Understanding Participation in the USDA's Farm to School Program: Results Integrating Information from the Farm to School Census and the Census of Agriculture

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Abstract

Farm to School programs (FTS) have proliferated since the first FTS pilot projects in 1996-1997 (National FTS Network 2011). Research surrounding FTS programs has focused on quantifying the potential benefits for local economies and students' nutrition, while little research has addressed factors that influence a school's decision to participate in a FTS program. FTS is often narrowly defined as the use of local foods by the school. However, the extent of local food inclusion alters the local economic stimulus generated by the program and may also alter school meal participation by students and support by parents. In this study, we follow the USDA's Farm to School Census approach and define FTS as any promotion of local foods or school gardens including fieldtrips to farms, maintenance of a school garden, taste tests, and other curriculum or promotional components. We also recognize that a school's decision to participate depends heavily on the supply of and types of farms in the area, so we take supply-side factors into account. In addition to simple binary FTS participation, we assess what factors are associated with the intensity of participation, the types of FTS activities implemented, and the challenges faced by participating and non-participating schools. The results provide a nuanced understanding of FTS participation. Our models are estimated using data from the USDA's Farm to School Census (2014), the USDA's Census of Agriculture (2012) and the USDA's database of farmers' markets (2015). We find factors that influence the FTS decision include the supply of local food, school size, percent of students on free or reduced cost meals, federal reimbursements for the cafeteria programs, total school system expenditures, food cost, cafeteria sales, county population, race composition and urbanicity. The results suggest that both school characteristics and local farm production factors may influence FTS participation. The results will be useful in informing policy as well as providing insight into the nature of FTS programs for future studies of FTS benefits.

Introduction

As of 2014, FTS legislation had been proposed in 45 states and the District of Columbia, and been enacted in 39 states and the District of Columbia (National Farm to School Network 2015). In addition to state legislation, federal law now allows schools to take geographical preference into consideration when choosing vendors (USDA 2014). The expansion of legislation to support FTS programs has led to wider adoption and the creation of more detailed data with which to evaluate program adoption. We examine these data in order to provide a comprehensive analysis of factors associated with the breadth and intensity of FTS participation, including analysis of factors associated with the intensity of participation, the types of FTS activities provided, and the challenges to participation faced by non-participants and participants.

There exists a limited literature on FTS programs. Most previous studies addressing the benefits of FTS programs are small and unpublished. Joshi, Azuma and Feenstra (2008) review this literature and conclude that there are health benefits to FTS programs, but there were too few studies addressing economic benefits to reach a conclusion. The lack of peer-reviewed literature suggests that more research is needed to fully understand the scope of benefits from FTS programs. Vo and Holcomb (2011) provide the only paper that addresses FTS participation. However, their study omits data critical to understanding FTS participation and relies upon a small sample from a single state with a low response rate.

We provide a comprehensive study of FTS participation across the US by using data from USDA's first Farm to School Census, a cross-sectional survey administered to each public school district in the US that provides a comprehensive and detailed account of FTS activity, as well as fundamental school characteristics such as school size, school system expenditures, and school location. We augment this data with farm supply-side factors taken from the US Census of Agriculture that may influence a school's ability to purchase locally produced foods. We also recognize that participation is likely influenced by interest in local food, which we control for by including a measure of local farmers' markets as a proxy for interest in local food.

An analysis of factors contributing to participation and non-participation is important in evaluating the economic merit of these programs and the likely future uptake of these programs. This improved understanding of FTS participation will be useful in two arenas: informing future studies aimed at understanding the benefits or other aspects of FTS, and policy design. First, understanding the underlying process that determines participation will provide critical insight into the potential differences to FTS benefits across heterogeneous school districts and how local agricultural production may influence school district participation. Second, this paper provides a critical understanding of the nuances of FTS participation and non-participation that can be used by policy makers to encourage additional participation or reduce roadblocks to participation.

We find factors that are associated with the school districts' FTS decision include the general level of all farming activity near the school district, the proportion of farms near the school district with direct-to-consumer sales, and the per-capita intensity of farmers' markets near the school. In addition, numerous school district characteristics are also associated with FTS participation, including school size, percent of students on free or reduced cost meals, federal reimbursements for the cafeteria programs, total school system expenditures, food cost, cafeteria sales, race composition, and urbanicity. While all of these factors are associated with some aspect of FTS participation, the proportion of farms near the school district with direct-to-consumer sales, the per-capita intensity of farmers' markets near the school, and school size were significant across most models.

To our knowledge, these results provide a first systematic analysis and an initial understanding of factors that influence a school's participation patterns in FTS programs. We believe the novelty of the data set and the integration of supply-side control variables will stimulate substantial discussion of the relationship between policy and community factors in shaping the integration of local foods into school meal programs.

Data

The data for this study are predominately from the USDA's Farm to School Census, a cross-sectional survey examining FTS activity that was administered to each public school district in the US. The survey, which was administered from March to November of 2013, asked school district administrators about FTS activities in the 2011/2012 and 2012/2013 school years (USDA 2014). Supply-side data on the number of farms that sold direct-to-consumers, total number of farms, and general farming activity (as measured by farm income) in each county was found in the 2012 US Census of Agriculture (USDA). The data on farmers' markets come from the USDA's Farmers' Market directory (USDA 2015), which lists all farmers' markets by zip code.

The richness of the FTS Census data provides the opportunity to explore a number of dependent and independent variables, where dependent variables are classified into three categories (D.1 – D.3, See Table 1) and independent variables are classified into six categories (I.1 – I.6, See Table 1). Tables 2 and 3 present summary statistics for all dependent and independent variables. We drop several variables from category D.2, Types of participation due to a failure of convergence during estimation (dropped variables not shown in tables).[1]

USDA received responses from 9,643 school districts, which represents a 75.3% response rate.[2] Of the surveyed school districts, 43.4% (4,212 districts) participated in some form of FTS activity in 2011/2012 and/or 2012/2013 (See Table 2). On average districts that participate in a FTS program spend 14.7% of their food budget on local foods (or 9.7% excluding fluid milk). While there are many types of FTS activity, the use of local food was the most prevalent with 3,418 districts serving local food, or 35.4% of all districts, and 81% of schools participating in FTS activity. The next most frequent FTS activities include promoting the local food used in school food (1,725), holding taste tests of local foods (1,576), planting edible school gardens (1,248) and taking field trips to farms (1,203). The most common local foods served were fruits (2,978) and vegetables (2,855), followed by baked goods (854) and dairy (700). Of the districts that did not participate in FTS activities the most commonly listed problems include: difficulty finding key items year round (1,996), local items not being available from primary vendors (1,481), difficulty finding new suppliers (974), and higher prices (937). Of the districts that did participate the most commonly listed problems were: difficulty finding key items year round (2,513), high prices (1,684), food not available through primary vendor (1,364) and vendors do not offer a large range of product (1,100).

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[1] This is most frequently caused by quazi-complete separation of one or more independent variable. While there are ways to deal with this problem, doing so would require us to change what variables are included in the model, rendering it less comparable to the rest of the study.

[2] USDA has not yet issued weighting factors that reflect this non-response. Our results will be updated with these weighting factors once they are made available.

There are many factors that may influence a school's decision to participate in FTS activities including supply-side controls, I.1, interest in local foods, I.2, school district controls, I.3, urbanicity, I.4, the racial composition of the school, I.5, and state fixed effects, I.6. (See Table 3). Total expenditures, food cost, and sales are all translated to log form when used as explanatory variables in regression (They are not presented in log form in Table 3). 504 school districts were dropped from the study because of inconsistencies in their answers, specifically they listed one racial group as having more students than were listed in the entire school district. Excluding these schools only changes the overall FTS participation rate by 1% so we do not expect this to skew our results (we cannot compare other variables as they are weighted by student and we are not confident in these schools' counts of students).

To construct the supply-side variables (Variables I.1) we examined two key measures to capture multiple aspects of the supply. First, we use farm income per county to account for overall farm activity of the area. Second, we use the proportion of local farms that have direct-to-consumer sales in the county, as these are most likely to be the farms selling to schools and, therefore, should account for the supply of local food the school can access (ERS 2015). Both of our supply-side measures are county level; however the definition of local food often extends beyond the county. While there are many definitions of local, we follow the Food, Conservation and Energy Act of 2008. In the Act, for product to be considered a "locally or regionally produced agricultural food product, it must be transported less than 400 miles from its origin or be within the State in which it was produced." [3] Though we considered anything within 400 miles to be local we recognize it is more likely for schools to give preference to more local products. So we construct our supply-side measures using inverse distance weighting, measuring distance from county centroid to county centroid (in miles) for all counties with in the 400 mile radius (Yu 2014). *Farm income* has a mean of $2.60 billion and the mean for the proportion of farms with direct sales is 3.31%. The States of Hawaii and Alaska were excluded from this study because county distances were not available for these states.

We use a geocoded list of farmers' markets from the USDA's Farmers' Markets Directory to match them to a county[4]. We weighted the number of farmers' markets in each county by county population to find the number of farmers' markets per 10,000 people. We chose not to use the inverse distance weighting approach with this variable because it seems likely that most people will stay within their home county to visit farmers' markets. To test this we tried inverse weighting any farmers' market within 20 miles and found there to be negligible difference between the two variables (Please contact the author for these results). We find a mean of 0.48 farmers' markets per 10,000 people in a county.

County population (2012) was taken from the US Census Bureau (US Census Bureau 2012). The Rural-Urban Continuum Codes (RUCC) were taken from the USDA (ERS 2013) which features a one to nine code where one is the most urban and nine is the most rural. Both *population* and the RUCCs are used to control for the school location.

[3] As a robustness check we also tried distances other than 400 miles. See Appendix***

[4] We thank Christina Connolly, PhD candidate, for sharing her geocoded farmers' markets data with us.

Methods

We employ several methods to deal with the multiple types of data being modeled. All models are run in Statistical Analysis System (SAS) version 9.3. We use logistic regression for the models with binary dependent variables; estimated coefficients are reported as the odds ratio.[5] For measures of intensity of participation and problems with partcipation, a negative binomial model was chosen because goodness-of-fit tests suggest the Poisson estimation faces problems of over-dispersion. To report significance we use *, **, *** to denote significance at the 10, 5 and 1 percent levels respectively. While we report significance at the 10 percent level, the discussion in the paper focuses on coefficients (and test statistics) that are significant at the 5 percent or lower levels ($p<0.05$).

The same independent variables are used for all models to determine how each factor is associated with each aspect of FTS participation. We assessed multicolinearity by calculating variance inflation factors (vif) and find no evidence of a problem in any models.

Results

Overall participation

We define Overall FTS participation (D.1) as participating in any FTS activity in the 2011/2012 or 2012/2013 school year. The log likelihood, score, and Wald tests (See Table 4) suggest that the estimated model has more explanatory power than simply using the odds ratio to predict FTS participation. To test goodness-of-fit we use the Homer-Lemeshow (H-L) test that had a χ^2 of 5.09 which is insignificant, suggesting that the model fits the data well.[6] We use the Somers's D as our variable of association rather than Gamma, as Gamma tends to overstate the strength of the relationship, and find that there are 48% fewer errors when using this model to predict FTS participation than by using chance.

The statistical significance of the individual regression coefficients are tested using a Wald's Chi-square test. The results of this regression suggest there are many factors significantly associated with FTS participation. Looking first at the I.1 variables we see that *Farm Income* is not significant while the *Prop. Direct* is significant. While high farm income suggests significant farming in the area, if the farms do not sell direct-to-consumers, or do not sell products for human consumption, then the farm activities will not impact the supply of local food that a school can purchase and therefore will not impact the decision to participate in FTS. On the other hand, *Prop. Direct* should be directly related to the supply of local food that a school may purchase, so it is expected that it has a strong significant impact on FTS. The odds ratio for *Prop. Direct* can be interpreted to mean that the odds of participating in FTS activities increase by 17% for each percent increase in the proportion of farms that have direct-to-consumer sales.

Variable I.2, *farm market* is significantly positive. The odds ratio is 1.17, meaning for each additional farmers' market per 10,000 people the odds of participating in FTS activities are 17% greater.

[5] Recall, the odds ratio is the increase in odds that an outcome will occur given a one unit increase in the coefficient, compared to the odds of the outcome without the one unit increase. For example, an odds ratio greater than one means increased odds as that coefficient increases, or the coefficient is positive.

[6] Recall that the H-L test has a null hypothesis that the model fits the data well, so rejecting the null suggests the model is a poor fit.

Next we look at the results for I.3 Variables for which *size, %reduced, fed. mon,* and *sales* are statistically significant. *Size* has a positive impact on FTS participation but at a decreasing rate, suggesting that there are economies of scale to implementing FTS programs. The turning point for the quadratic is at 2,327 students, which is well beyond the 99th percentile (1,175). However, the maximum school size in the study is 3,224 so there are a few schools that have this negative impact of size. The *%reduced* has a negative relationship with farm to school participation, which possibly suggests a budgetary limitation for these schools. *Fed. mon* has a positive relationship with FTS participation. The federal government reimburses schools participating in the National School Lunch Program. Starting with the passing of the Healthy, Hunger-Free Kids (HHFK) Act of 2010, reimbursement rates increase for schools that meet specific health requirements laid out in this act. Schools that qualify for this "performance-based cash assistance" receive an additional 6 cents per lunch served (Food and Nutrition Service 2014a; Food and Nutrition Service 2014b). We believe the reason *fed. Mon* is positive is that it is more likely for a school that meets this performance-based cash assistance to participate in FTS programs[7]. Finally, *sales* has a positive relationship with FTS, however, this relationship could have several explications. First, schools with FTS programs may have higher sales because serving local foods increases the quantity of food sold. Second, FTS could simply increase the price of the food sold and therefore increase sales without increasing the quantity of food sold. Third, schools with higher sales may have other attributes associated with them that make them more likely to participate in FTS. Further data and related analyses are needed to better understand this relationship.

Turing to the I.4 Variables, the results for the RUCCs use the most urban code as the baseline for comparison. As schools become more rural they are generally less likely to participate in FTS activities and codes 5-9 have a statistically negative impact on FTS relative to schools in the most urban category. Finally, the demographic controls for the percent of students in each race in each district suggest that there is a positive relationship between the percent of Hispanic and Black students, and FTS participation. Current policies often target supplemental funding toward poor urban schools, which may drive this result.

Types of participation/intensity of participation

To understand the nuances of FTS participation, we next examine factors that influence the types and intensity of participation (Variables D.2). We use logit models to estimate each type of FTS participation. For each activity, we present the odds ratio and the significance as seen in Table 5. (For the complete results please contact the author.) For all activities the results of the log likelihood, score, and Wald tests suggest that the models are more effective than the odds ratio at predicting participation type. To test goodness-of-fit we use the H-L test which had χ^2 ranging from 3.8-15.8, all of which are insignificant, suggesting that the models fit the data well. We use the Somers's D as our variable of association and find that there are 39-62% fewer errors when using these models to predict type of participation than by using chance.

Looking at the supply-side variables, (I.1) we find that once again *farm income* is not an important factor for any of the D.2 models, though it is significantly positive at the 10% level for *serve local food*, and

[7] These performance-based assistance criteria are to meet certain healthfulness requirements, however, they are not tied to FTS participation.

significantly negative at the 10% level for having a *school garden*. This may seem a surprising result, however, schools in farming communities may be less likely to have school gardens since the students are likely exposed to food production at home. *Prop. Direct* is positive and significant for all D.2 models. Many of the activities (such as *taste tests* and *other promotion*) often are supplementary activities that are only taken part in if the school is serving local food, so supply of local food will be important for these activities. The odds ratios range from 1.08-1.19 meaning that each percent increase in the proportion of farms makes the odds of participating in that activity 8-19% greater.

I.2, *farm market*, has a positive and significant relationship with all FTS activities. The odds ratios range between 1.15-1.34 meaning an additional farmers' market increased the odds of participating by 15-34%.

Many of the I.3 variables also impact the types of Farm to School participation. *Size* is positive and significant for all FTS activities except *serve school gardens* and *community events*. This result suggests economies of scale are present for participating in most FTS activities. The *%reduced* has a significant negative relationship with serving local food and *themed promotion*, but is insignificant for all other FTS activities. *Total exp*. has a positive significant relationship with *school garden*, *serve school garden*, and *field trips*. This result is not surprising as these are some of the more resource intensive ways to participate, so wealthier schools may be more likely to take part in these activities. *Food cost* has a positive relationship with *taste tests*, *themed promotion*, and *other promotion*. *Sales* have a positive significant relationship with serve food. This suggests that serving local foods may increase sales.

The RUCCs show that more rural areas have a negative relationship with serving local food, *taste tests*, *theme promotion*, and *other promotion* (Remember, when interpreting odds ratios anything between zero and one represents a negative relationship). The percent black and Hispanic has a significant positive relationship with several of FTS activities, however, there does not seem to be a particular pattern to these results. This again is likely driven by policy aimed at promoting FTS activities in urban schools.

Intensity of Participation

Next we analyze the intensity of participation (Table 6). For this analysis we only consider the set of districts that are participating in some way and analyze what factors intensify this participation. To create intensity we simply count the number of activities a district participates in. For example a school that *serves local* and has *other promotion* has an intensity of 2. We use a negative binomial model because the Poisson model displays over-dispersion (The Poisson model Deviance Value/DF=1.36 which is greater than one meaning there is over-dispersion, on the other hand the Deviance Value/DF for the negative binomial model is 0.96).

Within the I.1 variables we find that *Prop. Direct* has a positive significant relationship with the intensity of FTS participation. The coefficient can be interpreted to mean that a one percent increase in the proportion of farms with direct-to-consumer sales will cause the difference in the log of expected count to increase by 0.042 units. Interest in local foods, I.2, also has a positive significant relationship with intensity. Turning to the I.3 variables, just as with most of our previous results, *size* has a positive significant impact, at a decreasing rate which suggests that economies of scale would make implementing more FTS activities easier for larger schools. For example designing promotions would have a lower per student cost at a large school that a small one. *Total exp*. also have a positive impact on intensity. This result suggests that better-funded school districts are more likely to take on more intensive FTS programs.

The I.4 variables have no impact on intensity, which is surprising since the rest of our results suggest that more urban schools are more likely to take part in FTS activities. Finally, the only significant race component, I.5, was percentage of black students.

Overall the most important factors when considering type and intensity of participation are *Prop. Direct*, *Farm Market*, and *Size*. From a policy standpoint it may be difficult to increase local supply or local interest to promote FTS. However, recognizing that large schools are better able to implement FTS because of economies of scale could be policy relevant. Those interested in promoting FTS could work on policies that eliminate barriers to entry for smaller schools.

FTS Barriers

Next we examine the types of problems that schools face, the D.3 variables. We evaluate factors that impact each potential problem for the set of districts that participate separately from the set of districts that do not participate, as they have significant underlying differences with problems they face with FTS. Thus, we estimate a logit model for each problem for each of the two types of schools and a negative binomial model for the intensity of problems for each of the two types of schools.

Problems for non-participants

First we focus on the schools that do not participate in FTS in any way. For all the problems we present results for the log likelihood, score, and Wald tests (Table 7). All the tests suggest the models are more effective than simply using the odds ratio to predict. To test goodness-of-fit we use the H-L test which had χ^2 ranging from 3.5-15.6 all of which are insignificant, except for *processed*. We use the Somers's D as our variable of association and find that there are 24-32% fewer errors when using these models than by using chance.

Considering I.1 variables overall none of the problems have a significant relationship with *farm income*, which is not surprising considering *farm income* has had little impact on overall participation or any type of FTS participation. *Prop. direct* is insignificant for all problems. This is not expected given how significant *prop. direct* is for overall participation and types of participation.

I.2, *farm market* has only a positive significant relationship with *reliable delivery, processed* and *quality*. Farmers' markets are often, but not always seasonal so this variable should not be associated with *year round*. On the other hand, *reliable delivery, processed* and *quality* implies that the district looked into serving local food and found it to be problematic in one of these ways and since farmers' markets has a positive relationship with serving local foods it should have a positive relationship with schools that have tried or looked into serving local foods in the past as well.

Turning to the I.3 variables, we find that *size* had a significantly negative relationship with *year round, reliable delivery, processed,* and *quality*. *Fed. Mon* has a significant positive relationship with *year round, primary vendor, lack or reliable delivery, new supplier,* and *info.* Remember that schools get higher reimbursement rates if they meet health standards set out by the HHFK act of 2010. Districts that meet these standards may be more likely than other non-participants to have looked into sourcing local food and therefore be more likely to know all the challenges they face. *Food cost* has a significant negative relationship with all problems except *info* and *quality*, suggesting that schools that have higher food costs are less likely to have problems with vendors or availability. *Sales* has a positive relationship with *year* *round, primary vendor,* and *new supplier.* This result may be due to the fact that schools with higher sales may have checked to see if they could switch to some local while other schools may not know if their vendor carries local products.

Looking to the I.4 variables, in line with our other results more rural schools are more likely to face problems with FTS. This trend is particularly significant with: *primary vendor,* and *processed*. The coefficients for the race composition, variables I.5, show that in general increasing the *pct. Black* decreases the probability of facing a problem. This result is in line with our other results.

Intensity of Problems for non-participants

To model intensity of problems we look only at schools that did not participate and we look at factors that impact the schools' intensity of problems with FTS participation. To create intensity we simply count the number of problems a district lists. We use a negative binomial model because the Poission model has over-dispersion. The log likelihood is 3,976 (Table 8).

Looking at the I.1 variables we see that neither variable has an impact on the intensity of FTS problems. This finding is a bit surprising since a lack of local supply should increase the problems associated with FTS. We find that I.2, *farm market*, has a significant positive relationship with intensity of problems listed, which could be because schools with higher local interest are more likely to have considered a FTS program and are therefore more likely to know all the potential problems.

Turning to the I.3 controls, we see that larger districts are more likely to have more problems, again we suspect that this is because they were more likely to look into starting a FTS program. Intensity of problems also has a positive significant relationship with *fed. Mon* and *sales*, but a negative relationship with *food cost*.

Overall these models can be difficult to interpret because nonparticipating schools may fall into two distinct categories: schools that have had, or considered having a FTS program and schools that have never looked into FTS programs. Schools from the first group are likely to be more similar to schools that participate than the second group, but also more likely to list more problems, because they have actual experience with these problems.

Problems for participants

Considering the problems for schools that participate, we find different patterns than with schools that do not participate. For all the problems we present results for the log likelihood, score, and Wald tests (See Table 9). All the tests suggest the models are more effective than simply using the odds ratio to predict FTS participation. To test goodness-of-fit we use the H-L test which had χ^2 ranging from 2.8-13.7 all of which are insignificant, suggesting that the models fit the data well. We use the Somers's D as our variable of association and find that there are 19-34% fewer errors when using these models to predict problems with participation than by using chance.

Looking first at the I.1 variables we find that *farm income* has a negative significant relationship with *local vendor*, which differs from the non-participating districts. *Prop. direct* has a positive relationship with *high price*. Since smaller farms are more likely to have direct-to-consumer sales this suggests that smaller farms may have higher prices (Low and Vogel 2011). The I.2 variables, *Farm market* also has a significant positive relationship with *high price*. This could be because interest in local foods is creating a greater demand and driving up the price.

Turning to the I.3 controls we find that *size* is positively related with *year round, reliable delivery, processed, info,* and *quality*. *%reduced* has a positive relationship with *processed*. *Fed. mon* has no significant impact on any problem, which differs from the non-participating schools. *Total Exp*. has a positive significant relationship with *quality*. This could mean that wealthier school districts have higher quality standards. *Food cost* has a negative relationship with *year round, high price,* and *processed.* This suggests spending more on food can address some of the issues faced by other districts. Across all problems the I.4 and I.5 variables had little significant impact.

Intensity of Problems for Participants

For the intensity model, we use a negative binomial model because the Poission model has over-dispersion. The log likelihood is 3,976 (See Table 10). We find no impact from the I.1 or I.2 variables on the intensity of problems. Even though these schools already have enough local supply to participate we expected an increase in supply to decrease intensity of problems as this would mean more suppliers to choose from. Looking at the I.3 variables, we find that *size* has a positive relationship with the intensity of problems. All other I.3 variables are not significant.

There is also not much significance across the I.4 variables. For the I.5 variables, we find that the percent of Asian students is negatively related with intensity of problems while the percent of mixed race students is positively related.

Conclusions

Our analyses illuminate the complex nature of each school district's decision to participate in FTS programs. We show the nuances of the decision by evaluating overall participation, the types of participation, and the problems faced by the districts. It seems the most critical things driving FTS participation include p*rop. direct*, *farm market*, and *size*. Interestingly, *farm income* is not significant across most of our regressions suggesting that overall it is the supply of local food for direct-to-consumer sales, not total farm activity that is associated with the likelihood of FTS participation. We also find local interest and average school size to be significant in most of our models. Other district factors, urbanicity, and race also have significant impacts on some aspects of FTS participation.

While this study provides a comprehensive analysis of FTS participation, there are some limitations. The survey was only administered once, so the data is a single cross section. Because of this we lack an understanding of the dynamic aspect of FTS participation. Schools that participate may have been participating for years, or have just started recently, similarly participating schools could discontinue their program; however, our data does not capture these changes. This limits our analysis so we cannot address questions such as: what factors are associated with FTS programs failing? and how does policy implementation impact FTS programs? This limitation should be addressed in the future as the next round of the survey will be available in Oct. 2015.

Looking at the overall participation logit we find we have spatial autocorrelation using the Moran's I statistic. Spatial autocorrelation is not unexpected in this case, as there may be local policy impacting FTS decisions. Additionally, uptake of other schools in the area may also impact a schools decision. If other schools in the area participate then we expect to find spillover effects which is currently not controlled for. Our inclusion of state fixed effects significantly improves our spatial autocorrelation, however there is likely enough in-state variation such as local policy that we need a smaller area fixed effects to totally resolve this issue. The next logical step would be to try county fixed effects, however, there are too many counties in the study with only one district reporting to use this in our analysis. We plan to address this issue in the future by including the inverse distance weighted proportion of schools that participate in FTS in the area.

Not every school district in the US responded to the survey potentially skewing the sample, and therefore the results. The USDA is currently constructing weights to correct this issue, however, they are not available yet so we expect these results to be slightly skewed. This issue will be addressed as soon as weights become available.

Further limitations come from the resolution of the supply-side data. The data was only available at the county level. For example, a school and a farm that sit directly next to each other, but on a county border will be weighted by the distance from the centroid of the first county to the centroid of the second. The optimal approach would be to have the latitude and longitude of each farm, however this data is not available.

While there are some limitations to this work, our analysis can provide critical insight to those designing policy around FTS participation. The nuances of this analysis can provide insight not only for policy makers interested in increasing overall FTS participation, but also more targeted policy aimed at a specific type of participation, as well as policy addressing a common problem faced either by schools that already participate, to strengthen participation, or by schools that do not participate to encourage participation. For example, a policymaker designing a policy aimed at increasing field trips to schools should note that *total exp.* is positive and significant meaning that wealthier schools are more likely to partake in this activity. So a policy aimed at increasing trips to farms should target poorer school districts.

Beyond the policy implications this analysis also provides a detailed understanding of FTS participation that will provide useful insight for future studies aimed at evaluating FTS benefits or other aspects of FTS programs. We find that overall the supply of local food, *prop. direct*, is significant across most of our models. While it seems obvious that supply should drive the likelihood of a school serving local food the availability of food is left out of the majority of papers that discuss FTS programs (Joshi, Azuma, and Feenstra 2008). Though they often discuss the potential benefits to local farmers of increasing the demand for their products they rarely discuss that the ability of a school to obtain local food is dependent on the supply. Future studies of FTS programs should be more cognizant of both the supply and demand aspects of FTS programs. We also found interest in local foods to be important in most models, so future studies of FTS programs should take note of the local food climate as results from a study in an area with high interest in local foods may not translate to an area with lower interest. Our study also shows that school factors such as school size, total school expenditures, percent of students on free or reduced meals, federal cafeteria reimbursements, food cost, food sales, race, and urbanicity should be taken into account in any future study as they impact the uptake and type of participation in FTS programs.

Reference

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Tables:

Table 1: Variable Classifications

Classification	Description
D.1	Overall FTS participation
D.2	Types and intensity of participation
D.3	Types and intensity of problems (for participating and non-participating schools)
I.1	Supply-side controls
I.2	Proxy for interest in local food
I.3	School district controls
I.4	Rural/Urban controls
I.5	Race controls
I.6	State Fixed Effects

Table 2: Summary of Dependent Variables

Variable Class	Variable Abbreviation	Variable Definition	Mean	Min	Max
D.1	*FTS*	Farm to School participation	0.434		
D.2.	*Intensity participation*[1]	Count of FTS activities	3.442	1	13
D.3.	*Intensity of problems: non-participation*[2]	Count of Problems with FTS for those who do not participate	3.679	1	17
D.3	*Intensity of problems: Participation*[3]	Count of problems with FTS for those who participate	4.554	1	16
D.2	*Serve local*	Local products served	0.345		
D.2	*Taste tests*	Held local products taste tests	0.159		
D.2	*School Garden*	Kept an edible school garden	0.126		
D.2	*Serve School Garden*	Served food from school garden	0.095		
D.2	*Field Trips*	Took field trips to farms	0.122		
D.2	*Themed Promotion*	Used themed or branded promotion	0.103		
D.2	*Other promotion*	Used other promotion of local foods	0.174		
D.2	*Community Events*	Community events to promote local	0.062		
			Mean-non participant	**Mean-participant**	
D.3	*Year Round*[2,3]	Difficult to find year round	0.547	0.678	
D.3	*Primary Vendor*[2,3]	Primary vendor does not carry local	0.407	0.368	
D.3	*Local Vendor*[2,3]	Vendors don't offer range of products	0.234	0.297	
D.3	*High Price*[2,3]	High product prices	0.257	0.455	
D.3	*Reliable Delivery*[2,3]	Lack of reliable delivery	0.192	0.256	
D.3	*Processed*[2,3]	Lack of processed/pre-cut products	0.182	0.216	
D.3	*New Supplier*[2,3]	Hard to find new suppliers	0.266	0.227	
D.3	*Info*[2,3]	Hard to get info on products	0.221	0.191	
D.3	*Quality*	Problems with food quality	0.168	0.232	

Notes: N=9,634

[1] n=3,961 (Includes only schools that participated in some way)

[2] n=3,604 (Includes only schools that did not participate)

[3] n=3,704 (Includes only schools that participated in 2011)

Table 3: Summary of Independent Variables

Variable Class	Variable	Description	Mean	Median	Std Dev	Min	Max
I.1	Farm Income	In $10 billions	0.260	0.176	0.207	0.000	1.190
I.1	Prop. Direct	Proportion of farms with direct-to-consumer sales *100	3.312	1.941	3.173	0.215	19.849
I.2	Farm Market	Per 10,000 people	0.488	0.275	0.717	0.000	14.493
I.3	Size	Average school size In 1,000 students	0.407	0.385	0.252	0.001	3.224
I.3	Size sq.	Size Squared	0.229	0.148	0.370	0.000	10.394
I.3	%Reduced	% free and reduced meals	0.467	0.470	0.216	0.000	0.997
I.3	Fed. mon	Federal Reimbursements/ student, in $1,000	0.268	0.240	0.260	0.000	12.987
I.3	Total exp.	District exp./ student, in $10,000	2.167	1.187	43.232	0.454	4000.180
I.3	Food Cost	Food cost/ student	261.298	238.095	153.069	0.000	6133.330
I.3	Sales	Caf. Sales/ student	169.487	161.361	97.378	0.000	2110.430
I.4	Population	County population	0.037	0.006	0.102	0.000	0.996
I.4	RUCC 1	Rural-Urban Continuum Codes[8]	0.246				
I.4	RUCC 2		0.169				
I.4	RUCC 3		0.112				
I.4	RUCC 4		0.089				
I.4	RUCC 5		0.031				
I.4	RUCC 6		0.139				
I.4	RUCC 7		0.098				
I.4	RUCC 8		0.035				
I.4	RUCC 9		0.062				
I.5	Pct. am	% Native American	0.022	0.003	0.089	0.000	0.991
I.5	Pct. asian	% Asian	0.021	0.006	0.057	0.000	0.960
I.5	Pct. hisp	% Hispanic	0.132	0.044	0.201	0.000	0.998
I.5	Pct. black	% Black	0.079	0.015	0.165	0.000	1.000
I.5	Pct. pacific	% Pacific Islander	0.002	0.000	0.012	0.000	0.800
I.5	Pct. tr	% two or more races	0.024	0.015	0.040	0.000	0.982
I.6	State Fixed Effects						

[8] Rural-Urban Continuum Codes (RUCCs) classify counties on urbanicity where RUCC 1 is the most urban and RUCC 9 is the most rural. RUCCs 1-3 are metro counties. RUCCs 4-7 are urban either adjacent or non-adjacent to metro counties and RUCCs 8-9 are rural either adjacent or non-adjacent to metro counties (ERS 2013)

Table 4: Participation Logit Results

Analysis of Maximum Likelihood Estimates						
Parameter	**Estimate**		**SE**	**Chi-sq**	**p**	**Odds Ratio**
Intercept	-3.329	***	0.561	35.244	<.0001	-
Farm Income	0.296		0.232	1.628	0.202	1.344
Prop Direct	0.161	***	0.025	43.021	<.0001	1.174
Farm market	0.155	***	0.039	15.903	<.0001	1.168
Size	2.424	***	0.296	66.921	<.0001	11.292
Size sq.	-1.042	***	0.187	31.112	<.0001	0.353
%reduced	-0.447	**	0.193	5.376	0.020	0.639
Fed. mon	0.950	***	0.317	8.964	0.003	2.586
LN totexp	-0.052		0.099	0.276	0.599	0.949
LN foodcost	0.016		0.089	0.034	0.854	1.017
LN sales	0.156	***	0.058	7.195	0.007	1.169
population	-0.271		0.327	0.686	0.408	0.763
RUCC 2	0.113		0.082	1.882	0.170	1.119
RUCC 3	-0.071		0.096	0.548	0.459	0.932
RUCC 4	0.047		0.102	0.211	0.646	1.048
RUCC 5	-0.357	**	0.153	5.458	0.020	0.7
RUCC 6	-0.176	*	0.096	3.320	0.069	0.839
RUCC 7	-0.264	**	0.109	5.840	0.016	0.768
RUCC 8	-0.337	**	0.157	4.572	0.033	0.714
RUCC 9	-0.439	***	0.136	10.336	0.001	0.645
Pct. am	0.181		0.365	0.246	0.620	1.198
Pct. asian	1.088	*	0.618	3.099	0.078	2.969
Pct. hisp	0.622	***	0.202	9.528	0.002	1.863
Pct. black	0.482	**	0.217	4.938	0.026	1.619
Pct. pacific	-7.487		6.571	1.298	0.255	<0.001
Pct. tr	1.577	*	0.837	3.549	0.060	1.344
Tests						
Likelihood				1650	<.0001	
Score				1531	<.0001	
Wald				1240	<.0001	
H-L				5.095	0.747	

Notes: *, **, *** denote significance at the 10, 5 and 1 percent levels. State fixed effects are jointly significant but not displayed.

Table 5: Types of Participation Logit results

Analysis of Maximum Likelihood Estimates Odds Ratio Point Estimate

	Serve Local	Taste Tests	School Garden	Serve school garden	Field Trips	Themed Promotion	Other Promotion	Community Events
Intercept	1.615 *	1.311	0.537 *	1.66	1.46	1.134	1.24	0.964
Farm Income	1.167 ***	1.165 ***	1.172 ***	1.2 ***	1.18 ***	1.083 ***	1.113 ***	1.159 ***
Prop Direct	1.167 ***	1.26 ***	1.224 ***	1.28 ***	1.18 ***	1.34 ***	1.164 ***	1.154 **
Farm market	12.743 ***	42.52 ***	10.13 ***	1.88	2.65 **	243.735 ***	18.69 ***	1.512
Size	0.357 ***	0.159 ***	0.383 ***	0.9	0.48 **	0.05 ***	0.318 ***	0.757
Size sq.	0.669 **	0.627 *	1.107	0.9	1.5	0.538 **	0.713	0.781
%reduced	1.531	1.283	0.892	1.03	0.94	1.294	0.795	1.025
Fed. mon	0.948	1.17	1.517 ***	1.48 ***	1.34 **	1.204	1.087	1.29
LN totexp	1.118	1.272 **	0.893	0.83	0.88	1.448 ***	1.332 **	1.026
LN foodcost	1.211 ***	1.141 *	1.088	1.32 ***	1.12	1.126	1.164 *	1.036
LN sales	1.179	0.607	0.698	0.51	0.06 ***	0.586	0.4 **	0.825
population	1.162 *	0.994	1.214 *	1.12	1.24 *	1.148	1.019	1.081
RUCC 2	0.934	0.808 *	0.939	0.99	0.97	0.851	0.88	0.941
RUCC 3	0.989	0.913	1.169	1.19	1.25	1.015	0.955	1.312
RUCC 4	0.648 ***	0.684 *	0.906	0.62	0.84	0.764	0.606 **	0.693
RUCC 5	0.78 **	0.741 **	0.92	1.06	1.06	0.683 **	0.894	0.882
RUCC 6	0.678 ***	0.666 **	0.874	1.17	0.84	0.715 *	0.691 **	1.341
RUCC 7	0.716 **	0.749	1.041	0.71	1.02	0.501 **	0.728	0.848
RUCC 8	0.598 ***	0.818	0.821	0.83	1.06	0.417 ***	0.519 ***	1.193
RUCC 9	1.24	1.521	2.648 *	2.13	2.71 **	1.691	1.126	0.614
Pct. am	1.927	1.255	1.543	1.46	0.96	1.968	1.805	2.116
Pct. asian	2.014 ***	1.944 **	1.871 **	1.1	0.95	1.622	2.277 ***	3.002 ***
Pct. hisp	2.068 ***	3.419 ***	2.943 ***	2.61 **	1.09	2.119 **	1.72 *	1.81
Pct. black	0.002	0.022	0	0	0.12	0.002	1.837	<0.001
Pct. pacific	3.733	1.117	6.231 *	4.97	0.59	4.276	6.097 *	1.955
Tests								
Likelihood	2011 ***	1101 ***	771 ***	846 ***	493 ***	1062 ***	1294 ***	295 ***
score	1864 ***	1155 ***	870 ***	1077 ***	520 ***	1210 ***	1333 ***	383 ***
wald	1418 ***	853 ***	644 ***	656 ***	409 ***	755 ***	997 ***	289 ***
H-L	8.294	10.74	14.89 *	4.39	3.76	8.36	14.29 *	8.12

Notes: *, **, *** denote significance at the 10, 5 and 1 percent levels. State fixed effects are jointly significant but not displayed.

Table 6: Intensity of Participation Negative Binomial Results

Analysis of Maximum Likelihood Estimates				
	Estimate	**SE**	**Chi-sq**	**p**
Intercept	-0.0036	0.2612	0	0.9891
Farm Income	0.1342	0.1159	1.34	0.2471
Prop Direct	0.0427 ***	0.0079	29.48	<.0001
Farm market	0.0687 ***	0.0186	13.65	0.0002
Size	0.5886 ***	0.116	25.77	<.0001
Size sq.	-0.1799 ***	0.0597	9.08	0.0026
%reduced	-0.0392	0.0831	0.22	0.6373
Fed. mon	-0.0465	0.0503	0.85	0.3555
LN total exp.	0.1614 ***	0.0467	11.96	0.0005
LN food Cost	0.0462	0.0361	1.64	0.2006
LN Sales	0.0141	0.0257	0.3	0.5819
Population	-0.3137 **	0.1416	4.91	0.0267
RUCC 2	0.0022	0.0347	0	0.9487
RUCC 3	-0.0068	0.0429	0.03	0.8738
RUCC 4	0.0708	0.0456	2.42	0.1202
RUCC 5	-0.1117	0.0777	2.07	0.1506
RUCC 6	0.0101	0.0459	0.05	0.8249
RUCC 7	0.0293	0.0519	0.32	0.5725
RUCC 8	0.0439	0.0756	0.34	0.5617
RUCC 9	0.038	0.0699	0.3	0.5866
Pct. am	0.0231	0.182	0.02	0.8991
Pct. asian	-0.1109	0.2466	0.2	0.653
Pct. hisp	0.0821	0.0927	0.78	0.376
Pct. black	0.2681 ***	0.0977	7.54	0.006
Pct. pacific	-0.3753	3.247	0.01	0.908
Pct. tr	0.0391	0.3538	0.01	0.9119
Tests				
Log Likelihood			3646.1	
Over dispersion				

Notes: *, **, *** denote significance at the 10, 5 and 1 percent levels. State fixed effects are jointly significant but not displayed.

Table 7: Problems with FTS, Non-participants, Logit Results

Analysis of Maximum Likelihood Estimates Odds Ratio Point Estimate									
	Year Round	Primary Vendor	Local Vendor	High Price	Reliable Delivery	Processed	New Supplier	Info	Quality
Farm Income	0.964	0.714	0.703	1.259	1.249	1.228	0.693	0.685	1.176
Prop Direct	0.937	0.958	0.967	1.091 *	1.022	1.006	0.966	0.997	0.947
Farm market	1.108	1.020	1.108	1.097	1.235 ***	1.151 **	1.009	1.063	1.203 ***
Size	6.411 ***	2.350 *	1.608	2.115	3.236 **	3.735 **	2.757 *	1.886	7.680 ***
Size sq.	0.493 **	0.728	0.966	0.779	0.819	0.515	0.552	0.818	0.515 *
%reduced	1.077	1.165	0.881	0.944	0.982	1.306	1.433	0.882	1.370
Fed. mon	9.496 ***	3.123 **	3.072 *	2.454	6.852 ***	2.302	8.103 ***	4.093 **	1.719
LN total exp.	0.941	1.160	0.748 *	0.814	1.155	1.217	1.198	1.092	0.934
LN food Cost	0.592 ***	0.685 **	0.604 ***	0.663 **	0.653 **	0.599 ***	0.623 ***	0.708 *	1.056
LN Sales	1.230 **	1.419 ***	1.185	1.199 *	1.151	1.095	1.352 ***	1.114	1.053
Population	0.129 ***	0.172 **	0.570	0.827	0.790	0.189	0.459	0.272	0.156 *
RUCC 2	1.035	0.822	1.151	0.827	1.033	0.918	0.903	0.877	1.078
RUCC 3	1.277	1.195	1.113	1.213	1.175	1.451 *	1.148	0.941	1.102
RUCC 4	1.124	1.398 **	1.439 *	1.426 **	0.947	1.531 **	1.217	1.215	1.130
RUCC 5	1.235	1.285	1.053	0.826	0.728	1.658 *	1.021	0.996	0.889
RUCC 6	1.000	1.257	1.110	1.229	0.868	1.530 **	1.085	1.004	1.054
RUCC 7	1.271	1.622 ***	1.026	0.903	0.784	1.407	1.133	0.843	0.603 **
RUCC 8	1.164	2.647 ***	1.339	1.126	0.722	1.562 *	1.299	1.282	0.993
RUCC 9	1.409 *	1.726 ***	0.817	1.159	0.728	1.377	1.433 *	0.774	0.866
Pct. am	1.822	1.102	0.916	1.848	0.927	0.528	0.889	0.801	0.397
Pct. asian	2.406	0.123	0.231	0.449	1.225	0.066	1.434	0.157	0.784
Pct. hisp	0.581 *	0.750	1.423	0.882	1.104	0.889	0.511 *	0.907	1.063
Pct. black	0.460 **	0.427 **	0.929	0.915	0.646	0.803	0.418 **	0.732	0.917
Pct. pacific	0.073	555.58	3.318	688.80	>999	0.001	0.052	0.323	>999 **
Pct. tr	1.363	0.312	5.710	0.458	1.586	0.204	1.401	1.834	1.486
Tests									
Likelihood	273 ***	189 ***	147 ***	197 ***	121 ***	93 **	124 ***	126 ***	109 ***
score	261 ***	179 ***	149 ***	190 ***	120 ***	90 **	121 ***	115 ***	108 ***
wald	236 ***	165 ***	136 ***	167 ***	105 ***	85 **	113 ***	93 **	97 **
H-L	3.698	3.698	12.196	6.872	6.326	15.575 **	3.478	4.170	10.682

Notes: *, **, *** denote significance at the 10, 5 and 1 percent levels. State fixed effects are jointly significant but not displayed.

Table 8: Intensity of Problems, Non-Participants, Negative Binomial Results

Analysis Of Maximum Likelihood Parameter Estimates

	Estimate	SE	Chi-Sq	P
Intercept	1.379 ***	0.343	16.200	<.0001
Farm Income	0.031	0.127	0.060	0.804
Prop Direct	0.000	0.018	0.000	0.992
Farm market	0.058 ***	0.020	8.180	0.004
Size	0.665 ***	0.168	15.620	<.0001
Size sq.	-0.231 **	0.105	4.850	0.028
%reduced	0.080	0.120	0.450	0.503
Fed. mon	0.709 ***	0.191	13.850	0.000
LN total exp.	0.005	0.052	0.010	0.917
LN food Cost	-0.173 ***	0.058	8.830	0.003
LN Sales	0.074 **	0.035	4.520	0.034
Population	-0.412	0.258	2.550	0.111
RUCC 2	0.052	0.053	0.970	0.326
RUCC 3	0.074	0.057	1.690	0.193
RUCC 4	0.159 ***	0.061	6.810	0.009
RUCC 5	-0.009	0.083	0.010	0.914
RUCC 6	0.061	0.055	1.220	0.270
RUCC 7	-0.013	0.061	0.050	0.827
RUCC 8	0.099	0.078	1.590	0.208
RUCC 9	0.048	0.070	0.460	0.496
Pct. am	-0.123	0.202	0.370	0.543
Pct. asian	-0.199	0.456	0.190	0.663
Pct. hisp	-0.026	0.115	0.050	0.819
Pct. black	-0.164	0.134	1.490	0.222
Pct. pacific	1.532	2.552	0.360	0.548
Pct. tr	0.160	0.498	0.100	0.747
Tests				
Log Likelihood			3976	

Notes: *, **, *** denote significance at the 10, 5 and 1 percent levels. State fixed effects are jointly significant but not displayed.

Table 9: Problems with FTS, Participants, Logit Results

Analysis of Maximum Likelihood Estimates Odds Ratio Point Estimate

	Year Round	Primary Vendor	Local Vendor	High Price	Reliable Delivery	Processed	New Supplier	Info	Quality
Farm Income	0.643	0.928	0.352 **	0.760	0.788	0.993	0.703	0.896	0.910
Prop Direct	0.980	1.007	1.026	1.089 ***	0.963	1.050	0.943 *	1.034	0.957
Farm market	1.004	1.046	0.982	1.163 **	1.122	1.122	0.98	0.956	1.126
Size	3.524 ***	1.627	2.136 *	1.667	2.629 **	6.217 ***	2.576 *	3.022 **	13.277 ***
Size sq.	0.751	0.877	0.894	0.919	0.849	0.687	0.735	0.645	0.268 ***
%reduced	1.365	1.109	0.956	1.150	0.789	3.317 ***	0.877	1.233	1.544
Fed. mon	0.952	0.963	0.974	1.336	1.278	2.173	0.93	0.938	0.623
LN total exp.	1.359 *	1.171	1.180	1.322 *	1.144	1.360	1.068	1.006	1.840 ***
LN food Cost	0.719 **	0.855	0.883	0.552 ***	0.821	0.630 ***	1.005	0.853	0.770 *
LN Sales	1.162 *	0.972	0.945	1.109	1.058	1.182	1.064	1.090	1.041
Population	0.846	1.482	0.832	1.435	1.184	0.595	1.164	2.163	2.051
RUCC 2	0.778 **	0.954	1.022	0.906	0.939	0.690 ***	1.048	0.763 *	0.967
RUCC 3	1.262	0.861	1.088	1.280 *	1.171	1.195	1.24	1.478 **	1.395 **
RUCC 4	1.564 ***	1.169	1.153	1.053	1.119	1.288	1.268	1.518 **	1.362 *
RUCC 5	1.501	1.095	1.073	1.058	1.106	0.816	0.917	1.342	1.176
RUCC 6	1.311 *	0.993	1.186	0.958	0.686 **	1.009	1.069	1.114	1.006
RUCC 7	1.382 *	0.959	0.959	0.785	0.875	1.222	1.182	1.092	1.099
RUCC 8	1.378	0.921	1.170	0.916	0.990	0.898	0.785	0.548	1.408
RUCC 9	1.413	1.044	0.849	0.800	0.646	0.776	1.304	1.417	0.709
Pct. am	0.765	1.138	0.903	0.231 **	0.870	0.070 **	1.351	2.440	0.583
Pct. asian	0.549	0.500	0.347	0.246 *	0.195 *	0.567	0.065 **	0.037 **	0.139 *
Pct. hisp	0.816	0.872	1.340	0.722	1.008	0.666	1.22	0.788	1.708
Pct. black	0.935	0.557 *	1.338	0.697	1.158	0.909	1.203	0.967	0.887
Pct. pacific	999	999	999	18.99	999	0.082	792.53	999	999 **
Pct. tr	3.056	3.963	0.669	7.143	17.95 **	5.649	5.102	9.716 *	15.343 **
Tests									
Likelihood	248 ***	105 ***	112 ***	328 ***	132 ***	176 ***	89 *	146 ***	151 ***
score	243 ***	103 ***	108 ***	308 ***	133 ***	173 ***	85	145 ***	144 ***
wald	221 ***	96 **	100 **	266 ***	122 ***	154 ***	75	129 ***	132 ***
H-L	10.88	4.08	2.83	9.16	5.86	13.70 *	9.94	6.69	5.41

Notes: *, **, *** denote significance at the 10, 5 and 1 percent levels. State fixed effects are jointly significant but not displayed

Table 10: Intensity of Problems, Participants, Negative Binomial Results

Analysis Of Maximum Likelihood Parameter Estimates				
	Estimate	SE	Chi-Sq	P
Intercept	1.273 ***	0.282	20.450	<.0001
Farm Income	-0.037	0.132	0.080	0.777
Prop Direct	0.009	0.009	0.870	0.352
Farm market	0.031	0.021	2.070	0.151
Size	0.503 ***	0.128	15.450	<.0001
Size sq.	-0.172 ***	0.066	6.750	0.009
%reduced	0.068	0.089	0.580	0.446
Fed. mon	-0.005	0.053	0.010	0.919
LN total exp.	0.087 *	0.051	2.860	0.091
LN food Cost	-0.053	0.040	1.760	0.185
LN Sales	0.028	0.028	0.990	0.320
Population	0.282 *	0.148	3.610	0.058
RUCC 2	0.049	0.038	1.730	0.188
RUCC 3	0.082 *	0.047	3.090	0.079
RUCC 4	0.099 **	0.049	4.000	0.046
RUCC 5	0.021	0.082	0.060	0.801
RUCC 6	0.032	0.051	0.390	0.532
RUCC 7	-0.029	0.058	0.250	0.614
RUCC 8	-0.006	0.087	0.010	0.942
RUCC 9	-0.064	0.079	0.660	0.417
Pct. am	-0.002	0.210	0.000	0.994
Pct. asian	-0.566 **	0.279	4.120	0.042
Pct. hisp	0.016	0.103	0.020	0.881
Pct. black	0.085	0.110	0.600	0.440
Pct. pacific	6.386 *	3.433	3.460	0.063
Pct. tr	0.852 **	0.341	6.240	0.013
Tests				
Log Likelihood			7148.464	

Notes: *, **, *** denote significance at the 10, 5 and 1 percent levels. State fixed effects are jointly significant but not displayed.