals and not the share of students certified for reduced-price meals. Upon CEP adoption, all students receive free meals, eliminating the incentive for reduced-price students to turn in lunch forms. Indeed, when we estimate the effect of CEP adoption on the percent of free lunch students and reduced-price lunch students separately, we find no effect on the percent of free lunch students and a negative and statistically significant effect on the share of reduced-price lunch students - making the share of reduced-price students endogenous to CEP adoption.

[10] The poor suburbs near a city are often quite similar to the city itself and CEP eligible districts have high concentrations of poor children by design. These districts are observationally similar.

School breakfast (lunch) participation, *Bfast* (*Lunch*), is measured as the total number of breakfasts (lunches) served divided by enrollment and the 183 school days in the year.[11] This captures the average share of days a student participates in school breakfast (lunch). *Attd Rate* is the district or school attendance rate.

We have two weight outcomes - the percentage of students that are overweight (%*Overwgt*) and the percentage that are obese (%*Obese*) - measured at both the district level and separately for primary and secondary grades. There are two measurement challenges to using the NYSDOH SWSCRS weight outcome data. First, the measures are collected in September of each year, so that the outcomes are more akin to end of year measures for the prior academic year than for the ensuing school year. Thus, we link the treatment status for t-1 to the weight outcomes measured in year t.[12] Second, obesity and overweight rates are measured biannually – half of districts each year – rather than annually; further, we do not know the district-specific reporting year. We proceed by assigning weight outcomes to the first year of each two-year cycle, and explore the sensitivity of our results to alternative assumptions described below.[13]

Our fiscal outcomes include those related to revenues from school food services (*LocalRev*, *StateRev*, *FederalRev*, and *TotalFoodRev*), expenditures on school food services (*TotalFoodExp* and *PersonnelExp*), and instructional expenditures (*InstSalaries*, *InstBenefits*, and *InstTotal*). We calculate

[11] Enrollment includes total pre-kindergarten, K-12, and ungraded enrollment for each district or school.
[12] Student characteristics in year t reflect the characteristics of students in the academic year in which weight measures were taken, as opposed to t-1, which reflects the characteristics of the student population at the time of treatment.
[13] We assign student weight measures to the second of each two-year cycle as a robustness check and, as expected, find no effects. Results available upon request.

district revenues and expenditures per pupil (or per meals served), dividing total revenues earned or expenditures incurred by total district enrollment (or total meals served).[14]

*District Panel*

Our analyses rely upon two data sets: (1) a district panel, which is our primary analytic sample to assess impacts of CEP on district fiscal and student weight outcomes, and (2) a school panel, which we use to explore the mechanisms, namely school meals participation and attendance. Our district panel includes data on school district characteristics, finances, and school food utilization and policy (CEP adoption).

We restrict our district panel to 93 "Ever CEP" independent districts that adopt CEP in at least one school between 2013 and 2018. This excludes dependent school districts, NYC and the "Big 4" city districts (Buffalo, Rochester, Syracuse and Yonkers), because they operate quite differently than other districts and because they are disproportionately poor, non-white, and large.[15] The resulting analytic sample has 740 observations over 8 years.[16] As shown in Table 1, students in Never CEP districts are less likely to be FL, white, overweight, or obese than students in our analytic sample. Moreover, Never CEP districts earn less in school food revenues and accrue fewer expenditures per pupil than districts in our analytic sample.

Prior to the implementation of CEP, overweight and obesity are common in our sample districts: roughly two in five students were overweight and one in five obese. An average of roughly two thirds

[14] All dollar amounts are adjusted for inflation using CPI-Urban to 2017 dollars.
[15] The average "Big 4" district is larger (by an order of magnitude), disproportionately poor, non-white, and receives less local and more federal school food revenue than districts in our analytic sample.
[16] The analytic sample excludes charter schools, NYS Boards of Cooperative Educational Services (BOCES), four districts that consolidated in 2014, and one special education district as they do not reflect the typical, NYS district.

participate in school lunch and one quarter in school breakfast. Attendance is high with an average attendance rate of 94 percent. As for finances, these districts spend an average of $467 per pupil for school food but only earn $405 per pupil in total school food revenues - resulting an almost $60 per pupil deficit in the absence of CEP.

Among districts in our analytic sample, metro districts are larger (5,424 students), poorer (53.4 percent FL), and less white (47.5 percent) compared to town (2,163, 46.8 percent, and 74.8 percent, respectively) and rural (1,005, 42.6 percent, and 93.1percent, respectively) districts. Rural districts have fewer free lunch certified students, but higher participation (28.6 percent in breakfast; 66.8 percent in lunch) and attendance (94.8 percent) rates than metro (23.8 percent, 60.0 percent, and 92.8 percent, respectively) and town (24.2 percent, 61.9 percent, and 93.8 percent, respectively) districts. Rural districts also earn the most local food revenue ($155.83 per pupil) and spend the most on food services ($510.85 per pupil) compared to metro ($85.27 and $420.50, respectively) and town ($116.53 and $457.11, respectively) districts.[17] Furthermore, the average school food deficit (total food revenues per pupil minus expenditures per pupil) in metro districts is about half of that in town and rural districts ($35.31 versus $69.20 or $73.26).

*School Panel*

We use panel data on school characteristics, attendance, and school food utilization and policy (CEP adoption) to probe the underlying mechanisms: meal participation and attendance rates.[18] Our

[17] Mechanically, this could mean they charge and spend more on a per meal basis, or that a higher share of students partakes in the school meals programs or a combination of the two.

[18] Student weight data is unavailable at the school level. Meals served data is available at the school level and is aggregated to the district level for district analysis. There are 27 schools in 10 districts in our Ever CEP school sample that report meals served under two different meals programs (CEP and traditional meals programs), which could occur for a number of reasons, including instances in which CEP is offered to some grades and not others, when the program is added mid-year, or other processing or administrative reasons. We remove these schools from our analysis.

school sample includes schools that adopt CEP between 2013 and 2018 and includes 321 continuously open schools in 87 districts.[19] We assign each school to one of the following mutually exclusive grade levels (1) primary (enrolls 10 or more students in either 2nd or 4th grade) or (2) secondary (enrolls 10 or more students in 7th or 10th grade).[20] Since many districts have more than one CEP school, the school panel has a larger number of observations than the district panel, potentially increasing power. Further, school level data allow us to more precisely identify the schools (and students) who receive the CEP treatment – potentially improving the precision of our estimates.

## VII. Empirical Strategy

We exploit the staggered adoption of CEP over time to estimate the effect of CEP on student weight outcomes, consequences for district revenues and expenditures related to school food programs, and the underlying mechanisms such as meal participation and attendance. We use a district fixed effects, difference-in-differences specification linking outcomes to CEP status and a set of time-varying district characteristics.

*Mechanisms*

Before turning to estimating impacts on obesity and revenues, we examine the effect of CEP on participation. Notice there may differences in the participation response for breakfast and lunch, and there are differences in the reimbursement rates for those meals. Thus, we examine breakfast and lunch

[19] We also exclude schools in four districts that consolidated in 2014 and schools in the special education district. We exclude 26 Ever CEP schools that are not continuously open and 34 schools in 24 districts with implausibly high meal participation rates (see footnote 18). Furthermore, we exclude schools in three districts whose meals served data is only available at the district level. Of the "missing" six districts in the school panel (87 versus 93): four districts have only one CEP school and that school in each district has unreliable participation rates, three districts' meal participation data is only available at the district level, and one of these three districts has only one CEP school, which is not continuously open. We find consistent results when we restrict the district analysis to districts that are observed in the school-level panel.

[20] Four "Elementary-Middle" schools and eight "K-12" schools are not included in these analyses.

participation separately. In a different vein, both weight outcomes and spending patterns may depend upon student attendance, which we also examine before turning to impact estimates. We begin by estimating the effect of CEP on breakfast and lunch participation and attendance using the district panel as:

$$Y_{dt} = \beta_0 + \beta_1 CEP_{dt} + \mathbf{X'_{dt}}\beta_2 + \gamma_t + \mu_d + \varepsilon_{dt} \quad (1)$$

where $Y_{dt}$ is a vector of outcomes including *Bfast*, *Lunch*, and *Attd Rate* for district d, in year t. $\mathrm{X'_{dt}}$ is a vector of district characteristics, including *SWD*, *ELL*, *FL*, *black*, *Hispanic*, or *Asian/Other*. $\gamma_t$ and $\mu_d$ are year and district fixed effects. $\beta_1$ reflects the effect of CEP on meal participation and attendance. All models are weighted by enrollment and we use robust standard errors clustered by district. We estimate the same model using school-level data and school (rather than district) fixed effects.

We then re-estimate the models using an event study specification, substituting a set of indicator variables capturing the number of years prior to (or following) the adoption of CEP in the district for *CEP*. That is, we use *CEP YEAR*, a vector of variables that capture the time between the current academic year (*t*) and the first year a district (or school) offers CEP.

$$Y_{dt} = \beta_0 + \boldsymbol{CEP\ Year'_{dt}}\beta_1 + \mathbf{X'_{dt}}\beta_2 + \gamma_t + \mu_d + \varepsilon_{dt} \quad (2)$$

These models will shed light on any pre-trends in attendance or participation in school food prior to the adoption of CEP and/or the evolution of both following adoption.

*Obesity Impacts*

Our weight outcomes models are similar to our baseline models. We estimate the following model:

$$Y_{dt} = \beta_0 + \beta_1 CEP_{dt-1} + \mathbf{X'_{dt}}\beta_2 + \gamma_t + \mu_d + \varepsilon_{dt} \quad (3)$$

where $Y_{dt}$ is a vector of variables reflecting weight outcomes for district d, in year t, including %*Overwgt* and %*Obese* across all grades in a district, as well as by primary and secondary grades, separately. $CEP_{dt-1}$ takes a value of 1 if district d has CEP in year t-1. For the reasons discussed in the data section, our data set includes observations for academic years 2011, 2013, 2015, and 2017 only for these models (that is, the odd years only). We cluster standard errors by district and use analytic weights for the number of students enrolled in measured grades in the district.[21] Our coefficient of interest, $\beta_1$, reflects the impact of CEP on weight outcomes.

*Fiscal Impacts*

We then estimate the effect of CEP on local, state, federal, and total school food revenues, personnel and total school food expenditures, and instructional expenditures (salaries, benefits, and total) per pupil, as well as per meal served at the district level, using:

$$Y_{dt} = \beta_0 + \beta_1 CEP_{dt} + \mathbf{X'_{dt}}\beta_2 + \gamma_t + \mu_d + \varepsilon_{dt} \quad (4)$$

where $Y_{dt}$ reflects the vector of fiscal outcomes, and $\beta_1$ equals the effect of CEP on each fiscal outcome. Again, we also estimate an event-study specification, similar to Equation 2.

*Exploring Heterogeneity in Context*

To explore potential heterogeneity in effects by urbanicity, we introduce interactions between $CEP_{dt}$ and our urbanicity indicators (*Metro*, *Town*, and *Rural*). Finally, we explore how effects vary with the extent of implementation by replacing $CEP_{dt}$ with $PCT\_CEP_{dt}$, the percentage of students in the

[21] That is, enrollments in Pre-K, K, 2nd, and 4th grade for primary and 7th and 10th grade for secondary.

district attending a CEP school, and $Districtwide_{dt}$, an indicator for districtwide implementation, capturing potential ceiling effects:

$$Y_{dt} = \beta_0 + \beta_1 PCT\_CEP_{dt} + \beta_2 Districtwide_{dt} + \mathbf{X'_{dt}}\beta_3 + \gamma_t + \mu_d + \varepsilon_{dt} \quad (5)$$

Here, $\beta_1$ provides estimates of the effect of changes in the extent of CEP implementation within a district on outcomes.

# VIII. Results

*Mechanisms*

As shown in Table 2, we find CEP increases average district participation in breakfast and lunch by 7.72 and 6.58 percentage points, respectively. Breakfast effects are larger for primary schools, increasing breakfast in primary schools by 11.49 percentage points, more than double that of secondary schools - 4.66 percentage points. However, CEP increases *Lunch* in both primary and secondary schools by approximately 8.50 percentage points. In terms of changes over base participation rates, CEP increases *Bfast* and *Lunch* in primary schools by 33 and 12 percent, respectively, and 31 and 15 percent in secondary schools, respectively. We find no effects of CEP on attendance rates nor do we find differential effects by school level.

Turning to the event study results shown in Figure 4, we find no evidence of pretrends - that is, there are no statistically significant effects in years prior to CEP adoption - for any outcomes. District results in Panel A show that the effects of CEP on *Bfast* and *Lunch* increase over time. However, Panels B and C, estimated with the school-level panel, show relatively constant participation effects in the years post CEP adoption. This seemingly contradictory result would be consistent with within-district expansions of implementation from selective towards districtwide. As it turns out, two-thirds of districts

begin with selective implementation and expand - some eventually to districtwide CEP. Moreover, Figure 3 shows the share of students exposed to CEP grows in the years following initial district implementation, expanding from about 70 percent of students in the year of CEP adoption to 90 percent of students two years later. While at first glance increases in participation in post-CEP years (Panel A) suggests students might become more comfortable with school meals over time, our other results suggest that the growing impacts on participation can be fully explained by the expansion of CEP to more schools and students within CEP districts.

*Obesity Impacts*

As shown in Table 3, we find CEP decreases the percentage of obese students in secondary grades by 1.83 percentage points. The effect is substantively meaningful: 23.5 percent of secondary students were obese in 2012, translating to a 7.8 percent decrease in the prevalence of obesity.[22] None of the other results are statistically significant. That is, we find no statistically significant effects for students in primary grades. Our results are consistent with the hypothesis that greater responsiveness to price changes and reliance on less healthy alternatives to school food among secondary school students will yield larger effects.

*Fiscal Impacts*

Of note, Ever CEP districts run deficits in their school food programs prior to CEP (in 2012), with mean deficits of $60 per pupil. (See Table 1; $404.85 and $466.90 of total food service revenues and expenditures, respectively.) As shown in Table 4 Panel A, CEP decreases local food revenues by an average of $23.90 per pupil (column 1), which would exacerbate deficits on its own. However, this loss

[22] The structure of the health outcomes data allows for only four-year observations, preventing us from executing an event study design similar to what we later perform for meal participation and attendance rates.

in revenues is more than offset by the $72.96 per pupil increase in federal food revenues (column 3). Furthermore, we find no effect on state school food revenues - suggesting that federal reimbursements for CEP do not crowd out state funding for school food.

While the above results show CEP increases total food revenues on average (by $51.76 as shown in column 4 of Table 4 Panel A), it is still possible that deficits are exacerbated by increased expenditures resulting from higher participation rates. However, total food expenditures increase by only $38.23 per pupil (column 6), which is less than the increase in total school food revenues per pupil. In fact, it appears that CEP closes the $60 per pupil school food deficit that existed in 2012 by approximately $14 per pupil, with no consequences for instructional expenditures (columns 7-9).

We then explore consequences on a per meal basis in Panel B of Table 4. CEP decreases total revenue per meal by 18 cents per meal (column 4) but decreases expenditures per meal even faster - by 25 cents per meal (column 6). Thus, our estimates suggest that increasing meals served helps close the food services fiscal deficit by about 7 cents per meal on average (at least in this range of increased participation). Decreases in local food revenues (20 cents per meal) drive the decrease in revenues per meals. Food expenditures on personnel (12 cents per meal) and non-personnel (25-12 cents per meal) both contribute to the decrease in expenditures per meals. These food expenditure decreases are consistent with increasing returns to scale - in which districts can provide more meals at a lower cost per meal - but might also reflect reductions in the quality of inputs (i.e., cheaper ingredients).

Turning to the event studies, we find no evidence of pre-trends prior to CEP adoption for financial outcomes; no point estimate is distinguishable from zero (Figure 5). Local food revenues are pretty stable in the years following CEP adoption, while other fiscal outcomes grow over time. Again, this could reflect

expansions of implementation within CEP districts, with fiscal consequences growing with the share of students exposed to CEP over time (see Figure 3).

*Exploring Heterogeneity in Context*

Table 5 shows the effects by district urbanicity. We find metro and town districts respond similarly to CEP but impacts in rural districts are generally larger. Rural district students increase *Bfast* by almost twice as much as students in metro and town districts (column 1 of Table 5) but respond similarly for *Lunch*. As shown in columns 6 and 7, rural districts experience the largest decreases in prevalence of overweight and obesity in secondary grades (obesity effects in column 7 are insignificant). Once again, the effects on weight outcomes for primary school students are insignificant in all settings.

Table 6 shows the effect of CEP on district financial outcomes by urbanicity. We see the largest decline in local school food revenue in rural districts - where a greater share of students pays for school meals prior to CEP. At the same time, CEP increases personnel expenditures per pupil in rural districts, unlike metro and town districts, likely driven by increases in participation. In the absence of CEP, metro districts run school food deficits of about $35 per pupil, while town and rural districts run deficits around $70 per pupil (Table 1). While increases in expenditures are more than offset by revenue increases in metro and town districts, rural districts' school food deficit grows by roughly $30 per pupil (column 3 minus column 5). Again, we find no effects of CEP on instructional spending by urbanicity.

As shown in Table 7, we turn next to exploring the heterogeneity of the results across districts with different percentages of students exposed to CEP. We find a 10-percentage point increase in CEP implementation decreases the percent of overweight and obese students in secondary grades by 2.1 and 1.5 percentage points, respectively. While insignificant, point estimates for overweight secondary

students in districts with districtwide implementation are larger and more negative. Effects in primary grades are again smaller and insignificant.

While our event study results provide no evidence of problematic pre-trends that would undermine a causal interpretation of our results, we investigate empirically the extent to which observables predict the timing of CEP adoption, which might undermine our confidence in the causal interpretation. Specifically, we explore whether the timing of CEP adoption is plausibly exogenous by examining whether a school or district's observable characteristics in year t predict CEP adoption in t+1. We restrict the sample to districts (schools) that do not have CEP in year t, using the following model:

$$CEP_{dt+1} = \beta_0 + \mathbf{X'_{dt}}\beta_1 + \gamma_t + \mu_d + \varepsilon_{dt} \qquad (6)$$

where $\mathbf{X'_{dt}}$ describes the previously defined district (school) characteristics and $\beta_1$ reflects whether district (school) characteristics predict CEP adoption in the following year. Significant coefficients would suggest timing of CEP adoption is nonrandom. Table 8 shows district and school level results in Columns 1 and 2, respectively. We find no evidence that district (school) characteristics predict timing of CEP adoption, bolstering confidence that the causal interpretation is warranted.

We also investigate the robustness of our findings in two sets of analyses to buttress the evidence for a causal interpretation. First, we re-estimate the effects with a sample that includes the "Big 4" city districts, which were excluded in our preferred specifications. The results, shown in Tables A1 through A3 of the appendix are either consistent or stronger than those from the preferred sample. Table A1 shows meal participation and attendance rate results are robust, Table A2 shows slightly larger effects for overweight and obesity, and Table A3 panels A and B show, if anything, slightly larger effects revenues and expenditures.

Second, we re-estimate the models with different analytic weights, using unweighted models instead of those weighted by students.[23] The results, shown in Tables A4 through A6 of the appendix are consistent, with some effects even larger than those from the preferred sample. Table A4 shows meal participation and attendance rate results are robust, Table A5 shows slightly larger effects for overweight and obesity (though the effects on obesity are no longer significant), and Table A6 panels A and B show statistically indistinguishable or even slightly larger effects on revenues and expenditures, especially per meal.[24]

*Other Outcomes*

We explore three ancillary outcomes, Title I funding, proficiency rates in statewide English language arts (ELA) exams, and proficiency rates in statewide math exams.[25] The Title I results address a widespread concern of education administrators that the shift to CEP will make it harder to identify economically disadvantaged students for the purpose of eligibility for Title I funding. The test results are intended to contribute to the growing knowledge on the effects of UFM on student academic performance (previously explored in Ruffini, forthcoming and Schwartz & Rothbart, 2020).

Title I funding is provided to schools with high shares of economically disadvantaged students. Some worry that an unintended consequence of switching to CEP (and increasing reliance on direct certification of ISP students) might be reductions in Title I funding. We note, however, that districts must use the same method of counting the share of economically disadvantaged students for all schools in the

[23] As noted above, our main analyses use analytic weights for the number of students related to the outcome (e.g., models estimating impacts on lunch participation rates are weighted by total enrollment).
[24] We also examine the robustness to restricting the district panel to the 87 districts used in the school-level analyses. Results, available from the authors, are substantially unchanged.
[25] For ELA and math exams, we explore effects by grade for grades 3 through 8, so we actually estimate the effects on twelve testing outcomes.

district, including both CEP and non-CEP schools.[26] We test whether CEP adoption affects Title I revenues and find it does not. (Results available upon request).

We briefly examine CEP's effect on district-level ELA and Math proficiency rates to contribute to the growing literature of its effects on academic outcomes. Using proficiency rates obtained from the NYSED Student Report Card data, we find CEP increases proficiency rates on the ELA exam by approximately 4 percentage points for 6th, 7th, and 8th graders (Results available upon request). We also find a 5-percentage point increase in Math proficiency rates among 8th grade students, but a 3-percentage point decrease among 3rd grade math students. The remaining point estimates in other grades are small and statistically indistinguishable from zero. That is, consistent with previous research, we find some evidence CEP improves academic achievement in middle school statewide; we find no evidence of these improvements in elementary schools.[27]

## IX. Conclusion

School food advocates claim that expanding NSLP and SBP will lead to improved cognitive function and, ultimately, test scores for participating students. Their claims are bolstered by the recent evidence that Universal Free Meals (UFM) programs have, indeed, improved student academic and behavior outcomes. That said, critics worry that expanding such programs will exacerbate weight problems among school children (i.e., obesity and overweight) and place additional financial burdens on

[26] Districts that include both CEP and non-CEP schools can choose to use 1) direct certification times the 1.6 multiplier for CEP schools and free and reduced-price lunch forms for non-CEP schools, 2) direct certification numbers times the 1.6 multiplier for both CEP and non-CEP schools, or 3) direct certification numbers for both CEP and non-CEP schools without the 1.6 multiplier (CRS, 2016).

[27] This period saw a large increase in students opting out of the standardized testing regime as well as changes in NYS standards for both the ELA and Math exams. If these changes affect early (or late) adopting districts more than late (or early) adopters, then the estimates for effects on achievement would have to be interpreted with caution.

school districts. There is, however, little evidence on these unintended and potentially negative effects of the large - and growing - expansion of UFM under the Community Eligibility Provision (CEP). The rapid expansion of CEP to a majority of eligible U.S. schools as of 2019, makes empirical evidence on these effects critical to policymakers as they consider how to best manage this program going forward. This paper aims to provide credibly causal estimates of the effect of CEP on student weight outcomes and district fiscal consequences, as well as the key drivers of such effects, including school meal participation and attendance, by exploiting the staggered adoption of CEP throughout NYS districts and schools.

We find CEP increases student participation in school breakfast and lunch with no effect on attendance rates. Students in primary grades increase participation in breakfast at almost twice the rate of students in secondary grades, however all students increase participation in school lunch by approximately 8.5 percentage points. These increases in participation begin post CEP implementation and grow as districts gradually move from selective to districtwide implementation.

We find no evidence of deleterious effects of CEP on student weight. We find no effects on weight outcomes for primary students, despite large increases in school meals participation in those grades. Moreover, we find CEP reduces obesity in secondary grades with largely negative, albeit statistically insignificant, point estimates on other weight outcomes. The differences in effects by grade level may reflect biological differences between older and younger children or that the food eaten by secondary school students in the absence of CEP is less healthy than that among primary school students. Previous research also suggests that the obesity of secondary school students is more sensitive to the food environment than primary school students, perhaps due to differences in food consumption patterns (for example, Dwicaksono, et al. 2018 find this pattern in New York State school districts).

We further find that CEP reduces local food revenues (i.e., loss of meal fees) while increasing federal food revenues (i.e., reimbursements) and total food expenditures per pupil. By offering free meals to all students, CEP districts lose local school food revenue previously collected from students paying for full or reduced prices for meals. However, these costs are offset by the federal government, which pays districts for the number of meals equal to 1.6 times the district's ISP. CEP reduces both revenues and expenditures per meal - consistent with producing more meals for less. Some worry that districts struggling to cover gaps in revenues and expenditures may dip into instructional expenditures. We find no evidence of CEP reducing funds meant for the classroom.

There is widespread concern over performance and financial viability of rural districts. We find effects of CEP vary depending on district urbanicity, perhaps due to differences in the types of students served, baseline participation rates, availability of alternatives, and/or cost of living. Rural districts appear to be more responsive to CEP and experience larger impacts for almost all significant outcomes. This is likely because rural districts are more prone to implement CEP districtwide, have higher baseline participation rates, and have fewer alternatives to school food. Likely for these same reasons, however, CEP increases the size of school food program deficits in rural districts by $30 per pupil. Conversely, CEP helps close school food program deficits in metropolitan and town districts. This may lead to increased concerns over the fiscal condition of rural districts, who must find a way to cover these gaps. States may want to consider providing financial assistance to CEP-adopting rural districts to help them address the increased financial burden. Finally, we examine heterogeneous effects of CEP by implementation patterns and find wider implementation leads to more substantial effects.

This paper provides evidence that will likely assuage critics' worries, demonstrating that not only does UFM via CEP have no deleterious effects on student weight, it actually improves weight outcomes

for students in secondary grades while increasing participation rates, and, on average, covering potential CEP-induced gaps in school food revenues and expenditures. These effects vary by level of implementation and urbanicity - something for those making the decisions to adopt such policies to consider given their particular context.

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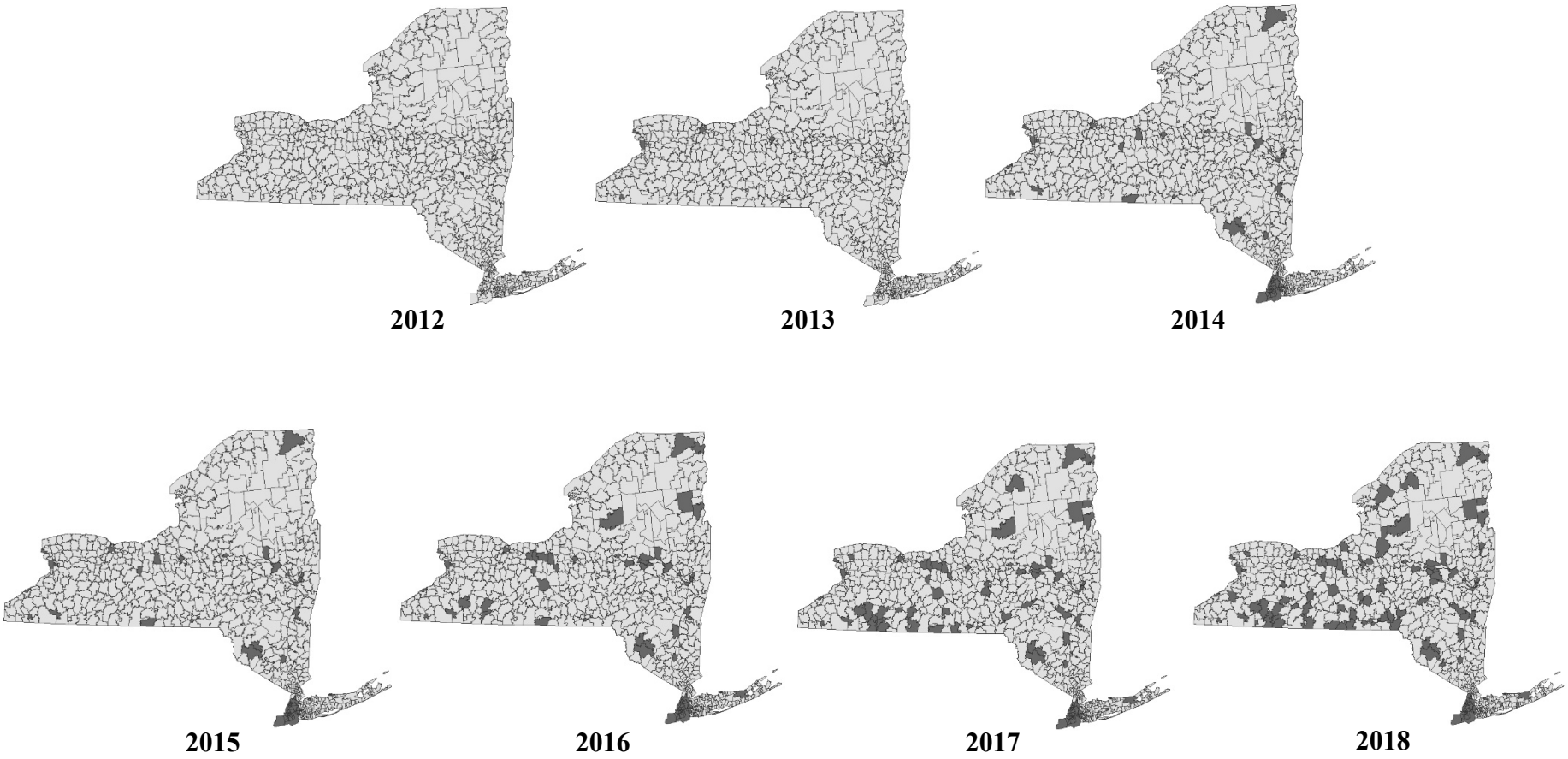
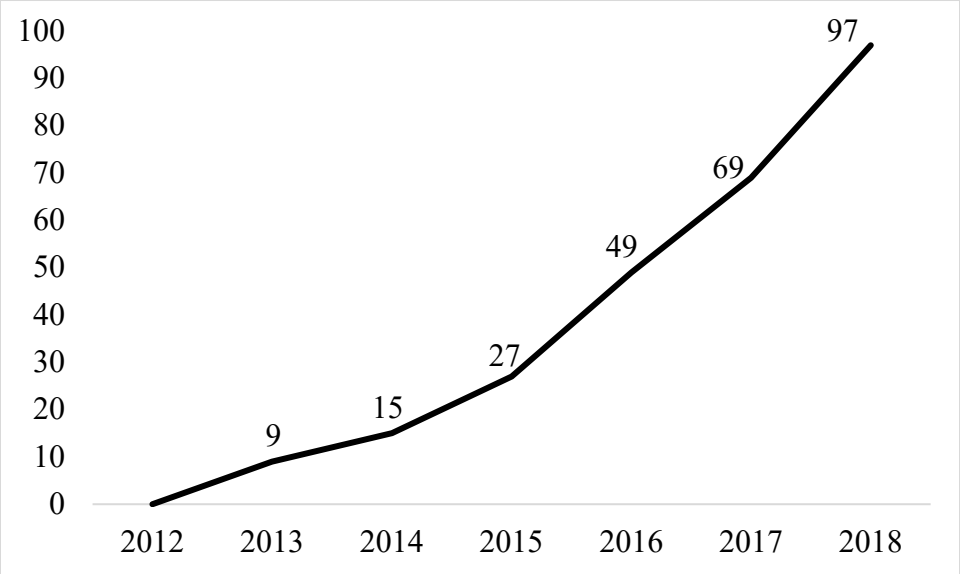
## Figure 1: CEP Expands Rapidly Across New York State



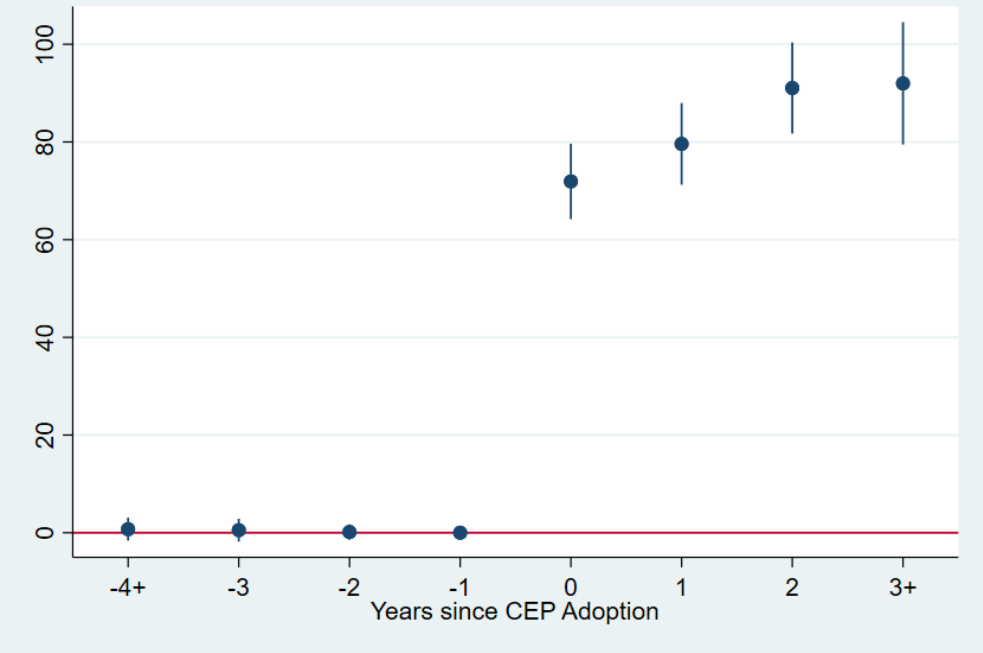

Note: Includes all 97 Ever CEP districts as well as NYC districts.

## Figure 2: Number of Districts with at Least 1 CEP School




Notes: Includes all 97 Ever CEP districts but excludes NYC districts.

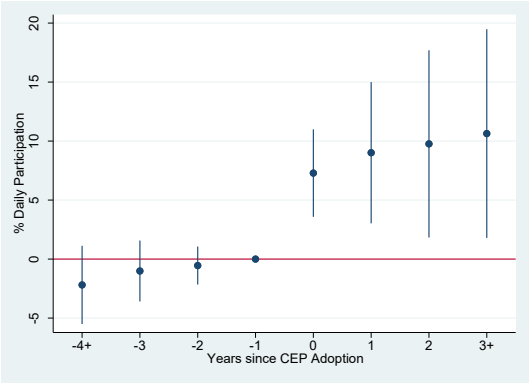
## Figure 3: Percent of Students Exposed to CEP by CEP Adoption Year, 2010-2017

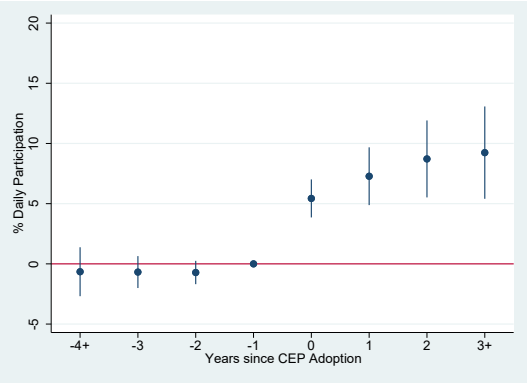



Notes: Figure displays point estimates and 95 percent confidence intervals derived from an event study of Ever CEP districts from 2010 to 2017. Sample excludes NYC, "Big 4" districts (Buffalo, Rochester, Syracuse, and Yonkers), four districts that consolidated in 2014, and one district with incomplete data. Model controls for percent black, Hispanic, Asian/other, English language learners, students with disabilities, and free lunch students, district fixed effects, and year fixed effects. Zero (0) indicates the first year of CEP adoption. Negative 1 (-1) is the omitted reference category. Models use districts with 4 or more years of pre-adoption data to identify "-4+" and 3 or more years of post-adoption data to identify "3+."

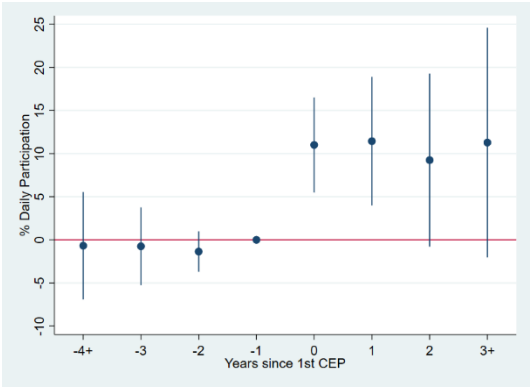
## Figure 4: Event Study Depicting Estimated Impacts of CEP on Meal Participation, 2010-2017

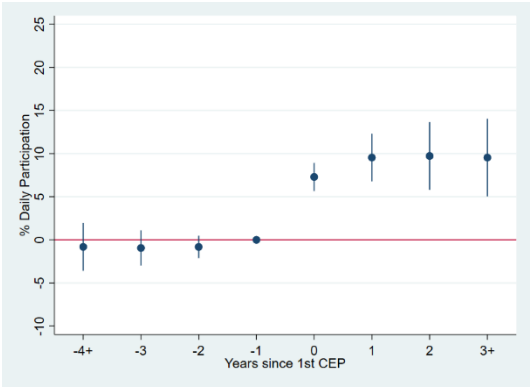
Panel A - District: Bfast Lunch



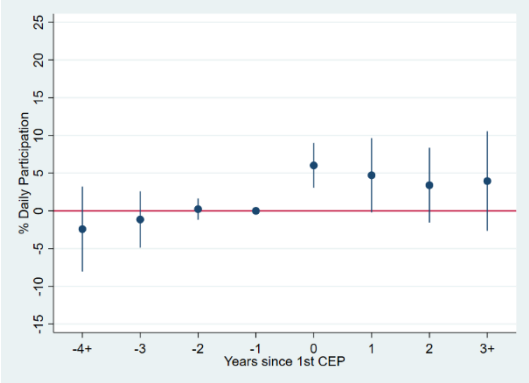



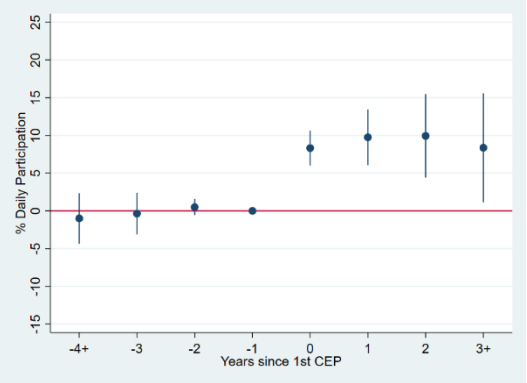

Panel B-Primary Schools: Bfast Lunch



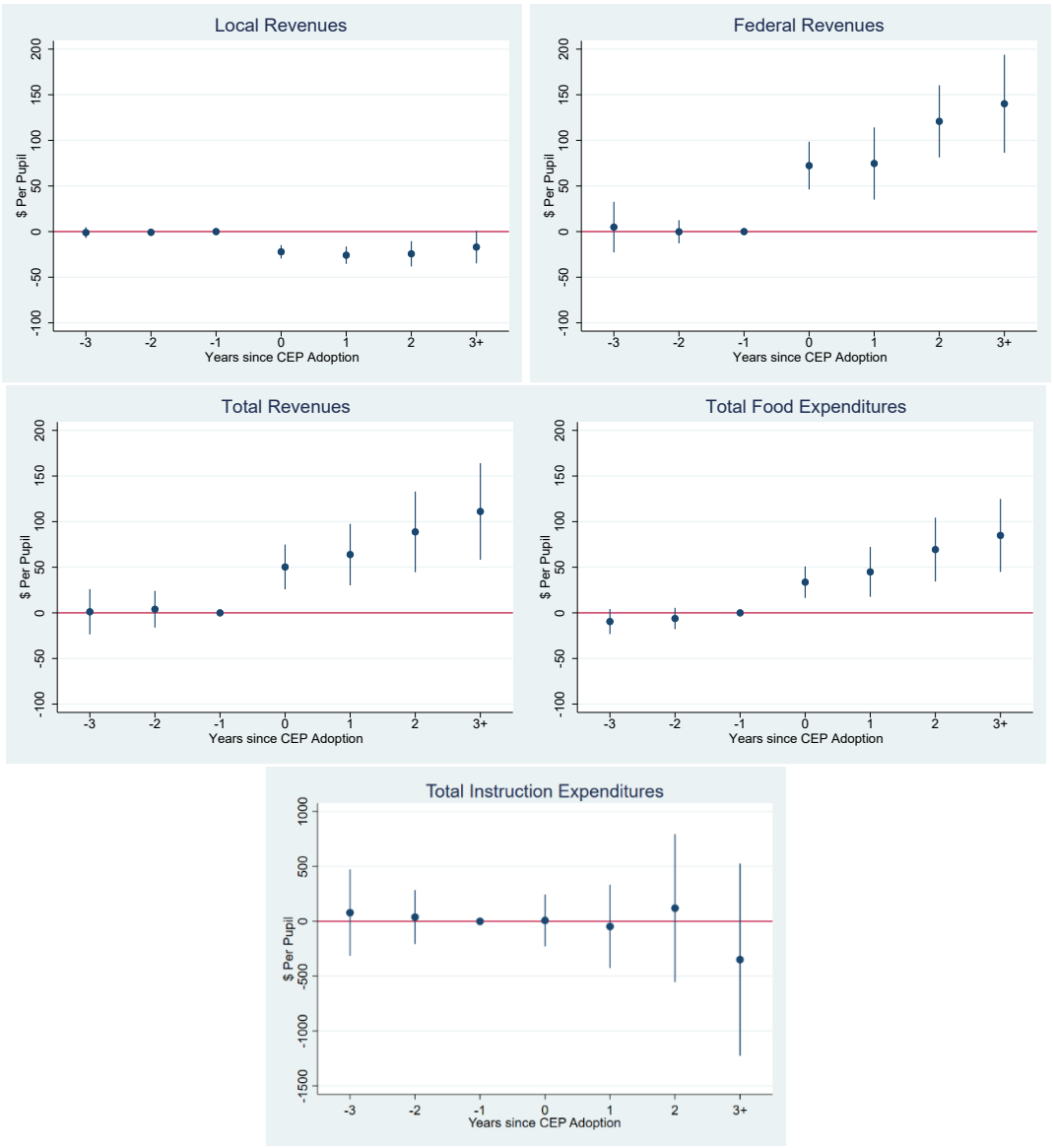

Panel C-Secondary Schools: Bfast Lunch




Notes: Figures display point estimates and 95 percent confidence intervals derived from an event study of Ever CEP districts (Panel A) and schools (Panel B and C) from 2010 to 2017 for meal participation outcomes and 2010 to 2016 for attendance outcome. Samples exclude NYC, "Big 4" districts (Buffalo, Rochester, Syracuse, & Yonkers) and four districts that consolidated in 2014. The school panel includes 198 primary and 93 secondary continuously open schools that adopt CEP between 2013 and 2018, excluding 34 schools in 24 districts with implausibly high meal participation rates, 4 Elementary-Middle schools and 8 K-12 schools. All models control for percent black, Hispanic, Asian/other, English language learners, students with disabilities (unavailable in school-level models), and free lunch students, district (school) fixed effects, and year fixed effects. Estimates weighted by enrollment. Zero (0) indicates the first year of CEP adoption. Negative 1 (-1) is the reference year. Models use districts with 4 or more years of pre-adoption data to identify "-4+" and 3 or more years of post-adoption data to identify "3+."

## Figure 5: Event Study Depicting Estimated Impacts of CEP on Revenues and Expenditures per Pupil, 2010-2017




Notes: Sample period covers 2010-2017 and includes Ever CEP districts. Sample excludes NYC, "Big 4" districts (Buffalo, Rochester, Syracuse, & Yonkers), four districts that consolidated in 2014, and one district with incomplete data. All models control for percent black, Hispanic, Asian/other, English language learners, students with disabilities, and free lunch students, district fixed effects, and year fixed effects. Estimates weighted by enrollment. Revenue and expenditures data are in 2017 dollars per pupil. Districts missing data in select years: 1 local food revenue, 6 federal food revenue, and 4 personnel food expenditures. Estimates weighted by enrollment. Zero (0) indicates the first year of CEP adoption. Negative 1 (-1) is the omitted reference category. Models use districts with 4 or more years of pre-adoption data to identify "-4+" and 3 or more years of post-adoption data to identify "3+." "-4+" estimates suppressed.

## Table 1: Descriptive Statistics by CEP Status, 2012

| | | Ever CEP | | | | |
|---|---|---|---|---|---|---|
| | Never CEP | Big 4 | Analytic Sample | Metro | Town | Rural |
| **District Characteristics** | | | | | | |
| *Demographics (%)* | | | | | | |
| FL | 23.6 | 74.0 | 47.2 | 53.4 | 46.8 | 42.6 |
| White | 84.2 | 19.0 | 72.0 | 47.5 | 74.8 | 93.1 |
| Black | 4.0 | 46.8 | 12.5 | 27.9 | 8.2 | 2.1 |
| Hispanic | 7.1 | 26.8 | 11.3 | 18.9 | 11.5 | 2.2 |
| Asian/Other | 4.6 | 7.5 | 4.0 | 5.5 | 5.3 | 2.6 |
| ELL | 1.8 | 11.8 | 3.6 | 7.2 | 2.6 | 0.2 |
| SWD | 12.1 | 16.2 | 13.8 | 13.8 | 13.2 | 14.3 |
| Public School Enrollment | 2,209 | 26,295 | 2,769 | 5,424 | 2,163 | 1,005 |
| Mean Number Schools | 3.9 | 47.5 | 5.2 | 9.0 | 4.6 | 2.7 |
| **Pre-Treatment Outcomes** | | | | | | |
| *Weight Outcomes (%)* | | | | | | |
| Overweight | 33.6 | 37.1 | 38.7 | 39.6 | 37.7 | 38.6 |
| Obese | 17.7 | 20.6 | 21.4 | 22.8 | 20.0 | 21.1 |
| *Mechanisms (%)* | | | | | | |
| Breakfast Participation | 14.5 | 37.2 | 25.8 | 23.8 | 24.2 | 28.6 |
| Lunch Participation | 47.9 | 57.7 | 63.2 | 60.0 | 61.9 | 66.8 |
| Attendance Rate | 95.3 | 89.75 | 93.9 | 92.8 | 93.8 | 94.8 |
| *Revenue per pupil from food (2017$)* | | | | | | |
| Local | 179.74 | 40.81 | 122.62 | 85.27 | 116.53 | 155.83 |
| State | 19.19 | 16.20 | 25.41 | 29.01 | 15.16 | 24.36 |
| Federal | 150.61 | 403.41 | 268.36 | 282.76 | 267.36 | 264.55 |
| Total | 328.57 | 460.42 | 404.85 | 385.19 | 387.91 | 437.59 |
| *Expenditures per pupil on food (2017$)* | | | | | | |
| Personnel | 200.35 | 251.18 | 231.70 | 196.88 | 211.66 | 269.56 |
| Total | 378.47 | 500.19 | 466.90 | 420.50 | 457.11 | 510.85 |
| Number Districts | 573 | 4 | 93 | 32 | 24 | 37 |

Notes: Analytic Sample includes 93 districts that adopt CEP in at least one school between 2013-2018, and excludes NYC, "Big 4" districts (Buffalo, Rochester, Syracuse, Yonkers), four districts that consolidated in 2014, and one district with incomplete data. Revenue and expenditures data are in 2017 dollars.

## Table 2: Estimated Impacts of CEP on Meal Participation and Attendance, 2010-2017

| | District | | | Primary Schools | | | Secondary Schools | | |
|---|---|---|---|---|---|---|---|---|---|
| | Bfast | Lunch | Attd Rate | Bfast | Lunch | Attd Rate | Bfast | Lunch | Attd Rate |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| CEP | 7.715*** | 6.584*** | -0.348 | 11.49*** | 8.511*** | -0.424 | 4.655** | 8.409*** | -1.779 |
| | (2.282) | (0.911) | (0.237) | (3.145) | (0.977) | (0.877) | (1.760) | (1.520) | (1.433) |
| 2012 Means | 25.8 | 63.2 | 93.9 | 34.7 | 70.8 | 93.9 | 14.9 | 57.4 | 92.8 |
| District Char. | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| School FE | N | N | N | Y | Y | Y | Y | Y | Y |
| District FE | Y | Y | Y | N | N | N | N | N | N |
| Year FE | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Observations | 744 | 744 | 651 | 1,584 | 1,584 | 1,386 | 744 | 744 | 651 |
| No Schools | - | - | - | 198 | 198 | 198 | 93 | 93 | 93 |
| No Districts | 93 | 93 | 93 | 75 | 75 | 75 | 50 | 50 | 50 |
| R-squared | 0.753 | 0.897 | 0.734 | 0.731 | 0.868 | 0.180 | 0.610 | 0.910 | 0.349 |

Notes: Robust standard errors in parentheses clustered by district (*p<.10; **p<.05; ***p<.01). Sample period covers 2010 to 2017 for meal participation outcomes and 2010 to 2016 for attendance outcome and includes Ever CEP districts (Columns 1-3) and schools (Columns 4-9). Both samples exclude NYC, "Big 4" districts (Buffalo, Rochester, Syracuse, & Yonkers) and four districts that consolidated in 2014. School panel sample includes 198 primary and 93 secondary continuously open schools that ever adopt CEP from 2013-2018 and excludes 34 schools in 24 districts with implausibly high meal participation rates, 4 Elementary-Middle schools and 8 K-12 schools. All models control for percent black, Hispanic, Asian/other, English language learners, students with disabilities (unavailable in school-level models), and free lunch students, district (school) fixed effects, and year fixed effects. Estimates weighted by enrollment.

## Table 3: Estimated Impacts of CEP on Student Weight Outcomes, 2010-2017

| | All Grades | | Primary Grades | | Secondary Grades | |
|---|---|---|---|---|---|---|
| | % Overwgt | % Obese | % Overwgt | % Obese | % Overwgt | % Obese |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| CEP | 0.030 | -0.561 | 0.605 | -0.047 | -1.689 | -1.831* |
| | (0.893) | (0.786) | (1.013) | (0.912) | (1.170) | (1.045) |
| 2012 Means | 38.7 | 21.4 | 37.7 | 20.7 | 40.9 | 23.5 |
| District Char. | Y | Y | Y | Y | Y | Y |
| District FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| Observations | 368 | 365 | 364 | 361 | 361 | 358 |
| No. Districts | 93 | 93 | 93 | 93 | 93 | 93 |
| R-squared | 0.729 | 0.723 | 0.741 | 0.726 | 0.597 | 0.573 |

Notes: Robust standard errors in parentheses clustered by district (*p<.10; **p<.05; ***p<.01). Sample period covers 2010-2017 and includes Ever CEP districts. Sample excludes NYC, "Big 4" districts (Buffalo, Rochester, Syracuse, & Yonkers), four districts that consolidated in 2014, and one district with incomplete data. Primary refers to grades K, 2, and 4, and Secondary refers to grades 7 and 10. Weight outcome data assigned to the beginning of the two-year reporting cycle using last year's treatment status. Estimates weighted by student enrollment in measured grades (K, 2, 4, 7, 10). All models control for a vector of district characteristics including percent black, Hispanic, Asian/other, English language learners, students with disabilities, and free lunch students, district fixed effects, and year fixed effects. Data is unavailable for districts with fewer than 5 students in a category. Therefore, the number of observations is inconsistent across outcomes.

## Table 4: Estimated Impacts of CEP on Fiscal Outcomes, 2010-2017

Panel A: Per Pupil

| | Food Revenue | | | | Food Expenditures | | Instructional Expenditures | | |
|---|---|---|---|---|---|---|---|---|---|
| | Local | State | Federal | Total | Personnel | Total | Salaries | Benefits | Total |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| CEP | -23.90*** | -2.11 | 72.96*** | 51.76*** | 7.46 | 38.23*** | -104.95 | -63.62 | -44.13 |
| | (3.75) | (4.62) | (12.25) | (12.19) | (5.91) | (9.19) | (81.61) | (54.60) | (145.10) |
| 2012 Means | 122.62 | 25.41 | 268.36 | 404.85 | 466.9 | 231.7 | 7,186.50 | 3,596.41 | 11,726.78 |
| District Char. | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| District FE | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Observations | 743 | 744 | 733 | 744 | 727 | 744 | 744 | 744 | 744 |
| No Districts | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 |
| R-squared | 0.93 | 0.67 | 0.87 | 0.82 | 0.95 | 0.90 | 0.96 | 0.95 | 0.96 |

Panel B: Per Meal

| | Food Revenue | | | | Food Expenditures | |
|---|---|---|---|---|---|---|
| | Local | State | Federal | Total | Personnel | Total |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| CEP | -0.20*** | -0.04 | 0.03 | -0.18*** | -0.12** | -0.25*** |
| | (0.03) | (0.03) | (0.05) | (0.06) | (0.05) | (0.06) |
| 2012 Means | 0.79 | 0.16 | 1.70 | 2.58 | 1.47 | 2.97 |
| District Char. | Y | Y | Y | Y | Y | Y |
| District FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| Observations | 743 | 744 | 733 | 744 | 727 | 744 |
| No Districts | 93 | 93 | 93 | 93 | 93 | 93 |
| R-squared | 0.94 | 0.68 | 0.81 | 0.67 | 0.91 | 0.75 |

Notes: Sample period covers 2010-2017 and includes Ever CEP districts. Sample excludes NYC, "Big 4" districts (Buffalo, Rochester, Syracuse, & Yonkers), four districts that consolidated in 2014, and one district with incomplete data. All models control for percent black, Hispanic, Asian/other, English language learners, students with disabilities, and free lunch students, district fixed effects, and year fixed effects. Estimates weighted by enrollment. Revenue and expenditures data are in 2017 dollars. Panel A outcomes are revenues and expenditures per pupil, and Panel B outcomes are revenues and expenditures per meal served. Districts missing data in select years: 1 local food revenue, 6 federal food revenue, and 4 personnel food expenditures.

## Table 5: Estimated Impacts of CEP on Mechanisms and Weight Outcomes by Urbanicity, 2010-2017

| | All Grades | | | Primary Grades | | Secondary Grades | |
|---|---|---|---|---|---|---|---|
| | Bfast | Lunch | Attd Rate | % Overwgt | % Obese | % Overwgt | % Obese |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| CEP | | | | | | | |
| Metro | 7.731*** | 6.406*** | -0.335 | 0.018 | -0.519 | -0.986 | -1.929 |
| | (2.817) | (1.138) | (0.281) | (1.098) | (0.985) | (1.736) | (1.483) |
| Town | 6.049** | 6.813*** | -0.611 | 2.162 | 1.661 | -2.733 | -0.356 |
| | (2.579) | (1.271) | (0.442) | (2.214) | (1.807) | (2.664) | (1.547) |
| Rural | 11.51*** | 7.347*** | 0.399 | 0.942 | -0.830 | -4.054* | -4.256 |
| | (3.160) | (1.484) | (0.404) | (1.778) | (1.367) | (2.400) | (2.636) |
| District Char. | Y | Y | Y | Y | Y | Y | Y |
| District FE | Y | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y | Y |
| Observations | 744 | 744 | 651 | 364 | 361 | 361 | 358 |
| No. Districts | 93 | 93 | 93 | 93 | 93 | 93 | 93 |
| R-squared | 0.758 | 0.904 | 0.736 | 0.743 | 0.732 | 0.602 | 0.582 |

Notes: Sample period covers 2010-2017 and includes Ever CEP districts. Sample excludes NYC, "Big 4" districts (Buffalo, Rochester, Syracuse, & Yonkers), four districts that consolidated in 2014, and one district with incomplete data. All models control for a vector of district characteristics including percent black, Hispanic, Asian/other, English language learners, students with disabilities, and free lunch students, district fixed effects, and year fixed effects. Primary refers to grades K, 2, and 4, and Secondary refers to grades 7 and 10. Weight outcome data assigned to the beginning of the two-year reporting cycle using last year's treatment status. Models in Columns 1-3 weighted by enrollment. Models in Columns 4-7 weighted by student enrollment in measured grades (K, 2, 4, 7, 10).

## Table 6: Estimated Impacts of CEP on Fiscal Outcomes by Urbanicity, 2010-2017

| | Revenue | | | Expenditures | | Instructional Expenditures | | |
|---|---|---|---|---|---|---|---|---|
| | Local | Federal | Total | Personnel | Total | Salaries | Benefits | Total |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| CEP | | | | | | | | |
| Metro | -14.01*** | 72.37*** | 56.39*** | 5.22 | 39.96*** | -163.96 | -81.02 | -66.00 |
| | (3.86) | (15.02) | (13.99) | (7.26) | (11.36) | (104.03) | (76.15) | (188.79) |
| Town | -39.38*** | 71.77*** | 52.83** | 5.48 | 30.33** | 25.88 | -7.71 | 38.87 |
| | (5.64) | (18.82) | (22.76) | (7.69) | (12.86) | (107.88) | (81.88) | (204.31) |
| Rural | -57.91*** | 79.83*** | 15.49 | 26.86** | 44.12* | 17.53 | -68.13 | -79.78 |
| | (9.02) | (25.29) | (19.31) | (13.41) | (22.41) | (159.39) | (59.86) | (256.55) |
| District Char. | Y | Y | Y | Y | Y | Y | Y | Y |
| District FE | Y | Y | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y | Y | Y |
| Observations | 743 | 733 | 744 | 727 | 744 | 744 | 744 | 744 |
| No. Districts | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 |
| R-squared | 0.94 | 0.87 | 0.82 | 0.95 | 0.90 | 0.96 | 0.95 | 0.96 |

Notes: Sample period covers 2010-2017 and includes Ever CEP districts. Sample excludes NYC, "Big 4" districts (Buffalo, Rochester, Syracuse, & Yonkers), four districts that consolidated in 2014, and one district with incomplete data. All models control for a vector of district characteristics including percent black, Hispanic, Asian/other, English language learners, students with disabilities, and free lunch students, district fixed effects, and year fixed effects. All models weighted by enrollment.

## Table 7: Estimated Impacts of CEP on Weight Outcomes by Extent of Implementation, 2010-2017

| | Primary Grades | | Secondary Grades | |
|---|---|---|---|---|
| | % Overwgt | % Obese | % Overwgt | % Obese |
| | (1) | (2) | (3) | (4) |
| PCT CEP | -0.073 | -0.056 | -0.206** | -0.152* |
| | (0.0817) | (0.0761) | (0.0905) | (0.0882) |
| Districtwide | -0.922 | 0.189 | -5.524 | -1.662 |
| | (2.661) | (2.519) | (3.608) | (4.071) |
| District Char. | Y | Y | Y | Y |
| District FE | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y |
| Observations | 364 | 361 | 361 | 358 |
| No. Districts | 93 | 93 | 93 | 93 |
| R-squared | 0.745 | 0.730 | 0.609 | 0.579 |

Notes: Robust standard errors in parentheses clustered by district (*p<.10; **p<.05; ***p<.01). Sample period covers 2010-2017 and includes Ever CEP districts. Sample excludes NYC, "Big 4" districts (Buffalo, Rochester, Syracuse, & Yonkers), four districts that consolidated in 2014, and one district with incomplete data. Primary refers to grades K, 2, and 4, and Secondary refers to grades 7 and 10. Weight outcome data assigned to the beginning of the two-year reporting cycle using last year's treatment status. Estimates weighted by student enrollment in measured grades (K, 2, 4, 7, 10). All models control for a vector of district characteristics including percent black, Hispanic, Asian/other, English language learners, students with disabilities, and free lunch students, PCT CEP$^2$, district fixed effects, and year fixed effects. Data is unavailable for districts with fewer than 5 students in a category. Therefore, the number of observations is inconsistent across outcomes.

## Table 8: Predicting CEP Adoption Among Ever CEP Districts & Schools, 2012-2017

| | District CEP t+1 | School CEP t+1 |
|---|---|---|
| | (1) | (2) |
| % Black | -0.02 | -0.01 |
| | (0.03) | (0.02) |
| % Hispanic | 0.04 | 0.00 |
| | (0.03) | (0.02) |
| % Asian/Other | 0.05 | 0.02 |
| | (0.03) | (0.02) |
| % LEP | -0.08 | -0.01 |
| | (0.06) | (0.01) |
| % SWD | -0.00 | |
| | (0.04) | |
| % Free Lunch | -0.00 | 0.00 |
| | (0.00) | (0.00) |
| School FE | N | Y |
| District FE | Y | N |
| Year FE | Y | Y |
| Observations | 404 | 1,154 |
| No. Schools | - | 321 |
| No. Districts | 93 | 87 |
| R-squared | 0.62 | 0.47 |

Notes: Robust standard errors in parentheses clustered by district (*p<.10; **p<.05; ***p<.01). Sample periods cover 2012 to 2017. Column 1 includes Ever CEP districts, and Column 2 includes Ever CEP schools. All models control for percent black, Hispanic, Asian/other, English language learners, students with disabilities, and free lunch students, district fixed effects, and year fixed effects. Estimates weighted by enrollment.

## Appendix

### Table A1: Estimated Impacts of CEP on Meal Participation and Attendance, Including Big 4, 2010-2017

| | Bfast | District Lunch | Attd Rate |
|---|---|---|---|
| | (1) | (2) | (3) |
| CEP | 8.650*** | 7.183*** | -0.0151 |
| | (1.826) | (0.773) | (0.273) |
| District Char. | Y | Y | Y |
| District FE | Y | Y | Y |
| Year FE | Y | Y | Y |
| Observations | 776 | 776 | 679 |
| No Districts | 97 | 97 | 97 |
| R-squared | 0.867 | 0.911 | 0.864 |

Notes: Robust standard errors in parentheses clustered by district (*p<.10; **p<.05; ***p<.01). Sample period covers 2010 to 2017 for meal participation outcomes and 2010 to 2016 for attendance outcome and includes Ever CEP districts. Sample excludes NYC and four districts that consolidated in 2014. All models control for percent black, Hispanic, Asian/other, English language learners, students with disabilities, and free lunch students, district fixed effects, and year fixed effects. Estimates weighted by enrollment.

## Table A2: Estimated Impacts of CEP on Student Weight Outcomes, Including Big 4, 2010-2017

| | All Grades | | Primary Grades | | Secondary Grades | |
|---|---|---|---|---|---|---|
| | % Overwgt | % Obese | % Overwgt | % Obese | % Overwgt | % Obese |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| CEP | -0.648 | -0.159 | 0.222 | 0.387 | -3.494*** | -2.393** |
| | (1.014) | (1.051) | (1.056) | (1.261) | (1.318) | (1.139) |
| District Char. | Y | Y | Y | Y | Y | Y |
| District FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| Observations | 384 | 381 | 380 | 377 | 377 | 374 |
| No. Districts | 97 | 97 | 97 | 97 | 97 | 97 |
| R-squared | 0.750 | 0.707 | 0.760 | 0.712 | 0.623 | 0.589 |

Notes: Robust standard errors in parentheses clustered by district (*p<.10; **p<.05; ***p<.01). Sample period covers 2010-2017 and includes Ever CEP districts. Sample excludes NYC, four districts that consolidated in 2014, and one district with incomplete data. Primary refers to grades K, 2, and 4, and Secondary refers to grades 7 and 10. Weight outcome data assigned to the beginning of the two-year reporting cycle using last year's treatment status. Estimates weighted by student enrollment in measured grades (K, 2, 4, 7, 10). All models control for a vector of district characteristics including percent black, Hispanic, Asian/other, English language learners, students with disabilities, and free lunch students, district fixed effects, and year fixed effects. Data is unavailable for districts with fewer than 5 students in a category. Therefore, the number of observations is inconsistent across outcomes.

## Table A3: Estimated Impacts of CEP on Fiscal Outcomes, Including Big 4, 2010-2017

Panel A: Per Pupil

| | Food Revenue | | | | Food Expenditures | | Instructional Expenditures | | |
|---|---|---|---|---|---|---|---|---|---|
| | Local | State | Federal | Total | Personnel | Total | Salaries | Benefits | Total |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| CEP | -21.89*** | 3.34 | 93.12*** | 77.60*** | 10.00 | 50.98*** | -55.99 | -57.86 | 49.26 |
| | (3.60) | (2.90) | (12.47) | (13.49) | (7.80) | (11.07) | (98.19) | (47.23) | (185.67) |
| District Char. | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| District FE | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Observations | 775 | 776 | 765 | 776 | 759 | 776 | 776 | 776 | 776 |
| No Districts | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 |
| R-squared | 0.95 | 0.66 | 0.93 | 0.90 | 0.93 | 0.92 | 0.95 | 0.94 | 0.95 |

Panel B: Per Meal

| | Food Revenue | | | | Food Expenditures | |
|---|---|---|---|---|---|---|
| | Local | State | Federal | Total | Personnel | Total |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| CEP | -0.18*** | -0.01 | 0.05 | -0.12* | -0.17*** | -0.25*** |
| | (0.03) | (0.02) | (0.04) | (0.06) | (0.06) | (0.05) |
| District Char. | Y | Y | Y | Y | Y | Y |
| District FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| Observations | 775 | 776 | 765 | 776 | 759 | 776 |
| No Districts | 97 | 97 | 97 | 97 | 97 | 97 |
| R-squared | 0.95 | 0.67 | 0.86 | 0.72 | 0.90 | 0.75 |

Notes: Sample period covers 2010-2017 and includes Ever CEP districts. Sample excludes NYC, four districts that consolidated in 2014, and one district with incomplete data. All models control for percent black, Hispanic, Asian/other, English language learners, students with disabilities, and free lunch students, district fixed effects, and year fixed effects. Estimates weighted by enrollment. Revenue and expenditures data are in 2017 dollars. Panel A outcomes are revenues and expenditures per pupil, and Panel B outcomes are revenues and expenditures per meal served. Districts missing data in select years: 1 local food revenue, 6 federal food revenue, and 4 personnel food expenditures.

## Table A4: Estimated Impacts of CEP on Meal Participation and Attendance, Unweighted, 2010-2017

| | Bfast | District Lunch | Attd Rate |
|---|---|---|---|
| | (1) | (2) | (3) |
| CEP | 9.101*** | 7.866*** | -0.348 |
| | (1.502) | (0.711) | (0.237) |
| District Char. | Y | Y | Y |
| District FE | Y | Y | Y |
| Year FE | Y | Y | Y |
| Observations | 744 | 744 | 651 |
| No Districts | 93 | 93 | 93 |
| R-squared | 0.791 | 0.876 | 0.734 |

Notes: Robust standard errors in parentheses clustered by district (*p<.10; **p<.05; ***p<.01). Sample period covers 2010 to 2017 for meal participation outcomes and 2010 to 2016 for attendance outcome and includes Ever CEP districts (Columns 1-3) and schools (Columns 4-9). Both samples exclude NYC, "Big 4" districts, and four districts that consolidated in 2014. School panel sample includes 198 primary and 93 secondary continuously open schools that ever adopt CEP from 2013-2018 and excludes 34 schools in 24 districts with implausibly high meal participation rates, 4 Elementary-Middle schools and 8 K-12 schools. All models control for percent black, Hispanic, Asian/other, English language learners, students with disabilities (unavailable in school-level models), and free lunch students, district (school) fixed effects, and year fixed effects.

## Table A5: Estimated Impacts of CEP on Student Weight Outcomes, Unweighted, 2010-2017

| | All Grades | | Primary Grades | | Secondary Grades | |
|---|---|---|---|---|---|---|
| | % Overwgt | % Obese | % Overwgt | % Obese | % Overwgt | % Obese |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| CEP | -0.215 | -1.031 | 0.295 | -0.740 | -2.899* | -2.096 |
| | (0.978) | (0.836) | (1.171) | (1.080) | (1.541) | (1.304) |
| District Char. | Y | Y | Y | Y | Y | Y |
| District FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| Observations | 368 | 365 | 364 | 361 | 362 | 358 |
| No. Districts | 93 | 93 | 93 | 93 | 93 | 93 |
| R-squared | 0.578 | 0.595 | 0.576 | 0.593 | 0.393 | 0.523 |

Notes: Robust standard errors in parentheses clustered by district (*p<.10; **p<.05; ***p<.01). Sample period covers 2010-2017 and includes Ever CEP districts. Sample excludes NYC, "Big 4" districts, four districts that consolidated in 2014, and one district with incomplete data. Primary refers to grades K, 2, and 4, and Secondary refers to grades 7 and 10. Weight outcome data assigned to the beginning of the two-year reporting cycle using last year's treatment status. All models control for a vector of district characteristics including percent black, Hispanic, Asian/other, English language learners, students with disabilities, and free lunch students, district fixed effects, and year fixed effects. Data is unavailable for districts with fewer than 5 students in a category. Therefore, the number of observations is inconsistent across outcomes.

## Table A6: Estimated Impacts of CEP on Fiscal Outcomes, Unweighted, 2010-2017

Panel A: Per Pupil

| | Food Revenue | | | | Food Expenditures | | Instructional Expenditures | | |
|---|---|---|---|---|---|---|---|---|---|
| | Local | State | Federal | Total | Personnel | Total | Salaries | Benefits | Total |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| CEP | -39.49*** | 0.08 | 77.05*** | 42.40*** | 10.36 | 39.63*** | -44.65 | -73.13 | -40.96 |
| | (4.49) | (3.64) | (9.17) | (9.34) | (6.42) | (8.26) | (68.09) | (44.31) | (117.10) |
| District Char. | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| District FE | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Observations | 743 | 744 | 733 | 744 | 727 | 744 | 744 | 744 | 744 |
| No Districts | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 |
| R-squared | 0.91 | 0.78 | 0.87 | 0.84 | 0.92 | 0.89 | 0.94 | 0.94 | 0.94 |

Panel B: Per Meal

| | Food Revenue | | | | Food Expenditures | |
|---|---|---|---|---|---|---|
| | Local | State | Federal | Total | Personnel | Total |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| CEP | -0.31*** | -0.03 | 0.01 | -0.31*** | -0.18*** | -0.33*** |
| | (0.03) | (0.02) | (0.04) | (0.06) | (0.05) | (0.06) |
| District Char. | Y | Y | Y | Y | Y | Y |
| District FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| Observations | 743 | 744 | 733 | 744 | 727 | 744 |
| No Districts | 93 | 93 | 93 | 93 | 93 | 93 |
| R-squared | 0.90 | 0.78 | 0.82 | 0.69 | 0.88 | 0.78 |

Notes: Sample period covers 2010-2017 and includes Ever CEP districts. Sample excludes NYC, "Big 4" districts, four districts that consolidated in 2014, and one district with incomplete data. All models control for percent black, Hispanic, Asian/other, English language learners, students with disabilities, and free lunch students, district fixed effects, and year fixed effects. Revenue and expenditures data are in 2017 dollars. Panel A outcomes are revenues and expenditures per pupil, and Panel B outcomes are revenues and expenditures per meal served. Districts missing data in select years: 1 local food revenue, 6 federal food revenue, and 4 personnel food expenditures.