ECONOMIC ANALYSIS OF THE IMPACT OF FREE SCHOOL MEAL ACCESS EXPANSION ON ELEMENTARY SCHOOL CHILDREN IN COMMUNITY ELIGIBILITY PROVISION PILOT STATES

by

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ABSTRACT

In 2010, the Healthy, Hunger-Free Kids Act was passed to update and improve provisions of the National School Lunch and School Breakfast Programs. Most prominently, it introduced new meal guidelines and nutritional requirements for school meals. Additionally, it authorized the Community Eligibility Provision (CEP) that became available to schools with more than 40 percent of students who are eligible for free school meals, based on federal means-tested program participation, in ten pilot states before it was authorized nationally for school year 2014-15. Schools that opt into the provision are required to provide free breakfast and lunch to all students. While a number of studies have established that implementation of the provision leads to increased student participation in school meals, no study is known that empirically analyzes the impact on individual student outcomes.

Student-level data from the Early Childhood Longitudinal Survey- K: 2011 is merged with school-level data in six pilot states and a difference-in-difference model estimates the impact of CEP implementation on students' health, academic, and behavioral outcomes. No statistically significant effect of CEP implementation on student outcomes is identified. Additionally, no indication is found, that students who receive free or reduced-price meals before CEP implementation are impacted differently than students who paid full price for school meals is found. Thus, this analysis does not provide any evidence that CEP implementation in fact benefits individual students, either by means of participation increases or reductions in stigma and student body segmentation associated with subsidized school meals. Additionally, it is unlikely that schools gain financially from implementation of the provision. Consequently, this thesis questions that there are any significant returns on this public policy.

1. INTRODUCTION

Over 90 percent of public and private schools in the United States participate in the National School Lunch Program (NSLP). A slightly smaller but increasing percentage of schools also participates in the School Breakfast Program (SBP). About 60 percent of school children consume these school meals every day, meaning that the majority of school age children in the United States consume food provided through federally assisted school meal programs on a daily basis. National school meal programs therefore provide a significant opportunity to impact children and adolescent nutrition and health in the United States.

Faced with unprecedented youth obesity and other diet related diseases, in 2010, U.S. lawmakers passed the Healthy, Hunger-Free Kids Act to update the National School Lunch and Breakfast Programs in order to ensure access to healthy nutrition. Along with new meal standards, the act introduced the Community Eligibility Provision (CEP) that allows schools with high percentages of needy students to provide universally free breakfast and lunch meals. The provision was authorized first in ten selected states for a three-year pilot period starting with school year 2011-12. Eligible schools in all states are now permitted to implement the CEP. Once implemented, all children can participate in the school's breakfast and lunch offerings at no charge. In contrast, under traditional school meal procedures, students may individually apply and qualify for free or reduced meals based on their parents' income or participation in other federal aid programs. Non-eligible students must purchase the meals at full price. In 2015, the average price for reduced-price meals was $0.40 and the average regular price was $2.50.

Due to loss of school meal sales at full and reduced prices, schools that choose to participate in the CEP likely lose some meal service revenue, but can benefit from reduced administrative costs and receive increased federal reimbursement. It is anticipated that schools that opt into the CEP will experience increases in overall school meal participation. Because students who were eligible to receive subsidized school meals before the CEP was implemented may experience a reduction in the social stigma associated with the consumption of subsidized school meals, participation increases are expected not only for children who experience a price reduction. Furthermore, participation among subsidy-eligible children may increase because parents no longer have to complete applications for their children to receive subsidized meals.

The CEP is intended to help combat food insecurity, or the lack of reliable access to a sufficient quantity of food, among school-age children and increase children's access to proper, healthy nutrition. Yet, previous empirical research on school meal participation suggests that the effects are somewhat difficult to estimate: children who participate in school meal programs are inherently different, and overall have less nutritious diets than their peers who bring lunches from home (Millimet et al. 2010). While a number of studies do find a positive relationship between school meal participation and individual child outcomes, overall results are ambiguous. Based on the existing literature, empirical evidence does not support the conclusion that increased participation in the federal lunch and breakfast programs necessarily positively impacts child outcomes. If implementation of the CEP leads to increased participation among already eligible children for meal

subsidies, as well as among previously non-eligible children, then there may be an impact on both groups of children.

The goal of this thesis is to determine how school-level implementation of the CEP impacts children with respect to health, behavioral, and academic outcomes. Additionally, by estimating these effects for different groups of students, this research aims to gain understanding of the mechanisms behind the impacts and may provide additional insights on the impact of school meal participation on students.

Overall, no impact of CEP implementation is found with respect to students' health, behavioral, and academic outcomes is found, regardless of whether a student qualifies for subsidized school meals before the CEP is in place. This suggests that there may lack of return in investment to schools that implement the CEP. Additionally, conditional on the assumption that CEP implementation leads students who previously never consumed school meals to participate in the NSLP, these results do not support findings that suggest that school meal participation has an impact on student outcomes.

2. BACKGROUND

National School Lunch Breakfast Program (NSLP)

The National School Lunch Program was established by the National School Lunch Act in 1946. Based on population and per capita income, the federal government provided financial assistance and commodities to states to aid schools that chose to offer lunch that complied with federal guidelines. While funding has evolved from a population-based formula to reimbursement based on participation, schools still have the option to participate and receive federal reimbursement conditional on compliance with federal program requirements. Federally, the program is administered by the Food and Nutrition Service. Cash subsidies and foods are provided to schools by the United States Department of Agriculture (USDA). At the state level, the program is administered by the State Education Agency and is typically operated by local school food authorities or individual schools.

Federal program requirements state that students in households with income between 130 and 185 percent of the federal poverty level are eligible for reduced price meals. Students at or below 130 percent of the federal poverty level are eligible for free meals. Additionally, Supplemental Nutrition Assistance Program (SNAP), Temporary Assistance for Needy Families (TANF), and Food Distribution Program on Indian Reservations (FDPIR) participation as well as migrant, homeless, orphan and foster child status qualify students to receive free meals through direct certification. While households are required to complete an application for each school year for their child to

qualify for income-based school meal assistance, state agencies identify students that fulfill the requirements for direct certification by matching enrollment data with participation records of the means-test programs.[1] In other words, direct certification eliminates the need for schools to provide parents with annual applications that they need to fill out accurately and return to the school where these applications are processed and approved. If parents are not willing, interested, or able to accurately complete the household application, it can pose a barrier to school meal enrollment of children in need.

School meals must comply with meal patterns, dietary specifications, and nutrition requirements provided by the Food and Nutrition Service. These requirements include meal targets for calories, sodium, vegetables, fruits, grains, among other specifications. In return, local school food authorities receive federal reimbursement based on the number of free, reduced and full priced meals served.[2]

Currently, more than 90 percent of public and private schools in the United States offer NSLP meals. Student participation has been fairly steady at 60 percent since 1989, meaning that today about 31 million children consume NSLP meals every day. About 35 percent of participating children receive their meals for free or at the reduced price ("National School Lunch Program: Participation and Lunches Served" 2016). Despite steady overall participation rates, federal program costs have increased immensely from $3.6 billion in 1990 to $11.2 billion in 2012, partially due to continuous increases in the

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[1]The 2004 Child Nutrition and Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Reauthorization Act requires states to develop direct certification systems for school-age SNAP participants (Ralston 2008).

[2]For example, for school year 2015-2016 the maximum reimbursement per lunch meal served in contiguous states was 37 cents per paid meal, $2.84 per reduced price meal and $3.24 per free meal. Reimbursements were somewhat lower for schools that served 60 percent or less of lunches for free or at reduced price during the previous school year ("Rates of Reimbursement" 2016).

participation of students that qualify for free or reduced-price meals ("Federal Cost of School Food Programs" 2016).

In 1966, the Child Nutrition Act established the School Breakfast Program (SBP). Designed to help provide adequate nutrition to children with severe need and to emphasize participation by schools in severe need areas, over time it has evolved to a program that is administered similarly to the NSLP. About one half of schools that participate in the NSLP also offer the SBP. About one third of NSLP participating children are also enrolled in the SBP, with the large majority of them receiving breakfast for free or at reduced price ("The School Breakfast Program – Fact Sheet" 2013).

Since the establishment of the SBP, numerous other school meal programs, such as the Fresh Fruit and Vegetable Program or the Special Milk Program have been authorized. Additionally, several acts have been passed to update and improve the procedures and nutrition guidelines of the NSLP and SBP.[3]

2010 Healthy, Hunger-Free Kids Act

The 2010 Healthy, Hunger-Free Kids Act (HHFKA) represents the most recent effort to improve federal school meal programs. Its objective was to update and extend national school meal programs to include more students. It also updated WIC, the Child

[3]In the 1980s, the Omnibus Budget Reconciliation Acts reduced federal subsidies for reduced-price eligible students but decreased the minimum income threshold that qualifies students to be eligible for free meals. The 1994 Healthy Meals for Americans Act required schools to meet the Dietary Guidelines for Americans and under the 2002 Child Nutrition and WIC Reauthorization Act, schools were required to develop nutrition guidelines for all foods offered (Ralston 2008).

and Adult Care Food Program, the After School Meal and Summer Food Programs, SNAP, as well as the SBP and NSLP. The law increases reimbursements to NSLP and SBP participating schools and requires these schools to comply with new nutrition standards. The new standards represent efforts to provide children with more fruit, vegetables, whole grain and lean protein but to limit the intake of sugar, fat and sodium. The new guidelines were phased in and largely went into effect starting in July 2012.

Community Eligibility Provision (CEP)

The Healthy, Hunger-Free Kids Act of 2010 authorizes the Community Eligibility Provision (CEP) which allows schools and local education agencies with 40 percent or more direct certified students to provide free breakfast and lunch meals to the entire student body. Schools can qualify for and implement the CEP individually if the percentage of direct certified students, the identified student percentage (ISP), exceeds 40 percent.[4] Analogously, local education agencies can qualify and implement the CEP as a whole if the district's ISP exceeds 40 percent. Additionally, individual schools within a school district can collaborate to form a group of schools that combined achieve an ISP of 40 percent of higher.[5] This means that schools with ISP of less than 40 percent may

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[4]The CEP is implemented at the beginning of a school year, in September. Eligibility and reimbursement are based on enrollment data from April 1st during the previous school year.

[5]For an individual school, the identified student percentage is calculated by dividing the number of direct certified students by total enrollment. Similarly, for an entire district or a group of schools, the identified student percentage can be calculated by adding up every school's number of direct certified students and dividing this number by the sum of every school's total enrollment. Groups of CEP schools can consist of any number of schools. To clarify,

ISP = Percentage of direct certified students

= Percentage of students that are eligible for free school meals because of TANF, SNAP, or FDPIR participation or due to homeless, migrant, runaway or foster child status

$$= \frac{\text{Total number of direct certified students}}{\text{Total number of students}}$$

also become eligible to participate in the CEP if they are able to collaborate with another school or schools that have an identified student percentage that is higher than 40 percent.

Eligible schools or local education agencies can choose to implement the CEP for a four year period. Once implemented, all children attending these schools can consume both breakfast and lunch at no charge, regardless of their individual certification status. Even if a school did not previously offer school breakfast meals, it must do so after implementation of the CEP. During the four-year period, schools receive federal reimbursement based on enrollment numbers as of April 1st in the year before the CEP was implemented. Schools can drop out of the provision at any time. In order to receive increased federal reimbursement, schools can choose to restart their four year CEP participation cycle early if the percentage of direct certified students increased. Recalculation of a school's ISP is only mandatory if the school's attendance area changes. Similarly, recalculation for groups of schools or whole districts is only mandatory if the composition of the group or school district changes. In other words, if a school's or district's ISP drops below 40 percent during the four year cycle, the school or district can continue CEP participation and receives reimbursement based on its initial ISP for the remainder of the four-year period. If during the fourth year the ISP is below the 40 percent threshold but above 30 percent, schools, groups of schools or school districts can maintain CEP participation for the duration of a one-year grace period. After the grace year, either a new four-year cycle is started, conditional on the ISP again

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For example, for a group of two schools:

$$\text{ISP} = \frac{\text{Number of direct certified students at school A+Number of direct certified students at school B}}{\text{total enrollment school A+total enrollment school B}}$$

exceeding 40 percent, or standard meal and reimbursement practices are restored. CEP schools receive federal reimbursement for 1.6 times the number of direct certified students at the free meal rate and reimbursement at the paid meal rate for all additional meals served.[6]

The CEP became available nationally for school year 2014-15. Prior to that, ten states were identified by the Food and Nutrition Service to participate in a three-year pilot period of the program, based on their potential to reach the highest numbers of qualifying schools and school districts. During school year 2011-12, schools in Michigan, Illinois and Kentucky were the first to be able to adopt CEPs. In these three states, 665 schools or roughly 4 percent of schools participated in the CEP during this first pilot year ("Community Eligibility Provision. Planning and Implementation Guidance" 2016). Three additional states, New York, Ohio and West Virginia, and the District of Columbia were added as pilot states for school year 2012-13. Georgia, Florida, Maryland and Massachusetts were identified as the four final pilot states where eligible schools and school districts were able to implement the CEP for school year 2013-14. After the pilot period, the CEP became available in all states for school year 2014-15. Over 14,000 schools chose to participate nationally during school year 2014-15, including schools in

[6]In comparison, under the traditional reimbursement scheme schools receive payments at the free meal rate (the highest reimbursement) for all meals served to students at no charge and payments at the reduced meal rate for all meals served at the reduced price. The number of direct certified students is likely smaller than the number of students who are eligible to receive free school meals because students can qualify for free meals based on their parents' income, additionally to the criteria for direct certification. Multiplying this number of direct certified students by 1.6 is intended to approximate the sum of meals served for free and for reduced price. If this is accurate, under the CEP schools receive higher reimbursement for meals served to students that would qualify for free or reduced meals than they do under traditional procedures, and equal reimbursement for meals served to students that have to pay full price under traditional procedures. The Food Nutrition Service is authorized to change this multiplier to a number between 1.3 and 1.6.

every state except New Hampshire. School participation increased to over 17,000 schools, or about 50 percent of eligible schools, for school year 2015-16.

State agencies are responsible for collecting and posting lists with eligible schools and school districts by April 15th each year. Eligible schools and districts must declare their intent to participate by June 30th. Not all states maintain accurate records of each school's ISP. These states recalculate a school's or district's identified student percentage once the school or district declares its intention to implement the CEP based on eligibility according to its own calculations.[7]

[7]Of the pilot states, this applies to Illinois, New York, Ohio and Georgia.

3. IMPLEMENTATION OF THE COMMUNITY ELIGIBILITY PROVISION

School Take-up of the Community Eligibility Provision

Based on the pilot states' records of Community Eligibility Provision (CEP) participating schools that were collected for this analysis and merged with the Common Core Data, only 4.8 percent of elementary schools in the first three pilot states (Michigan, Illinois and Kentucky) implemented the CEP for school year 2011-12. In 2012-13, 6.6 percent of elementary schools in the first six pilot states implemented the CEP. This percentage increased to 15.9 percent in 2013-14 and 19.1 percent in 2014-15, when the provision was available in all pilot states (see table 3.1a). State-level school implementation rates continuously increased from initial authorization of the CEP in all states except Florida and Georgia. Large differences exist in the percentage of elementary schools that opted into CEP between pilot states. This holds true for school implementation of the CEP across all schools. Yet, on average, take-up is slightly higher for elementary schools than for secondary schools. Specifically, 3.9 percent of all schools in the first three pilot states implemented the CEP for school year 2011-12, 5.7 percent of all schools in the pilot states implemented the CEP for school year 2012-13, 13.2 percent for school year 2013-14 and 15.6 percent for school year 2014-15.

Table 3.1b summarizes the percentage of elementary schools with school-wide Title 1 status that also implemented the CEP. Title 1 of the Elementary and Secondary Act provides federal financial assistance to local education agencies and schools with high percentages of children from low-income families to ensure that all children meet state academic standards. Elementary schools are eligible to implement Title 1 as a

school-wide program if at least 40 percent of enrolled children are from low income families. While different combinations of data may be used as poverty measures to determine Title 1 eligibility, the eligibility standards are comparable to the requirement for CEP eligibility.[8] Contingent on the assumption that schools with school-wide Title 1 status are highly likely to also be eligible to implement the CEP, this provides an estimate of the percentage of eligible elementary schools that have the CEP in place. Using this proxy, 80.7 percent of elementary schools that have the CEP in place also have continuous school-wide Title 1 status. Based on this definition of eligibility, 9.5 percent of eligible elementary schools in the first three pilot states implemented the CEP in 2011-12, 13.4 percent implemented it in the first 5 pilot states in 2012-13 and 28.1 percent of eligible schools implemented the CEP in 2013-14 when it was authorized in all pilot states. The implementation rate increased further to 33.7 percent in all pilot states in 2014-15. Of the pilot states, the highest take-up of the CEP occurred in West Virginia with 66.6 percent of eligible schools in 2013-14 and 70.1 percent of eligible schools in 2014-15 compared to the lowest take-up in Maryland with 0.9 percent in 2013-14 and 3.4 percent in 2014-15. Tables 3.1a and 3.1b exhibit that take-up was low but increasing among all schools and among schools that were considered eligible to implement the CEP. Yet, differences in the take-up rate within and between states are fairly consistent when looking at all schools and schools that are considered eligible. Thus, it appears that school-level eligibility is relatively uniform across states and time.

[8]Depending on availability of data, schools can measure poverty by the percentage of children that are enrolled in subsidized meal programs, the percentage of students that are direct certified, or the share of students from low-income families determined through state income surveys.

Evaluating data on elementary, middle and high schools, the USDA's Evaluation Report of the CEP provided by Logan et al. (2014) finds that there are large differences between states in the percentage of eligible schools and districts that implement the CEP in the first seven pilot states. According to Logan et al. (2014), on average 32 percent of eligible districts and 29 percent of eligible schools implemented the CEP during the first two pilot years.[9] In this study, in all seven states, schools and districts in more urban areas, with lower enrollments, higher ISPs, higher percentages of students in lower grades and higher percentages of black students on average, are found more likely to have implemented the CEP, as were charter schools. Logan et al. (2014) also suggest that the decision to implement the CEP may depend on unobservable factors, such as the perceived financial benefit for an eligible school or local education agency.

The decision to implement the CEP can be made by an individual school, by a group of schools, or by a school district. Because school meal providers often serve more than one school, grouped CEP implementation might not only occur strategically to qualify schools that would not be eligible individually, but also to continue school meal provision without disruption. Table 3.2 summarizes the percentage of schools that have the CEP in place within a district where at least one school implemented the CEP by state and school year. It illustrates that in all states except for Kentucky, the percentage of CEP-schools within a school district where at least one school has the CEP in place increases over time. During school year 2013-14, in school districts with at least one CEP school, on average, almost 50 percent of schools participate in the CEP. Additionally,

[9]A school district or local education agency is defined as eligible, non-participating if it has at least one eligible school with ISP at 40 percent, but no participating schools.

almost all pilot states have at least one school district where all schools have the CEP in place during school year 2013-14. Yet, in each state there is also at least one school district where only a very small percentage of schools implemented the CEP. Consequently, table 3.2 suggests that CEP take-up decision in fact is made by various decision authorities. Figure 3.1 further illustrates this. It provides a graphical summary of the average percentage of CEP schools within a school district. The figure excludes all school districts where no school has the CEP in place.

While a number of school districts implement the CEP at every school, in a significant number of school districts the majority of schools do not have the CEP in place. Yet, the distribution is skewed to the right, indicating that a school is more likely to have the CEP in place if the majority of schools in its district has it in place as well.

Meal Service Revenues and Federal Reimbursement Influence on Take-up Decision

This section outlines the financial incentives of a school or school district to take-up the CEP. In the following it is assumed that a school maximizes its meal service profits, and will only consider CEP implementation if it expects that it does not lead to significant reductions in the funding of its meal service. While this is likely a gross simplification of a school's objective function, it allows for better understanding why some eligible schools may be more or less inclined to implement the CEP. Additionally, a school might include factors such as students' wellbeing, state or local funding for its meal service, as well as revenues from food sales outside of the NSLP in its considerations for whether or not to implement the CEP. Another factor that may lead

schools to financially benefit from CEP implementation that has recently been discussed in the media are schools' difficulties collecting outstanding student meal payments. In fact, the School Nutrition Association estimates that as many as 76 percent of school districts reported unpaid meal debt at the end of school year 2014-15 ("School Meal Trends& Stats" 2017). Consequently, schools may decide to implement the CEP to minimize losses rather than to maximize meal service profits. Even if a school's meal service revenue from reimbursement and sales revenue does not increase due to CEP implementation, the meal service may still benefit financially if CEP implementation significantly decreases costs of service or costs of student certification processes.

A number of school meal service profit maximization scenarios, based on average reimbursement rates and meal prices for the NSLP for school year 2014-15, are summarized in table 3.3 to provide insights into schools' financial incentives to implement the CEP. The table provides calculations based on a school with 100 students and an ISP of 40 percent and 60 percent, respectively. Federal reimbursements are assumed to be the same for all three types of schools at $3.06 for every free meal served, $2.66 for every reduced-price meal served and $0.36 for every meal served at full price.[10] Consistent with average prices for school year 2014-15 in the United States, students are assumed to be paying $2.50 for a full price lunch and $0.40 for a reduced-price lunch at all schools. Separate calculations are performed for a school where only subsidized

[10]Reimbursement rates are contingent on the percentage of free and reduced price meals a school served during the previous school year, as well as on a school's performance. During school year 2014-15, an average school in the contiguous states received $3.06 for every free lunch served, $2.66 for every reduced-price lunch served, and $0.36 for every full priced meal served ("School Programs Meal, Snack and Milk Payments to States and School Food Authorities" 2015).

students consume meals, for a school where all students consume school meals, and for a school where only subsidized students consume school meals before CEP implementation, but all students consume school meals once the CEP is in place. The first two rows of each scenario summarize which students participate in the NSLP prior to and under the CEP.

Under the CEP, schools receive federal reimbursement at the free meal rate for the number of meals that corresponds to the Identified Student Percentage (ISP) multiplied by 1.6. The Food and Nutrition Service authorizes this multiplier to reimburse approximately all meals served to free and reduce-price eligible students at the free meal reimbursement rate. In fact, Logan et al. (2014) find that this multiplier corresponds to the average ratio of a school's ISP and its percentage of subsidy eligible students. The calculations in this section also rely on this assumption that multiplying the ISP by 1.6 gives a percentage that is approximately equal to the percentage of subsidy eligible students at a school. Finally, the calculations in table 3.3 depend on the assumption that if participation increases when a school implements the CEP, meal service costs to the school's meal service provider will increase by $1.00 per every new student. This is consistent with the assumption that 37 percent of the cost of providing a meal stems from actual food cost, as estimated by the school nutrition association ("School Meal Trends& Stats" 2017). The first part of table 3.3 shows different calculation scenarios that all assume that 100 percent of students who are eligible for subsidized school lunches participate in the program. The second part of table 3.3 shows the same scenarios with the assumption that only 50 percent of subsidy eligible students participate in the NSLP.

Upon implementation of the CEP, reimbursement for meals served to students who previously consumed free meals remains the same. Reimbursement for meals served to students who previously consumed reduced-price meals increases by 40 cents per meal, while 40 cents of reduced-price meal revenue is lost per meal, leading to no change in total revenue from meals served to reduced-price eligible students. This can easily be seen when considering the following equations (1) and (2) for total school meal service revenue with and without the CEP in place where FME and RME stand for the number of students that are eligible to receive free and reduced meals, $FULL^0$ stands for the number of students who purchase full-price meals without the CEP and $FULL^1$ for the number of additional students who consume meals under the CEP and had to pay for school meals prior to CEP implementation. The percentage of subsidy eligible students who participate in the NSLP without the CEP is given by α and the percentage of subsidy eligible students who participate in the NSLP with the CEP is given by β.

$$\textit{Revenue without CEP} = \$3.06*\alpha*(FME+RME) + \$2.86*FULL^0 \quad (1)$$

$$\textit{Revenue after CEP implementation} = \$3.06*\beta*(FME+RME) + \$0.36*(FULL^0+FULL^1) - \$1*FULL^1 - \$1*(\beta-\alpha)*(FME+RME) \quad (2)$$

Consequently, regardless of a school's ISP, if only subsidized students consume school meals, CEP implementation has little impact on the total of revenue and reimbursement (scenarios 1 and 4). In contrast, for every meal served at full price under the standard meal program, the net loss in revenue and reimbursement due to CEP implementation equals $2.14 per meal, so that a school will incur a substantial loss in

total revenue and reimbursement if the entire student body consumes school meals with and without the CEP in place. These losses are greater for schools with a lower ISP (scenario 3). Somewhat smaller losses are incurred if schools experience increases in participation when the CEP is in place (scenario 2). However, scenarios 5 and 6 illustrate that schools at which only a portion of subsidy eligible students participate in the NSLP can financially benefit from CEP implementation, especially if participation among subsidized students increases and a school has a high ISP (scenario 5).

Consider scenario 5 for a school with an ISP of 40 percent and 100 students that is displayed in the second part of table 3.3. Prior to CEP implementation only 50 percent of subsidy eligible students participate in school meals, meaning that of 40 free meal eligible students only 20 participate, and of 24 reduced-price eligible students only 12 students participate ((40*1.6-40)*0.5=12). For every free eligible student the school receives $3.06 federal reimbursement and for every reduced eligible students it receives $2.66 federal reimbursement and $0.40 sales revenue, so that total revenue prior to the CEP equals $97.92. Now assume that CEP implementations leads to the entire student body participating in the NSLP, meaning that additionally 32 subsidy eligible and 36 non-subsidy eligible students participate. Under the CEP, the school receives $3.06 federal reimbursement for each of its 64 subsidy eligible students and $0.36 federal reimbursement for the remaining 36 students. Meal service costs increase by $1 for each of the 68 new meal participants. In this scenario, in total, the school earns $42.88 more meal service revenue and reimbursement after CEP implementation.

In contrast, scenario 2 illustrates that the same school is highly unlikely to benefit financially from CEP implementation if it differs only with respect to the percentage of subsidy eligible students who consume school meals (100 percent in scenario 2 and 50 percent in scenario 4). In this scenario, before the CEP is implemented the school receives $3.06 reimbursement each for its 40 direct certified students and $2.66 reimbursement and $0.40 sales revenue for each reduced-price eligible students, so $195.84 in total. With the CEP in place, the school receives this same amount in reimbursement for its 64 subsidy eligible students, but only receives $0.36 reimbursement for each of the 36 newly participating students. This does not cover the additional cost per student, meaning that in total the school loses $23.05 by implementing the CEP.

In the sample of this analysis, elementary schools, on average, have 618 students. This, means that if school meals are provided for 180 school days, a $90 loss of revenue when implementing the CEP with full NSLP participation and an ISP of 40 percent (scenario 3) means that a school would lose $100,500 of meal service revenue in one school year. Thus, even if CEP implementation only leads to small changes in daily meal services revenues, it may have a significant financial impact over the course of one or multiple school years.

Overall, based on these calculations a school's meal service is more likely to benefit financially from CEP implementation if its revenues from meal sales are very small, if CEP implementation leads to large increases in student participation, or if a large portion of direct certified students do not consume school meals. Generally, it is unlikely

that a school's meal service would be able to achieve significant financial gains from CEP implementation.

Impact on Participation

The CEP is designed to help ensure that children in need participate at greater rates in school meal programs. It eliminates the need for income-based free and reduced meal applications, thus decreasing the administrative burden to low-income households and to schools. If children in need choose not to participate in subsidized school meals because they fear judgement from their peers, such stigma may be reduced by the CEP because it eliminates segmentation of the student body. Participation may increase as a consequence.

Economic theory predicts that unless school meals are a giffen good, school-wide CEP implementation will lead to increases in student meal participation rates. This is especially true if reductions in stigma and application cost are treated as further price reductions, additional to the price reductions to students who previously had to pay the full or a reduced price for school meals. Figure 2 displays a budget constraint and indifference curve model for a student with income M for whom the cost of school meals decreases from a positive price per meal (as reflected by the slope of BC_1) to zero cost, up to the maximum number of school meals the student is able to consume in a year (reflected by the slope of BC_2). Initially, this student consumes s_1 school meals. After the student's budget constraint becomes horizontal, his or her consumption will increase from A to B due to the substitution effect. Final consumption of school meals will depend

on the size and sign of the income effect. If school meals are a normal good, the final consumption point *C* will lie to the right of *B*. If school meals are an inferior good, the final consumption point *C* will lie to the left of point *B*, but to the right of point *A*, unless the income effect is negative and larger in absolute value than the substitution effect. In this unlikely case, school meals would be a giffen good and the income effect would lead to a decrease in the number of school meals consumed. Consequently, even if school meals are an inferior good, but the income effect is smaller than the substitution effect, economic theory predicts that the CEP will lead to increases in students' school meal consumption.

Additionally, it is plausible that the CEP may have an impact on students' behavior and academic performance, even if no significant or only small changes in participation occur as a result of CEP implementation. Again, such effects could stem from decreases in segmentation of the student body and possible reductions of stigmatization of students who are eligible for meal subsidies.

Table 3.1a: Percentage of Elementary Schools That Have Implemented the CEP

State	SY 2011-12	SY 2012-13	SY 2013-14	SY 2014-15
Michigan	7.0%	10.8%	12.7%	16.6%
Illinois	1.3%	2.2%	14.4%	25.2%
Kentucky	8.2%	15.6%	28.1%	49.0%
New York	--	3.1%	5.3%	6.6%
Ohio	--	9.2%	10.4%	15.2%
West Virginia	--	--	53.3%	57.4%
Florida	--	--	21.0%	14.1%
Maryland	--	--	0.3%	1.5%
Georgia	--	--	34.0%	25.1%
Massachusetts	--	--	No data	No data
All Pilot States	4.8%	6.6%	15.9%	19.1%

Notes: Among all pilot states CEP take-up for school year 2014-15 was highest in West Virginia and lowest in Maryland. In all states except for Florida and Georgia take-up is continuously increasing over time.
Sources: Individual State CEP data and Common Core of data, school years 2011-12 to 2014-15.

Table 3.1b: Percentage of Elementary Schools with School-wide Title 1 Status That Have Implemented the CEP

State	SY 2011-12	SY 2012-13	SY 2013-14	SY 2014-15
Michigan	12.8%	20.3%	25.2%	29.7%
Illinois	2.5%	4.8%	32.7%	53.3%
Kentucky	10.3%	18.7%	34.2%	58.5%
New York	--	8.0%	11.2%	12.9%
Ohio	--	16.7%	16.8%	23.5%
West Virginia	--	--	66.6%	70.1%
Florida	--	--	13.3%	22.9%
Maryland	--	--	0.9%	3.4%
Georgia	--	--	46.8%	35.6%
Massachusetts	--	--	--	--
All Pilot States	9.5%	13.4%	28.1%	33.7%

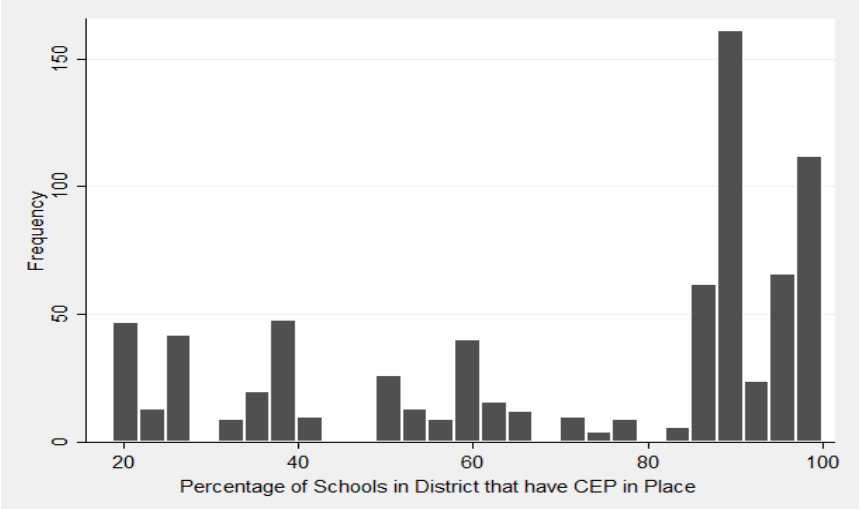
Notes: Similarly to take-up among all schools, CEP take-up of elementary schools that are considered eligible to implement the CEP has increased throughout the pilot period and varies largely by state. A significant portion of eligible schools do not have the CEP in place. Sources: Individual State CEP data and Common Core of data, school years 2011-12 to 2014-15.

Table 3.2: Percentage of Elementary CEP-Schools within a School District

State	SY 2011-12			SY 2012-13			SY 2013-14		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Michigan	29.3%	4.5%	50%	39.9%	1.9%	100%	56.4%	3.6%	100%
Illinois	5.7%	0.2%	100%	7.1%	2.3%	50%	47.7%	4.8%	100%
Kentucky	50.2%	4.8%	83.3%	50.8%	6.5%	100%	50.1%	1.2%	100%
Ohio	--	--	--	76.0%	25%	100%	85.4%	25%	100%
New York	--	--	--	14.8%	1.8%	100%	17.1%	3.0%	100%
West Virginia	--	--	--	--	--	--	61.2%	14.3%	100%
Florida	--	--	--	--	--	--	20.7%	0.4%	76%
Georgia	--	--	--	--	--	--	37.1%	1.6%	100%
Maryland	--	--	--	--	--	--	4.8%	4.8%	4.8%
All Pilot States	24.5%	0.2%	100%	33.8%	2.5%	100%	43.4%	0.6%	100%

Notes: Only school districts with at least one CEP-school are included in this table. The average percentage of schools within a school district is increasing throughout the pilot period. Each school year, there is at least one school district with a very small percentage of CEP-schools, and one where each school has implemented the CEP. Sources: Individual State CEP data and Common Core of data, school years 2011-12 to 2014-15.

Figure 3.1: Percentage of Elementary CEP-Schools within a School District



Notes: Only school districts with at least one CEP-school are included in this table. Bars show the number of school districts in the pilot states from school year 2010-11 to 2013-14 that have a certain percentage of CEP-schools. Sources: Individual State CEP data and Common Core of data, school years 2011-12 to 2014-15.

Table 3.3: Scenarios of Changes in Total School Meal Sales and Reimbursement Revenue

Student body composition	Source of revenue	Scenario 1			Scenario 2			Scenario 3		
		Prior to CEP	Under CEP	Change	Prior to CEP	Under CEP	Change	Prior to CEP	Under CEP	Change
	NSLP participants prior to CEP:	Subsidized students only			Subsidized students only			All students		
	NSLP participants with CEP in place:	Subsidized students only			All students			All students		
ISP=40%. Assumes 40 direct certified students are eligible for free meals, 40*1.6= 64 students are eligible for subsidized meals, and 64-40=24 students are eligible for reduced meals.	Reimbursement for meals served for free	40*$3.06 =$122.40	64*$3.06 =$195.84	+$73.44	40*$3.06 =$122.40	64*$3.06 =$195.84	+$73.44	40*$3.06 =$122.40	64*$3.06 =$195.84	+$73.44
	Reimbursement for meals sold at reduced price	24*$2.66 =$63.84	--	-$63.84	24*$2.66 =$63.84	--	-$63.84	24*$2.66 =$63.84	--	-$63.84
	Reimbursement for meals sold at full price	--	--	--	--	36*$0.36 =$12.96	+$12.96	36*$0.36 =$12.96	36*$0.36 =$12.96	--
	Revenue from reduced-price meal sales	24*$0.40 =$9.60	--	-$9.60	24*$0.40 =$9.60	--	-$9.60	24*$0.40 =$9.60	--	-$9.60
	Revenue from full price meal sales	--	--	--	--	--		36*$2.50 =$90.00	--	-$90.00
	Change in meal cost due to change in participation	--	--	--	--	-36*$1.00 =-$36.00	-$36.00	--	--	--
	Total	**$195.84**	**$195.84**	**--**	**$195.84**	**$172.80**	**-$23.05**	**$ 98.80**	**$208.80**	**-$90.00**
ISP=60%. Assume 60 direct certified students are eligible for free meals, 60*1.6= 96 students are eligible for subsidized meals, and 96-60=36 students are eligible for reduced meals.	Reimbursement for meals served for free	60*$3.06 =$183.60	96*$3.06 =$293.76	+$110.16	60*$3.06 =$183.60	96*$3.06 =$293.76	+$110.16	60*$3.06 =$183.60	96*$3.06 =$293.76	+$110.16
	Reimbursement for meals sold at reduced price	36*$2.66 =$95.76	--	-$95.76	36*$2.66 =$95.76	--	-$95.76	36*$2.66 =$95.76	--	-$95.76
	Reimbursement for meals sold at full price	--	--	--	--	4*$0.36 =$1.44	+$1.44	4*$0.36 =$1.44	4*$0.36 =$1.44	--
	Revenue from reduced-price meal sales	36*$0.40 =$14.40	--	-$14.40	36*$0.40 =$14.40	--	-$14.40	36*$0.40 =$14.40	--	-$2.50
	Revenue from full price meal sales	--	--	--	--	--	--	4*$2.50 =$10.00	--	-$10.00
	Change in meal cost due to change in participation	--	--	--	--	-4*$1 =-$4.00	-$4.00	--	--	--
	Total	**$293.76**	**$293.76**	**--**	**$293.76**	**$291.20**	**-$2.56**	**$ 305.20**	**$295.20**	**-$10.00**

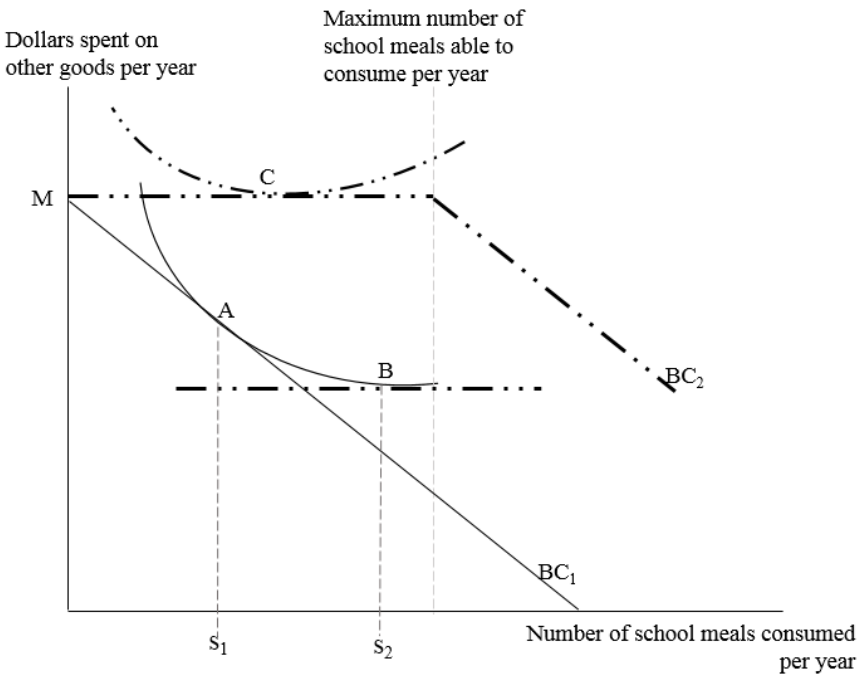
Notes: This table summarizes different scenarios of changes in a school's meal service revenue and meal reimbursements due to CEP implementation at a school with 100 students. If all subsidized students participate in the NSLP, a school can earn equal revenues from sales revenue and federal reimbursement by switching from traditional meal service to the CEP if it does not have any full price meal sales, regardless of its ISP. It is highly unlikely that a school where all subsidized students participate in the NSLP can financially benefit from CEP implementation.

Table 3.3 continued: Scenarios of Changes in Total School Meal Sales and Reimbursement Revenue

Student body composition	Source of revenue	Scenario 4			Scenario 5			Scenario 6		
		Prior to CEP	Under CEP	Change	Prior to CEP	Under CEP	Change	Prior to CEP	Under CEP	Change
	NSLP participants prior to CEP: NSLP participants with CEP in place:	50% of subsidy eligible students 50% of subsidy eligible students			50% of subsidy eligible students All students			50% of subsidy students and all others 50% of subsidy students and all others		
ISP=40%. Assume 40 direct certified students are eligible for free meals. 40*1.6= 64 students are eligible for subsidized meals. 64-40=24 students are eligible for reduced meals.	Reimbursement for meals served for free	20*$3.06 =$61.20	32*$3.06 =$97.92	+$36.72	20*$3.06 =$61.20	64*$3.06 =$195.84	+$134.64	20*$3.06 =$61.20	64*$3.06 =$195.84	+$134.64
	Reimbursement for meals sold at reduced price	12*$2.66 =$31.92	--	-$31.92	12*$2.66 =$31.92	--	-$31.92	12*$2.66 =$31.92	--	-$31.92
	Reimbursement for meals sold at full price	--	--	--	--	36*$0.36 =$12.96	+$12.96	36*$0.36 =$12.96	36*$0.36 =$12.96	--
	Revenue from reduced-price meal sales	12*$0.40 =$4.80	--	-$4.80	12*$0.40 =$4.80	--	-$4.80	24*$0.40 =$9.60	--	-$9.60
	Revenue from full price meal sales	--	--	--	--	--	--	36*$2.50 =$90.00	--	-$90.00
	Change in meal cost due to change in participation	--	--	--	--	-68*$1.00 =-$68.00	-$68.00	--	--	--
	Total	**$97.92**	**$97.92**	--	**$97.92**	**$172.80**	**+$42.88**	**$168.96**	**$197.28**	**+$28.32**
ISP=60%. Assume 60 direct certified students are eligible for free meals. 60*1.6= 96 students are eligible for subsidized meals. 96-60=36 students are eligible for reduced meals.	Reimbursement for meals served for free	30*$3.06 =$91.80	48*$3.06 =$146.88	+$55.08	30*$3.06 =$91.80	96*$3.06 =$293.76	+$201.96	30*$3.06 =$91.80	52*$3.06 =$159.12	+$67.32
	Reimbursement for meals sold at reduced price	18*$2.66 =$47.88	--	-$47.88	18*$2.66 =$47.88		-$47.88	18*$2.66 =$47.88	--	-$47.88
	Reimbursement for meals sold at full price	--	--	--	--	4*$0.36 =$1.44	+$1.44	4*$0.36 =$1.44	4*$0.36 =$1.44	--
	Revenue from reduced-price meal sales	36*$0.40 =$14.40	--	-$14.40	36*$0.40 =$14.40	--	-$14.40	36*$0.40 =$14.40	--	-$14.40
	Revenue from full price meal sales	--	--	--	--	--	--	4*$2.50 =$10.00	--	-$10.00
	Change in meal cost due to change in participation	--	--	--	--	-4*$1 =-$4.00	-$4.00	--	--	--
	Total	**$146.88**	**$146.88**	--	**$146.88**	**$243.20**	**+$96.32**	**$156.32**	**$159.12**	**+$2.80**

Notes: This table shows different scenarios of changes in a school's meal service revenue and meal reimbursements due to CEP implementation at a school with 100 students. Schools can benefit in terms of meal service revenues from implementing the CEP if only a portion of meal subsidy eligible students participate in the NSLP if non-subsidy eligible students participate (scenario 6) or participation of subsidized students increases under the CEP.

Figure 3.2: Budget Constraint and Indifference Curve



Notes: This figure illustrates the budget constraints and indifference curves for a student who experiences a reduction in cost, through a decrease in price and through decreased stigma and administrative burden, due to CEP implementation, as shown by a shift from BC_1 to BC_2.

The number of school meals consumed per year is plotted on the X-axis and dollars spent on goods other than school meals per year are plotted on the Y-axis. This simplification arises from $M = P_xX + \sum P_yY_i, = P_xX + P_yY$, where $P_y=1$. BC_1 displays the initial budget constraint and BC_2 displays the budget constraint after CEP implementation. It is horizontal up until the maximum amount of school meals a student can consume in one year because those meals can be consumed at no charge.

Economic theory predicts that a student who initially consumes s_1 school meals will increase his or her consumption of school meals, unless school meals are a giffen good. Point *C* illustrates a scenario were school meals are an inferior good. Yet, school meal consumption will increase after CEP implementation because the substitution effect is bigger than the negative income effect.

4. LITERATURE REVIEW

It is well established that greater dietary quality and food security is linked to improved health, behavioral and academic outcomes. National school meal programs provide a significant opportunity to impact children's nutrition and food security and therefore have been studied extensively with respect to these outcomes. Additionally, a number of studies examine the relationship between school meal availability and participation and academic and weight outcomes directly. Empirical studies typically distinguish between National School Lunch (NSLP) and School Breakfast Program (SBP) participation. Less empirical work has been conducted on the effects of the changes implemented under the 2010 Healthy, Hunger Free Kids Act (HHFKA). Studies that analyze the Community Eligibility Provision (CEP) to date have mainly focused on school-level participation and changes in student participation rates. This chapter provides a brief overview of the existing literature in the above described areas of focus.

Individual School Meal Participation

Existing studies, mainly found in the medial literature, establishes that there is a positive relationship between food sufficiency and academic outcomes, child behavior (Alaimo et al. 2001), and a healthy weight (Gundersen and Kreider 2009). Similarly, students that consume higher quality diets are found to perform better (Glewwe et al. 2001, Winicki and Jemison 2003, Alderman 2006). Economic literature also finds that the quality of school meals is positively related to student achievement. Belot and James (2011) and Andersen et al. (2017) come to this conclusion when looking at the impact of

schools switching to a new food service provider that serves healthier meals on students' academics.

Studies that have looked at the impact of NSLP or SBP participation on food security and dietary quality have also largely found a positive effect. While Gao (2012), using the time a child has available to eat lunch as an instrumental variable, does not find a significant effect on food security, Huang and Barridge (2016) find that NSLP participation is associated with a reduction in food insufficiency risk by 14 percent, using a fixed effect regression model. Artega and Heflin (2014) have similar conclusions. Looking at the impact of SBP participation on food security, Bartfeld and Ahn (2011) find no change in a child's risk of being considered food insecure, but a reduction in a child's risk of being close to the food insecurity threshold.

Gleason and Suitor (2003) employ student-level fixed effects to estimate the impact of NSLP participation on nutrient intake and find that it increases both the intake of valuable nutrients and the intake of fat, and decreases the intake of sugar. Bhattacharya et al. (2016) also conclude that NSLP participation leads to increased nutritional quality of the foods consumed. These findings are strengthened further by Gordon (1995) and Akin et al. (1983) who find a positive impact on children's nutrition, especially for low income children. In contrast, Campell et al. (2011) find that NSLP participants consume a higher quantity of food, but do not consume higher quality food. Using a fixed effect regression model, this paper finds no significant difference in dietary outcomes. With respect to SBP participation, Crepinsek et al. (2006) randomly assign schools to offer universally free breakfast and find that students at the treatment schools consume higher nutritional

quality breakfasts, but daily nutrient intake was not impacted. Yet, Bhattacharya et al. (2004) find that SBP participation leads to improvements in a variety of nutritional outcomes. It is worth noting that, as Bhattachary et al. (2016) point out, studies that focus on nutrition outcomes rely on highly unreliable 24 hour recall data.

Despite the overwhelmingly positive evidence of school meal participation on food security and diet quality, the results of empirical research with respect to the effect of NSLP participation on weight and academic outcomes are inconclusive. In contrast, research with respect to the impact of SBP participation points to a positive impact on weight and academic outcomes. Discrepancies in findings likely arise due to endogenous selection and selection bias. Because there is a positive relationship between school meal participation and children's weight, and a negative relationship between school meal participation and dietary quality (Millimet et al. 2010), a causal effect of school meal participation on individual outcomes is difficult to identify.

Schanzenbach (2009) employs a regression discontinuity design that takes advantage of the income cutoff of reduced price meal eligibility and finds that NSLP participation increases a child's likelihood of being obese. Using data from the same survey, the Early Childhood Longitudinal Study (1998-1999), Millimet et al. (2010) analyze the impact of long term NSLP and SBP participation and similarly concluded that NSLP participation exacerbates youth obesity issues. Additionally, this study points out that the mechanism by which NSLP participation impacts weight outcomes is not clear. Capogrossi et al. (2016) find that both short and long term participation in the NSLP increases the probability of being overweight. In contrast, Gundersen et al. (2012) employ an

instrumental variable strategy and find that under weak assumptions NSLP actually leads to a decrease in the likelihood of being obese and other negative health outcomes. Gleason and Dodd (2009) find that SBP participation, but not NSLP participation, is associated with a lower Body Mass Index (BMI). This result is strengthened by Millimet et al. (2010) who point out that there is non-random selection into the program. When accounting for selection bias, SBP participation is found to lead to decreased rates of obesity.

Most studies that look at academic outcomes focus on the SBP. Yet, Hinrichs (2010) employs a change in the formula used to allocate state funding as an instrumental variable to estimate the effect of NSLP participation on adult health outcomes and educational attainment. He finds no effect on long term health outcomes, but a positive impact on adult educational attainment. Imberman and Kugler (2014) and Frisvold (2015), using a regression discontinuity design as well as a difference-in-difference model, find that SBP availability leads to increased student achievement. In contrast, Schwanzenbach and Zaki (2014) and Leos-Urbel et al. (2013) do not find an effect of SBP access on academic outcomes.

While school meal participation is largely found to positively impact children's food security and nutrient intake, studies that look directly at the impact on student outcomes provide less clear conclusions. Overall, evidence for the impact of NSLP participation is mixed, and recent studies seem to point to predominantly higher weight outcomes. This is important because obesity has become the number one health problem facing children in the United States (Cawley 2010) and is especially prevalent among lower socio-economic

populations (Rosin 2008). With respect to the SBP, evidence points to mostly decreased weight outcomes, and to a somewhat weaker but mostly positive relationship between SBP participation and academic achievement.

Determinants of School Meal Program Participation

Literature that examines the determinants of individual's school meal program participation can provide insights into the mechanism of how the CEP leads to increased participation rates. Moore et al. (2009) find that school type is the biggest determinant of participation. Elementary students are more likely than middle school students to participate and high school students are the least likely to participate (Moore et al. 2009, Newman and Ralston, 2006). Ohri-Vachaspati (2014) argues that students whose parents perceive the quality of school meals to be greater are more likely to participate. With respect to the effect of price changes on participation, Akin et al. (1983) find that a 50 percent increase in the price of school lunch is expected to reduce participation by 20 percent. Analogously, Gleason (1995) finds a negative relationship between meal participation and price.

The SBP was made available to all students at no charge in New York City schools starting in school year 2003. Leos-Urbel et al. (2013) find that this change to universally free breakfast resulted in increases in participation, both for students who previously were eligible to receive reduced price and free breakfast meals, as well as for students who had to pay full price before the policy change. Similarly, schools with a high

portion of needy schools in Guildford County in North Carolina offered free breakfasts to all students during school year 2007-08. Ribar and Haldeman (2013) exploit the reversal of this policy and find that the switch from universally free to eligibility-based pricing led to significant reductions in SBP participation for students who were eligible for breakfast subsidy before and after the policy change and for students that were no longer eligible. Leos-Urbel et al. (2013) conclude that these findings suggest that there is some type of non-price mechanism that affects school meal participation, but that it is difficult to conclude that participation increases due to a reduction in stigma.

Other studies have found a direct relationship between peer effects and student meal participation. Holford (2015) looks at the take-up of free school meals in the United Kingdom and finds that a 10 percentage point increase in peer-group take-up reduces non-participation by 29 to 35 percent. Similarly, Mirtcheva (2009) estimates that a 10 percent higher free meal eligibility rate at a student's school is associated with a 1.8 percentage point increase in the probability of school meal participation, a 6.7 percentage point increase in the probability of participation in reduced price school meals and a 2.6 percentage point increase in free school meal participation.

Healthy, Hunger Free Kids Act of 2010

Implementation of the updated nutrition standards was highly controversial with concerns of decreased student meal participation, increased food waste, and increased food service costs. Accordingly, a few studies have looked into the impact on plate waste, and some research has been conducted that evaluates the impact of meal standard updates

on student's food selection and meal participation. Overall, there is evidence of improvements in children's nutrition, specifically increased fruit and vegetable consumption, and little indication that there is a decrease in student participation or an increase in plate waste in response to the updates. Consistent with the results of a number of previous studies that have looked at different nutrition intervention or obesity prevention programs that have been implemented on a more local level (Cluss et al. 2014, Taber et al. 2013, Nanney et al. 2014, Struempler et al. 2014), overall evidence points to improvements in children's nutrition, specifically increased fruit and vegetable consumption, and little indication that there is a decrease in student participation or an increase in plate waste in response to the new standards.

To estimate the effect of the updated nutrition standards on food selection and consumption, Schwartz et al. (2015) collect data at 12 middle schools in an urban, low-income school district during school year 2011-12 and during school years 2012-13 and 2013-14, after the nutrition requirement updates went into effect. They find that the percentage of students choosing to consume fruit increased significantly from 54 to 66 percent and find that fewer entrees and vegetables were thrown away after the new meal standards were implemented. Johnson et al. (2016) look at daily food selection data from January 2011 through January 2014 in an urban school district in Washington State and find no real changes to student meal participation rates, but improvements to the nutritional quality of food consumed by students after implementation of the nutrition updates. Cohen et al. (2014) examine several elementary schools in a low-income, urban school district in Massachusetts before and after implementation of the nutrition updates

and find that schools mostly comply with the standards before and after the update. On an individual student level, they find no impact on student selection of entrees and vegetables, but a 23 percent increase of fruit selection. Additionally, this study also finds that entrée consumption increases by 15.6 percent and vegetable consumption by 16.2 percent post implementation of the updated standards, suggesting that the Act in fact has contributed to improvements in school meal nutrition and has not led to increased plate waste.

Community Eligibility Provision

Much of the existing literature on the Community Eligibility Provision (CEP) focuses on the effect of school level implementation on school-level participation rates. As mandated by the HHFKA, an evaluation of the CEP was published in February 2014, and its year 3 addendum in January 2015 by the USDA. These reports provide information on the implementation of the CEP as well as incentives and barriers for adoption, and operational issues in administering the CEP. Additionally, an impact study aims to gain insights in the impact of CEP implementation on students' participation, school meal revenues and costs, certification errors and meal quality (Logan et al. 2014 and Harkness et al. 2015).

Using a matched comparison design approach, Logan et al. (2014) find that local education agency and school CEP implementation leads to a 5-10 percent increase in breakfast and lunch program participation compared to similar, eligible, non-participation local education agencies or school (similar results are found by Harkness et al (2015) in

the Year 3 Addendum of the CEP evaluation report). The studies find no evidence that CEP implementation has an impact on meal quality or overall meal claiming error but suggest that CEP implementation eliminated errors and cost associated with the processing of income-based free or reduced meal applications. However, due to the design of the studies, these results assess the effect on school districts or schools that have chosen to participate. Generalization of these results is difficult because CEP implementation is likely determined by unobserved, heterogeneous district or school characteristics (Logan et al. 2014).

Kwon et al. (2015) and Henry (2015) also find an increase in participation associated with the first year of CEP implementation in Chicago elementary schools and Kansas, respectively. Kwon et al. (2015) evaluate monthly meal count data for school years 2011-2012 and 2012-13 at six schools that adopted the CEP for this school year. They estimate a 28 percent increase in SBP participation and a 7 percent increase in NSLP participation. Henry (2015) finds a 6.5 percent increase in breakfast program participation and a 3.4 percent increase in lunch program participation. This study additionally examines the impact of CEP implementation on local education agencies and food service departments and finds that schools that implemented the CEP in Kansas, on average, receive increased meal reimbursement of 4 percent per meal.

Moore (2016) examines the perception of principals and food service workers in a qualitative analysis by administering surveys regarding implementation of the CEP to 68 CEP schools in a county in Kentucky. Based on the participants' perceptions, this study

concludes that perceived benefits seem to outweigh barriers to implementation. Overall satisfaction with the provision among schools that have implemented appears to be high.

In conclusion, existing literature has found increases in school meal participation due CEP implementation. Findings from the literature on school meal participation suggest that these increases likely stem from both a price and a non-price effect. Participation increases among students who already qualified to receive subsidized school meals indicate the presence of a non-price mechanism, such as a reduction in social stigma. In essence, CEP implementation can be seen as a way to increase all students' access to school meals.

While school meal access and participation overall is found to be positively related to students' food security and nutrient intake, the impact of participation on weight and academic outcomes is controversial. Consequently, it is not clear that CEP implementation benefits students' health, behavior, and academic performance. This thesis contributes to the existing literature by empirically evaluating the impact of school-level CEP implementation on these outcomes. Additionally, because it exploits a natural experiment that provides increased incentive to participate in school meals to all students, the results of this study may help provide understanding for how students who do not self-select into school meal programs prior to CEP implementation are impacted by participation in national school meal programs.

4. DATA OVERVIEW

The analysis combines three data sets. First, annual data on public schools that participate in the National School Lunch Program (NSLP) in Michigan, Illinois, Kentucky, Ohio, West Virginia, New York, Florida, Maryland, Texas and California with specific information on each school's annual Community Eligibility Provision (CEP) eligibility and participation status were received by request from each state's education agency. These data are then merged with the Common Core Data (CCD) of the Department of Education's National Center for Education Statistics, an annual collection of information on all public schools in the United States. Together, the data provide information on every public school in the CEP pilot states from 2010-11 to 2014-15 school years.

Student data used in this analysis are provided by the restricted-access versions of the Early Childhood Longitudinal Survey, Kindergarten Class of 2010-11 (ECLS-K: 2011). This study comprises a nationally representative sample of children that are followed from kindergarten through fifth grade. It conducts individual assessments and provides information from interviews with students' schools, their teachers and parents. The restricted-access version provides the NCES School ID, allowing for the data to be combined with the above data set by school and school year. The ECLS-K: 2011 initially collected data from a nationally representative sample of 18,170 children enrolled in 970 schools across the United States, during school year 2010-11.[11]

[11]Observations rounded to nearest 10 as per data license restriction.

Due to students dropping out of the study, these data are an unbalanced panel over four consecutive school years. This analysis focuses on students that attend a school in a CEP pilot state during 2010-11 to 2013-14 school years. It excludes students that change schools during a school year, but retains students that change schools between school years. Currently, ECLS-K data are only available to school year 2013-14 and the most recent data were collected in the spring of 2014. This limits the analysis to school years 2010-2011 (pre-CEP), 2011-12 (Michigan, Illinois and Kentucky authorize the CEP), 2012-13 (New York, West Virginia and Ohio authorize the CEP) and 2013-14 (Florida, Georgia, Maryland and Massachusetts authorize the CEP).

While schools implement the CEP at the beginning of a school year, ECLS-K variables are collected throughout the fall and spring of each school year.[12] For some variables and children, two observations, one for the fall and one for the spring semester, per school year are available. For most variables only one observation per school year is available, collected either during the fall or the spring. To determine the impact of the CEP, the spring observation is used when available, even if two observations are available for the school year. When only a fall observation is available, this observation is used and a binary variable is coded in order to indicate that the data point was collected during the fall. This allows to control for more exact timing of effects.

[12]The restricted ECLS data to date are available for seven periods. Period one data were collected during the fall of school year 2010-11, period 2 data were collected during the spring of school year 2010-11, period 3 data were collected during the fall of school year 2011-12, and so forth. During school year 2013-14, only one round of data collection occurred. These data, period 7 data, were collected in the spring of school year 2013-14.

One challenge of this analysis stems from the limitations of states' records on Identified Student Percentages rates (ISPs). While all states provided annual lists with records of all CEP participating schools, not all states maintain records of every school's ISP. Specifically, Illinois did not provide ISPs for any of its schools and New York and Georgia do not maintain records of non-CEP schools' ISP. For these states, schools or school districts calculate their ISP and the state verifies this once a school or district applies for CEP participation. Thus, for New York and Georgia, the ISP is only available for CEP participants. Additionally, for their first year of CEP implementation, Michigan, Illinois and West Virginia only provided lists with CEP participating schools. Consequently, for school year 2011-12 in Michigan and Illinois and for school year 2012-13 in West Virginia, the ISP is also only available for these participating schools. Hence, school-level CEP eligibility cannot consistently be defined based on a school's ISP. Additionally, schools can apply jointly to implement the CEP, even when an individual school's ISP does not exceed 40 percent. Figure 5.1 shows the distribution of CEP participating schools' ISPs.[13] The data indicate that the 40 percent cutoff is somewhat arbitrary as a number of schools with an ISP of less than 40 percent participate in the CEP by combining with other schools. Still, a large majority of schools that have the CEP in place in fact have an ISP that exceeds 40 percent.

[13]Only CEP schools for which the ISP is provided in the state data are included in the figure.

Definition of School-level Eligibility

A measure of school-level eligibility to implement the CEP that is available for all schools is required to define a control group of students who attend schools that are eligible for the CEP but have not implemented it. To avoid selection bias, four different measures are constructed for this thesis.

The primary definition of school-level CEP eligibility used in this analysis is based on a school's school-wide Title 1 status throughout the sample. As described in Chapter 3, schools are eligible for school-wide Title 1 that provides federal financial assistance to the school if at least 40 percent of enrolled children are from low income families. Schools and districts are allowed some flexibility in the measuring of the percentage of low income families. Consequently, while eligibility for school-wide Title 1 can be based on the same criteria as eligibility for the CEP, it may differ slightly in some cases.[14] However, schools that have school-wide Title 1 in place are highly likely to also qualify for the CEP. This definition of CEP eligibility leads to the smallest control group in the analysis. 31 percent of students in the sample attend a school that has school-wide Title 1 status during all years of the sample period.

Secondly, school-wide eligibility is relaxed to a school having school-wide Title 1 status at some point in the sample instead of throughout the sample. The control group constructed with this definition is bigger and may include schools that experience changes in the composition of the student body or schools that are closer to the eligibility

[14]Again, depending on availability of data, schools may measure poverty by the percentage of children that are in enrolled in subsidized meal programs, the percentage of students that are direct certified, or the share of students from low-income families determined through state income surveys.

cutoff and consequently don't have Title 1 status during all years of the sample. 63 percent of students in the sample attend a school that has school-wide Title 1 status at some point during the sample period.

Alternatively, a measure of a school's percentage of students who are direct certified, a proxy for ISP, is used to define a control group according to the criteria that is used by the states to determine CEP eligibility. The proxy is calculated by dividing a school's percentage of free and reduced-price eligible students from the states' CEP data by 1.6, the reimbursement multiplier used by the Food and Nutrition Service (FNS).[15] Where the percentage of free and reduced price students is not available, it is calculated by dividing the number of free and reduced price eligible students by total enrollment. Where this count is missing in the CEP data, the number of free and reduced price eligible students from the CCD data is used. When no information other than the ISP on the number of eligible students is available, the ISP is also used as the proxy. Figure 5.2 shows the distribution of CEP participating schools' proxy ISPs.

Discrepancies between Figure 5.1 and 5.2 arise because the ISP is missing for a number of schools, but also because schools self-report the number of meal-subsidy eligible students and these number appear to be somewhat unreliable.[16] When the ISP proxy is calculated based on the percentage of free and reduced price eligible students, it

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[15]Because students who are eligible for free school meals based on their household income falling below the 130 percent threshold of the FPL are also eligible to enroll in SNAP, a school's percentage of students who are eligible for free meals should be roughly equal to a school's percentage of direct certified students. Yet, large discrepancies exist in the CCD data so that the measure of the percentage of free-eligible students is determined unreliable and thus eliminated as an alternative measure of a school's percentage of direct certified students for this analysis.

[16] For example, a number of schools in the CCD report a number for students who are eligible for free and reduced-price meals that exceeds the school's total enrollment in a given year.

cannot exceed 62.5 percent so that Figure 5.2 shows a large number of schools with a proxy of 62.5 percent.[17] Distributions of ISPs and proxy ISPs of all elementary schools in pilot states are shown in figures A.1 and A.2 in Appendix A.

Based on the ISP proxy, the last two definitions of eligibility are constructed. The third definition of school-level eligibility includes all schools with a proxy ISP that is greater than 40 percent. The last definition also includes schools that lie just below this threshold, but may be eligible to implement the CEP when grouped with other schools, eligibility is constructed on a state-to-state basis. A school is considered eligible to implement the CEP if its ISP Proxy exceeds the minimum ISP Proxy of all CEP participating schools in a state.

Table 5.1 summarizes schools' proxy ISPs in each state. The average proxy ISP of all CEP participating schools in the pilot states is 53.4 percent. In comparison, the average proxy ISP for non-CEP elementary schools is 33.4 percent. In all pilot states, the average proxy ISP for CEP schools lies above the 40 percent threshold, but except for Maryland there is at least one CEP-school in each state with a proxy ISP that is lower than 40 percent. Again, this table illustrates that schools do implement the CEP in groups. In all pilot states the average proxy ISP for CEP schools is between 45.3 percent (West Virginia) and 59.7 percent (Maryland). In Illinois the minimum proxy ISP of all CEP-schools equals 13.4 percent, representing the smallest proxy ISP of all CEP-schools in the

[17]If the percentage of free and reduced price eligible students at a school equals 100 percent, the corresponding proxy is 62.5 percent= 100/1.6. However, a school's actual ISP may exceed this percentage if a bigger percentage of meal subsidy eligible students than 62.5 are direct certified to receive free school meals.

pilot states. On the other hand, all pilot states except for West Virginia have at least one non-CEP school with an ISP proxy that is smaller than 1 percent.

Table 5.2 provides a summary of the percentage of schools that are considered eligible to implement the CEP according to the four definitions of eligibility in this analysis. Based on all four definitions, the percentage of eligible CEP participating schools exceeds the percentage of eligible non-participating schools by substantial margins. 80.7 percent of CEP schools are considered eligible if school-wide Title 1 throughout the sample is used to define eligibility. Basing eligibility on the minimum ISP Proxy of all CEP schools leads to 100 percent of CEP schools being considered eligible to implement the CEP. The percentage of CEP schools that are considered eligible to implement the CEP lies in between these two percentages for the remaining definitions of eligibility. Of schools that have not implemented the CEP, 37.8 percent are considered eligible according to the minimum Proxy ISP definition and 52 percent are considered eligible if school-wide Title 1 is used to define eligibility. Again, the percentage of non-CEP schools that are considered eligible to implement the CEP according to the remaining definitions lies in between the two percentages. Regardless of the definition for school-level eligibility to implement the CEP, a significant percentage of schools that have not implemented the CEP are considered eligible to do so, which is consistent with estimates based on schools' actual ISPs.

After merging the ECLS-K data with state CEP and CCD data, Table 5.3 summarizes the percentage of students in each school year and state that attend a school that has authorized the CEP. Due to the nature of the sampling process of the ECLS-K,

there are no student observations in Kentucky in the ECLS-K data set. None of the students in the data in West Virginia and Maryland attend a school that has implemented the CEP. Consequently, West Virginia and Maryland are omitted from the analysis and this analysis is limited to Michigan, Illinois, Kentucky, New York, Ohio, Florida, and Georgia. With 410 student-level observations from 270 students over time who attend a school that implements the CEP, the treatment group is small and limits this analysis.[18]

To provide an overview of the student-level data from the ECLS-K, summary statistics are provided in the following section. Table 5.4 provides a summary of school characteristics, table 5.5 summarizes student characteristics and Table 5.6 summarizes the outcomes. Means are provided for all students, for students that attend a school that has implemented the CEP, and for students that attend a school with school-wide Title 1 status during the entire sample, that has not implemented the CEP. School-wide Title 1 status throughout the sample is chosen as the definition for school-level eligibility because it most conservatively constructs the control group.

Table 5.4 provides an overview of the average racial composition of schools in the sample, as well as their size, location, Title 1 status, and percentage of students who are eligible for meal subsidies. CEP-schools, on average, have more black students, are smaller, and more likely to be located in a rural area than non-CEP schools. Of the students at non-CEP schools, on average, 72.9 percent are eligible for meal subsidies, compared to 82.4 percent at CEP schools. Yet, this percentage is significantly higher than

[18]Observations rounded to nearest 10 as per data license restriction.

the average percentage of students that qualify for subsidized meals at all schools in the sample, 51.2 percent.

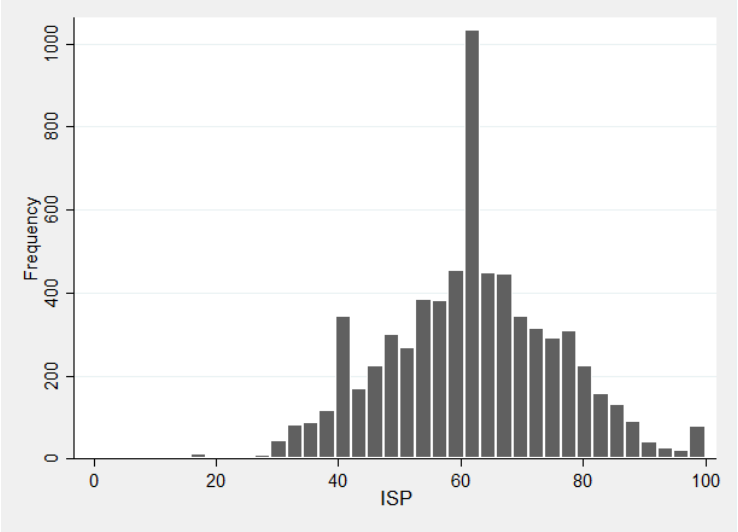
Table 5.5 summarizes the characteristics of students, including race, gender, age, birthweight, highest parental education, household size, eligibility for meal subsidies and whether a student reports consumption of school meals. The indicator variable “eligible for meal subsidy” equals one when a child is eligible to receive free or reduced school meals based on his or her parent’s income or participation in federal means tested programs. The indicator variable “school meal participation” indicates whether a student participated in the NSLP at some point during the analysis. Because the ECLS-K collected this variable only during the first two years of the survey, the data available do not allow for inferences of how CEP implementation affect student school meal participation. Based on t-tests, students who attend a CEP school, on average, are more often black, older, have parents with less education and are more likely to qualify for meal subsidies than students at non-CEP schools. Students at CEP schools are more likely to report that they consume school meals than students at all schools, but equally likely to report consumption as students at the control schools. Similarly to school characteristics, the averages for students who are part of the control group lie in between the averages of all students and students who attend a CEP school.

Table 5.6 summarizes individual student outcomes. BMI is included in this analysis as a variable for students’ health. It is a continuous variable with a mean of 17.5. Reading, math, science, cognitive flexibility and working memory test scores are included as academic outcomes. Instead of raw scores, item response theory (IRT)

calculated test scores are used for these direct cognitive assessments to allow for better comparison across students and time. All five direct cognitive assessment variables are continuous, but ranges are different for each score. Next, teacher assessments of attentional focus and inhibitory control, as well as whether a student is held back a grade, are included. Assessments of attentional focus and inhibitory control are based on the judgement of a student's teacher and rated on a continuous scale from one to seven. Based on the grade a student attains at each round of data collection, a binary variable for whether the student has been held back a grade is calculated and included as a teacher assessment. Finally, behavioral assessments of motivation, cooperation, and attention, as evaluated during administration of the survey, are included. These variables are categorical and have five initial categories that are collapsed into three.

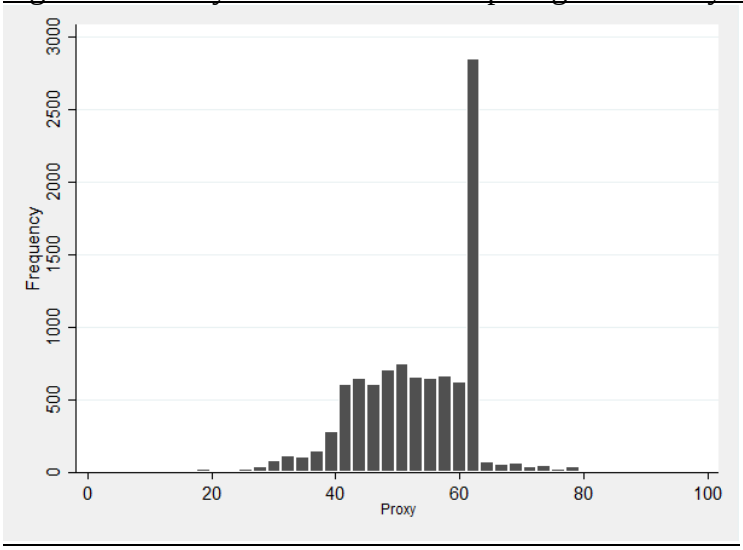
Differences in the number of observations stem from a number of missing data points throughout the data set. Most notably, students who attend a CEP school, on average, appear to have a higher BMI, higher math, reading and science test scores, but lower assessment test and teacher assessment scores, and are more likely to be held back a grade than students at control schools.

Figure 5.1: ISPs of CEP Participating Elementary Schools



Notes: Figure displays the number of CEP schools for a given ISP where ISP is the percentage of students at a school who are direct certified and therefore automatically qualify for free school meals. A school's ISP has to exceed 40 percent in order for it to implement the CEP individually. Schools with ISPs below 40 percent may qualify to implement the CEP when grouped with other schools that have an ISP above 40 percent. N=6,888. Mean=61.7. Standard Deviation=14.4.
Source: Individual State CEP data, school years 2011-12 to 2014-15.

Figure 5.2: Proxy ISPs of CEP Participating Elementary Schools



Notes: Figure displays the number of CEP schools for a given proxy ISP, where the proxy is calculated by dividing the percentage of students that qualify for free or reduced-price schools meals by 1.6, the reimbursement multiplier authorized by the Food and Nutrition Service. By calculation, schools where 100 percent of students are eligible for subsidized school meals have a proxy of 62.5 percent. The proxy is calculated because the ISP is not available for all schools.
N=10,113. Mean=53.4. Standard Deviation =10.2.
Sources: Individual State CEP data and Common Core of data, school years 2011-12 to 2014-15.

Table 5.1: Summary of Proxy ISP by State

State	Elementary Schools with CEP				Elementary Schools without CEP			
	Mean	Min	Max	N	Mean	Min	Max	N
Michigan	52.7	15.3	64.0	743	32.0	0.0	62.5	9,164
Illinois	59.7	13.4	62.5	490	32.8	0.0	62.5	7,880
Kentucky	50.9	29.6	100.0	427	39.7	0.3	84.8	2,739
New York	50.8	15.0	68.2	223	25.7	0.0	62.0	8,164
Ohio	59.6	25.0	62.5	399	33.7	0.5	62.5	7,106
West Virginia	45.3	14.6	80.4	265	36.4	6.4	62.5	1,580
Florida	53.8	16.2	93.3	530	37.5	0.0	94.0	8,744
Maryland	59.7	57.2	62.1	3	30.0	0.0	62.5	3,781
Georgia	50.4	30.0	62.3	448	38.9	0.0	62.4	4,831
All Pilot States	53.4	13.4	100.0	3,528	33.4	0.0	94.0	63,025

Notes: The above table summarizes the proxy ISP of CEP and non-CEP schools in the pilot states from school year 2011-12 to 2013-14. The mean proxy ISP lies well above the 40 percent threshold, but in all states except Maryland at least one school that has the CEP in place has a proxy ISP of less than 40 percent. The mean proxy ISP of CEP schools is significantly higher than the mean proxy ISP of non-CEP schools in each state.
Sources: Individual State CEP data and Common Core of data, school years 2011-12 to 2013-14.

Table 5.2: Percentage of Elementary Schools Considered Eligible for CEP

Definition of school-level eligibility for CEP implementation	CEP schools	Non-CEP schools
Percent of elementary schools with continuous school-wide Title 1 status throughout sample	80.7%	41.1%
Percent of elementary schools with school-wide Title 1 status at some point in sample	91.4%	52.0%
Percent of elementary schools with Proxy ISP above 40 percent	93.5%	40.1%
Percent of elementary schools with Proxy ISP above state minimum Proxy ISP of CEP schools	100%	37.8%

Notes: Table summarizes the percentage of CEP and non-CEP schools that are considered eligible to implement the CEP according to the four definitions of school-level eligibility employed in this analysis.
Sources: Individual State CEP data and Common Core of data, school years 2011-12 to 2013-14.

Table 5.3: Percentage of Students in ECLS-K Data who Attend a CEP School by State

State	SY 2011-12	SY 2012-13	SY 2013-14
Michigan	7.2%	9.8%	1.3%
Illinois	0%	0%	6.5%
New York	--	10.7%	9.5%
Ohio	--	19.6%	20.9%
West Virginia	--	0%	0%
Florida	--	--	5.2%
Georgia	--	--	32.2%
Maryland	--	--	0%

Notes: A total of 410 observations are associated with students at a CEP. Of the sample, 210 students attend a school that has the CEP in place at some point during the sample period.[19] There are no observations of students who attend a school that implements the CEP in West Virginia or Maryland in the ECLS-K data.

[19]Observations rounded to nearest 10 as per data license restriction.

Table 5.4: Summary Statistics of Students' Schools

	All students			Students at school-wide Title 1 schools	Students at CEP schools	Column 2 - column 3
Characteristics	Mean (SD)	Min	Max	Mean (SD)	Mean (SD)	Difference
Percent white	48.26	0	98.67	26.97	33.94	-0.07***
Percent black	21.09	0	100.00	31.68	40.29	-0.08***
Percent Hispanic	21.75	0	97.91	33.32	17.87	0.15***
Percent Asian	5.48	0	83.46	4.98	2.96	0.02***
Percent other minorities	3.41	0	54.98	3.04	5.20	-0.02***
Enrollment	617.78 (282.30)	82	2628	688.36 (297.48)	478.22 (220.64)	210.14***
City	0.14	0	1	0.17	0.12	0.05**
Suburb	0.07	0	1	0.02	0.01	0.01
Town	0.48	0	1	0.39	0.19	0.20***
Rural	0.31	0	1	0.42	0.68	-0.25***
Title 1 Status	0.82	0	1	1	1	--
Percent free eligible students	43.29	1.48	99.49	63.71	72.36	-8.66***
Percent reduced eligible students	7.96	0	78.04	9.21	10.76	-1.55***
N	9,830[a]			2,790[c]	410[b]	

Note: Standard deviations omitted on indicator variables. Observations rounded to nearest 10 as per data license restriction. The final column provides the results of a two sample t-test that the means of students at Title-1 schools are significantly different from the means of students at CEP schools. *** p<0.01, ** p<0.05, * p<0.1

[a]0.3% of observations for *percent white, percent black, percent Hispanic, percent Asian, percent other minorities* and *enrollment* are missing. 3.8% of observations are missing for *Title 1 status* and 6.8% of observations are missing for *percent free eligible* and *percent reduced eligible*.

[b]3.4% of observations for *percent free eligible* and *percent reduced eligible* are missing.

[C]12% of observations for *percent free eligible* and *percent reduced eligible* are missing.

Table 5.5: Summary Statistics of Student Characteristics

	All students			Students at school-wide Title 1 schools	Students at CEP schools	Column 2 - column 3
Characteristics	Mean (SD)	Min	Max	Mean (SD)	Mean (SD)	Difference
White	0.69	0	1	0.59	0.55	0.04
Black	0.23	0	1	0.36	0.47	-0.12***
Hispanic	0.25	0	1	0.37	0.21	0.16***
Asian	0.10	0	1	0.10	0.04	0.06***
Native	0.02	0	1	0.03	0.03	-0.01
Male	0.51	0	1	0.52	0.50	0.01
Age (months)	91.20 (15.80)	62.93	133.89	91.13 (15.81)	106.00 (11.59)	-14.88***
Birth weight (lbs.)	6.82	0	1	6.76	6.60	0.16*
Highest Parental Education: No Degree	0.09	0	1	0.17	0.16	0.01
High school	0.51	0	1	0.60	0.68	-0.08***
Bachelor	0.35	0	1	0.21	0.14	0.07***
Masters	0.05	0	1	0.02	0.01	0.00
Household size	4.59 (1.34)	2	14	4.62 (1.31)	4.67 (1.11)	-0.05
Subsidy eligible	0.53	0	1	0.77	0.81	-0.05*
Free meal eligible	0.42	0	1	0.65	0.72	-0.07**
Reduced meal eligible	0.10	0	1	0.12	0.09	0.03
Meal participant	0.76	0	1	0.89	0.89	0.01
N	9,800[a]			2,790[c]	400[b]	

Note: Standard deviations omitted on indicator variables. Observations rounded to nearest 10 as per data license restriction. The final column provides the results of a two sample t-test that the means of students at Title-1 schools are significantly different from the means of students at CEP schools. *** p<0.01, ** p<0.05, * p<0.1

[a]18% of observations for *subsidy eligible, free meal eligible, reduced meal eligible* and *household size* are missing. More than 25% of observations are missing for *birth weight.*

[b]29% of observations for *subsidy eligible, free meal eligible, reduced meal eligible* and *household size* are missing. More than 25% of observations are missing for *birth weight.*

[c]22% of observations for *subsidy eligible, free meal eligible, reduced meal eligible* and *household size* are missing. More than 25% of observations are missing for *birth weight.*

Table 5.6: Summary Statistics of Student Outcomes

	All students				Students at school-wide Title 1 schools		Students at CEP schools		Column 2 – column 3
Characteristics	Mean (SD)	Min	Max	N	Mean (SD)	N	Mean (SD)	N	Difference
Health									
BMI	17.45 (3.32)	6.46	43.93	9,560	17.93 (3.74)	2,710	18.81 (4.04)	400	-0.87***
Test scores									
Reading IRT	89.97 (22.58)	30.76	134.21	9.670	87.30 (21.91)	2,750	99.05 (16.55)	400	-11.75***
Math IRT	72.94 (24.41)	8.94	133.02	9,650	69.21 (23.46)	2,750	83.58 (21.91)	400	-14.37***
Science	41.97 (13.00)	14.80	76.32	9,560	39.18 (12.60)	2,750	46.52 (10.95)	400	-7.34***
Cognitive Flexibility	11.43 (4.79)	0.00	18.00	9,620	11.16 (4.76)	2,750	7.20 (2.87)	400	3.96***
Working Memory	95.75 (18.25)	20.00	179	9,650	92.91 (18.75)	2,750	93.88 (20.26)	400	-0.97
Teacher Assessment									
Attentional Focus	4.23 (1.41)	1	7	8,220	4.13 (1.47)	2,310	3.31 (1.24)	350	0.82***
Inhibitory Control	4.42 (1.29)	1	7	8,150	4.31 (1.28)	2,300	3.53 (1.00)	350	0.78***
Held back a grade	0.02	0	1	9,050	0.03	2,530	0.06	390	-0.03***
Assessment Test									
Motivation	3.70 (0.93)	1	5	9,580	3.52 (0.92)	2,250	3.58 (0.91)	400	-0.06
Cooperation	4.16 (0.80)	1	5	9,580	4.05 (0.80)	2,260	4.06 (0.83)	400	-0.01
Attention	3.73 (1.00)	1	5	9,580	3.53 (0.98)	2,250	3.57 (0.98)	400	-0.04

Note: Standard deviations omitted on indicator variables. Observations rounded to nearest 10 as per data license restriction. The final column provides the results of a two sample t-test that the means of students at Title-1 schools are significantly different from the means of students at CEP schools. *** p<0.01, ** p<0.05, * p<0.1

5. EMPIRICAL SPECIFICATION

Difference-in-Difference Estimation

The effect of school-level implementation of the Community Eligibility Provision (CEP) on individual student outcomes is estimated by a difference-in-difference (DD) approach that compares within variation in outcomes between students at CEP schools and students at non-CEP schools over time. The model is estimated by

$$Y_{ijt} = \beta_0 + \beta_1 I(CEP)_j + \beta_2 I(CEP)_j * Post_{jt} + \beta_3 X_{it} + \beta_4 X_{jt} + \beta_5 I(Fall)_{ijt} + \delta_s + \delta_t + e_{ijt} \qquad (1)$$

where Y_{ijt} is the outcome of interest for student i in school $_j$ for school year t. $I(CEP)_j$ is an indicator variable equal to one for students that attend a school j that implements the CEP at some point during the sample. $POST_{jt}$ is a binary variable that equals one in the years a student's school has the CEP in place. The effect of CEP implementation is identified by the difference between the change in outcomes between students at CEP schools, before and after CEP implementation, and the change in the outcomes of students at non-CEP schools. The coefficient β_2 on the interaction term $I(CEP)_j * POST_{jt}$ estimates the effect of school-level CEP implementation on student outcomes Y_{ijt}. X_{it} is a vector of individual student control variables and X_{jt} is a vector of individual school control variables of school j that individual i attends during school year t. $I(Fall)_{it}$ is an indicator variable that equals one when the variable is taken during the fall data collection. δ_s is a vector of state fixed effects and δ_t is a vector of school-year fixed effects. Finally, e_{ijt} is the idiosyncratic, time varying error term clustered at the school district level.

In an ideal experiment, students' schools would randomly be assigned the treatment, CEP implementation, and this treatment group could be compared to the control group over an extended period of time, both before and after CEP implementation. While the staggered implementation across states resembles randomized assignment on the state level in the form of a natural experiment, the pilot states were chosen by the Food and Nutrition Service as the states with the greatest likelihood of succeeding in the provision. Moreover, schools become eligible to implement the CEP based on their ISP so that CEP treatment within a state is non-random. It is also important to note that eligible schools that choose to implement the CEP are likely different from eligible schools that choose to not implement the CEP, possibly because of different characteristics of their student body. Recall that the sample used in the analysis does not include all students in the pilot states. Rather, the control group is constructed narrowly, based on school-level eligibility to implement the CEP, in order to minimize the differences between CEP schools and non-CEP schools. For the main part of the analysis, school level eligibility is defined by school-wide Title 1 status throughout the sample period.

The model removes unobserved heterogeneity between students and relies on the assumptions that the treatment (school-level CEP implementation) is exogenous and the treatment and control group exhibit parallel trends. Previous research suggests that a number of school-level characteristics are associated with greater probability of school-level CEP participation (Logan et al. 2014, Harkness et al. 2015). Thus, to assist in controlling for non-random selection into the CEP on a school level, ISP, enrollment,

racial composition of the student body, charter school status, and urbanicity of the school are included as school control variables. Student-level control variables include a child's gender, race, parent's income and the number of household members, as well as a student's eligibility to receive school meal subsidies. Because the rate of CEP implementation among eligible schools varies greatly between the different states, it appears likely that state differences in the implementation of the provision, for example in providing the relevant information or advertising the CEP to eligible schools, are additional determinants of school level CEP implementation. Therefore, state fixed effects (δ_s) are included. It is important to note that this analysis does not evaluate the impact of the meal standard updates that occur during the same time frame as CEP implementation. The updates affect all students in the analysis equally. Therefore, this effect is absorbed in the school-year fixed effects.

Three of the outcome variables, attention assessment, cooperation assessment and motivation assessment are categorical variables. To address these limited dependent variables and the fact that the impact likely varies across different categories, a panel ordered logit model is used to estimate the impact of CEP implementation on the outcomes of assessments of students' attention, cooperation and motivation. For all continuous variables, as well as for the binary outcome variable that indicates whether a student is held back a grade, the regression models are estimated by panel ordinary least squares.

The second part of the analysis studies the CEP impact between subsidized and non-subsidized students. Because the effect of school-wide CEP implementation may be

expected to differ if a student was eligible to receive subsidized school meals before universal free meals became available, relative to students who would have to pay full price for meals without the CEP, the base line model is extended to a difference-in-difference-in-difference estimation by adding the interaction terms $I(CEP)_j * I(SubsidyEligible)_{it}$, $I(CEP)_j * POST_{jt} * I(SubsidyEligible)_{it}$ and $I(SubsidyEligible)_{it} * \delta_t$. Note that $I(SubsidyEligible)_{it}$ is included in X_{it} in the baseline specification.

$$y_{ijt} = \beta_0 + \beta_1 I(CEP)_j + \beta_2 I(CEP)_j * Post_{jt} + \beta_3 I(SubsidyEligible)_{it} * I(CEP)_j + \beta_4 I(SubsidyEligible)_{it} * I(CEP)_j * Post_{jt} + \beta_5 I(SubsidyEligible)_{it} * \delta_t + \beta_6 X_{it} + \beta_7 X_{jt} + \beta_8 I(Fall)_{ijt} + \delta_s + \delta_t + e_{ijt} \quad (2)$$

This specification allows an analysis on how students who were eligible to receive subsidized school meals before the CEP was implemented are impacted by its implementation, relative to students that would have to had paid full price for school meals.

A sub analysis similar to the differential effect between subsidy eligible and non-subsidy eligible students is differentiating between students that are eligible to receive reduced-price school meals and students that are eligible to receive free school meals. This allows for differentiation between the effect of CEP implementation on students that previously were eligible to receive free meals and students that previously were eligible to receive reduced meals, compared to students that did not receive any meal subsidies prior to CEP implementation.

$$y_{ijt} = \beta_0 + \beta_1 I(CEP)_j + \beta_2 I(CEP)_j * Post_{jt} + \beta_3 I(FreeEligible)_{it} * I(CEP)_j + \beta_4 I(FreeEligible)_{it} * I(CEP)_j * Post_{jt} + \beta_5 I(FreeEligible)_{it} * \delta_t + \beta_6 ReducedEligible_{it} * I(CEP)_j + \beta_7 I(ReducedEligible)_{it} * I(CEP)_j * Post_{jt} + \beta_8 I(ReducedEligible)_{it} * \delta_t + \beta_9 I(Fall)_{ijt} + \beta_{10} X_{it} + \beta_{11} X_{jt} + \delta_s + \delta_t + \delta_j + e_{ijt} \quad (3)$$

Difference-in-Difference-in-Difference Estimation with Control States

For robustness, a triple difference (DDD) approach is explored. The basic strategy is to estimate the difference-in-difference estimates between the "experimented" group, where the "experimented" group is made up of the previous model's treatment and control group, and a new control group, students in schools in other non-pilot states during the sample period. In order to include students at schools of similar composition as the CEP schools in the pilot states, students who attend a school in Texas or California that are considered eligible to implement the CEP are included. Additionally, an indicator variable is created for each school in Texas and California that equals one throughout the sample if the school implements the CEP during school-year 2014-15. In other words, this estimator compares the difference between the change in outcomes of students at eligible, non-implementing pilot state schools and students at pilot state schools that implement the CEP to the difference between eligible schools in Texas and California and schools in Texas and California that implement the CEP during school year 2014-15,

the year following the sample period. Again, in all states school-level eligibility is defined by school-wide Title 1 status throughout the sample period.

The difference-in-difference-in-difference model is estimated by

$$y_{it} = \beta_0 + \beta_1 I(CEP)_j + \beta_2 I(CEP)_{jt} * Pilot_j + \beta_3 I(CEP)_j * Pilot_j * Post_{jt} + \beta_4 I(CEP)_j * \delta_t + \beta_5 I(Fall)_{it} + \beta_6 X_{it} + \beta_7 X_{jt} + \delta_s + \delta_t + e_{it} \quad (4)$$

where $I(CEP)_j$ equals one for students who attend a school that implements the CEP at some point during the pilot period if it is in a pilot state and for students who attend a school in Texas or California that implemented the during 2014-15 school year. All of the variables are included as previously specified. The effect of CEP implementation on the individual student outcomes of interest Y_{it} is captured by the coefficient β_4 on the interaction term $I(CEP)_j * POST_{jt} * Pilot_j$.

This estimation strategy takes into account non-CEP factors that differentially affect individual student outcomes at CEP schools. By including students from states that did not implement the CEP before school year 2014-15, it can be controlled for general trends in individual child outcome variables that are different for students at CEP schools than for students at non-CEP schools.

6. RESULTS

This section discusses the results of the regressions that estimate the impact of implementing the Community Eligibility Provision (CEP) on individual students. Overall, this analysis does not find a significant effect on a student's health, test scores, teacher assessment, and behavioral assessment scores. No evidence is found that suggests that providing all students at a school with high rates of poverty with access to free school meals leads to improvements of these individual student outcomes.

Table 6.1 presents the main results of the analysis, corresponding to equation (1). Each column reports the coefficients and standard errors of the dependent variables, including all control variables, for each outcome. State and school year fixed effects are not reported in the table. Results for the behavioral assessment outcomes are presented as marginal effects at the median outcome, outcome 2. The first row of table 6.1 shows that a student attending a school that implements the CEP during the pilot period is associated with a decrease in the student's science score, a decreased in attentional focus and inhibitory control, and an increase in cooperation and attention, all significant at the 10 percent level. Yet, the effect during and after CEP implementation, β_2 in equation (1), is not found to be significant with respect to any of the outcomes. This suggests no differential effect on any outcomes once the CEP is implemented.

For the results presented in table 6.1, the control group is defined as all students who attend a school that has school-wide Title 1 in place throughout all years of the sample. This allows for the construction of a control group that includes all students who attend a school that is eligible to implement the CEP but does not do so. Estimations of

equation (1) are extended by using one of the four definitions of school-level CEP eligibility defined in the data section. The results using the different control groups are provided in table 6.2 and suggest no significant effect of CEP post implementation on any of the outcomes. The differences in outcomes of students in the treatment and students in the control group are fairly consistent across all four definitions. Table 6.2 demonstrates that the results of the difference-in-difference analysis are robust to different definitions of the control group. Because it most narrowly defines the control group, school-wide Title 1 status throughout the sample is being used to identify students who attend a schools that is eligible to implement the CEP for the reminder of the analysis.

The results presented for the behavioral assessment variables in table 6.1 are based on redefining of the five initial categories into three categories. The median category, in all three cases labeled as “matter of fact”, remains the median category, but the two categories below, for example “very unmotivated” and “unmotivated”, are grouped into one and the two categories above, “motivated” and “very motivated”, are grouped into a third category. Redefining the categories addresses potential discrepancies between the assessments of different students as well as low frequency of the first two outcomes, as seen in figure 6.1. The results of the ordered logit regression with the original five categories in comparison to the results after redefining the categories are presented in table 6.3. Both sets of coefficients are reported as marginal effects at the median outcome. It can be seen that the results only change slightly due to the redefinition. In both cases, no significant effect of CEP implementation on the behavioral

outcomes is found. Due to the distribution of the categorical variables, the redefined categories are used for the remainder of this analysis.

An extension of the baseline regression analysis that includes interaction terms between $I(CEP)_j$ and school year fixed effects is presented in table 6.4. Coefficients and standard errors are reported for the impact of being a student at a treatment school, for the impact of CEP implementation, as well as for school year fixed effects for students of the control and students of the treatment group. This extension allows to control for a change in the difference between treatment and control group students' outcomes over time. It does not appear to lead to large changes in the results in terms of the impact of a student attending a school that implements the CEP compared to a student attending a non-CEP school. Yet, a statistically significant, positive effect of CEP implementation on a student's math score is found. No evidence is found that CEP implementation has an effect on any of the other outcome variables.

The results of regressions using equation (2) that include interaction terms with student eligibility to receive meal subsidies in order to differentiate between the effects of CEP implementation on subsidy eligible versus non-eligible students are presented in the first part of table 6.5. The second part presents the results of regressions using equation (3) that separates subsidy eligible students into students who are eligible to receive free meals and students who are eligible to receive reduced-price school meals. In both cases, students at treatment schools are found to have significantly lower math test scores and lower attentional focus. Additionally, in both cases being eligible for free school meals is associated with a significantly lower math score and eligibility for reduced-price school

meals is associated with a significantly higher BMI and lower attention and attentional focus, compared to non-subsidy eligible students. The coefficients of interest, being a student receiving subsidized school meals post-CEP implementation, show that there is no significant difference between subsidy eligible and non-eligible students at treatment schools. Additionally, no significant effect of CEP implementation on students with any subsidy eligibility status is found, relative to non-eligible students. A negative effect on student's cognitive flexibility test score, significant at the 10 percent level only, is found on non-subsidy eligible students post CEP implementation. A very similar effect is found in the second set of regressions of table 6.5. Yet again, no significant impact of CEP implementation on outcomes of students who are eligible for free or reduced-price meals is identified. Because non-subsidy eligible students are less likely to participate school lunch programs before CEP implementation and are provided with an exogenous incentive by the CEP, the effect of CEP implementation on non-subsidy eligible students can be interpreted as the effect of school meal participation on students. This analysis does not find an impact on students' weight, behavioral, or academic outcomes.

The above results do not provide evidence that CEP implementation impacts student outcomes. In particular, the results do not provide evidence that students who were eligible for reduce-price or free school meals even before meals became available to all students at no charge are impacted any differentially than students who experience a sudden price decrease when the CEP is implemented. One explanation for this lack of evidence could be that schools that implemented the CEP during the pilot period already had a large portion of their student body qualify for federal meal subsidies. The

distribution of the percentage of students who are eligible for subsidized meals at schools included in the analysis, and at CEP schools specifically, are provided in figures A.3 and A.4 in Appendix A. At schools with high rates of subsidy eligible students, CEP implementation may not lead to large changes in the way school meals are served. Therefore, a bigger impact may be expected at schools with lower rates of subsidy eligible students. One way to test this hypothesis is to estimate equation (2), omitting all students who attend a school where all students are eligible to receive free or reduced-price meals. Table 6.6 presents the results of the regressions. Little deviation from the results of regression equation 2 with all students, as shown in the first part of table 6.5, is found.

Due to limitations of the student data that do not provide an indicator variable for whether or not a student participates in school meals for the most recent two years of the survey, it is unknown in this analysis if a particular student participated in school meals when the CEP was in place. Additionally, no conclusions can be reached if school meal participation increased or if individual students choose to alter their participation decision when the CEP is implemented. To mitigate this gap in the analysis, a variable is coded to indicate if a student ever reported school meal participation. The first part of table 6.7 summarizes the results of a regression that estimates the impact of CEP implementation on students who report participation at some point during the sample, compared to students who never report school meal participation.[20] First, it can be seen that meal

[20]For this estimation the following regression equation is used:
$y_{ijt} = \beta_0 + \beta_1 I(CEP)_j + \beta_2 I(CEP)_j * Post_{jt} + \beta_3 I(Participant)_i * I(CEP)_j + \beta_4 I(Participant)_i * I(CEP)_j * Post_{jt} + \beta_5 I(Participant)_i * \delta_t + \beta_6 X_{it} + \beta_7 X_{jt} + \beta_8 I(Fall)_{ijt} + \delta_s + \delta_t + e_{ijt}$

participants at schools that implement the CEP are different than non-participants at CEP schools only with regard to working memory and inhibitory control. A positive effect on non-participating students' memory scores and a positive effect on their likelihood to be held back a grade, as well as a negative effect on their inhibitory control is found. Conversely, a negative effect on participating students' memory, their likelihood to be held back a grade and a positive effect on their inhibitory control are observed. However, because it is not clear if students who did not report school meal participation at the beginning of the survey in fact choose to participate at a later point, or possibly even due to CEP implementation, these results need to be interpreted with caution. Instead, the second part of table 6.7 shows a summary of results for regression equation 2, where only students who report school meal participation are included. While some slight differences to the initial results, as reported in table 6.5 can be observed, no significant impact of CEP implementation on non-subsidy eligible, and only a negative effect on the attention assessment of subsidy eligible children can be observed.

Lastly, table 6.8 summarizes the results of regression equation 4, the difference-in-difference-in-difference estimation. Students who attend a school that implements the CEP in the pilot states and in Texas or California have significantly lower reading, math and science scores, are more likely to be held back a grade, but have a better attention assessment than students at similar non-CEP schools. Students at schools that implement the CEP in the pilot states are not found to be significantly different from students at schools in California or Texas that implement the CEP in 2014-15. Equivalent to the

findings from the results of the difference-in-difference models used in this analysis, no significant effect of CEP implementation on any of the student outcomes is found.

Overall, the analyses do not find significant effects of CEP implementation on student outcomes, regardless of specification or control group. While a small number of coefficients throughout the analyses seem to point to some effects, none are consistently significant, thus little weight is put on them. However, it can be noted that almost none point to positive impacts of CEP implementation. The lack of evidence may reflect the small treatment group used in this analysis or the short time span of the analysis, especially if CEP implementation does not have an immediate impact. Further analysis using a larger and longer dataset data set may or may not find positive impacts.

Policy Implications

The CEP was established as a tool to allow schools with students in need to provide universally free school meals to combat issues of malnourishment that are likely highly related to children's health, academic and behavioral performance. Yet, as discussed in chapter 3 of this thesis, it appears unlikely that schools benefit financially from implementation, even when potential administrative cost savings are considered. Low take-up rates among eligible schools suggest may be explained by the financial impact on schools and suggest that decision makers are aware of the limitations of the CEP. Furthermore, this policy leads to increased federal reimbursement to participating schools, potentially increasing the cost of the National School Lunch Program (NSLP) and School Breakfast Program (SBP) significantly if take-up among eligible schools

continues to increase over time. While the intended benefits to students, improved meal access and better nourishment, as well as decreased stigma associated with universally free school meals are straight forward, previous research on the impact of school meal participation on student outcomes has found ambiguous effects and indicates that precaution should be taken in jumping to conclusions about the benefits of universal school meal participation.

This analysis suggests that no statistically significant improvements in students' weight, test scores, or behaviors are achieved by expanding free meal access to all students at a school with high rates of poverty. It provides no support for the theory that students who are eligible for subsidized school meals before CEP implementation benefit from it as it reduces segmentation of the student body, social stigma, and administrative barriers associated with subsidized school meals. Additionally, no effect is found on students who do not qualify for subsidized meals and may not self-select into school meal programs before CEP implementation. Because these students are provided with incentive to participate in school meals by the CEP, this result suggests that school meal participation does not impact students health, behavior, and academics. Overall, this thesis indicates that there is a lack of return in investment, at least in the short term, if students in fact are not impacted by implementation of this policy.

Table 6.1: Difference-in-Difference Main Regression Results

	BMI	Reading	Math	Science	Cog. Flex.	Memory	Grade back	Att. Focus	In. Control	Motivat.	Cooperat.	Attent.
CEP	0.305	-1.071	-2.115	-1.193*	-0.090	-1.803	0.013	-0.311*	-0.204*	0.022	0.023*	0.065*
	(0.209)	(1.886)	(1.546)	(0.629)	(0.245)	(1.719)	(0.011)	(0.159)	(0.115)	(0.017)	(0.013)	(0.037)
CEP*post	0.021	-0.389	-0.793	-0.379	-0.317	-0.118	-0.019	0.023	0.046	0.019	-0.003	0.022
	(0.181)	(0.918)	(1.129)	(0.498)	(0.312)	(1.483)	(0.026)	(0.142)	(0.159)	(0.023)	(0.015)	(0.028)
% Black Students	0.130	-2.887	-1.229	-6.290***	-0.717	-12.616***	-0.003	-0.148	-0.087	0.032	-0.022	0.123*
	(0.468)	(2.882)	(2.676)	(1.954)	(0.568)	(3.108)	(0.037)	(0.297)	(0.251)	(0.038)	(0.030)	(0.065)
% Hispanic	0.427	-1.629	-0.432	-8.687***	-1.104**	-9.501***	0.017	-0.414**	-0.155	0.042	0.029	0.164**
	(0.681)	(3.690)	(3.094)	(1.763)	(0.438)	(2.571)	(0.033)	(0.192)	(0.185)	(0.041)	(0.027)	(0.066)
% Asian Students	2.224*	-5.670	-6.383	-10.188***	-0.220	-2.445	0.046	-1.573***	-1.049***	-0.199	0.005	-0.070
	(1.315)	(5.036)	(5.862)	(2.722)	(0.730)	(6.342)	(0.063)	(0.368)	(0.387)	(0.162)	(0.061)	(0.203)
% Other Races	5.091*	4.360	2.439	-14.540	-0.142	17.808	-0.133	-0.338	-1.932*	0.207	0.010	-0.052
	(2.763)	(14.543)	(11.962)	(11.709)	(2.583)	(25.295)	(0.195)	(0.995)	(0.986)	(0.201)	(0.135)	(0.301)
Enrollment (in 100)	-0.093**	0.424*	0.060	-0.250	-0.015	0.265	0.000	0.039*	0.021	-0.004	-0.009***	-0.001
	(0.037)	(0.236)	(0.217)	(0.163)	(0.028)	(0.225)	(0.003)	(0.023)	(0.021)	(0.004)	(0.002)	(0.005)
School in City	0.983*	0.516	-0.216	-1.074	-0.685**	-1.408	0.023	-0.088	-0.129	-0.103	-0.044**	-0.024
	(0.521)	(3.033)	(2.788)	(1.317)	(0.289)	(2.788)	(0.017)	(0.108)	(0.099)	(0.038)	(0.022)	(-0.083)
Suburb	2.011**	-2.286	-5.051	-2.324	-1.573***	1.783	0.048**	0.151	-0.165	-0.065	0.004	-0.023
	(0.867)	(3.808)	(5.053)	(3.395)	(0.414)	(3.471)	(0.020)	(0.169)	(0.177)	(0.030)	(0.051)	(0.091)
Town	1.115***	-0.628	-2.724*	0.233	-0.341*	0.401	-0.015	-0.078	0.085	-0.005	-0.003	0.005
	(0.350)	(1.498)	(1.498)	(0.495)	(0.197)	(0.882)	(0.012)	(0.106)	(0.089)	(0.025)	(0.012)	(0.033)
Male	-0.119	-2.090**	0.604	0.422	0.017	-0.451	-0.000	-0.399***	-0.382***	0.058***	0.050***	0.043**
	(0.235)	(0.890)	(1.048)	(0.794)	(0.137)	(1.422)	(0.010)	(0.107)	(0.075)	(0.016)	(0.011)	(0.022)
Birthweight	0.424***	0.512	0.603**	0.117	0.005	0.335	-0.009***	-0.006	-0.001	-0.006	-0.004	-0.001
	(0.095)	(0.436)	(0.268)	(0.252)	(0.043)	(0.302)	(0.003)	(0.030)	(0.020)	(0.005)	(0.003)	(0.007)
Age (in months)	0.099***	0.195	0.300*	0.213**	0.029**	-0.103	0.005***	0.002	-0.000	-0.001**	-0.002	-0.005
	(0.026)	(0.153)	(0.179)	(0.097)	(0.015)	(0.138)	(0.002)	(0.014)	(0.010)	(0.002)	(0.002)	(0.003)
Black	0.097	-1.531	-5.608***	-3.637***	-0.193	-0.241	-0.003	-0.215*	-0.209*	0.050**	0.027*	0.029
	(0.330)	(1.077)	(1.137)	(0.677)	(0.267)	(1.925)	(0.011)	(0.112)	(0.109)	(0.021)	(0.015)	(0.032)
Hispanic	0.636	-0.830	-2.531	-1.261	-0.034	0.245	-0.018	0.233*	0.164	-0.028	-0.041***	-0.064*
	(0.477)	(1.019)	(1.775)	(0.964)	(0.265)	(1.919)	(0.015)	(0.123)	(0.103)	(0.027)	(0.015)	(0.037)
Asian	0.564	4.827***	5.796**	2.318	0.133	7.426**	-0.033**	0.432***	0.209	-0.054**	-0.065***	-0.069
	(0.652)	(1.759)	(2.848)	(1.442)	(0.325)	(3.490)	(0.015)	(0.140)	(0.127)	(0.026)	(0.024)	(0.044)
Native	-1.401*	3.041	0.277	-0.952	0.488	8.134***	0.087	0.282	0.435*	-0.012	-0.033	0.017
	(0.752)	(2.645)	(3.209)	(2.135)	(0.302)	(2.441)	(0.072)	(0.211)	(0.224)	(0.085)	(0.051)	(0.094)
No degree	-0.824***	-4.514***	-3.496***	-1.211	-0.396*	-2.031*	0.021	-0.024	-0.014	0.040**	0.013	0.041
	(0.313)	(1.003)	(1.093)	(0.787)	(0.217)	(1.163)	(0.021)	(0.108)	(0.095)	(0.016)	(0.014)	(0.035)
Bachelors	-0.279	6.652***	6.283***	4.069***	0.463***	3.968***	-0.011	0.291**	0.168*	-0.047***	-0.040**	-0.004
	(0.390)	(1.303)	(1.328)	(0.948)	(0.140)	(1.500)	(0.009)	(0.126)	(0.096)	(0.016)	(0.015)	(0.020)
Masters	0.754	10.864***	11.167**	6.766***	0.998***	12.079***	0.032	0.544***	0.248	-0.084	-0.065*	-0.152
	(1.358)	(2.539)	(3.294)	(1.293)	(0.294)	(2.883)	(0.046)	(0.164)	(0.166)	(0.052)	(0.039)	(0.097)
Size of household	0.016	-0.378**	-0.487**	-0.359**	0.007	-0.393	0.005	0.009	0.034**	0.010**	0.007*	0.004
	(0.058)	(0.191)	(0.214)	(0.166)	(0.042)	(0.288)	(0.004)	(0.023)	(0.017)	(0.005)	(0.004)	(0.005)
Free eligible	-0.049	0.525	-0.462	-0.784*	-0.061	-0.689	0.006	-0.060	-0.212***	-0.006	0.015	0.034
	(0.123)	(0.850)	(0.644)	(0.474)	(0.113)	(1.326)	(0.014)	(0.101)	(0.076)	(0.020)	(0.012)	(0.024)
Reduced eligible	0.291	0.404	-0.632	-0.608	0.021	0.817	0.013	0.073	-0.128	0.026	0.030**	0.031
	(0.180)	(1.043)	(0.515)	(0.639)	(0.224)	(1.052)	(0.014)	(0.137)	(0.093)	(0.025)	(0.013)	(0.028)
Nutrition taught	-0.123	0.442	-0.243	0.418	-0.141	0.301	-0.010	-0.111*	-0.042	0.015	-0.000	0.032
	(0.121)	(0.449)	(0.564)	(0.357)	(0.153)	(1.239)	(0.016)	(0.065)	(0.063)	(0.013)	(0.043)	(0.023)
Fall measurement	0.424**	1.775	-0.453	-0.104	0.249	-2.121	---	---	---	-0.025	-0.047	0.017
	(0.185)	(1.613)	(1.023)	(1.155)	(0.331)	(1.530)				(0.051)	(0.043)	(0.056)
N	1450	1450	1450	1450	1450	1450	1430	1450	1450	1450	1450	1450

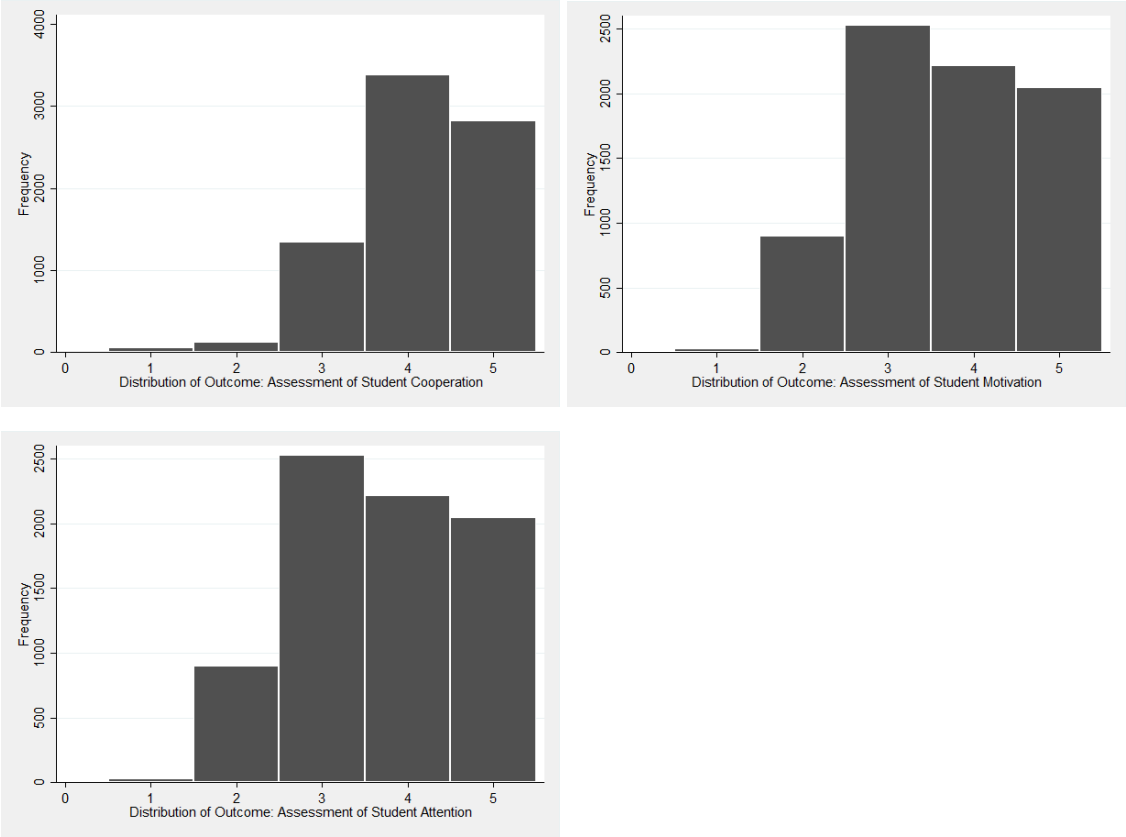
Notes: Robust standard errors clustered, at the district level in parenthesis (*** p<0.01, ** p<0.05, * p<0.1). Regression include state and school year fixed effects. Marginal effects are reported for ordered logit regression on the outcomes motivation assessment, cooperation assessment and attention assessment at the median category. Observations rounded to nearest 10 as per data license restriction.

Table 6.2: Difference-in-Difference Regression Results with Different Control Groups

Variable	Health	Test Scores					Teacher Assessment			Behavioral Assessment		
	BMI	**Reading**	**Math**	**Science**	**Cognitive Flexibility**	**Working Memory**	**Grade back**	**Attentional Focus**	**Inhibitory Control**	**Motiva-tion**	**Coopera-tion**	**Atten-tion**
Control group: Students at non-CEP schools that have school-wide Title 1 Status throughout sample.												
CEP	0.305	-1.071	-2.115	-1.193*	-0.090	-1.803	0.013	-0.311*	-0.204*	0.022	0.023*	0.065*
	(0.209)	(1.886)	(1.546)	(0.629)	(0.245)	(1.719)	(0.011)	(0.159)	(0.115)	(0.017)	(0.013)	(0.037)
CEP*post	0.021	-0.389	-0.793	-0.379	-0.317	-0.118	-0.019	0.023	0.046	0.019	-0.003	0.022
	(0.181)	(0.918)	(1.129)	(0.498)	(0.312)	(1.483)	(0.026)	(0.142)	(0.159)	(0.023)	(0.015)	(0.028)
N	1450	1450	1450	1450	1450	1450	1430	1450	1450	1450	1450	1450
Control group: Students at non-CEP schools with Proxy ISP greater than 40 percent.												
CEP	0.232	-1.814	-2.127*	-1.514***	-0.049	-1.055	0.018	-0.257*	-0.178	0.004	0.027	0.016
	(0.187)	(1.247)	(1.221)	(0.454)	(0.227)	(1.397)	(0.015)	(0.148)	(0.123)	(0.017)	(0.032)	(0.016)
CEP*post	-0.077	-0.637	-0.803	0.096	-0.300	-0.702	-0.013	-0.016	0.004	0.005	0.030	-0.012
	(0.187)	(0.987)	(1.068)	(0.442)	(0.304)	(1.388)	(0.024)	(0.150)	(0.158)	(0.020)	(0.023)	(0.014)
N	1970	1980	1980	1970	1970	1980	1950	1970	1970	1980	1980	1980
Control group: Students at non-CEP schools that have school-wide Title 1 Status for at least one year of sample.												
CEP	0.137	-1.760	-2.137	-1.124**	0.039	-1.087	0.015	-0.218	-0.185	0.011	0.037	0.024
	(0.205)	(1.467)	(1.411)	(0.540)	(0.244)	(1.472)	(0.013)	(0.144)	(0.123)	(0.016)	(0.029)	(0.016)
CEP*post	0.121	-1.006	-1.266	-0.472	-0.261	-0.399	-0.014	-0.031	0.013	0.025	0.029	0.007
	(0.192)	(1.038)	(1.003)	(0.426)	(0.333)	(1.454)	(0.024)	(0.139)	(0.154)	(0.020)	(0.025)	(0.016)
N	2840	2840	2840	2830	2830	2840	2800	2830	2830	2850	2850	2850
Control group: Students at non-CEP schools with Proxy ISP greater than minimum Proxy ISP of all CEP schools in state.												
CEP	0.097	-2.625*	-2.949**	-1.173**	-0.106	-1.536	0.015	-0.286*	-0.208*	0.021	0.052	0.042**
	(0.224)	(1.484)	(1.344)	(0.498)	(0.271)	(1.559)	(0.014)	(0.162)	(0.122)	(0.020)	(0.032)	(0.018)
CEP*post	0.159	-0.654	-1.227	-0.521	-0.124	-0.572	-0.015	-0.008	0.040	0.020	0.018	0.006
	(0.193)	(1.039)	(0.950)	(0.441)	(0.346)	(1.418)	(0.026)	(0.136)	(0.151)	(0.022)	(0.025)	(0.019)
N	3100	3120	3110	3100	3100	3110	3070	3100	3100	3120	3120	3120

Notes: Robust standard errors, clustered at the district level in parenthesis (*** p<0.01, ** p<0.05, * p<0.1). Regression include full set of control variables, state and school year fixed effects. Marginal effects are reported for ordered logit regression on the outcomes motivation assessment, cooperation assessment and attention assessment at the median category. Observations rounded to nearest 10 as per data license restriction.

Figure 6.1: Distribution of Assessment of Student Cooperation, Motivation and Attention



The figures show the distribution of the three categorical, behavior assessment variables that are included in the analysis as outcome variables. Because of their distribution, the main results in this analysis rely on redefinition of the five categories into three categories, so for example "unmotivated", "matter of fact", and "motivated".

Table 6.3: Impact of Redefining Categories on Ordered Logit Regression Results

Dependent Variable	**Motivation**	**Cooperation**	**Attention**	**Motivation**	**Cooperation**	**Attention**
CEP	0.022	0.023*	0.065*	0.025	0.046*	0.024
	(0.017)	(0.013)	(0.037)	(0.016)	(0.026)	(0.014)
CEP*post	0.019	-0.003	0.022	0.015	0.039	0.006
	(0.023)	(0.015)	(0.028)	(0.022)	(0.027)	(0.017)
N	1450	1450	1450	1450	1450	1450

Notes: Robust standard errors, clustered at the district level in parenthesis (*** p<0.01, ** p<0.05, * p<0.1). Regressions include full set of control variables, state and school year fixed effects. Marginal effects are reported for ordered logit regression at the median category.
Categories are assigned as unmotivated=1, unmotivated=2, matter of fact=3, motivated=4, and very motivated=5 for the first three columns, and as very unmotivated and unmotivated=1, matter of fact=2, motivated and very motivated=3 for the last three columns.
Observations rounded to nearest 10 as per data license restriction.

Table 6.4: Difference-in-Difference Regression Results with Treatment and Control Group Specific Year Fixed Effects

	Health	Test Scores					Teacher Assessment			Behavioral Assessment		
	BMI	**Reading**	**Math**	**Science**	**Cognitive Flexibility**	**Working Memory**	**Grade back**	**Attention-al Focus**	**Inhibitory Control**	**Motiva-tion**	**Coopera-tion**	**Atten-tion**
CEP	0.155	-0.095	-1.006	-0.788	-0.046	-0.145	0.038	-0.379**	-0.212	0.013	0.086**	0.035***
	(0.196)	(1.543)	(1.349)	(0.670)	(0.292)	(2.004)	(0.026)	(0.157)	(0.136)	(0.021)	(0.039)	(0.013)
CEP*post	-0.344	1.562	2.218***	0.451	-0.384	1.805	-0.005	-0.118	-0.159	-0.014	0.011	-0.004
	(0.321)	(1.155)	(0.631)	(0.534)	(0.334)	(1.463)	(0.015)	(0.159)	(0.143)	(0.021)	(0.031)	(0.016)
CEP*11	0.187	0.340	-0.229	-0.143	-0.016	-2.939*	-0.050	0.128	-0.078	-0.009	-0.070	-0.047*
	(0.195)	(1.910)	(1.115)	(0.686)	(0.369)	(1.525)	(0.036)	(0.210)	(0.201)	(0.036)	(0.064)	(0.027)
CEP*12	0.316	-5.106***	-4.101**	-1.575	-0.273	-3.344*	-0.052	0.083	0.054	0.055*	-0.040	0.008
	(0.322)	(1.607)	(1.612)	(1.022)	(0.452)	(1.745)	(0.038)	(0.214)	(0.148)	(0.031)	(0.048)	(0.021)
CEP*13	0.714	-2.286	-4.910**	-1.269	0.200	-4.102**	-0.032	0.310	0.365	0.049*	0.018	-0.016
	(0.485)	(1.605)	(1.990)	(1.096)	(0.496)	(2.079)	(0.054)	(0.314)	(0.240)	(0.030)	(0.044)	(0.026)
2011	-0.333	22.904***	18.788***	5.818***	0.825**	2.727	-0.099***	-0.074	0.037	-0.051	0.014	-0.004
	(0.376)	(1.989)	(2.746)	(1.430)	(0.402)	(2.981)	(0.034)	(0.156)	(0.157)	(0.032)	(0.037)	(0.028)
2012	-0.552	34.996***	30.583***	11.995***	-8.651***	2.936	-0.161***	-1.502***	-1.383***	-0.036	0.058	0.019
	(0.655)	(3.368)	(4.782)	(2.590)	(0.553)	(4.472)	(0.056)	(0.339)	(0.268)	(0.072)	(0.078)	(0.048)
2013	-1.915*	36.405***	36.669***	15.813***	-8.974***	12.807**	-0.187**	-1.645***	-1.483***	-0.037	0.146	0.017
	(1.089)	(6.291)	(7.450)	(4.603)	(0.668)	(5.953)	(0.091)	(0.572)	(0.433)	(0.099)	(0.107)	(0.070)
N	1450	1450	1450	1450	1450	1450	1430	1450	1450	1450	1450	1450

Notes: Robust standard errors, clustered at the district level in parenthesis (*** p<0.01, ** p<0.05, * p<0.1). Regressions include full set of control variables, state and school year fixed effects. Marginal effects are reported for ordered logit regression on the outcomes motivation assessment, cooperation assessment and attention assessment at the median category. Observations rounded to nearest 10 as per data license restriction.

Table 6.5: Difference-in-Difference Regression Results with Impact of CEP on Subsidy versus Non-Subsidy Eligible Students

	Health	Test Scores					Teacher Assessment			Behavioral Assessment		
	BMI	**Reading**	**Math**	**Science**	**Cognitive Flexibility**	**Working Memory**	**Grade back**	**Attention-al Focus**	**Inhibitory Control**	**Motiva-tion**	**Coopera-tion**	**Atten-tion**
CEP	0.350	-1.942	-3.239**	-0.976	0.120	-2.071	-0.011	-0.434**	-0.071	0.009	0.044	0.010
	(0.407)	(3.437)	(1.390)	(0.908)	(0.185)	(2.066)	(0.016)	(0.207)	(0.145)	(0.034)	(0.105)	(0.022)
CEP*post	0.089	-0.352	-0.688	-0.409	-0.696*	1.748	0.024	0.140	-0.025	0.055	0.014	0.009
	(0.325)	(2.003)	(1.320)	(1.209)	(0.381)	(3.180)	(0.020)	(0.134)	(0.110)	(0.045)	(0.064)	(0.028)
Free eligible	0.324	0.229	-2.570**	-0.485	0.086	2.615	0.027	0.027	0.012	-0.003	0.023	0.024
	(0.227)	(1.031)	(1.124)	(0.801)	(0.163)	(2.653)	(0.033)	(0.125)	(0.099)	(0.030)	(0.041)	(0.018)
Reduced eligible	0.628**	0.153	-2.536***	-0.305	0.156	3.815*	0.033	0.152	0.077	0.030	0.024	0.040**
	(0.250)	(1.370)	(0.885)	(0.732)	(0.273)	(2.285)	(0.023)	(0.128)	(0.085)	(0.035)	(0.049)	(0.017)
Subsidy*CEP	-0.033	1.006	1.189	-0.343	-0.232	0.492	0.028	0.162	-0.142	0.012	0.021	0.015
	(0.286)	(2.776)	(1.055)	(0.951)	(0.258)	(1.863)	(0.017)	(0.181)	(0.190)	(0.041)	(0.096)	(0.027)
Subsidy*CEP*post	-0.129	0.131	0.246	0.180	0.441	-2.827	-0.050	-0.167	0.049	-0.038	0.019	-0.011
	(0.295)	(2.748)	(1.269)	(1.691)	(0.472)	(2.938)	(0.040)	(0.132)	(0.142)	(0.064)	(0.070)	(0.037)
The following regression results differentiate between the impact of CEP implementation on non-subsidy eligible students, free meal eligible and reduced meal eligible students:												
CEP	0.342	-1.884	-3.243**	-0.813	0.125	-2.184	-0.010	-0.430**	-0.060	0.011	0.046	0.010
	(0.460)	(3.231)	(1.389)	(0.863)	(0.190)	(2.295)	(0.014)	(0.185)	(0.140)	(0.033)	(0.104)	(0.022)
CEP*post	0.087	-0.401	-0.699	-0.429	-0.693*	1.771	0.024	0.134	-0.027	0.055	0.014	0.009
	(0.342)	(1.936)	(1.306)	(1.234)	(0.377)	(3.222)	(0.021)	(0.172)	(0.135)	(0.045)	(0.063)	(0.028)
Free eligible	0.306	-0.031	-3.189***	-0.554	0.100	2.203	0.035	-0.008	0.022	0.002	0.018	(0.030*)
	(0.223)	(1.106)	(1.154)	(0.800)	(0.190)	(2.319)	(0.039)	(0.130)	(0.103)	(0.031)	(0.042)	(0.018)
Free *CEP	0.041	1.570	1.096	-0.616	-0.248	0.879	0.022	0.208*	-0.153	0.003	0.015	0.013
	(0.349)	(2.334)	(1.165)	(0.882)	(0.278)	(2.442)	(0.015)	(0.126)	(0.179)	(0.042)	(0.102)	(0.029)
Free*CEP*post	-0.186	-0.532	0.940	-0.022	0.440	-2.605	-0.227	0.013	-0.049	-0.037	0.021	-0.009
	(0.292)	(2.617)	(1.544)	(1.635)	(0.501)	(3.072)	(0.155)	(0.148)	(0.045)	(0.067)	(0.080)	(0.032)
Reduced eligible	0.597*	0.605	0.711	0.045	0.025	4.750	-0.004	0.301**	0.035	0.009	0.042	0.015
	(0.339)	(1.370)	(1.118)	(0.954)	(0.260)	(3.940)	(0.033)	(0.137)	(0.097)	(0.057)	(0.066)	(0.027)
Reduced *CEP	-0.436	-3.256	1.711	-0.082	-0.120	-0.558	0.065	-0.199	-0.171	0.051	0.050	0.033
	(0.509)	(3.946)	(2.756)	(1.800)	(0.503)	(2.810)	(0.044)	(0.406)	(0.255)	(0.048)	(0.085)	(0.032)
Reduced*CEP*post	0.230	4.347	-3.876	1.274	0.442	-4.078	-0.059	0.220	0.260	-0.040	0.004	-0.019
	(0.571)	(3.633)	(3.345)	(2.605)	(0.498)	(5.136)	(0.066)	(0.512)	(0.292)	(0.081)	(0.087)	(0.053)
N	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450

Note: Robust standard errors, clustered at the district level in parenthesis (*** p<0.01, ** p<0.05, * p<0.1). Regressions include full set of control variables, state and school year fixed effects. Marginal effects are reported for ordered logit regression on the outcomes motivation assessment, cooperation assessment and attention assessment at the median category. Observations rounded to nearest 10 as per data license restriction.

Table 6.6: Difference-in-Difference Regression Results without Students who Attend Schools with 100 Percent Subsidy Eligibility

	Health	Test Scores					Teacher Assessment			Behavioral Assessment		
	BMI	**Reading**	**Math**	**Science**	**Cog. Flex-ibility**	**Memory**	**Grade back**	**Atten. Focus**	**Inhib. Control**	**Motiva-tion**	**Coopera-tion**	**Atten-tion**
CEP	0.330	-2.000	-3.293**	-1.032	0.129	-2.123	-0.011	-0.430**	-0.079	0.010	0.045	0.012
	(0.396)	(3.462)	(1.360)	(0.908)	(0.185)	(2.077)	(0.016)	(0.206)	(0.146)	(0.035)	(0.105)	(0.022)
CEP*post	0.049	-0.445	-0.867	-0.541	-0.682*	1.544	0.024	0.158	-0.043	0.059	0.020	0.013
	(0.339)	(1.952)	(1.402)	(1.189)	(0.386)	(3.263)	(0.020)	(0.130)	(0.109)	(0.046)	(0.064)	(0.030)
Free eligible	0.317	0.341	-2.468**	-0.456	0.085	2.786	0.025	0.023	0.009	-0.003	0.022	0.023
	(0.229)	(1.026)	(1.112)	(0.803)	(0.167)	(2.644)	(0.033)	(0.126)	(0.100)	(0.030)	(0.041)	(0.018)
Reduced eligible	0.604**	0.081	-2.455***	-0.331	0.141	3.797*	0.035	0.137	0.057	0.030	0.023	0.039**
	(0.252)	(1.389)	(0.884)	(0.739)	(0.278)	(2.286)	(0.024)	(0.127)	(0.085)	(0.035)	(0.050)	(0.016)
Subsidy*CEP	0.007	1.065	1.247	-0.242	-0.237	0.434	0.026	0.154	-0.126	0.010	0.019	0.014
	(0.292)	(2.795)	(1.028)	(0.955)	(0.258)	(1.869)	(0.017)	(0.183)	(0.194)	(0.041)	(0.097)	(0.027)
Subsidy*CEP*post	-0.150	0.219	0.608	0.299	0.413	-2.065	-0.050	-0.200*	0.027	-0.044	0.010	-0.019
	(0.308)	(2.716)	(1.289)	(1.677)	(0.466)	(3.082)	(0.040)	(0.114)	(0.141)	(0.064)	(0.070)	(0.037)
N	1440	1440	1440	1440	1440	1440	1420	1440	1440	1440	1440	1440

Notes: Robust standard errors, clustered at the district level in parenthesis (*** p<0.01, ** p<0.05, * p<0.1). Regressions include full set of control variables, state and school year fixed effects. Marginal effects are reported for ordered logit regression on the outcomes motivation assessment, cooperation assessment and attention assessment at the median category. Observations rounded to nearest 10 as per data license restriction.

Table 6.7: Difference-in-Difference Regression Results with Impact of CEP on Meal Participating versus Non-Participating Students

	Health	Test Scores					Teacher Assessment			Behavioral Assessment		
	BMI	**Reading**	**Math**	**Science**	**Cognitive Flexibility**	**Working Memory**	**Grade back**	**Attention-al Focus**	**Inhibitory Control**	**Motiva-tion**	**Coopera-tion**	**Atten-tion**
The following regression results differentiate between the impact of CEP implementation on students who report school meal consumption and the impact on students who do not report school meal consumption.												
CEP	0.276	1.282	-1.511	-2.709**	0.213	-2.741	0.011	0.688**	0.986***	0.103*	0.119	0.030
	(0.915)	(4.160)	(3.234)	(1.337)	(0.462)	(4.783)	(0.029)	(0.334)	(0.376)	(0.056)	(0.097)	(0.030)
CEP*post	-0.343	-4.479	-0.409	1.436	-0.230	6.549**	-0.127**	-0.446	-0.598*	-0.003	0.029	0.007
	(0.416)	(3.600)	(1.212)	(1.226)	(0.406)	(2.741)	(0.059)	(0.419)	(0.345)	(0.065)	(0.074)	(0.034)
Meal	0.583	-1.591	-0.041	-0.383	0.495	0.568	0.012	-0.186	-0.203	0.045	0.056	-0.010
Participant	(0.368)	(1.982)	(2.357)	(1.106)	(0.606)	(2.441)	(0.019)	(0.176)	(0.174)	(0.043)	(0.090)	(0.030)
Participant	-0.099	-3.150	-1.191	1.381	-0.447	-0.670	-0.001	-1.063***	-1.273***	-0.086	-0.051	-0.006
*CEP	(0.930)	(3.844)	(3.563)	(1.532)	(0.569)	(4.635)	(0.023)	(0.386)	(0.383)	(0.062)	(0.090)	(0.036)
Participant	0.382	4.784	-0.587	-2.417	-0.017	-6.485**	0.138**	0.459	0.706*	0.022	-0.021	-0.016
*CEP*post	(0.594)	(3.975)	(1.485)	(1.477)	(0.498)	(2.998)	(0.055)	(0.453)	(0.396)	(0.084)	(0.080)	(0.050)
N	1330	1330	1330	1330	1330	1330	1310	1330	1330	1330	1330	1330
Only students who reported participation in school meals at some point of sample were included in the following regression:												
CEP	0.177	-3.563	-3.112*	-0.306	-0.013	-3.913**	-0.014	-0.706***	-0.297	0.001	0.075	0.024
	(0.504)	(3.189)	(1.656)	(1.206)	(0.347)	(1.911)	(0.014)	(0.212)	(0.246)	(0.034)	(0.129)	(0.029)
CEP*post	0.437	2.231	-0.891	-1.014	-0.641	2.395	0.056***	0.322**	0.148	0.055	-0.067	-0.013
	(0.552)	(1.777)	(1.725)	(1.305)	(0.488)	(2.862)	(0.020)	(0.138)	(0.120)	(0.047)	(0.104)	(0.036)
Free Eligible	0.366*	1.261	-1.906	-0.616	0.001	2.701	0.043	0.038	0.029	-0.005	-0.008	0.014
	(0.210)	(0.999)	(1.340)	(0.971)	(0.166)	(2.949)	(0.031)	(0.149)	(0.120)	(0.027)	(0.040)	(0.019)
Reduced Elig	0.709***	0.754	-2.154*	-0.721	0.061	3.717	0.038	0.132	0.029	0.031	-0.016	0.025
	(0.219)	(1.087)	(1.190)	(0.920)	(0.281)	(2.549)	(0.024)	(0.129)	(0.106)	(0.032)	(0.051)	(0.020)
Subsidy*CEP	1.247	-0.828	-0.084	2.117	0.009	-0.018	0.045	1.247	-0.828	-0.003	0.028*	0.379*
	(1.458)	(1.127)	(0.397)	(1.626)	(0.041)	(0.125)	(0.300)	(1.458)	(1.127)	(0.036)	(0.016)	(0.215)
Subsidy	0.364	0.616	0.364	-4.169	-0.035	0.112	-0.083	0.364	0.616	0.016	-0.070	-0.327**
*CEP*post	(1.926)	(1.701)	(0.582)	(2.797)	(0.066)	(0.117)	(0.208)	(1.926)	(1.701)	(0.051)	(0.046)	(0.156)
N	1260	1270	1260	1260	1260	1260	1250	1260	1260	1270	1270	1270

Notes: Robust standard errors, clustered at the district level in parenthesis (*** p<0.01, ** p<0.05, * p<0.1). Regressions include full set of control variables, state and school year fixed effects. Marginal effects are reported for ordered logit regression on the outcomes motivation assessment, cooperation assessment and attention assessment at the median category. Observations rounded to nearest 10 as per data license restriction.

Table 6.8: Difference-in-Difference-in-Difference Regression Results

	Health	Test Scores					Teacher Assessment			Behavioral Assessment		
	BMI	**Reading**	**Math**	**Science**	**Cognitive Flexibility**	**Working Memory**	**Grade back**	**Attention-al Focus**	**Inhibitory Control**	**Motiva-tion**	**Coopera-tion**	**Atten-tion**
CEP	0.502*	-2.070**	-2.128**	-1.310*	0.082	-0.745	0.026**	-0.105	-0.134	-0.269	0.029	0.032**
	(0.266)	(0.865)	(1.011)	(0.751)	(0.118)	(1.325)	(0.011)	(0.077)	(0.089)	(0.179)	(0.020)	(0.013)
CEP*pilot	-0.191	0.879	1.410	0.892	0.048	0.216	-0.018	-0.194	-0.115	-0.293	0.032	0.009
	(0.358)	(2.027)	(1.923)	(1.044)	(0.302)	(2.352)	(0.017)	(0.175)	(0.143)	(0.354)	(0.038)	(0.022)
CEP*pilot*post	-0.013	-0.317	-1.556	-0.425	-0.330	-1.057	-0.027	-0.039	-0.023	-0.086	0.009	-0.031
	(0.223)	(1.130)	(1.128)	(0.348)	(0.325)	(1.373)	(0.023)	(0.154)	(0.149)	(0.228)	(0.025)	(0.019)
N	5080	5080	5070	5000	5060	5080	4980	5040	5050	5090	5090	5090

Notes: Robust standard errors, clustered at the district level in parenthesis (*** p<0.01, ** p<0.05, * p<0.1). Regressions include full set of control variables, state and school year fixed effects. Marginal effects are reported for ordered logit regression on the outcomes motivation assessment, cooperation assessment and attention assessment at the median category. Observations rounded to nearest 10 as per data license restriction.

8. CONCLUSION

The Community Eligibility Provision was made available to schools and school districts with a large percentage of students who are eligible for subsidized school meals. If an eligible district or school implements the provision, it is required to provide breakfast and lunch to all students at no charge. While implementation of the provision may lead to some administrative cost savings associated with reduced processing of household applications for meal subsidies, this analysis finds that a school's meal service is unlikely to financially benefit from implementation, unless a substantial portion of subsidy eligible students does not participate in the school meals.

This analysis uses a difference-in-difference model, as well as a triple difference model to estimate the impact of CEP implementation on students' health, test scores, and behavior. Additionally, it estimates the effect on students who are eligible to receive subsidized school meals, regardless of the school's CEP status, compared to non-subsidy eligible students. The CEP is intended to positively impact student outcomes by increasing participation among non-subsidy eligible students through a decrease in price, and by increasing participation among subsidy eligible students through reductions in the burden to apply and in stigma associated with subsidized meal participation. Yet, while previous literature has well established that school meal participants typically perform worse with respect to health, academics and behavior, it is not clear that participation increases, especially in the school lunch program, inevitably benefit students. This analysis looks at the impact of the CEP as a cumulative, regardless of a student's participation status in school meals.

No statistically significant impact is found on any of the student outcomes, suggesting that there may be a lack of return in investment to schools. This findings offer an explanation for low take-up rates among eligible schools. Additionally, no evidence is found that students who were eligible for school meal subsidies before the CEP was implemented are impacted any differently than students who paid full-price. The lack of evidence that there is an impact on non-subsidy eligible students provides indication for how students who traditionally do not self-select into school meal programs are affected by participation. It strengthens the findings of Leos-Urbel et al. (2003) who does not find an impact on academic outcomes with respect to universally free breakfast offerings in New York City. While this analysis cannot differentiate between the impact of NSLP and SBP on students, this result is consistent with a number of previous studies that have found no impact of increased school meal access on weight and academic outcomes (Gleason and Dodd 2009, Schwanzenbach and Zaki, 2014) and differs from Schwanzenbach (2009) and Millimet et al. (2010) who both find an negative impact on weight outcomes using the previous version of the Early Childhood Longitudinal Data (ECLS-K 1998-99).

Schools and school districts need to assess on a case by case basis whether implementing this policy, shown to have a lack of any positive impact on the student body in this analysis, is viable and beneficial for their school meal provision. Further quantitative research, applied to a larger and longer data sample, is required to gain further evidence of the impact on school districts, schools and individual students. Most obviously, an impact on students' BMI may take more than one or two years post CEP

implementation to appear. The impact may also differ for non-pilot states. Future research should also aim to determine a connection between individual students' propensity to participate in school meals, before and after CEP implementation, and how this impacts student outcomes.

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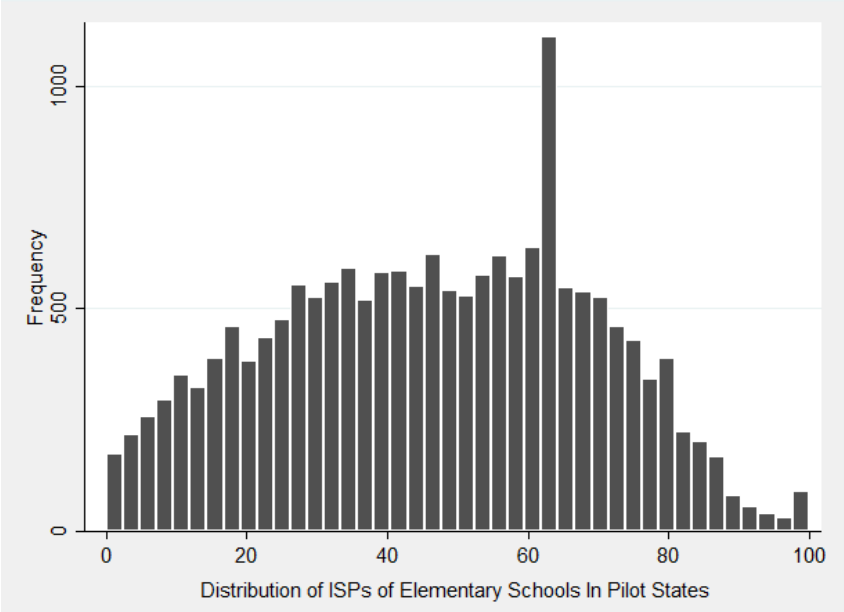
APPENDIX A

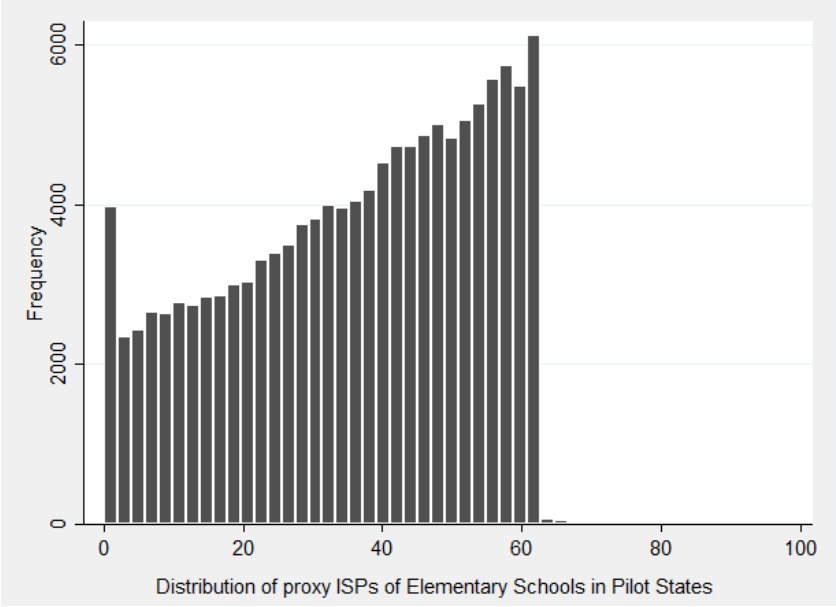
FIGURES

Figure A.1: ISPs of Elementary Schools in the Pilot States



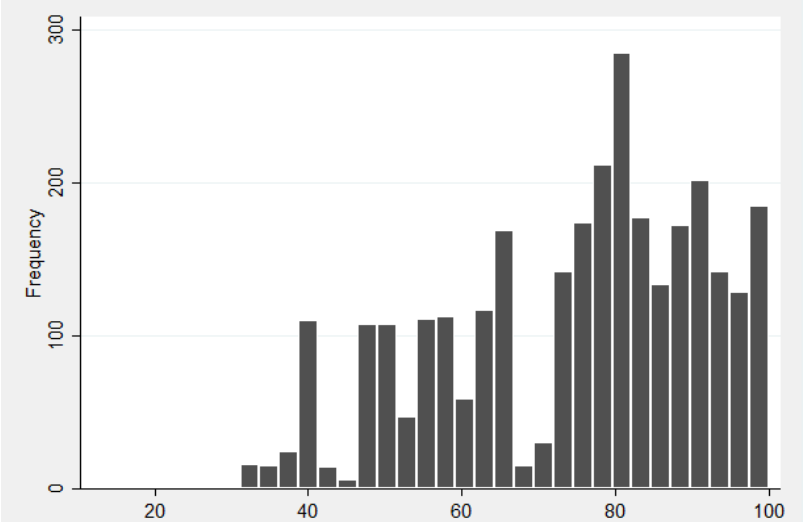
Notes: Figure displays the number of elementary schools for a given ISP, when it is available.
Sources: Individual State CEP data and Common Core of data, school years 2011-12 to 2014-15.

Figure A.2: Proxy ISPs of Elementary Schools in the Pilot States



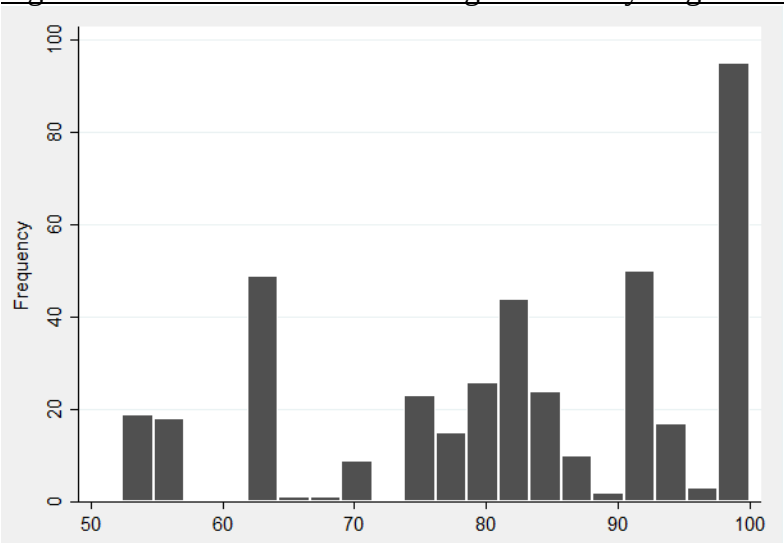
Notes: Figure displays the number of CEP schools for a given proxy ISP, where the proxy is calculated by dividing the percentage of students that qualify for free or reduced-price schools meals by 1.6, the reimbursement multiplier authorized by the Food and Nutrition Service. By calculation, schools where 100 percent of students are eligible for subsidized school meals have a proxy of 62.5 percent.
Sources: Individual State CEP data and Common Core of data, school years 2011-12 to 2014-15.

Figure A.3: Distribution of Percentage of Subsidy Eligible Students



Notes: Bars display the number schools with a certain percentage of subsidy eligible students. Percentages are included for all students who are a part of the sample of analysis when the control group includes all students who attend a school that has school-wide Title 1 status throughout the sample.
Sources: Individual State CEP data, Common Core of data and ECLS-K data in pilot states, school years 2011-12 to 2013-14.

Figure A.4: Distribution of Percentage of Subsidy Eligible Students at CEP Schools



Notes: Bars display the number schools with a certain percentage of subsidy eligible students. Percentages are included for all students who attend a school that has the CEP in place for the school-year.
Sources: Individual State CEP data, Common Core of data and ECLS-K data in pilot states, school years 2011-12 to 2013-14.