



United States Department of Agriculture

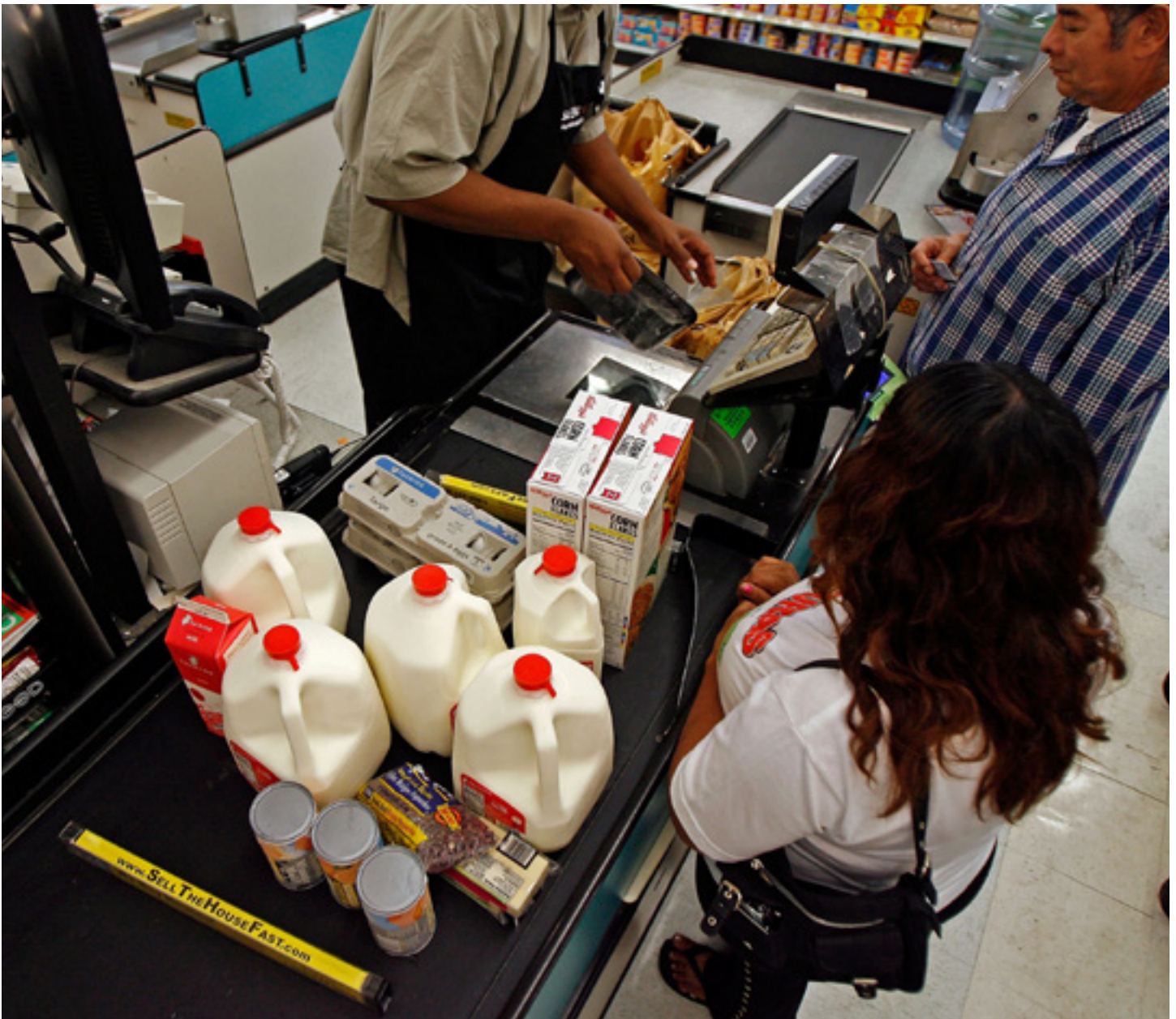
Economic
Research
Service

Economic
Research
Report
Number 171

August 2014

Cost Containment in the WIC Program: Vendor Peer Groups and Reimbursement Rates

Tina L. Saitone, Richard J. Sexton, and Richard J. Volpe





United States Department of Agriculture

Economic Research Service

www.ers.usda.gov

Access this report online:

www.ers.usda.gov/publications/err-economic-research-report/err171

Download the charts contained in this report:

- Go to the report's index page www.ers.usda.gov/publications/err-economic-research-report/err171
- Click on the bulleted item "Download err171.zip"
- Open the chart you want, then save it to your computer

Recommended citation format for this publication:

Saitone, Tina L., Sexton, Richard J., and Richard J. Volpe. *Cost Containment in the WIC Program: Vendor Peer Groups and Reimbursement Rates*, ERR-171, U.S. Department of Agriculture, Economic Research Service, August 2014.

Cover image: Shutterstock.

Use of commercial and trade names does not imply approval or constitute endorsement by USDA.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and, where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.



**Economic
Research
Service**

Economic
Research
Report
Number 171

August 2014

Cost Containment in the WIC Program: Vendor Peer Groups and Reimbursement Rates

Tina L. Saitone, Richard J. Sexton, and Richard J. Volpe

Abstract

Cost containment is a concern for the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), a Federal food assistance program providing participants with key foods and beverages. Since WIC is not an entitlement program, the amount of aid available to cover those who are eligible depends on fixed budget appropriations and WIC agency cost containment. This report examines the extent to which cost containment might be improved through changes in the regulations governing WIC vendors and allowable reimbursement levels for foods covered by the program. Using California, the largest U.S. WIC program, as a case study, we analyze data on WIC redemptions—that is, reimbursements to vendors for items bought by WIC participants—and determine the potential for cost savings through changes to the cost-containment practices. Smaller vendors, often with higher operating and procurement costs, are more likely to charge higher prices for WIC products than larger vendors. However, these small vendors comprise only a small percentage of total WIC redemptions. Policies intended to reduce maximum allowable WIC reimbursement rates would have little to no effect on most standard-size supermarkets, where the majority of WIC transactions take place.

Keywords: WIC program, cost containment, vendor peer grouping, food assistance

Acknowledgments

The authors thank Zoe Neuberger, Center on Budget and Policy Priorities; David Davis, South Dakota State University; and Chan Chanhatisilpa, USDA, Food and Nutrition Service, for their reviews. Thanks to colleagues Victor Oliveira, Elizabeth Frazão, and Christian Gregory, USDA/ERS Food Economics Division, for useful background on WIC and food assistance, and to Timothy Park and Laura Tiehen for their reviews. Finally, we thank Courtney Knauth for editing and Curtia Taylor for design and layout, both in USDA/ERS.

Contents

Summary **iii**

Introduction..... **1**

FNS Regulations That Govern WIC Agencies **4**

Economic Incentives in the California WIC Program **5**

 Vendor Incentives Under WIC **5**

WIC Cost Containment Strategies: Vendor Peer Groups and Maximum Allowable Redemption Rates **7**

 The A-50 Peer Group **7**

 Non-A-50 Vendor Peer Groups **8**

Vendor Characteristics and WIC Redemptions..... **11**

Do the MARR Help To Contain Costs? **17**

Estimating the Effect of Vendor Peer Groups on FI Redemption Rates **19**

Simulating Potential Savings Through Changes to Cost Containment..... **23**

Conclusions **29**

References **30**



Find the full report at www.ers.usda.gov/publications/err-economic-research-report/err171

Cost Containment in the WIC Program: Vendor Peer Groups and Reimbursement Rates

Tina L. Saitone, Richard J. Sexton, and Richard J. Volpe

What Is the Issue?

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is the third largest Federal food assistance program, serving approximately 53 percent of all infants born in the United States. WIC participants receive food instruments (FIs), or vouchers, redeemable for set quantities/categories of food, regardless of the prices charged by authorized vendors (stores) and without cost to the participants. Vendors are then reimbursed for the purchase. There is concern that WIC participants lack incentive to be price-conscious in their purchases using FIs. In addition, although some authorized vendors charge reasonable prices to attract non-WIC customers, vendors with a high share of WIC customers have little incentive to compete on price.

For cost-containment purposes, Federal regulations require that WIC vendors be organized into peer groups. WIC then sets price ceilings, called maximum allowable redemption rates (MARR), by peer group for each FI the group redeems. This report examines whether cost containment can be improved by adjustments to either the vendor peer grouping or to how the MARR are set. Using California (the largest U.S. WIC program) as a case study, we analyze data on WIC redemptions (reimbursements to vendors for items bought by WIC participants) and determine the potential for cost savings through changes to the cost-containment practices employed by agencies.

What Did the Study Find?

Modest cost-containment improvements can be achieved through changes to the peer-grouping structure and to the way that MARR (maximum redemption rates) are calculated. However, adopting these changes will not significantly alter the costs per WIC participant or help to contain program costs for WIC-authorized foods.

ERS is a primary source of economic research and analysis from the U.S. Department of Agriculture, providing timely information on economic and policy issues related to agriculture, food, the environment, and rural America.

In California, vendor peer groups have been determined by two factors: geographic location and cash register count, a proxy for vendor (store) size. The analysis of California's geographic peer grouping demonstrates that geographic location is not an important determinant of pricing for WIC products. However, based on vendor (store) size, there are large differences in pricing and program costs. Smaller vendors not only charge much higher prices on average than larger vendors, but there is also far greater disparity of prices and FI redemption values among small vendors.

We conducted two simulation analyses to gauge the magnitude of program cost savings from two cost-containment modifications. The first estimated the savings that could be achieved if small vendors were induced to lower prices comparable to the larger vendors. In this simulation, program cost savings were quite substantial within each of the FIs considered, particularly for the milk-based infant powder formula FI (savings were 34.5 percent). However, since these small vendors represent only a small percentage of total WIC redemptions, this would result in overall program cost savings of only 6.3 percent.

The second simulation focused on eliminating the vendors in each peer group who charged the highest redemption values (prices)—either the highest 5 or 10 percent. This simulation yielded savings ranging from 1 to 3 percent per FI. Savings are not larger because most vendors with the highest FI redemption values are small, and again, these stores on average, do not redeem large numbers of WIC FIs, so removing them from the program yields only modest cost savings. Eliminating vendors as a cost-containment measure may also limit some participants' access to WIC benefits, and benefits from program savings need to be weighed against the costs of reduced access.

Greater cost savings may be achievable by focusing on the eligibility of products authorized for purchase under a given FI. The California WIC program allows FIs to be exchanged for combinations of products, which makes cost containment difficult under the current system of peer groups and MARR. More significant savings may be gained by eliminating some of the more expensive products, brands, or sizes authorized by the California WIC Program, a subject for further research on cost containment.

How Was the Study Conducted?

The researchers used a dataset consisting of all WIC redemptions made under the California WIC Program for the 29-month period from October 2009 to February 2012. Each observation identifies the vendor, date, FI number, and the amount the vendor requested for reimbursement. This allowed us to observe the prices in the WIC Program as they vary by FI and vendor. The central component of our analysis was a regression model of redemption rates as a function of number of cash registers operated by a vendor and county fixed effects, which identify the impact of store size on redemption values in the program. Using these results, we conducted the two simulation exercises discussed above to measure the potential savings from improved program cost containment.

Cost Containment in the WIC Program: Vendor Peer Groups and Reimbursement Rates

Tina L. Saitone, Richard J. Sexton, and Richard J. Volpe

Introduction

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) supports food access, health care, and nutrition education for low-income, pregnant, and postpartum women; infants; and children up to 5 years of age. It is the third largest U.S. food assistance program as measured by expenditure, with Fiscal Year (FY) 2012 spending totaling \$6.8 billion.¹ An average of 8.9 million people per month participated in the WIC Program in FY 2012, consisting of 53 percent children ages 1–4, 24 percent infants, and 23 percent women (U.S. Department of Agriculture, 2012). The program typically serves about 53 percent of all infants born in the United States and about a quarter of children ages 1–4 (Hansen and Oliveira, 2009). WIC participants receive food instruments (FIs) that are exchanged for specific food products, usually a combination of products, at authorized program vendors and without cost to the participants.

The WIC Program began in 1972 with an amendment to the Child Nutrition Act and has continued with subsequent reauthorizations of the act. The U.S. Department of Agriculture (USDA), Food and Nutrition Service (FNS) administers U.S. food assistance programs, including WIC. Given that WIC is a discretionary grant program and not an entitlement, the number of participants served each year depends on congressional appropriations and operating costs.² Hence, for program administrators, cost containment is central to determining total participant access to program benefits and has been a topic of discussion, analysis, and debate throughout WIC's history.³ Recently, operating costs have been rising. The number of WIC participants fell from 2010 to 2011, but the cost per participant increased 12 percent and overall WIC expenditures increased 7.6 percent (Oliveira, 2012)⁴. Costs in the WIC program include food costs, which are incurred when States reimburse vendors for foods sold in the program, as well as nutrition services and administrative costs. The focus of this study is entirely on food costs.

¹ The largest program by far is the Supplemental Nutrition Assistance Program (SNAP). SNAP accounted for 72 percent of all Federal food and nutrition assistance spending in FY 2010 (U.S. Department of Agriculture, 2012). The second largest program is the National School Lunch Program.

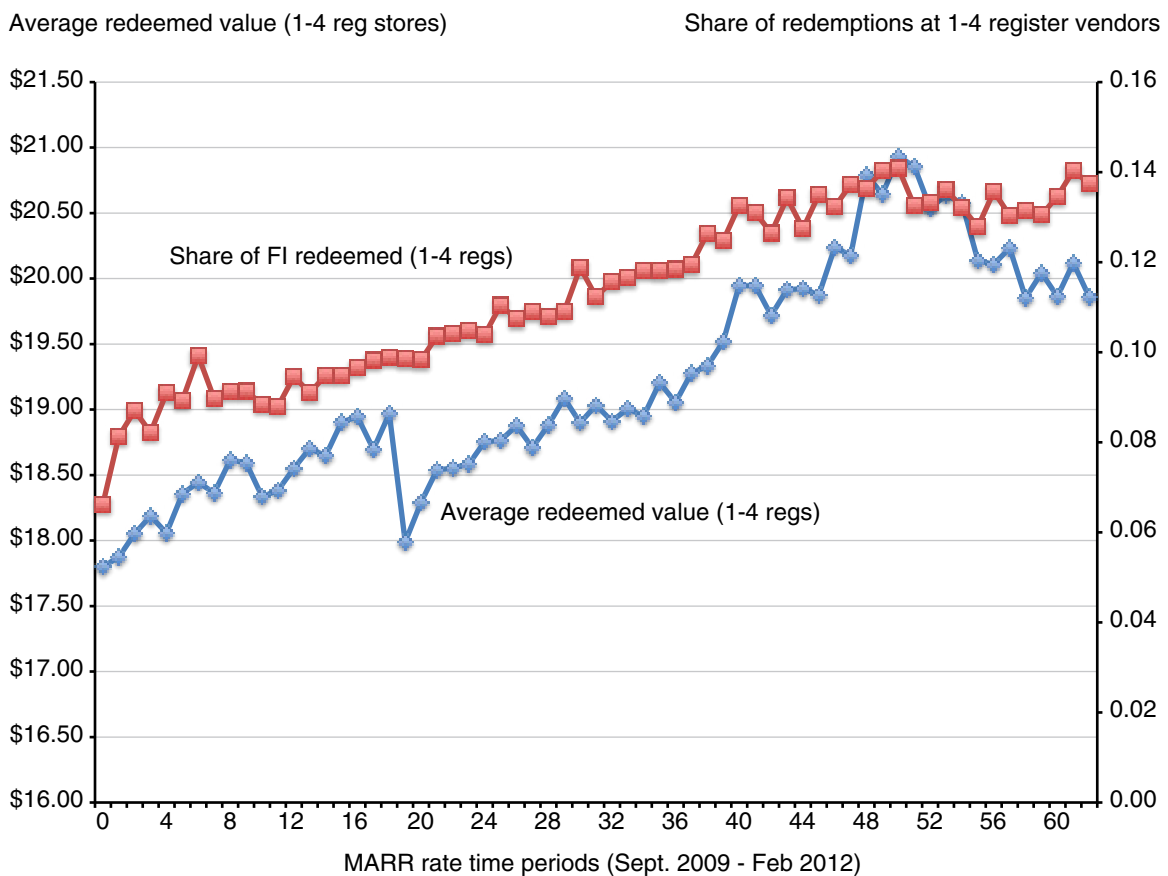
² The WIC Program is 100 percent federally funded, meaning that it does not require matching funds from the States (Oliveira and Frazao, 2009).

³ See, for example, Montgomery and Splett, 1997; Davis and Leibtag, 2005; Ludwig and Miller, 2005; Davis, 2007; and Oliveira and Frazao, 2009.

⁴ Due to a change in the accounting procedure for manufacturer rebates, the WIC program costs for the final quarter of fiscal year 2011 are overstated somewhat. Manufacturer rebates are also a cost-containment mechanism for the WIC program, and rebates for this quarter were processed in fiscal year 2012. This transition accounts for a portion of the increased program costs realized between 2010 and 2011. For more details see <http://www.fns.usda.gov/pd/wic-program>.

This study focuses on the California WIC Program as a case study for investigating potential cost-containment mechanisms.⁵ The program is the largest in the United States, with over \$1.15 billion allocated to the State for WIC in 2012 (U.S. Department of Agriculture, 2012). California was home to 16.1 percent of total WIC participants in 2010 (Abt Associates, 2011). Cost-containment issues surfaced for the California WIC Program during the 2009-2012 period of our analysis due to an increase in the number of small vendors (those with one to four cash registers) operating in the program and in the market share of total WIC transactions handled by these vendors. Average redemption values, which for non-WIC customers are simply shelf prices, charged by these vendors for FIs from WIC participants also rose throughout this period.⁶ Figure 1 illustrates these trends in market share and redemption value for one-to-four-register vendors for FI 6012, which covers milk,

Figure 1
Market share and redemption value for 1-4 cash register stores (FI 6012)



FI = Food instrument presented by WIC participants to vendors.
MARR = Maximum allowable redemption rate that vendors can charge.
Source: California Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and authors' calculations.

⁵ California WIC is one of 90 WIC agencies that receive grants based on congressional appropriations. The 90 WIC agencies include the 50 States, the District of Columbia, Guam, the American Virgin Islands, American Samoa, the Commonwealth of Puerto Rico, the Northern Mariana Islands, and 34 Indian tribal organizations (Abt Associates, 2011).

⁶ Costs per participant for the California WIC Program peaked in 2011 at a \$52.31 monthly average per participant and fell to \$46.05 in 2013 (USDA, 2013), no doubt in large part due to the interim regulations imposed in May 2012. Nationally, the WIC program made changes to the manufacturer rebates that reduced the average real cost of infant formula by 43 percent between 2008 and 2013 (Oliveira et al., 2013).

eggs, cheese, and beans or peanut butter and was the most frequently redeemed food instrument in California during this period. The increase in redemption values for these vendors was halted in May 2012 when interim regulations were imposed to change the way maximum redemption values were computed for one-to-four-register vendors.⁷

In this study, we explore the economic relationships in the California WIC Program: vendors, program costs, and the foods authorized for redemption under the program. The centerpiece of our analysis is a statistical model of FI redemption values and a series of simulations that consider various approaches to improving cost containment in the California Program. Because all State WIC Programs operate under a common set of FNS regulations (*Code of Federal Regulations*, title 7, sec. 246), our results should be relevant for programs outside of California.

⁷ Direct distribution delivery systems involve participants or their representatives picking up authorized supplemental foods from storage facilities operated by the State or local WIC Program.

FNS Regulations That Govern WIC Agencies

FNS regulations set forth standards regarding participant eligibility, the authorization of food products, and the sale and redemption of the allowable foods. Oliveira and Frazao (2009) provide a thorough background on many of these regulations, along with related economic research and policy implications. The regulations specify seven “food packages” that must be made available under the program, with eligibility for each package determined by participant’s age in the case of infants and children; pregnancy status (pregnant, postpartum) and breastfeeding status (e.g., partially breast-feeding, fully breast feeding) in the case of women; and the presence of special health conditions in the case of women, infant, or child participants.

The regulations also specify criteria for delivery systems for the supplemental foods provided by the program. Although home delivery and direct distribution systems are authorized by FNS, the most common distribution system nationally is through authorized retail vendors.⁸ Most States, including California, use a retail delivery system exclusively. FNS requires that retail delivery systems use FI and cash-value vouchers (CVVs) (redeemable for fruits and vegetables) that contain the supplemental foods authorized by the FI or voucher, the first and last date the FI or voucher may be used, and the purchase price.⁹ Prices for food products sold through the WIC Program must be the same as the prices charged to non-WIC customers. As discussed later, this means that retailers with a large share of non-WIC customers are more likely to be competitive in prices for WIC-eligible products.

Further, the FNS regulations specify criteria that State WIC agencies must apply in authorizing vendors for the WIC Program:

The State agency must authorize an appropriate number and distribution of vendors in order to ensure the lowest practicable food prices consistent with adequate participant access to supplemental foods and to ensure effective State agency management, oversight, and review of its authorized vendors (*Code of Federal Regulations*, title 7, sec. 246.12.3).

Vendors are authorized on a store-by-store basis. The FNS regulations specifically address vendors that derive more than 50 percent of their annual food sales revenue from WIC FIs or CVVs. These so-called “A-50” vendors have emerged primarily or solely to sell WIC food products to program participants.

To address concerns about cost containment, FNS regulations specify procedures that State agencies must implement to promote competitive pricing among authorized vendors. Specifically, the regulations require that all States using a retail delivery system establish a vendor peer group system and set “distinct competitive price criteria and allowable reimbursement levels for each peer group” (*Code of Federal Regulations*, title 7, sec. 246.12.4). In practice, State agencies typically meet this requirement by establishing maximum allowable redemption rates for each FI as well as for each peer group. These can be thought of as price ceilings for WIC-eligible foods, typically calculated on a rolling basis using statistical functions that rely on average prices across States or vendor peer groups.

⁸ Vermont and Mississippi are the only States currently using a direct distribution system (U.S. Department of Agriculture, 2013).

⁹ CVVs are similar to SNAP benefits in that the redemption does not depend on product size or brand, but on price. WIC consumers can stretch the values of CVVs by seeking the lowest priced eligible products. CVVs are not a focus of this study.

Economic Incentives in the California WIC Program

Through the WIC Program, participants receive authorized FIs at no direct cost, as well as CVVs redeemable for fruits and vegetables. WIC FIs are redeemable for set quantities of food, regardless of the price charged by retailers. In this respect, WIC operates quite differently than SNAP, where participants receive a fixed-dollar voucher. This feature of the WIC Program is the administrative incentive for cost-containment efforts. Other factors constant, participants lack the incentive to shop at vendors offering the lowest prices for FIs. Moreover, when FIs allow the purchase of different products, package sizes, and brands, as is often the case in California and other States, participants have no motivation to seek the best value among available items.¹⁰

Given that direct cost is not a consideration for WIC participants for foods acquired through FIs, the decision as to where to redeem FIs is likely determined by travel costs, convenience, and ease of purchasing. Major factors affecting travel costs are proximity of the vendor to a participant's residence or another location the participant visits regularly (Solgaard and Hansen, 2003) and the opportunity to engage in one-stop shopping (i.e., to redeem FIs at a location where the participant does regular grocery shopping) (Messinger and Narasimhan, 1997; Fox and Sethuraman, 2010).

Particularly for participants in urban settings, who may not have access to an automobile, both convenience and comfort may be maximized by making purchases at small vendors that emphasize WIC Program sales in their business plans. Program personnel report that stores tend to locate near program participants' homes or local WIC offices and to make the purchasing process easy and stress-free, ensuring that WIC-authorized products are easy to find and that checkout is convenient.¹¹

Vendor Incentives Under WIC

Retail food stores generally find it profitable to participate in the WIC Program, reflected in the fact that over 5,500 vendors are authorized in California, including most stores of the leading retail food chains.¹² WIC participants comprise a large share of sales for many products, especially formula and infant foods (Oliveira et al., 2010). Thus, retailers would forgo a significant share of the market for these products if they did not obtain WIC authorization, and they would risk losing the business of WIC participants entirely if the participants were unable to redeem FIs at their stores.

It is not clear how—if at all—WIC authorization may affect a retailer's pricing strategy. This economic relationship has implications for both program cost containment and prices for non-WIC consumers (Davis, 2012). Because WIC participants receive the food products included in their FIs at no personal cost, the participants are perfectly price inelastic (price-insensitive) for the cost of those products. Holding other factors constant, the less elastic the demand for a seller's product, the higher the markup over cost that the seller will charge. This theory, however, applies to an individual product, and even smaller vendors may sell thousands of different product codes (Levy et al., 1998;

¹⁰ Some States require participants to purchase the least-cost brand for some of the product categories, most often milk, eggs, and cheese.

¹¹ The California WIC-Authorized Food List Shopping Guide summarizes the process of making a purchase, which requires the participant to group the purchases by FI, inform the cashier that WIC FIs are being used, and sign the FI vouchers after the cashier has recorded the purchase price. This process might be rather stressful in a supermarket with long checkout lines.

¹² As of January 12, 2012, California had 5,581 authorized WIC Program vendors.

Dimitri et al., 2003). Many of the products contained in WIC FIs are staple foods (e.g., milk, eggs, cheese, and breads) that steer traffic to a store, so vendors may elect not to impose an additional markup due to a product's WIC status, even though profit maximization for each product would dictate that they should. In fact, perishable staples such as many of the foods that comprise WIC FIs are often promoted heavily or even sold below cost in order to attract customers (Lal and Matutes, 1994; Chevalier et al., 2003).

A wealth of research on food retailing has examined the circumstances under which food prices tend to rise. Food prices are typically higher in more concentrated markets or those with fewer retailers (Cotterill, 1986; Yu and Connor, 2002). Additionally, prices for comparable items have been found to be higher in small stores situated in dense urban environments or rural areas than in large conventional supermarkets (Liese et al., 2007; Bustillos et al., 2008). In terms of retailer incentives, retailers are more likely to increase margins—and by extension, prices—as their share of captive or loyal consumers increases. This is particularly true in the case of WIC customers, who are insensitive to prices for WIC-eligible foods. Considering both participant and vendor incentives, it stands to reason that concerns about cost containment stemming from very high prices for WIC FIs are likely to be most warranted for those stores with a high volume of sales to WIC participants. However, as noted above, these stores tend to be small.

WIC Cost-Containment Strategies: Vendor Peer Groups and Maximum Allowable Redemption Rates

Because the incentives of participants and vendors in the WIC Program are not necessarily aligned with the goals of cost containment and maximization of program participation, it is important that the cost-containment strategies embedded in the program work effectively. The program engages in a number of cost-containment strategies, and some have proven to be quite effective. For example, changes in the use of manufacturer rebates reduced national program costs for infant formula by \$107 million between 2008 and 2013 (Oliveira et al., 2013). However, as noted, total program costs in 2012 were over \$6.8 billion, and these savings are small in percentage terms. The focus of our report is on the program guidelines governing vendors. FNS requires that WIC agencies using commercial vendors establish maximum allowable reimbursement rates (MARR), which effectively serve as a price ceiling for FIs. Vendors are fully reimbursed for the sale of all FIs up to the MARR, but not beyond. Due to the various store- and market-specific factors that can influence retail food prices, FNS regulations stipulate that MARR be set based on vendor peer groups to establish accurate bases for comparison.

Kirlin et al. (2003) investigated the effectiveness of cost containment in WIC, based on a case study of six States, including California.¹³ The report examined a number of program features, including competitive pricing policies (i.e., vendor peer groups and MARR), but also restrictions on package size or FI components. Much has changed within the WIC Program since Kirlin's report was published, but the authors noted two salient points with respect to competitive pricing policies. First, they found no evidence that these policies adversely impact WIC consumers in terms of food access, store choice, or food choice. Second, due to data limitations, their study was unable to determine what impact, if any, these policies had on food package costs and therefore on cost containment. Thus, the establishment of vendor peer groups and the setting of MARR constitute a promising area for research on WIC cost containment.

The A-50 Peer Group

All authorized WIC vendors deriving more than 50 percent of their annual food sales revenue from WIC redemption are categorized into the Above-50 (A-50) peer group. As of 2012, A-50 stores accounted for 902 of the more than 5,500 authorized WIC vendors in California (table 1). A-50 vendors are mostly small relative to other food retailer peer groups. The majority (481) operate 1 register, while 270 stores operate 2 registers and 89 stores operate 3 registers. Only 24 of the A-50 vendors in the State operate 5 or more cash registers. A-50 vendors collectively are important to the California WIC Program, accounting for 37 percent of total program food sales from October 2009 through February 2012, the largest share of any single vendor peer group. Given that A-50 vendors comprised less than 20 percent of all California WIC vendors during the study period, their collective market share indicates that WIC participants patronize the A-50 stores heavily relative to other vendors across the State.

Federal regulations require State WIC agencies to ensure that participant redemption of FIs at A-50 vendors does not result in total higher food costs than if participants redeemed their FIs at other

¹³ The other States included in the case study that utilized competitive pricing policies were Connecticut, Oklahoma, and Texas.

Table 1
California-authorized vendors by number of cash registers, Jan. 2012

Registers	Geo 1	Geo 2	Geo 3	Total
1	232	88	115	435
2	428	213	274	915
3	159	79	96	334
4	108	76	61	245
5	69	37	61	167
6	114	23	42	179
7	119	31	26	176
8	119	39	29	187
9	130	36	34	200
10+	920	491	430	1,841
A-50				902
Total				5,581

Geo=Geographic Area. Geo 1 contains Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, and Ventura counties. Geo 2 contains Alameda, Calaveras, Contra Costa, Del Norte, Humboldt, Lake, Marin, Mendocino, Merced, Monterey, Napa, San Benito, San Francisco, San Joaquin, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma, Stanislaus, Trinity, and Tuolumne counties. Geo 3 contains Alpine, Amador, Butte, Colusa, El Dorado, Fresno, Glenn, Kings, Lassen, Madera, Mariposa, Modoc, Nevada, Placer, Plumas, Sacramento, San Diego, Shasta, Sierra, Siskiyou, Sutter, Tehama, Tulare, Yolo, and Yuba counties.

Source: California Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).

vendors that do not meet the above-50 percent criterion. Thus, the MARR for A-50 vendors in California are set on a bi-weekly basis at the statewide average of redemption values of the FI for all non-A-50 vendors computed over a 12-week moving average. Most A-50 vendors redeem FIs for values very close to the MARR. For this reason, it is necessary to consider A-50 vendors in conjunction with non-A-50 vendors when examining cost containment in the WIC Program. Because prices charged for redemptions by the non-A-50 vendors determine the A-50 vendor MARR, effective cost containment for the non-A-50 vendors implies that costs will be constrained for A-50 vendors as well.

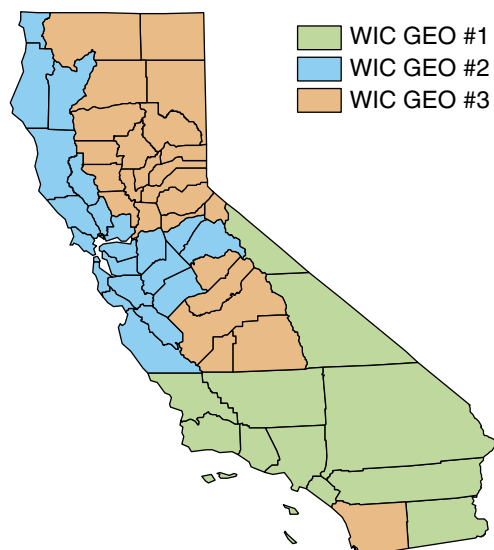
Non-A-50 Vendor Peer Groups

FNS regulations specify that at least two criteria must be used for establishing peer groups for WIC-authorized vendors deriving less than 50 percent of their sales from WIC redemption. One must be geography, unless an exemption is approved by FNS. California has established three geographic peer groups that are intended to represent high-, medium-, and low-priced counties (fig. 2).¹⁴

¹⁴ The State's rationale for geographic grouping of counties is set forth in California WIC Program (2006). Briefly, the State began with groupings of counties contained in Economic Areas constructed by the U.S. Bureau of Economic Analysis. Economic Area 97 contained 11 counties in Southern California and was adopted as Geographic Area ("Geo") 1 for construction of vendor peer groups. Economic Area 146 contained 22 counties, including the San Francisco Bay Area and the Central and North coast, and these counties were designated as Geo 2. All other counties were combined into Geo 3. At the time these designations were made, Geo 1 was considered to have the lowest prices and Geo 2 the highest among the three geographic designations.

Figure 2

Geographic vendor peer groups



Note: Legend box shows peer group names.

Source: California Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).

Based in part on recommendations in a consultancy report prepared by Burger, Carroll, & Associates Inc. (2006), California chose to use the number of cash registers operated by a vendor (in essence, a proxy for store size and sales volume) as its second criterion for peer grouping. California has utilized 5 vendor groupings based upon number of registers—1-2, 3-4, 5-6, 7-9, and 10 and above. Thus, the California WIC Program operates with 16 peer groups, 15 (5 x 3) register-geography combinations, and the A-50 peer group.

The non-A-50 peer groups account for 63 percent of total WIC food sales (table 2). Notably, the 1-2 and 3-4 register vendors, which are the focus of ongoing cost-containment concerns due to the WIC incentive structure, collectively comprised only about 15 percent of the value of redemptions over the 29-month period of the data. Large supermarkets, those operating 10 or more registers, accounted for 31 percent of total WIC redemptions. These conventional grocery stores are likely to have lower shares of WIC consumers than other authorized WIC vendors.

On a biweekly basis, the California WIC Program computes a MARR for each of the 16 peer groups. Any requested FI redemption value at or below its MARR will be paid by the State. Prior to May 25, 2012, the MARR for each FI for the 15 non-A-50 peer groups was set by a formula based upon redemptions of that FI made by vendors in that peer group over a rolling 12-week average.¹⁵ Specifically, the average and standard deviation of redemption values for the FI were computed over the prior 12 weeks, and the MARR was set at the average redemption value, X , plus a tolerance factor equal to the standard deviation of the redemption values, σ , times a constant, c , determined by the relative variability of redemption values for the FI charged by vendors with 10 or more registers in the same geographic area.

¹⁵ The MARR for most FIs remained frozen until January 2010, at which point the MARR were manually adjusted based on 12 weeks of redemption data. Beginning in June 2010, the automated MARR calculation was used. Whether the calculation was run manually or on an automated basis, the same procedure was used to determine the MARR.

Table 2
Number and value of California WIC FIs redeemed by cash register peer group, Oct. 2009 – Feb. 2012

Register group	Number of FIs redeemed ¹	Value (\$) of FIs redeemed ¹	Percent of total value of FIs redeemed
A-50 Vendors	51,638,123	956,792,684.88	37.0
1-2 Registers	9,677,149	277,222,603.58	10.7
3-4 Registers	5,744,937	121,740,696.55	4.7
5-6 Registers	7,432,990	128,569,514.80	5.0
7-9 Registers	17,951,286	295,549,773.86	11.4
10+ Registers	50,731,895	808,884,544.80	31.2
Total	143,176,380	2,588,759,818.47	100.0

¹The statistics on FI (Food Instrument) redemption include cash value vouchers for fresh produce.

Source: California Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and author calculations.

California measured relative variability using the coefficient of variation (CV) of the redemption values for the FI, which is the standard deviation of redemption values divided by the mean redemption value. The greater the CV, the larger is the constant factor applied to the standard deviation, based on the rationale that FIs with more variable redemption values, (e.g., due to greater participant choice) require more tolerance in establishing the MARR. Thus, for FI j in peer group i in time period t , the MARR was given by

$$(1) \quad MARR_t^{j,i} = X_{t\sim 12}^{j,i} + c_{t\sim 12}^{j,10+} \sigma_{t\sim 12}^{j,i}.$$

The subscript $t\sim 12$ denotes the use of the 12-week rolling average, and the superscript 10+ denotes that c is based upon the CV for 10+ register stores in the same geographic region. Currently, the tolerance coefficients range from 1.5 to 3.0.¹⁶ Note that under this rolling-average approach to constructing the MARR, high redemption values requested by some vendors cause the MARR to increase in future periods, opening the door to still higher prices by increasing both the mean and standard deviation of redemption values.

This system of constructing vendor peer groups and establishing the MARR for each FI is codified in Federal regulations as a primary cost-containment strategy for the WIC Program. We now consider whether changes to this system may improve cost containment by reducing the redemption values of FIs and thus lowering costs per participant.

¹⁶ Since May 25, 2012, the formula in equation (1) and the respective tolerance coefficients apply only to the nine vendor peer groups containing stores with five or more registers because the decision was made to remove, on an interim basis, 1-2 and 3-4 register stores from the MARR-determination process summarized in equation (1). Effective May 25, 2012, 1-2 (3-4) register stores have a MARR set for each FI at 15 percent (11 percent) above the average redemption value charged for that FI by stores with five or more registers in their geographic region.

Vendor Characteristics and WIC Redemptions

Our dataset consists of all FI and CVV redemptions made under the California WIC Program for the 29-month period from October 2009 to February 2012. Table 3 describes the foods contained in the most frequently redeemed FIs in California. Each month of redemption data contains approximately 5 million observations, resulting in approximately 150 million observations in total over the 29-month period. The variables in the redemption data can be divided into three categories: (1) FI identification and information, (2) vendor identification and information, and (3) redemption information.

Table 3
Description of food contents for FIs included in the analysis

FI	Description	FI	Description
1008	1 (12.5 OZ) INFANT FORMULA ENFAMIL PREMIUM LIPIL OR ENFAMIL PREMIUM INFANT POWDER ONLY MUST BUY FULL QUANTITY	1093	10 (12.5 OZ) INFANT FORMULA ENFAMIL PREMIUM LIPIL OR ENFAMIL PREMIUM INFANT POWDER ONLY MUST BUY FULL QUANTITY
1009	2 (12.5 OZ) INFANT FORMULA ENFAMIL PREMIUM LIPIL OR ENFAMIL PREMIUM INFANT POWDER ONLY MUST BUY FULL QUANTITY	2110	15 (2.5 OZ) INFANT MEATS
1010	3 (12.5 OZ) INFANT FORMULA ENFAMIL PREMIUM LIPIL OR ENFAMIL PREMIUM INFANT POWDER ONLY MUST BUY FULL QUANTITY	2111	16 (2.5 OZ) INFANT MEATS
1011	4 (12.5 OZ) INFANT FORMULA ENFAMIL PREMIUM LIPIL OR ENFAMIL PREMIUM INFANT POWDER ONLY MUST BUY FULL QUANTITY	6003	1 (GALLON) MILK, LOWER FAT 1 (16 OZ) WHOLE GRAINS 36 OZ BREAKFAST CEREAL
1012	5 (12.5 OZ) INFANT FORMULA ENFAMIL PREMIUM LIPIL OR ENFAMIL PREMIUM INFANT POWDER ONLY MUST BUY FULL QUANTITY	6011	1 (GALLON) MILK, LOWER FAT 1 (16 OZ) WHOLE GRAINS 2 (64 OZ) BOTTLED JUICE OR 2 (11.5 OR 12 OR 16 OZ) CONCENTRATE JUICE
1013	9 (12.5 OZ) INFANT FORMULA ENFAMIL PREMIUM LIPIL OR ENFAMIL PREMIUM INFANT POWDER ONLY MUST BUY FULL QUANTITY	6012	1 (GALLON) AND 1 (QUART) MILK, LOWER FAT 1 DOZEN EGGS 1 (16 OZ) CHEESE 1 (16 OZ) DRY BEANS, PEAS OR LENTILS OR 1 (16-18 OZ) PEANUT BUTTER
1090	6 (12.5 OZ) INFANT FORMULA ENFAMIL PREMIUM LIPIL OR ENFAMIL PREMIUM INFANT POWDER ONLY MUST BUY FULL QUANTITY	6145	18 (4 OZ) INFANT FRUITS AND VEGETABLES OR 18 (3.5 OZ) INFANT FRUITS AND VEGETABLES 1 (16 OZ) OR 2 (8 OZ) INFANT CEREAL 4 FRESH BANANAS

—continued

Table 3
Description of food contents for FIs included in the analysis—continued

FI	Description	FI	Description
1091	7 (12.5 OZ) INFANT FORMULA ENFAMIL PREMIUM LIPIL OR ENFAMIL PREMIUM INFANT POWDER ONLY MUST BUY FULL QUANTITY	6232	2 (HALF GALLONS) MILK, LACTOSE FREE, LOWER FAT 1 (16 OZ) WHOLE GRAINS 36 OZ BREAKFAST CEREAL
1092	8 (12.5 OZ) INFANT FORMULA ENFAMIL PREMIUM LIPIL OR ENFAMIL PREMIUM INFANT POWDER ONLY MUST BUY FULL QUANTITY	6315	6 (QUARTS) OR 3 (HALF GALLONS) SOY 1 DOZEN EGGS 2 (14-16 OZ) TOFU 1 (16 OZ) DRY BEANS, PEAS OR LENTILS OR 1 (16-18 OZ) PEANUT BUTTER

FI = Food Instrument.

Source: California Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).

Every observation in the data identifies both the serial number and food item code for each specific FI for which the vendor requested reimbursement. Further, the data provide information on the participant category (e.g., breastfeeding mother, pregnant woman, etc.) under which the FI is provided, as well as a brief description of the items contained in the FI. There were 239 active FIs and CVVs in the California WIC Program at the time of our study, but a few account for most redemptions and program expenditures (table 4). The 35 FI and CVVs for which we report sales figures collectively account for 91 percent of program food expenditures, and the largest 7 FI and CVVs collectively account for over 50 percent of program food expenditures. Infrequently redeemed FIs generally pertain to participants with special circumstances (e.g., homeless or with dietary restrictions based upon religious beliefs or special dietary needs, such as lactose intolerance).

With respect to vendor information, each observation provides a vendor identification number, contract identification number, Zip Code, county where the vendor is located, and the vendor peer group. From the vendor identification number, we merged vendor name and address information into the data to allow for the identification of specific retailers or chains of retailers. We then inferred the number of registers operated at each vendor location based upon location and peer-group information. Redemption information includes the MARR and the dollar amount redeemed.¹⁷

A simple examination of FI redemption values demonstrates how the vendor peer-grouping system can shape prices, and therefore program costs, for WIC. We provide box plot distributions of FI 6012 redemption values (figs 3a-3c) by geographic areas and vendor peer groups. The red line in the box plot denotes the median of the distribution; the gray box denotes the 25th – 75th percentiles of the distribution); the lines emanating from the box (known as whiskers) extend to the lower 2.5 percentile and upper 97.5 percentile (i.e., the 95-percent confidence interval of the distribution), and the dots extending beyond the whiskers denote outlier observations. There is little meaningful

¹⁷ The data also contain a field known as “present amount,” which is populated when the vendor submits a redemption request that does not conform to program regulations. Requests made in excess of the MARR fall into this category. When this happens, the vendor must revise the original amount submitted to an amount that does not exceed the MARR before reimbursement can occur.

Table 4

**California Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)
Food Instrument and Cash-Value Voucher (CVV) redemptions, by count and redemption
value, Oct. 2009 – Feb. 2012**

FI Code ¹	Food products ²	Number of FIs redeemed ³ (1,000s)	Value (\$) of FIs redeemed ³ (millions)	% of program redemption cost ⁴
6012	LM, E, CH, DB/PB	23,154	334.96	12.94
6003	LM, WG, CE	16,065	261.82	23.05
6011	LM, WG, J	14,872	210.70	31.19
1011	F	2,515	175.21	37.96
1091	F	1,161	143.87	43.52
2004	CVV	20,887	122.75	48.26
1012	F	1,272	110.29	52.52
6000	WM, WG, CE	5,763	93.49	56.13
6001	WM, E, CH, DB/PB	5,923	86.16	59.46
6002	WM, WG, J	5,831	82.10	62.63
1010	F	1,484	77.38	65.62
2007	CVV	7,693	75.09	68.52
6107	LM, CE, DB	4,000	70.71	71.25
1013	F	446	70.04	73.96
6105	LM, WG, J	4,102	66.04	76.51
6106	LM, CE, J	2,342	46.42	78.30
1093	F	264	46.26	80.09
6145	IF&V, IC, B	2,051	37.57	81.54
1051	F	514	34.27	82.86
6100	LM, E CH, CF	1,479	29.51	84.00
1052	F	265	21.99	84.85
6146	IF&V, IC	1,987	21.78	85.69
6103	LM, B, J	1,431	17.23	86.36
1056	F	119	16.01	86.98
1027	F	229	15.44	87.57
2101	IF&V	1,830	14.13	88.12
1028	F	141	11.84	88.58
6232	LFM, WG, CE	432	9.20	88.93
1026	F	149	7.53	89.22
1002	F	117	7.36	89.51
2100	IF&V	952	7.15	89.78
6231	LFM, WG, J	368	7.08	90.06
6148	IF&V, B	333	6.71	90.31
300	CE	637	5.77	90.54

— continued

Table 4
California Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Food Instrument and Cash-Value Voucher (CVV) redemptions, by count and redemption value, Oct. 2009 – Feb. 2012—continued

FI Code ¹	Food products ²	Number of FIs redeemed ³ (1,000s)	Value (\$) of FIs redeemed ³ (millions)	% of program redemption cost ⁴
2111	IM	318	5.77	90.76
6213	LFM, E, CH, DB/PB	247	5.60	90.98

¹FI=Food Instruments. FIs with fewer than 100,000 redemptions or that are no longer active are excluded from table.

²Food product legend: B=fresh bananas, CE=cereal, CF=canned fish, CH=cheese, CVV=cash value voucher, DB=dried beans, peas, or lentils, DB/PB=dried beans, peas, lentils, or peanut butter, E=eggs, F=infant formula, IC=infant cereal, IF&V=infant fruits & vegetables, J=juice, LM=low fat milk, LFM=lactose-free milk (low fat), O=other, PB=peanut butter, SM=soy milk, T=tofu, WG=whole grains, WLFM=whole lactose-free milk, WM=whole milk.

³Only FIs with the disposition code “R” are included in table.

⁴Fraction of total value is based upon total value of all FIs with disposition code “R”. Given the exclusion of FIs with less than 100,000 redemptions, percentages do not add to 100.

difference across geographic regions (fig. 3a).¹⁸ Region 2 has the lowest median redemption value but the largest number of high outliers. Region 3 shows the most variation. However, the differences across register sizes are much more apparent and follow an easily discernible pattern (fig. 3b). As store size increases, the median and variation of FI redemption values both fall. The 25th percentile for the smallest stores is larger than the 75th percentile for all stores with at least five registers, clearly suggesting that program cost containment among smaller stores is a greater concern than among large stores. It is worth noting that previous research on food retailing has also uncovered an inverse relationship between store size and prices (e.g., Chung and Myers, 1999). There are potential explanations for this phenomenon that extend beyond the program. For example, larger chains and stores may be able to negotiate lower prices with wholesalers, enabling them to charge lower retail prices (Chen, 2003).

The pattern in redemption values across store sizes suggests that the important variation in redemption rates from a cost-containment perspective is driven more by store characteristics than geography. Finally, the majority of redemptions for the A-50 stores take place at or very near the MARR. For the A-50 stores, the median and modal redemption value is effectively equal to the MARR, as most prices are at or nearly the price ceiling (fig. 3-c).¹⁹ The patterns shown here for FI 6012, the FI with the most total redemptions and total redemption value, are qualitatively similar for other frequently redeemed FIs.

¹⁸ FI 6012 consists of low-fat milk, eggs, cheese, and a choice between peanut butter or dry beans. It is important to keep in mind that WIC participants generally have wide flexibility in choice of brand and container size within this FI and others.

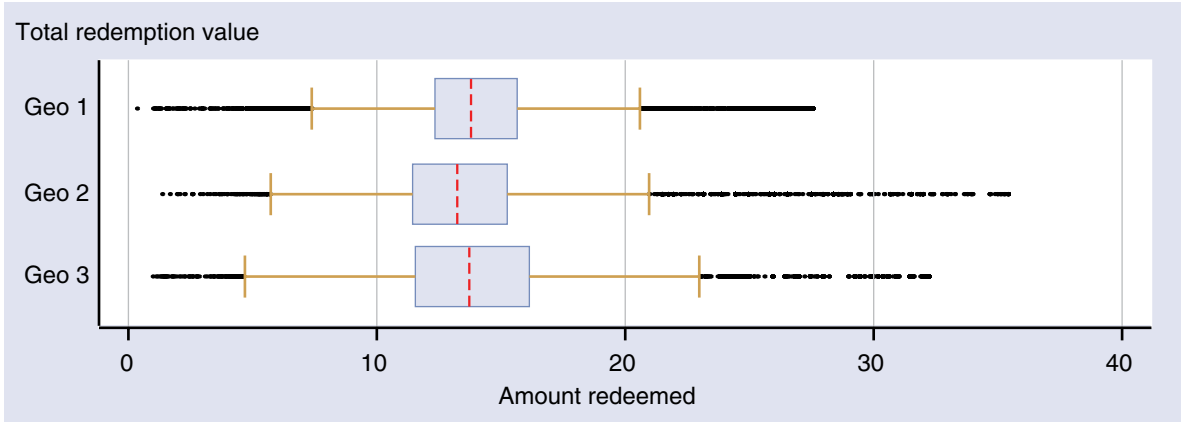
¹⁹ For all FIs except milk-based infant formula, participants are allowed to redeem the FI only partially, that is a participant need not purchase all of the food items authorized in the FI. These instances are known as “partial redemption,” and they likely account for many of the outlier observations in the lower end of the box plots in figures 3a-c.

Figure 3

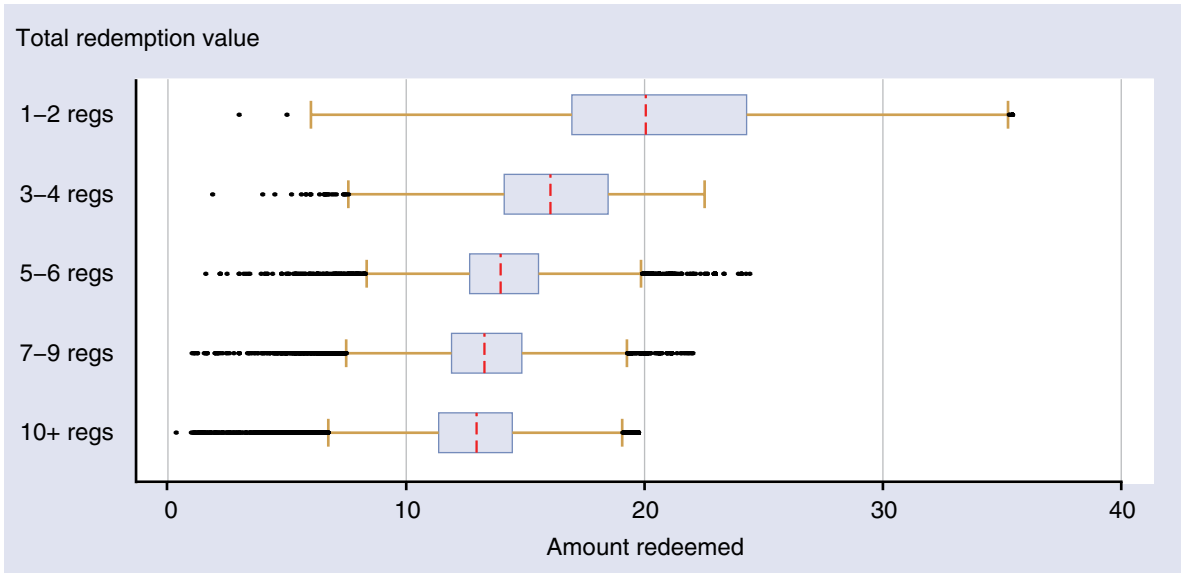
Box plots for distribution of Food Instrument (FI) 6012 redemption values

FI 6012; MARR Cycle: Jan 7, 2011 – Jan 21, 2011

3a. Box plots for distribution by geographic area



3b. Box plots for distribution by peer group register size



Notes: Serial numbers with redeemed values less than \$1.89 dropped. A-50 store redemptions are not included.

The middle value (median) of the distribution is indicated with a red dotted line, while the boundaries of the box indicate the 25th (left boundary) and 75th (right boundary) percentiles of the distribution. The brown lines, known as “whiskers,” extend to the 5th and 95th percentiles of the distribution. Black dots extending beyond the whiskers indicate observations in the upper and lower tails of the distribution.

Source: California Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and authors calculations.

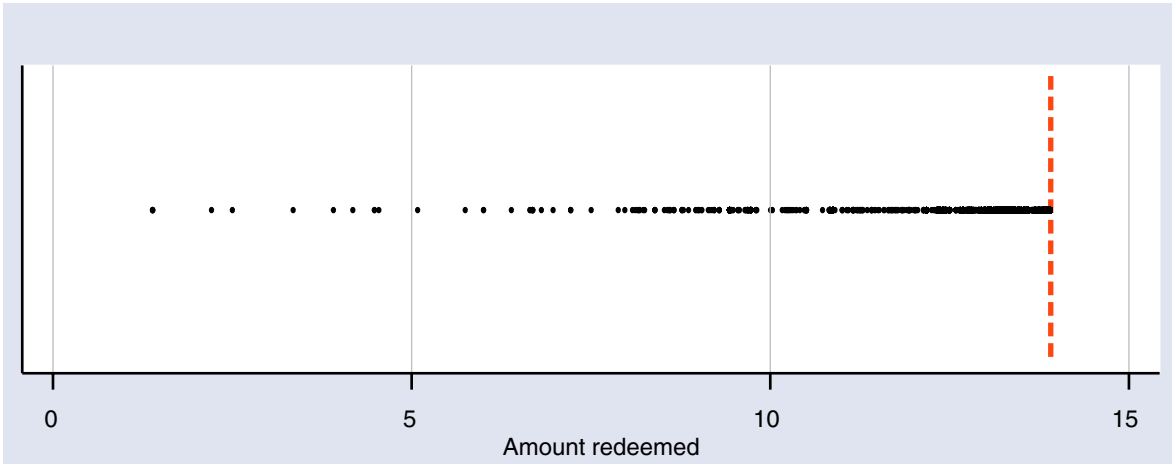
—continued

Figure 3

Box plots for distribution of Food Instrument (FI) 6012 redemption values—continued

FI 6012; MARR Cycle: Jan 7, 2011 – Jan 21, 2011

3c. Box plots for distribution among A-50 vendors



Notes: Serial numbers with redeemed values less than \$1.89 dropped.
MARR=\$13.91.

The middle value (median) of the distribution is indicated with a red dotted line, while the boundaries of the box indicate the 25th (left boundary) and 75th (right boundary) percentiles of the distribution. The brown lines, known as “whiskers,” extend to the 5th and 95th percentiles of the distribution. Black dots extending beyond the whiskers indicate observations in the upper and lower tails of the distribution.

Source: California Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and authors calculations.

Do the MARR Help To Contain Costs?

Figure 3 suggests that while the MARR is effective in restraining the pricing of A-50 vendors for FI 6012, it does not appear to be limiting pricing of FI 6012 for the non-A-50 vendors, a pattern that is repeated for other highly redeemed FIs as well. If the MARR were containing costs for these FIs, we would observe a concentration of prices at the upper bound of the distributions, but we do not. This raises questions about the extent to which WIC vendors charge the MARR for FIs, and in turn, the efficacy of the MARR in containing costs. If FI redemption values are consistently below MARRs, then prices at those stores are shaped mainly by the overall store-pricing strategy and market forces, such as competition among vendors and the behavior of price-conscious, non-WIC consumers.

To test the hypothesis that the MARR were not restraining prices for non-A-50 vendors in California, we calculated the share of FI redemptions made at the MARR, as well as the share of vendors who set prices at the MARR at least once during the 29-month period, by peer group and for selected FIs (table 5). We define all prices within 1 percent of the MARR as meeting the MARR. We used this small deviation below the MARR in recognition of the facts that (a) vendors may not always adjust prices in response to small biweekly changes in the MARR and (b) setting price at the exact MARR is a difficult proposition for combination FIs and vendors who carry multiple brands of the same product.²⁰

We found that the MARR is far more relevant to redemption values for A-50 peer groups than elsewhere; redemptions are made far more often at or very near the MARR at A-50 vendors than at the non-A-50 vendors. The share of FI redemptions at the MARR for A-50 vendors ranges from 81 to 94 percent across the sampled FIs, while the shares of all non-A-50 vendors redeeming at the MARR hover around 1 percent. The differences in the shares within vendor peer groups charging the MARR are less striking but also consistent and large. The range in the A-50 peer group is 95 to 97 percent, while it is 6 to 44 percent for the geographic peer groups.

Among the geographic peer groups, the share of redemptions made at the MARR decreases as store size increases. The percentage of redemptions made at the MARR for stores with one or two registers runs from 4 to 12 percent. These values are small compared with the shares for A-50 vendors, but they are considerably larger than the shares for the largest vendors, which are never higher than 1 percent. This supports the notion that smaller stores are more likely to see higher proportions of WIC customers, and, therefore, are more likely to tailor their pricing strategies toward those price-insensitive consumers.

The same pattern does not hold for the shares of vendors setting redemption values at the MARR at least once. For most FIs, the largest stores have the highest incidences of MARR-rate pricing. But even these percentages are much smaller than those for the A-50 vendors, which are all near 100. Very likely, the higher incidence among larger vendors of having at least some redemptions

²⁰ Alternatives to a 1.0-percent deviation below the MARR could also be considered, and the greater the percentage deviation below the MARR included in the calculation, the greater the share of FI redemptions that would be classified as “at the MARR.” However, extensive analysis of the distributions of FI redemptions conducted as part of this study revealed no evidence of a massing of redemptions anywhere in the upper tail of the distribution. Such a mass point or “thickness” in the upper tails of the redemption distributions would be observed if, for example, vendors were strategically choosing their FI redemption values at, say, 95 percent of MARR to extract most of the available revenue from the program, while hopefully avoiding (from the vendor’s perspective) compliance auditing by the program staff.

Table 5

Redemptions made within 1 percent of the MARR for selected Food Instruments (FIs), by vendor peer group

	FI 6012				FI 6003			
	Transactions		Vendors		Transactions		Vendors	
	<i>Count</i>	<i>Percent</i>	<i>Count</i>	<i>Percent</i>	<i>Count</i>	<i>Percent</i>	<i>Count</i>	<i>Percent</i>
A-50	6.8 Mil	86.2	1,130	98.1	5.0 Mil	81.8	1,119	97.1
1-2 Regs.	56,580 ¹	4.00	292	19.69	44,514	3.51	254	14.44
3-4 Regs.	11,162	1.34	192	29.05	9,281	1.33	156	20.55
5-6 Regs.	4,373	0.41	178	43.20	2,459	0.29	168	36.52
7-9 Regs.	7,404	0.29	388	54.57	2,761	0.14	318	41.57
10+ Regs.	54,908	0.77	1,242	65.71	8,987	0.17	1,005	51.64
Total Non-A-50	134,427	1.03	2,292	44.44	68,002	0.68	1,901	33.42
	FI 6011				FI 6145			
	Transactions		Vendors		Transactions		Vendors	
	<i>Count</i>	<i>Percent</i>	<i>Count</i>	<i>Percent</i>	<i>Count</i>	<i>Percent</i>	<i>Count</i>	<i>Percent</i>
A-50	5.1 Mil	89.3	1,110	96.5	784,194	93.9	1,015	97.1
1-2 Regs.	44,296	3.77	296	16.81	10,447	7.04	200	12.85
3-4 Regs.	12,077	1.85	143	18.77	876	1.40	78	11.52
5-6 Regs.	3,069	0.39	136	29.69	473	0.60	78	18.44
7-9 Regs.	4,091	0.23	333	43.53	1,209	0.55	212	29.36
10+ Regs.	13,327	0.28	1,128	58.14	6,723	0.97	781	40.70
Total Non-A-50	76,860	0.84	2,036	35.81	19,728	1.64	1,349	25.47
	FI 6232				FI 6315			
	Transactions		Vendors		Transactions		Vendors	
	<i>Count</i>	<i>Percent</i>	<i>Count</i>	<i>Percent</i>	<i>Count</i>	<i>Percent</i>	<i>Count</i>	<i>Percent</i>
A-50	145,316	86.9	923	96.6	38,883	80.6	771	95.3
1-2 Regs.	1,998	7.99	116	12.39	618	11.28	47	9.07
3-4 Regs.	118	0.89	27	5.08	33	1.18	14	3.97
5-6 Regs.	96	0.49	23	5.67	18	0.30	16	4.62
7-9 Regs.	41	0.08	32	4.50	39	0.19	28	4.07
10+ Regs.	212	0.14	135	7.33	149	0.22	90	5.03
Total Non-A-50	2,465	0.94	333	7.52	857	0.83	195	5.28

Regs. = Cash registers. The FIs are defined as follows: 6012: low-fat milk, eggs, cheese, and either dry beans or peanut butter. 6003: low-fat milk, whole grains, and cereal; 6011: low-fat milk, whole grains, and juice; 6145: infant fruits and vegetables, infant cereal, and fresh bananas; 6232: lactose-free milk, whole grains, and cereal; 6315: soy milk and either dry beans or peanut butter.

¹To properly interpret these numbers, consider the case of 1-2 register stores and FI 6012. During the time series of our data, FI 6012 was redeemed 56,580 times within 1 percent of the maximum allowable redemption rates (MARR) among all 1-2 register stores. This constituted 4 percent of the total number of FI 6012 redemptions among this vendor peer group. At the same time, 292 vendors in this peer group sold FI 6012 within 1 percent of the MARR at least once. These vendors comprised 19.69 percent of all vendors in this peer group.

Source: California Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and author calculations.

at the MARR is due to the great variety of eligible products, brands, and package sizes offered by larger vendors. Thus, occasionally a participant will choose a particularly expensive combination of eligible products for an FI, causing the nominal redemption value to exceed the MARR. In these cases, it seems the practice of large vendors to simply request redemption at the MARR.

Estimating the Effect of Vendor Peer Groups on FI Redemption Rates

In order to estimate the impact of the vendor peer group system on WIC prices and to lay the groundwork for simulation analysis, we conducted an econometric analysis of the dollar value that vendors request for reimbursement for each FI. Given that the A-50 MARR are binding for most vendors and that redemption rates for that peer group vary mainly due to changes in the A-50 MARR, in this section we focus on the geographic peer groups. We also focus on the leading FIs (those redeemed most often) over the 29-month study period and include other FIs to generate coverage of foods for participants with special dietary needs. We include the leading combination FIs 6012, 6003, and 6011, as well as redemptions for FIs 6001, 6002, and 6000 (table 4). The latter FIs rank 5th, 6th, and 7th in redemptions, respectively, over the study period and represent the whole-milk equivalent combination FIs 6012, 6003, and 6011. We also examine three important FIs for infants—milk-based powder formula (combined FIs 1008–1013 and 1090–1093), infant meats (combined FIs 2110–2111), and FI 6145 (combination containing infant fruits and vegetables, infant cereal, and fresh bananas). Finally, we include two FIs for participants with special dietary needs—6315, which is similar to 6012 except that soy milk and tofu are substituted for low-fat cow’s milk and cheese, and 6232, which is similar to 6003 except that lactose-free milk is used. Summary statistics for the FIs included in the regression model are provided in table 6.

The following regression model was estimated for each FI studied:

$$R_{ij} = c + \sum_{l=2}^{10} \beta_l X_l + \sum_{k=1}^{56} \delta_k Z_k + \varepsilon_{ijh}$$

where R_{ij} is the amount that vendor j requests for reimbursement for FI i . The X_l are {0,1} indicator variables to account for the number of registers, 2, 3, . . . , 10+, operated by a vendor, where $X_l = 1$ if vendor j operates l registers and equals 0 otherwise. The Z_k are fixed-effect {0,1} indicator variables to denote a vendor’s county location within California, where $Z_k = 1$ if vendor j is located in county k and equals zero otherwise.²¹ Finally, ε_{ijh} is a random error term, where subscript h denotes clustering of error terms based upon vendor peer group.²² We therefore use a fixed-effects model with each vendor identified by its county location and number of cash registers. This enables us to focus squarely on the impacts of the key variables that have been used in setting MARRs.²³ The MARR was considered as an explanatory variable but was ultimately excluded, based on the fact that it is typically not binding among the geographic peer groups (table 5) and was statistically insignificant in the regressions.

²¹ The California WIC Program has authorized vendors in Arizona and Nevada. These vendors serve California participants who are located near the State border in rural areas with limited food access within the State. For purposes of the statistical analysis, these vendors were grouped into California counties based on geographic proximity.

²² Because variability in redemption values is clearly influenced by peer group (e.g., figure 3a-3b), standard errors for the model were clustered on vendor peer group.

²³ We also ran models including the interaction of month and year fixed effects. This accounts for any secular drift in prices across the 29-month period. Inclusion of these fixed effects had almost no impact on the coefficients of interest in the model.

Table 6
Summary statistics for major California WIC FIs

FI	Obs.	Mean	S.D.	Max
Infant formula	4,266,819	17.63	4.42	42.30
Infant meats	373,876	1.17	0.36	3.55
6000	3,685,762	16.46	5.51	56.45
6001	3,815,947	14.71	3.81	39.00
6002	3,748,811	14.21	4.88	42.29
6003	9,960,009	16.56	5.56	57.41
6011	9,170,513	14.34	5.02	41.54
6012	13,537,988	14.63	3.84	37.80
6145	1,204,545	18.88	8.68	64.20
6232	2,622,393	21.76	7.60	70.80
6315	102,965	18.18	8.16	89.79

Note: Minimum values are not reported as, in the vast majority of cases, they constitute partial redemptions.

FIs = Food Instruments.

Source: California Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and author calculations.

The regression results are reported in table 7, and they indicate a consistent pattern for the impact of register vendor peer groups on FI redemption rates.²⁴ The reference case is the set of stores with a single register, so each coefficient can be interpreted in dollar terms relative to redemption rates at single-register stores. For example, after controlling for county fixed effects, FI 6003 vendors with two registers redeemed FI 6003 for \$3.83 less per FI, on average, than one-register vendors. Hence, the average prices for these identical products were substantially different between one- and two-register stores.

For every FI (or group of FIs), increases in register count—serving as a proxy for store size—are associated with significantly lower redemption rates. The smallest price effect, which in some cases is statistically insignificant, is observed for the two-register case. The impact of store size on redemption values is negative and statistically significant for all other register counts and for all the examined FIs, meaning that redemption values decrease significantly with the addition of each successive register.

Importantly, the relative magnitudes of the coefficients exhibit a pattern that corroborates the depiction of redemption values in figure 3-b. For each FI, we observe economically important reductions in price associated with increased size for smaller stores. That is, expected FI redemption values decrease substantially between two- and three-register stores or three- and four-register stores. But in most cases, beyond five or six registers, the coefficients are all very similar in magnitude, suggesting that the highest prices in the WIC Program are found primarily among the smallest participating vendors. Another way of stating this is that nearly all of the cost savings for the State are achieved among vendors with six or more registers.

²⁴ Statistical tests do, however, reveal that the county fixed effects are jointly statistically significant variables in explaining variations in FI redemption values.

Table 7

Regression results for estimating the impact of vendor peer groups on FI redemption rates

No. of registers	FI 6011	FI 6012	FI 6000	FI 6001	FI 6002
Two	-2.55* (1.65)	-2.34 (1.62)	-3.75* (1.73)	-2.43 (1.57)	-2.60 (1.63)
Three	-6.70*** (4.79)	-5.60*** (3.94)	-8.51*** (4.25)	-5.65*** (3.79)	-6.63*** (4.85)
Four	-9.00*** (6.86)	-7.25*** (5.26)	-11.11*** (5.84)	-7.33*** (5.08)	-9.02*** (7.13)
Five	-9.91*** (6.86)	-7.65*** (5.47)	-11.80*** (6.10)	-7.66*** (5.27)	-9.88*** (7.06)
Six	-11.495*** (8.44)	-8.16*** (5.98)	-13.30*** (6.88)	-8.14*** (5.72)	-11.43*** (8.73)
Seven	-11.42*** (8.18)	-8.03*** (5.78)	-13.18*** (6.76)	-8.02*** (5.53)	-11.37*** (8.50)
Eight	-12.05*** (9.25)	-8.71*** (6.37)	-13.74*** (7.23)	-8.65*** (6.05)	-11.93*** (9.53)
Nine	-12.19*** (9.17)	-8.73*** (6.33)	-13.88*** (7.17)	-8.69*** (6.03)	-12.09*** (9.48)
Ten or more	-12.54*** (9.44)	-9.53*** (6.75)	-14.33*** (7.47)	-9.19*** (6.42)	-12.45*** (9.82)
County fixed effects	Yes	Yes	Yes	Yes	Yes
N	9,170,513	13,537,988	3,685,762	3,815,947	3,748,811
R ²	0.57	0.47	0.55	0.46	0.56
No. of registers	FIs 2110-2111	FI 6145	FI 6232	FI 6315	
Two	-0.25 (1.64)	-1.38 (1.13)	0.91 (0.46)	-5.70*** (9.14)	
Three	-0.62*** (3.97)	-9.46*** (9.84)	-10.66*** (7.98)	-17.59*** (6.69)	
Four	-0.73*** (4.57)	-13.88*** (13.37)	-15.39*** (11.52)	-21.92*** (10.08)	
Five	-0.84*** (5.29)	-17.84*** (23.67)	-16.00*** (10.58)	-23.61*** (10.74)	
Six	-1.00*** (6.30)	-21.09*** (23.13)	-18.28*** (13.62)	-25.77*** (11.66)	
Seven	-1.00*** (6.26)	-20.98*** (25.36)	-18.09*** (14.01)	-25.22*** (11.85)	
Eight	-1.01*** (6.38)	-21.25*** (30.83)	-18.58*** (14.79)	-25.47*** (12.16)	
Nine	-1.01*** (6.29)	-21.31*** (28.43)	-18.84*** (14.80)	-25.37*** (11.65)	
Ten or more	-1.01*** (6.27)	-21.65*** (31.72)	-19.30*** (15.27)	-25.94*** (12.00)	
County fixed effects	Yes	Yes	Yes	Yes	
N	373,876	1,204,545	262,393	102,965	
R ²	0.65	0.68	0.62	0.49	

*Coefficient is significant the 0.10 level; ** At the 0.05 level; *** At the 0.01 level. Absolute values of t-statistics in parentheses. N = Number of redemptions. R² measures the percentage of the variation in which redemption value is explained by the model.

Notes: The FIs (Food Instruments) are defined in table 3. Standard errors are clustered on vendor peer groups.

The pattern among the coefficients is particularly pronounced for FIs 6145, 6232, and 6315, which contain foods for participants with specific dietary needs and include infant fruits and vegetables, lactose-free milk, soy milk, and tofu. For example, FI 6315 redemption values are estimated to be an average of \$26 lower per FI redeemed at the largest stores than at the smallest, all else constant. However this same coefficient for the largest stores is only about \$10 for FI 6012, which is comparable to 6315 but does not include foods tailored to consumers with dietary restrictions. The reasons for this disparity are likely twofold: (1) most small vendors sell very few of these FIs but are required to carry them under minimum stocking requirements. Thus, small vendor costs are very high, in terms of both acquisition and losses due to spoilage and expiration dates; (2) almost all sales of these products will be to WIC participants, so incentives for cost containment are absent or minimal. The results indicate, therefore, that the highest prices among the non-A-50 vendors are found among the smallest vendors and for some of the least frequently redeemed FIs that were examined. For example, we observe nearly 10 million redemptions for FI 6003, which exhibits relatively small store-size impacts on redemption value compared with FI 6315, for which we observe just over 100,000 redemptions in the 29-month period studied.

For each regression, we also report the R^2 , the measure of the share of the variation in redemption values for the FI around its mean that is explained by the statistical model. In our case, it represents the share of variation explained by store size and geography. These shares range from 0.46 to 0.68. Therefore, county and registers jointly have significant explanatory power, in most cases explaining more than half of the variation in redemption values, but considerable variation in redemption values remains unexplained. The unexplained variation is due at least in part to participant choice among products, brands, and container sizes available to at least some extent for all of the FIs in table 7 except for infant formula.

Simulating Potential Savings Through Changes to Cost Containment

We used the regression results in table 7 to conduct two simulation analyses designed to estimate the potential cost savings from adjustments to the current system of cost containment in California. In the first simulation, we figuratively “resold” all of the FIs sold during the 29-month analysis period at vendor locations with one to five registers at the largest vendor operating in the same county as the now-excluded smaller vendors. This simulation assumes implicitly that all WIC customers shopping at small vendors have access to larger WIC vendors.²⁵ For example, in Los Angeles County, the small vendor FIs would be resold in vendors with 10 or more registers, thus holding county effects on prices constant. In Calaveras County, however, the largest authorized vendor has nine registers, so the FIs redeemed at small-register vendors in that county are resold, figuratively, at the county’s nine-register vendor.²⁶

We chose one-to-five-register vendors for the simulation because the econometric and statistical analysis showed that nearly all of the available cost savings associated with sales at larger vendors was achieved with vendors operating six or more registers. We applied this methodology to the leading FIs of the California WIC Program and calculated the savings achievable through—effectively—eliminating all small vendors in the program.²⁷

Results of the simulation are reported in table 8. The FIs included in the table account for approximately 65 percent of program redemptions. Column (8) reports the share of total redemption value that is reduced for those resold FIs, or alternatively, for those sold at small vendors. The savings are largest, just over 50 percent, for the infant combination FI 6145, and they are also large for the FIs for participants with special dietary needs, FI 6232—40.8 percent and FI 6315— 47.1 percent. These results are fully consistent with the observation that smaller vendors attach their highest markups to specialty foods that they are required to stock for the WIC Program, but which they likely sell little or none of to non-WIC customers. These percentages also support the notion that larger vendors are considerably more effective at containing costs. Total estimated savings across the FIs in table 8 are just over \$111 million for the 29-month period.

These estimated savings should be examined in the context of the California WIC Program in its entirety. Column (8) reports the percentage savings for each FI, calculated as the share of savings achieved for the resold FIs times the share of total FIs resold, or column (4) multiplied by column (7). These numbers are considerably lower, ranging from 5 percent for FI 6001 to 10 percent for 6145, one of the smaller FIs examined in terms of number of redemptions. Weighing these percentages by the share of total program expenditures attributed to each FI yields total program savings of 6.3 percent.

²⁵ This assumption will not be true for all program participants. Eliminating program vendors will inevitably compromise access for some participants. The simulation, however, will provide a sense of the program cost savings achievable by targeting WIC sales to the larger and more cost-effective vendors. Policymakers would ultimately have to weigh the value of these savings against the costs of reduced participant access.

²⁶ A second methodological approach to estimating this cost savings is to use predicted, rather than actual, redemption values for both the small- and large-register vendors in making the cost-savings calculation. For any single calculation, these two measures will differ by the error or residual in predicting the redemption value for the smaller vendor, but when aggregated across a large number of FIs these residuals should sum roughly to zero. We applied this approach and found the two methods yielded very similar results.

²⁷The FIs included in this simulation are provided in table 7 and account for approximately 65 percent of program redemptions.

Table 8

Simulation results for removing all California Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) redemptions at vendors with five or fewer cash registers and reselling at large vendors, by Food Instruments

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
FI	Total redeemed value (mil. \$)	Redeemed value (1-5 reg) (mil. \$)	% Redeemed at 1-5 regs (by value) (percent)	# of FIs "resold" at 1-5 regs	Savings (mil. \$) at 1-5 regs	Total savings on resold FIs (1-5 regs) (percent)	Total savings (percent)	# of FIs sold at A-50	Savings (mil. \$) at A-50 vendors
Infant formula	634.62	108.98	17.2	908,210	37.44	34.4	5.90	2,831,926	2.87
Infant meats	11.31	1.65	14.6	60,880	0.62	37.9	5.52	269,015	0.02
6000	93.49	18.67	20.0	813,965	6.80	36.4	7.28	2,078,348	2.39
6001	86.16	15.12	17.5	808,205	4.21	27.9	4.89	2,107,954	1.47
6002	82.10	16.49	20.1	816,644	6.31	38.3	7.68	2,083,530	2.22
6003	261.82	52.38	20.0	2,272,151	19.16	36.6	7.32	6,109,709	7.09
6011	210.70	43.08	20.4	2,118,818	16.63	38.6	7.89	5,704,622	6.26
6012	334.96	53.92	16.1	2,873,603	15.32	28.4	4.57	8,525,559	5.53
6145	37.57	7.56	20.1	235,957	3.83	50.6	10.18	842,864	1.51
6232	9.20	1.48	16.1	44,926	0.60	40.8	6.57	169,625	0.23
6315	2.70	0.32	11.7	9,881	0.15	47.1	5.49	48,424	0.05

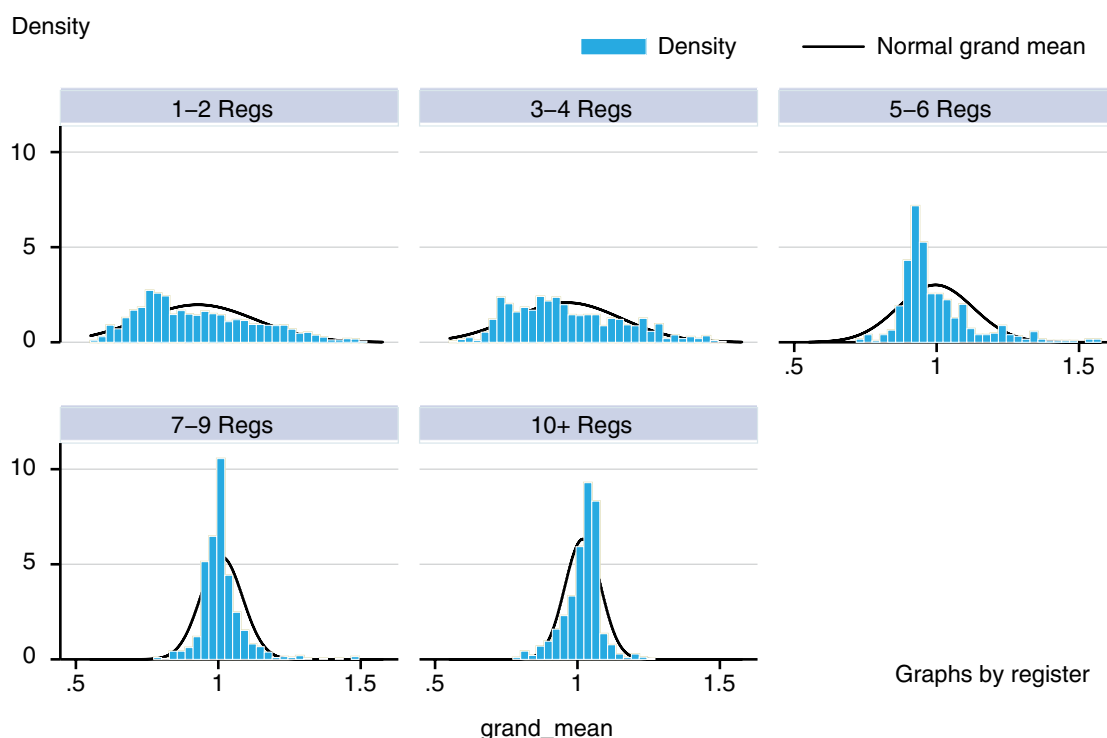
FI = Food Instrument.

Additional savings from this improved cost containment would also occur with A-50 vendors, for whom the MARR is set at the statewide average redemption value. Thus, the A-50 MARR for an FI would decline by approximately the percentage indicated in column (8). This savings across the FIs considered in table 8 is an additional \$29.63 million. The combined savings, nearly \$141 million, can be interpreted as the total program savings achievable, per the simulation, of either eliminating all vendors with five or fewer registers from the California WIC Program or forcing those vendors to be cost competitive with the largest vendors in the program. It should be thought of as an upper bound on available savings, as equivalent cost competitiveness between large and small stores is unlikely to be realistic. Smaller vendors' operating costs are likely to be higher on a unit-of-sales basis (Guy, Bennison and Clarke, 2005), and the removal of small vendors from the WIC Program could make it more difficult for some participants to use WIC vouchers since there would be fewer stores in the program.

Given the interest of the California WIC Program in identifying and constraining the pricing of noncompetitive vendors, or "bad actors," or possibly eliminating them from the program, we designed a second simulation to examine the potential savings from such a strategy. Noncompetitive vendors need not be contained exclusively within the smaller register peer groups. Thus, we investigated the consequences of eliminating the vendors whose prices were above either the 90th or the 95th percentile, respectively, for each register peer group.

This simulation focuses on the most important FIs, 6012, 6003, 6011, and infant formula, to identify the least competitive vendors.²⁸ First, we calculated each vendor’s mean FI redemption value over the 29-month period. We then normalized each vendor’s mean redemption value by dividing it by the mean redemption value for the entire vendor peer group to facilitate aggregation across multiple FIs. We next calculated a “grand mean” for each vendor as the share-weighted average of that vendor’s normalized means for the four FIs, where the weight for each FI was its share of total redemptions for the four FIs. Thus, each vendor was assigned a single normalized mean redemption value that facilitated direct comparison of cost competitiveness with its peers. We then identified those vendors operating above the 90th or 95th percentiles, respectively, in FI redemption values in order to conduct two separate simulations. As with the previous simulation, we “resold” all redemptions for these noncompetitive vendors, in this case at the mean redemption value charged for each FI.^{29,30}

Figure 4
Box plots for Food Instruments (FI) histograms of mean redemption values (mean = 1) by register groups FI 6012 redemption values



Source: California Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and authors calculations.

²⁸ Selecting a small subset of FIs make this simulation tractable. The four FIs used collectively comprise over 50 percent of all program redemptions during the period of the data.

²⁹ By reselling at the mean FI prices for the remaining vendors, we are simulating a scenario whereby noncompetitive vendors are removed from the program, and their customers are left to redeem FIs at an alternative vendor. Over a large number of participants, these decisions should result in FIs being redeemed at about the mean redemption value for the remaining vendors.

³⁰ We did not include A-50 vendors as options for the FIs that were figuratively resold. Inclusion of A-50 vendors would not change the calculations in any meaningful way because they are constrained to charge a statewide average price, which is what the simulation used for reselling purposes.

Histograms for the grand means (fig. 4) provide convenient snapshots of differences in pricing among program vendors within peer groups. To aid with the interpretation of these means, consider that a vendor who has a grand mean of 1.0 charges precisely at the average redemption rate for his peer group. Similarly a vendor with a grand mean of 1.5 charges 50 percent more than the average vendor in the peer group. The histograms for one-to-two and three-to-four register vendors are flat and have long upper tails, indicating that many vendors in these groups charge considerably above the group average, including some that charge more than 50 percent above it. The shapes of the histograms change quite dramatically for vendors in the 5-6, 7-9, and 10+ register groups. The distributions become considerably more peaked, meaning a large share of vendor grand means are concentrated in a limited range of prices around the group mean, and the right skew of the distribution—so apparent in the histograms for the smaller vendors—disappears. Indeed, for 10+ register vendors the distribution is left-skewed, indicating the significant presence of highly cost-competitive vendors in that group.

The results of the second simulation, reported in table 9, broadly support the implications of the first. The mean per unit savings are large—e.g., \$8.83 for a can of formula, \$16.59 for FI 6003—relative to the percentage savings in program cost. Even examining the smallest peer group, where both the histogram and the summary statistics suggest we find the least cost-competitive vendors, the achievable savings range from 5 percent to 10 percent, based on the removal of the 90th percentile of prices and above from the program. These numbers fall considerably as register count increases. The potential savings are markedly lower even for the three-to-four register peer group and are uniformly below 1 percent for the largest stores. The total simulated savings of removing the least competitive 10 percent of vendors in the program is about 2.5 percent of total costs.

The simulation results, taken together, indicate that the potential cost savings from taking steps to eliminate those vendors charging the highest FI redemption rates are fairly small, on a percentage basis. While there are some very noncompetitive vendors among the geographic peer groups, they are largely concentrated among the one-to-three or three-to-four register sizes. Further, while large shares of the clientele of these smaller vendors are likely WIC customers, they redeem few FIs relative to the largest vendors in the program. Even taking into account the A-50 peer group, the total achievable percentage savings remain small. Recall that the A-50 vendors are neutral with respect to containing costs, given that the large majority of FI redemptions at these stores take place at or near the MARR, set at the statewide average redemption value. Since the one-to-two and three-to-four register peer groups collectively account for only 15 percent of all FI redemption value in California WIC, the simulated efforts to constrain prices for these peer groups have a limited impact on statewide average redemption values and, hence, on the redemption values charged by A-50 vendors.

Table 9

Simulating removal of the least cost-competitive vendors from the California Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)

1-2 Registers	Infant formula	FI 6003	FI 6011	FI 6012	Total
Total value redeemed (mil \$)	68.18	33.68	27.41	33.13	162.39
Cost with FI resold (mil \$) (95th)	66.57	32.01	26.25	32.02	156.84
Savings (95th)	1.61	1.67	1.16	1.11	5.55
Units resold	182,372	100,530	90,458	124,186	
Per unit savings	8.83	16.59	12.84	8.95	
Percent savings (95th)	2.36	4.95	4.24	3.36	3.42
Cost with FI resold (mil \$) (90th)	64.45	30.35	24.91	30.79	150.49
Savings (90th)	3.73	3.33	2.50	2.34	11.90
Units resold	444,329	222,370	202,203	281,156	
Per unit savings	8.39	14.99	12.35	8.32	
Percent savings (90th)	5.47	9.89	9.11	7.06	7.33
3-4 Registers	Infant formula	FI 6003	FI 6011	FI 6012	Total
Total value redeemed (mil \$)	30.59	13.44	11.27	14.64	69.94
Cost with FI resold (mil \$) (95th)	30.06	13.23	11.06	14.45	68.80
Savings (95th)	0.53	0.21	0.21	0.19	1.14
Units resold	58,003	23,136	21,551	29,754	
Per unit savings	9.06	9.26	9.65	6.44	
Percent savings (95th)	1.72	1.59	1.85	1.31	1.63
Cost with FI resold (mil \$) (90th)	29.41	12.99	10.81	14.26	67.47
Savings (90th)	1.17	0.45	0.46	0.38	2.47
Units resold	135,532	56,796	52,898	72,591	
Per unit savings	8.66	7.96	8.72	5.24	
Percent savings (90th)	3.84	3.36	4.09	2.60	3.53
5-6 Registers	Infant formula	FI 6003	FI 6011	FI 6012	Total
Total value redeemed (mil \$)	28.28	13.45	11.09	16.56	69.37
Cost with FI resold (mil \$) (95th)	27.84	13.21	10.82	16.34	68.20
Savings (95th)	0.44	0.25	0.27	0.22	1.17
Units resold	61,507	38,232	35,669	50,387	
Per unit savings	7.10	6.46	7.48	4.36	
Percent savings (95th)	1.54	1.84	2.41	1.33	1.69
Cost with FI resold (mil \$) (90th)	27.05	12.98	10.56	16.11	66.70
Savings (90th)	1.23	0.48	0.53	0.45	2.68
Units resold	188,849	104,280	98,306	138,202	
Per unit savings	6.49	4.58	5.35	3.23	
Percent savings (90th)	4.34	3.55	4.74	2.70	3.86

— continued

Table 9

Simulating removal of the least cost-competitive vendors from the California Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)—continued

7-9 Registers	Infant formula	FI 6003	FI 6011	FI 6012	Total
Total value redeemed (mil \$)	65.28	28.79	22.94	36.61	153.61
Cost with FI resold (mil \$) (95th)	64.71	28.42	22.52	36.25	151.90
Savings (95th)	0.56	0.37	0.42	0.36	1.71
Units resold	181,355	95,154	88,938	126,968	
Per unit savings	3.10	3.92	4.71	2.83	
Percent savings (95th)	0.86	1.29	1.83	0.98	1.12
Cost with FI resold (mil \$) (90th)	64.40	28.23	22.34	36.13	151.10
Savings (90th)	0.88	0.56	0.60	0.48	2.52
Units resold	334,915	183,679	170,649	246,144	
Per unit savings	2.63	3.03	3.50	1.94	
Percent savings (90th)	1.35	1.94	2.61	1.31	1.64
10+ Registers	Infant formula	FI 6003	FI 6011	FI 6012	Total
Total value redeemed (mil \$)	172.26	75.55	58.75	97.52	404.08
Cost with FI resold (mil \$) (95th)	171.67	75.28	58.54	97.39	402.87
Savings (95th)	0.59	0.27	0.21	0.13	1.21
Units resold	244,164	140,564	130,346	194,292	
Per unit savings	2.43	1.92	1.64	0.68	
Percent savings (95th)	0.34	0.36	0.36	0.13	0.30
Cost with FI resold (mil \$) (90th)	171.42	74.96	58.31	97.17	401.85
Savings (90th)	0.84	0.60	0.44	0.35	2.23
Units resold	648,576	343,536	319,600	477,706	
Per unit savings	1.29	1.74	1.37	0.74	
Percent savings (90th)	0.49	0.79	0.75	0.36	0.55
Total	Infant formula	FI 6003	FI 6011	FI 6012	Total
Total value redeemed (mil \$)	364.58	164.92	131.45	198.45	859.40
Cost with FI resold (mil \$) (95th)	360.85	162.15	129.18	196.44	848.62
Savings (95th)	3.73	2.77	2.27	2.01	10.78
Percent savings (95th)	1.02	1.68	1.73	1.01	1.25
Cost with FI resold (mil \$) (90th)	356.73	159.50	126.93	194.46	837.61
Savings (90th)	7.85	5.42	4.52	4	21.78
Percent savings (90th)	2.15	3.28	3.44	2.01	2.53

FI = Food Instrument.

Conclusions

The costs of the WIC Program, on a State by State basis, are directly related to program participation. For that reason, an understanding of the sources of program costs and insights into potential cost containment are of interest to policymakers and participants alike. We have discussed the primary cost-containment mechanisms of the WIC Program—vendor peer groups and associated maximum allowable redemption rates (MARR)—in detail. Using a comprehensive dataset on food instrument (FI) redemptions in the California WIC Program, we investigated the relationship between these program containment features and FI redemption rates. We also examined the extent to which efforts to contain prices charged by the least cost-competitive vendors might reduce overall program costs.

For California, vendor peer grouping and MARR pricing have been largely ineffective at restraining program costs. Only a very small percentage of the redemptions were within 1 percent of the MARR, meaning it was restraining program costs in only a small share of cases. Small vendors operating from one to five registers charge, by a considerable amount, the highest WIC redemption values in California. Removing these vendors from the program or, equivalently, compelling them to charge prices comparable to those set by larger vendors, would yield substantial savings per FI redeemed. The overall program savings, however, was estimated to be only about 6.3 percent because on average these small vendors do not redeem a large number of FIs.

The cost savings from a second potential improvement, eliminating the least competitive—or highest charging—vendors in the WIC Program in each peer group are also small on a percentage basis. For example, removing the least competitive 10 percent of all vendors, by geographic peer group, would result in cost savings to the program of only about 2.5 percent. In considering policy adjustments, these potential cost savings need to be weighed against possible reductions in participant access if some vendors are forced to leave the program under more restrictive price controls.

Future WIC cost-containment research may need to focus on the breadth of food products allowable for purchase in the WIC Program. The California program features combination FIs, which contain food and beverage products across a range of product categories. Further, for many foods, a wide assortment of brands and product sizes are available. In some cases, organic products can be purchased. In practice, this means that the retail cost of many FIs can vary substantially, depending on participants' choices and product availability. Other States, however, offer less participant choice and for some product categories require that the cheapest brand be purchased. The cost-containment implications of allowing broad participant choice versus requiring the purchase of least-cost brands are not well understood. Analysis of this varied element of State programs may show other ways that USDA and its State-agency partners can provide WIC benefits in a more cost-effective manner.

References

- Abt Associates. 2011. *WIC Participant and Program Characteristics 2010*, Special Nutrition Programs Report No. WIC-10-PC, U. S. Department of Agriculture, Food Nutrition Services, Washington, DC.
- Burger, C., & Associates Inc. 2006. *Grocer Price Analysis Project: Final Peer Group Analysis Report*, March 21.
- Bustillos, B., J. Sharkey, J. Anding, and A. McIntosh. 2008. "Availability of More Healthful Food Alternatives in Traditional, Convenience, and Nontraditional Types of Food Stores in Two Rural Texas Counties," *Journal of the American Dietetic Association* 109(5):883-89.
- California WIC Program. 2006. *Request for Certification*. Report submitted to the U.S. Department of Agriculture, Food and Nutrition Service, Washington, DC, June.
- Chen, Z. 2003. "Dominant Retailers and the Countervailing-Power Hypothesis," *RAND Journal of Economics* 34(4):612-25.
- Chevalier, J.A., A. K. Kashyap, and P.E. Rossi. 2003. "Why Don't Prices Rise During Periods of Peak Demand? Evidence from Scanner Data," *The American Economic Review* 93(1):15-37.
- Chung, C., and S.L. Myers. 1999. "Do the Poor Pay More for Food? An Analysis of Grocery Store Availability and Food Price Disparities," *Journal of Consumer Affairs* 33(2):276-96.
- Cotterill, R. 1986. "Market Power in the Retail Food Industry: Evidence from Vermont," *The Review of Economics and Statistics* 68(3):379-86.
- Davis, D. 2007. Containing the Cost of Infant Formula to the WIC Program, *Issue Briefs, South Dakota State University* No. 2007491, Department of Economics.
- Davis, D. 2012. "Bidding for WIC Infant Formula Contracts: Do Non-WIC Customers Subsidize WIC Customers?" *American Journal of Agricultural Economics* 94(1):80-96.
- Davis, D., and E. Leibtag. 2005. *Interstate Variation in WIC Food Package Costs: The Role of Food Prices, Caseload Composition, and Cost-Containment Practices*, FANRR-41, U.S. Department of Agriculture, Economic Research Service.
- Dimitri, C., A. Tegene, and P. Kaufman. 2003. *U.S. Fresh Produce Markets: Marketing Channels, Trade Practices, and Retail Pricing Behavior*, AER-825, U.S. Department of Agriculture, Economic Research Service.
- Food and Nutrition Service. 2013. *WIC Program Regulations*, <http://www.fns.usda.gov/wic/lawsandregulations/>.
- Fox, E., and R. Sethuraman. 2010. *Retail Competition*. SpringerImages.
- Guy, C., D. Bennison, and R. Clarke. 2005. "Scale Economies and Superstore Retailing: New Evidence from the UK," *Journal of Retailing and Consumer Services* 12(2):73-81.
- Hansen, K., and V. Oliveira. 2009. *Economic Linkages Between the WIC Program and the Farm Sector*, EIB-12, U.S. Department of Agriculture, Economic Research Service, March.

- Kirlin, J., N. Cole, and C. Logan. 2003. *Assessment of WIC Cost-Containment Strategies: Executive Summary*, Food Assistance and Nutrition Research Report No. 31, U.S. Department of Agriculture, Economic Research Service.
- Lal, R., and C. Matutes. 1994. "Retail Pricing and Advertising Strategies," *The Journal of Business* 67(3):345-70.
- Levy, D., S. Dutta, M. Bergen, and R. Venable. 1998. "Price Adjustment at Multiproduct Retailers," *Managerial and Decision Economics* 19(2):81-120.
- Liese, A., K. Weis, D. Pluto, E. Smith, and A. Lawson. 2007. "Food Store Types, Availability, and Cost of Foods in a Rural Environment," *Journal of the American Dietetic Association* 107(11):1916-23.
- Ludwig, J., and M. Miller. 2005. "Interpreting the WIC Debate," *Journal of Policy Analysis and Management* 24(4):691-701.
- Messinger, P., and C. Narasimhan. 1997. "A Model of Retail Formats Based on Consumers' Economizing on Shopping Time," *Marketing Science* 16(1):1-23.
- Montgomery, D., and P. Splett. 1997. "Economic Benefit of Breast-feeding Infants Enrolled in WIC," *Journal of the American Dietetic Association* 97(4):379-85.
- Oliveira, V. 2012. *The Food Assistance Landscape: FY 2011 Annual Report*, EIB-93, U.S. Department of Agriculture, Economic Research Service, March. .
- Oliveira, V., and E. Frazao. 2009. *The WIC Program: Background, Trends, and Economic Issues, 2009 Edition*, ERR-73, U.S. Department of Agriculture, Economic Research Service, April.
- Oliveira, V., E. Frazao, and D. Smallwood. 2010. *Rising Infant Formula Costs to the WIC Program: Recent Trends in Rebates and Wholesale Prices*, ERR-93, U.S. Department of Agriculture, Economic Research Service, February.
- Oliveira, V., E. Frazao, and D. Smallwood. 2013. *Trends in Infant Formula Rebate Contracts: Implications for the WIC Program*, EIB-119, U.S. Department of Agriculture, Economic Research Service, December.
- Solgaard, H., and T. Hansen. 2003. "A Hierarchical Bayes Model of Choice between Supermarket Formats," *Journal of Retailing and Consumer Services* 10(3):169-180.
- Special Supplemental Nutrition Program for Women, Infants and Children, *Code of Federal Regulations*, Title 7, Food and Nutrition Service, USDA, 2009.
- United States Department of Agriculture. 2013. Women, Infants, and Children: Annual State Level Data: Average Monthly Food Costs Per Person. <http://www.fns.usda.gov/pd/wisummary.htm>, accessed January 2014.
- United States Department of Agriculture. 2012. Women, Infants, and Children: Summary of FY 2012 Grants, <http://www.fns.usda.gov/wic/fundingandprogramdata/grants2012.htm>.
- Varian, H. 1980. "A Model of Sales," *The American Economic Review* 70(4):651-59.
- Yu, C., and J. Connor. 2002. "The Price-Concentration Relationship in Retailing: Retesting Newmark," *Agribusiness* 18(4):413-26.