



# Understanding participation in farm to school programs: Results integrating school and supply-side factors<sup>☆, ☆ ☆</sup>



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## ABSTRACT

Despite their status as the largest and most systematic of government programs to promote local foods in the US, few studies identify the factors that are associated with the school district decision to participate in farm to school (FTS) programs. We are the first to leverage the USDA's Farm to School Census to analyze factors associated with FTS participation, the types of FTS activities implemented, and the challenges faced by participating school districts. Because a school's participation is circumscribed by access to local foods, we control for the supply of local foods. We use spatially articulate data to estimate the spatial spillover effects of FTS participation. The results demonstrate that both school characteristics and local farm production factors are associated with FTS participation. The estimated spatial spillover effect is positive suggesting that areas with a high penetration of FTS activities have lower barriers associated with implementing FTS programs.

## 1. Introduction

School food programs are prevalent around the globe and are used to promote childhood nutrition, diminish childhood hunger, and improve school enrollment and learning outcomes (Sumberg and Sabates-Wheeler, 2011). In recent years, school meals have been used to promote the development of more localized agricultural systems. These programs are referred to as home-grown school feeding (HGSF), which is broadly defined as the promotion of national or more localized agricultural systems through school food programs. HGSF programs are prevalent in developed and developing economies in South America, North America, Sub-Saharan Africa, Asia, and Europe (Espejo et al., 2009). However, little scholarship exists that explores the uptake and efficacy of HGSF programs.

This paper focuses on Farm to School (FTS) programs, which are HGSF programs that promote of regional, state or local food products in the US and that have proliferated in the last several years.<sup>1</sup> FTS is considered to be any activity that promotes local foods or food systems in primary or secondary schools including the use of local foods in school meals, having school gardens, hosting field trips to farms,

promoting the local foods that are included in school meals, and hosting community events. The growing interest in local food systems has fueled FTS legislation, which has been proposed in 45 states and the District of Columbia and has been enacted in 39 states and the District of Columbia as of 2014 (National FTS Network, 2015). Federal FTS efforts were codified in the Healthy, Hunger-Free Kids Act of 2010 (Pub.L. 111-296), and these efforts are directed by the U.S. Department of Agriculture's Food and Nutrition Service (USDA FNS). The USDA's FNS promotes FTS program uptake and engagement by school districts through more than five million dollars in annual funding that school districts use to plan and implement FTS programming. Further, federal law now allows schools to exert local geographical preference when choosing food service vendors (Food and Nutrition Service, 2014a).

The literature on FTS programs can fit into the broader literature on school food programs. While there is a mature literature that evaluates an individual's decision to participate in a school food program (Lülfes-Baden et al., 2008; Maietta and Gorgitano, 2016; Mirtcheva and Powell, 2009; Moore et al., 2010; Weible et al., 2013, among others), little research evaluates school level participation. Jensen et al. (2013) does evaluate the school level participation decision and finds that larger

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<sup>1</sup> For the remainder of the paper HGSF will refer broadly to any program that encourages the use of nationally or more locally grown foods in schools, while FTS will refer specifically to US school programs that promote local foods.

schools are more likely to be able to sustain school lunch programs in Danish schools. However, the study relies on a small sample size. Within the broader literature of HGSF, [Espejo et al. \(2009\)](#) report on HGSF and provide information on program details, and [Sumberg and Sabates-Wheeler \(2011\)](#) provide a theoretical perspective of HGSF in Sub-Saharan Africa. However, there are no papers that evaluate program benefits or how school level participation is determined.

Despite the pivotal role that FTS programs play in the emergent local foods movement in the United States and the associated trends in local and regional food systems ([Low et al., 2015](#)), there exists only limited research on FTS benefits and a paucity of research examining the correlates of FTS program participation. While studies tout the benefits of FTS participation for local farmers, all previous studies fail to consider key supply-side components, such as the availability of locally produced food, that naturally circumscribe the extent of districts' abilities to serve local foods. The extant literature on the benefits of FTS primarily consists of studies with small sample sizes that do not appear in peer-reviewed outlets and that focus on assessing possible benefits associated with uptake.<sup>2</sup> There are several papers that demonstrate that FTS programs increase fruit and vegetable knowledge and consumption ([Nicholson et al., 2014](#); [Bontrager Yoder et al., 2014](#)), suggesting there are tangible benefits to FTS programs, though further analysis is needed to understand the scope of benefits from FTS programs. [Vo and Holcomb \(2011\)](#) and [Thompson et al. \(2014\)](#) provide the only peer-reviewed articles that address FTS participation at the school district level. However, the [Vo and Holcomb \(2011\)](#) study omits data critical to understanding FTS participation and relies on a small sample from a single state taken from a survey with a low response rate. [Thompson et al. \(2014\)](#) rely on a sample size of 18 farms and do not demonstrate any statistically significant results.

The purpose of this study is to analyze factors correlated with school districts' FTS participation to provide a detailed understanding of FTS program participation. Specifically, we evaluate the importance of various determinants of FTS participation including school characteristics, supply of local foods, and other factors, and we estimate if there is a significant spatial spillover effect in participation rates. This work constitutes the first large-scale evaluation of any HGSF program and provides an understanding of whether local agricultural production and spatial spillovers are correlated to school district participation. Given the dynamic nature of local food production activities and infrastructures ([Low et al., 2015](#)), an understanding of the role of local food production in FTS activity may be essential for predicting future program participation. An improved understanding of FTS participation at the school district level is useful in two areas. First, understanding the correlates of participation will provide critical insight into the potential differences in FTS benefits across heterogeneous school districts, which the current literature is lacking. Second, our results provide a critical understanding of the nuances of FTS participation that can be used by policy makers to encourage additional participation, or reduce roadblocks to participation through targeting grant funds and policies.

This is the first study to provide a comprehensive examination of FTS participation using nationally representative 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 detailed understanding of their FTS participation, as well as fundamental school characteristics such as school size, school system expenditures, and school location. A further novelty of this paper is that the data is augmented with farm supply-side factors taken from the US Census of Agriculture that may influence a school's ability to purchase locally produced foods. Participation may also be influenced by the local food environment, which is measured with data from USDA's Food Environment Atlas to account for a community's interest in local food, the prices of local foods, and food access measures. These data help provide an extensive

analysis of factors associated with the breadth of FTS participation, the types of FTS activities undertaken, and the challenges to participation. Additionally, we exploit the limited panel information included in the FTS Census that allows us to improve the estimation in three ways.<sup>3</sup> First, the panel aspects enable us to address the potential endogeneity between supply and participation (i.e. ruling out that FTS participation drives local food production) by using supply data collected prior to when these schools began FTS programs. Second, the panel aspect allows us to estimate spatial spillover effects (how the probability of FTS participation is altered by neighboring districts' participation), and third, it allows us to understand FTS uptake in a single year, which may differ from the schools that began earlier FTS programs.

We find that numerous supply side and community factors are associated with school districts' FTS decision, including the general level of all farming activity near the school district, the proportion of farms near the school district with direct-to-retail sales, the per-capita intensity of farmers' markets as a proxy for interest in local foods, the percent of spatially proximate school districts which have previously adopted FTS programs, whether the county has a food hub,<sup>4</sup> local commodity prices, and the local poverty rate. 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, racial 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-retail sales, the per-capita intensity of farmers' markets near the school, food hubs, and school size were significant across most models.

By exploiting the limited panel nature of the data, and focusing on those districts which adopted FTS programs in the most recent data collection year, we identify spatial spillover effects that are statistically significant and economically meaningful. We find that, for the average school, one additional neighboring school that previously began participation in a FTS program will increase the likelihood of the average school's participation by 0.5%. Furthermore, the marginal effect is increasing across FTS penetration in an area, so an additional school previously participating in a FTS program in an area of high FTS penetration will increase the likelihood of a school's participation by 1.1%. Given our extensive controls for local supply-side and community factors, and the spatial fixed effects employed during estimation, this finding suggests that spatial proximity to other schools may reduce barriers to implementing FTS programs and may provide guidance to USDA in allocating scarce funding to districts by considering the density of FTS penetration in an area when making funding and other support decisions.

## 2. Data

The primary data source is the USDA's Farm to School Census, which was administered from March to November of 2013 and asked school district administrators about FTS activities in the 2011/2012 and 2012/2013 school years ([FNS, 2014b](#), see [Table 1](#) for variable definitions). Supply-side data on the number of farms that sold direct-to-retail, total number of farms, and farm income in each county is from

<sup>3</sup> While we have aspects of the data that have panel components, we do not have data that allows for the use of a panel data model, so all models are cross-sectional. The panel aspect is possible due to a survey question about overall participation in the 2011/2012 school year. The possible answers are: yes; no, but started in 2012/2013; no, but plan to start; no; and not sure. Because of the way the question is phrased we do not know what year schools started participation unless they started in 2012/13. Therefore, we do not have full panel data.

<sup>4</sup> The USDA defines food hubs as "businesses or organizations that actively manage the aggregation, distribution, and marketing of source-identified food products to multiple buyers from multiple producers, primarily local and regional producers, to strengthen the ability of these producers to satisfy local and regional wholesale, retail, and institutional demand." ([USDA, 2016](#))

<sup>2</sup> See [Joshi et al. \(2008\)](#) for a review of unpublished studies.

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