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The Welfare Impact of Supermarkets Entry into Food Deserts

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Low-income households have poorer diets and higher rates of obesity than high-income households in the United States (e.g. Handbury, Rahkovsky and Schnell 2015; Allcott, Diamond and Dube 2015; USDA 2014). However, it is unclear why these disparities exist. Poor diets can be driven by three factors: limited access to healthy foods, higher prices of healthy foods, or preferences for unhealthy foods. Under the assumption that differential access plays an important role in explaining nutritional disparities, the 2014 Farm Bill appropriated \$125 million each year for the federal Healthy Food Financing Initiative to promote access to healthy foods in food deserts (Aussenberg 2014), where food deserts are defined by the USDA as low-income low-access census tracts (USDA 2013). Many state and local governments have also introduced programs to improve food access by providing loans, grants and tax credits to subsidize supermarkets to enter food deserts among other policy interventions (CDC 2011).

Despite the growing popularity of such programs, little is known about their welfare impact. This paper seeks to fill in this gap. Following earlier work by Fan (2016) who looks at expanding access to fruits and vegetables in food deserts, we study the welfare impact of the entry of a new grocery store. In doing so, we make two key contributions to the food deserts literature. First, the entry of a supermarket will not only affect food availability, it may affect price. Based on the Nash-Bertrand firm price competition model, we allow the prices of existing stores to change when a supermarket entered the food deserts. Research has suggested that price is the most important factor when consumers choose where to shop (Fan 2016). Thus incorporating price effect into the welfare analysis gives us a more accurate implication of the policy impact. Second, we include both producers' and consumers' surplus into the welfare analysis and thus account for the changes in producers' profitability from the policy intervention. In doing so, we could also quantify the amount of subsidies needed for the entering store to be profitable and evaluate whether benefits justify costs in different policy scenarios.

We use four different datasets for our analysis. We obtain store prices and quantities from the IRI InfoScan from 2009 to 2012, which records weekly barcode level sales and quantities for major national and regional food retail chains. The store characteristics are from TDLinx, the most comprehensive annual list of geo-coded food stores in the U.S. Consumer socio-demographics at the census tract level are from the 2008-2012 American Community Survey (ACS) and the food deserts indicator variables are from the 2010 Food Access Research Atlas (FARA). To increase the generalizability and statistical power of our study, we choose a sample of counties with medium-size population.

With these data, we employ a model of an oligopoly industry characterized by spatial competition between multi-store firms to study the welfare implications of supermarket entry. The model includes both consumers' demand and firms' supply. First, we follow the random coefficients discrete choice approach taken in Berry, Levinsohn, and Pakes (BLP, 1995) and Nevo (2001) to estimate consumers' demand for a food store in each census tract in a county. The indirect utility of the consumer patronizing a store is a function of store prices, characteristics, heterogeneous consumer preferences, and unknown parameters. This model allows for consumer-level heterogeneity in tastes for store characteristics and prices. By exploiting the panel structure of our data, we control for retail chain specific unobserved characteristics through retail chain fixed effects and national demand shocks through time dummy variables. Furthermore, we use observed variation in cost shifters such as the store's

distance to the nearest the distribution center and world fruits prices as the instrumental variables for prices and the availability of fruits and vegetables in the demand estimation.

Second, we specify the price competition between firms as a Nash-Bertrand pricing game. Given the demand and spatial market structure of food retail, the incumbent firms set prices for each of their own stores to maximize firm-level profits. According to this model, firms can have different prices across their own stores in equilibrium. Thus this model recognizes the multi-store nature of retailers and the cannibalization effects on the demand.

Using the estimated demand, prices and cost distributions for each retail chain in each of the census tract, we simulate the welfare impact of the entry of supermarkets with different store characteristics. Entry of a supermarket enlarges the choice set of local consumers and will shift prices of existing stores. We obtain the new equilibrium price vectors based on our demand and supply model. The new prices are then used to quantify the impact on firms' profits, producer surplus and consumers' welfare. Specifically, we allow welfare changes from entry to vary with store characteristics. For example, the entry of Walmart will cause a different effect than the entry of a corner store.

Our article contributes to the literature in a number of ways. First, we evaluate the welfare impact of a policy that has constantly been proposed to tackle food deserts. In order to get credible estimates, we use structural demand model approach and strengthen the identification of the policy impact by holding the unobserved concurrent supply and demand factors constant. Second, we allow firms to respond to the entry of a new grocery store and adjust prices accordingly. Thus we can account for changes in firms' profits and have a more complete and realistic way to assess the total welfare impact of moving a grocery store into a food desert. Third, we estimate the heterogeneous effects of different types of grocery stores entry on welfare and thus facilitate the targeting of the policy interventions on food deserts.

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