Privatizing the Provision of Healthy Food: Evidence from Mississippi WIC

Shreya Bhardwaj (USC), Katherine Meckel (UCSD, NBER), Jaeyeon Shin (UCSD)

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Motivation

- A central question in economics is whether government services should be provided directly ("in-house") or contracted out (Hart, Shleifer, and Vishny, 1997)
- Private firms generally have stronger cost-cutting incentives
  - e.g., due to competition, ownership rights
- Impact on service quality is less clear-cut
  - Firms may invest to improve quality——or cut corners to reduce costs
- Long-standing interest in privatizing aspects of U.S. social benefit programs
  - Changes in service quality can affect take-up and targeting
  - Empirical challenge: need quasi-random shifts in provision for identification

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Our Study

- **WIC:** federal nutrition program for low-income women, infants, and young children
  - Provides monthly transfer of nutritious, low-cost foods
- **Mississippi:** Until 2021, WIC food distributed via 95 state-run warehouses
  - In 2021, shifted retail model: participants shop at authorized stores using benefit card
  - Rare opportunity to study large-scale privatization of benefit delivery
- **Conceptual framework**:
  - Service can be delivered by gov (WIC-only) or private firm (WIC + non-WIC)
  - Quality: contractable (e.g., hours) vs. non-contractable (e.g., store environment)
  - Store spends effort on WIC-specific and general amenities; gov. spends effort on WIC-specific
  - $\rightarrow$ if low WIC sales: privatization increases (decreases) quality of shared (WIC) amenities
  - $\rightarrow$ Participation (welfare) impact depends on value of shared vs. WIC-specific quality

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Empirical Analysis

- **Unique dataset** compiled from large number of sources
  - County-level administrative data on monthly **WIC participation** by type
    - also, reported WIC usage in birth certificate records
  - State-level monthly **quantities of food redeemed** by product
  - State-level monthly **program costs**: food and administrative spending, food prices
  - **Service quality**: qualitative text analysis of online reviews, state reports, photos

- **Empirical strategy:**
  - Diff-diff #1: staggered rollout across Mississippi counties vs. never-treated neighbors
    - de Chaisemartin & d'Haultfoeuille estimator to address treatment effect heterogeneity
  - Diff-diff #2: MS vs. neighboring states (AL, AR, LA, TN)

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Key Findings (Preview)

- **WIC participation** ↓ 12–14%
  - Largest declines among children, lower-SES families, and those with smaller benefit packages
  - Redemption rates also fall
  - No change in enrollment or clinic access; points to shopping experience as key mechanism
- **Shifts in service quality**
  - *WIC-specific amenities* ↓ - loss of simplified logistics and low-burden shopping at warehouses
  - *General amenities* ↑ - improved access (location, hours)
- **Per-participant costs** ↓ 32%
  - Driven by warehouse closures and reduced benefit redemption

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Contributions to Literature

- **Privatization and the efficiency/quality of government services**
  - Tends to lower cost and improve contractable quality, may reduce non-contractable quality (Theory: Hart and Moore 1990; Hart, Shleifer, and Vishny 1997. Empirical: Knutsson and Tyrefors 2022)
- **Privatization within US social benefit programs**
  - contracting out eligibility services (e.g., Wu and Meyer 2023)
  - public health insurance (e.g., Aizer, Currie, and Moretti 2007; Currie and Fahr 2005; Duggan 2004; Kuziemko, Meckel, and Rossin-Slater 2018; Macambira et al 2025)
- **Take-up of social benefits** (Currie 2004)
  - highlighting transaction costs and administrative hurdles (Deshpande and Li 2019; Finkelstein and Notowidigdo 2019; Herd and Moynihan 2018; Homonoff and Somerville 2021)
  - e.s., WIC: distance to clinics, documentation requirements, and hurdles involved in shopping (Barnes et al. 2023; Bitler et al 2003; Swann 2007; Rossin-Slater 2013; Meckel 2020)

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2 Institutional Background

3 Conceptual Framework

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6 Results: Participation

7 Results: WIC Program Costs

What is WIC?

- Federal **nutrition program** for low-income **women, infants, and children** (< 5 yrs)
  - Food packages, nutrition education, health screening, referrals
  - Income $<$ 185% FPL ($51,338 for a family of four) or Medicaid participant
  - Enroll at WIC clinics; quarterly appointments
  - Coverage: 39% of infants, 23% of children, 20% of pregnant/postpartum women
  - Improves infant health and access to social services
    - Bitler and Currie (2005); Hoynes et al. (2011); Rossin-Slater (2013)

- **Food Benefits**: fixed-quantity, not cash-value ⏩ Infants ⏩ Women and Children
  - Voucher pick-up at quarterly clinic appointments
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Food Distribution Systems

- Federally funded but states control many aspects, like distribution system
  - **Direct:** state procures food and distributes it from warehouses
  - **Retail:** state issues vouchers redeemable at participating grocery stores
  - (**Home:** state procures food and delivers it to participants)

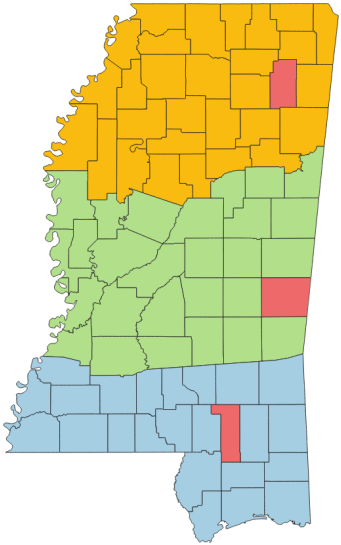
- Mississippi WIC switched from **direct** to **retail** distribution in 2021
  - Historically, funding formulas incentivized states to choose retail dist. (Bendick et al., 1976)
  - In 2019, all state WIC programs use retail dist. *except* MS
  - 2010 Healthy, Hunger-Free Kids Act mandated use of electronic benefit cards by 2020
    - Forced MS to switch to retail distribution (delayed by pandemic)

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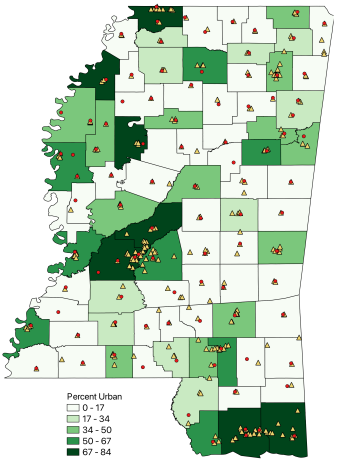
Rollout Schedule: Transition to Retail Distribution in MS WIC

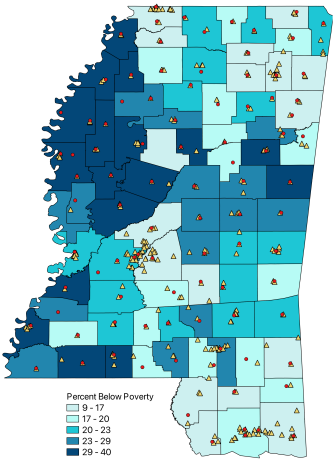


Rollout	Date	Locations (# of counties)
Pilot	Feb 2021	Forrest, Lauderdale, Lee (3)
Rollout 1	Apr 2021	Northern Region (29)
Rollout 2	May 2021	Central Region (27)
Rollout 3	May/June 2021	Southern Region (23)

- EBT cards issued at regular quarterly clinic appointment
- Transition completed w/in 3 months of rollout date
- Stores start accepting EBT on rollout start date

WIC Distribution Centers vs. Retail Stores in Mississippi





Distribution Centers (96) Picture

- evenly spaced (1 per county)

WIC Stores (292) Picture

- cluster in urban areas (e.g., Jackson, Gulf Coast)
- fewer in high-poverty rural areas (e.g., Delta)
- large stores
  - superstores (56%)
  - supermarkets (40%)

Notes: Red circles = WIC warehouses in FY 2020; Yellow triangles = WIC-authorized vendors in FY 2022

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Model Setup

- A service (e.g. WIC food distribution) can be:
  - government-run (serving only WIC), or
  - provided by private retailers (serving WIC and non-WIC).

- Service quality has two components:
  - **Contractable:** (minimum inventory, hours) enforceable by contract or regulation.
  - **Non-contractable:** (store environment, staff effort) depends on manager discretion.

- Managers allocate residual effort E_r to non-contractable quality:
  - **Retailer:** chooses share ω for WIC-only amenities (e.g., signage) ; $(1-\omega)$ goes to general amenities (cleanliness, variety), of which share α also benefits WIC.
  - **Government:** allocates all effort γE_r to quality that benefits WIC customers.

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Private vs. Public Provision

- Retailer earns net revenues from attracting customers:
  - ρ_w: from WIC customers per hour of effort (= 1 unit quality)
  - ρ_{nw}: from non-WIC customers
- **Retailer's objective:** chooses ω to maximize profits from WIC and non-WIC customers:

$$\pi(\omega) = \rho_{nw}(1-\omega)E_r + \rho_w\left(\omega E_r + \alpha(1-\omega)E_r + E_o\right) - C_o$$

- Retailer's optimal allocation of effort:

$$\omega^* = \begin{cases} 1 & \text{if } \rho_w(1-\alpha) > \rho_{nw} \\ 0 & \text{otherwise} \end{cases}$$

- **Service quality** under private and public provision:

$$E_r\left(\alpha + (1-\alpha)\omega^*\right), \quad \gamma E_r$$

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  - $\rightarrow$ Resulting service quality under each regime: private $= \alpha E_r$, public $= \gamma E_r$
  - $\rightarrow$ Privatization improves service quality only if spillovers from shared amenities are large ($\alpha > \gamma$)
  - $\rightarrow$ shared amenities may improve, but WIC-only amenities will decline
  - $\rightarrow$ Net effect on WIC participation (extensive and intensive) depends on how much eligible households value shared vs. WIC-only amenities

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    - Type: women (pregnant, breastfeeding, postpartum), infants, and children
    - Definition: individual who received food instruments during clinic visits (every 3 months)
  - Statewide monthly **food redemption amount** by category
  - State-level monthly spending on **food and administrative costs** ⏩ Raw Trends
- **Vital Statistics Birth Records** (2018-2023)
  - Self-reported WIC use during pregnancy
  - Maternal demographics and county of residence
- **Comparison states:** Alabama, Arkansas, Louisiana, and Tennessee (plus others)

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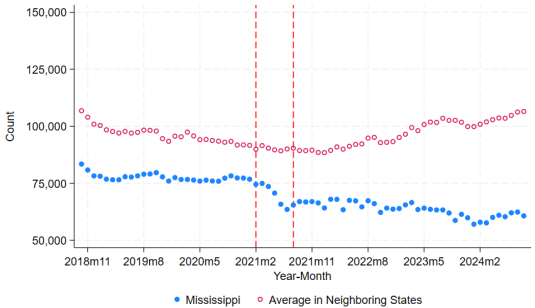
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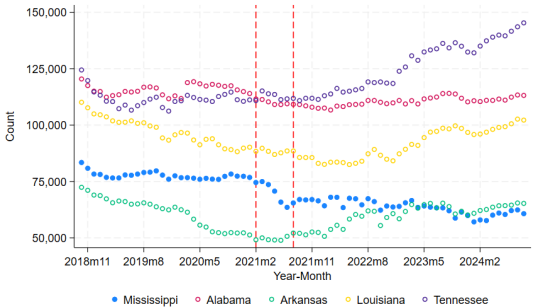
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WIC Participation Trends Over Time

with Confounders | by Rollout Wave



(a) Mississippi vs. Neighboring States



(b) By State

- Vertical dashed lines indicate rollout period: Feb-Aug 2021.

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County-Level: TWFE and de Chaisemartin and D'Haultfoeuille (DCDH)

- Staggered rollout across counties in MS; use surrounding states as pure controls

$$Y_{gt} = \alpha + \beta Post_{gt} + \gamma_g + \mu_t + \Gamma' Z_{gt} + \epsilon_{gt}$$

- $\boldsymbol{Y}$: participant counts (inverse hyp. sine); program costs
- $\boldsymbol{g}$: county for MS, state for AL, AR, LA, TN, $\boldsymbol{t}$: year-month
- $Post_{gt}$ indicates county g has transitioned by time t; always 0 for control states
  - event-study; rollout vs. post-rollout
- γ_g and μ_t: fixed effects for geographic unit and year-month
- Z_{gt}: state-level controls (unemployment rate, Medicaid policies) ⏩ State-Level Controls
- ϵ_{gt}: clustered at county level (for MS) or state level (for neighboring states)

State-Level: Difference-in-Differences (DiD)

- MS is treated starting in Feb 2021; control states are never treated

$$Y_{st} = \alpha + \beta(AfterJan2021_t \cdot MS_s) + \rho_s + \lambda_t + \Gamma' Z_{st} + \epsilon_{st}$$

- s: state, t: year-month
- $AfterJan2021_t = 1$ for post-rollout; $MS_s = 1$ for Mississippi
  - event-study; rollout vs. post-rollout periods
- ρ_s and λ_t: fixed effects for state and year-month
- Z_{st}: state-level controls (unemployment rate, Medicaid policies) ⏩ State-Level Controls
- ϵ_{st}: clustered at state-month level

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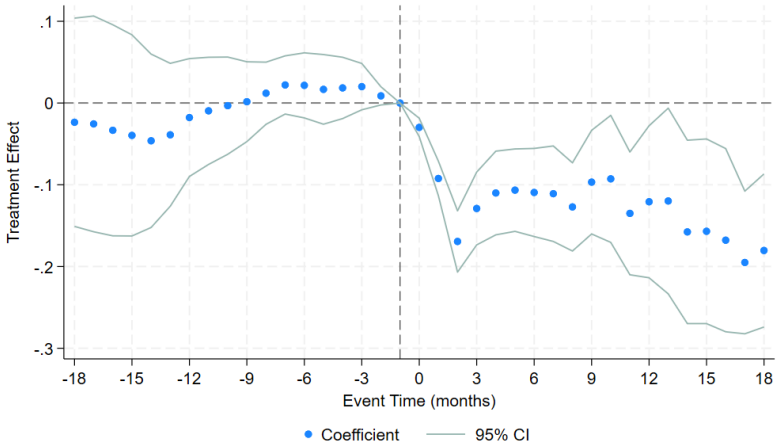
5 Empirical Strategy

6 Results: Participation

7 Results: WIC Program Costs

Participation Declines Following the Reform

- Event study (DCDH estimator) shows a **sharp** drop that **persists**



Estimated Magnitudes of Decline

- County-level: **12.7%** (DCDH) and **12.1%** (TWFE); state-level DiD: **13.9%** By Estimator
  - Implied loss of 10,500 to 13,800 participants/month in post-rollout period
- Robustness checks: 10.8% to 13.1% decline Robustness | Birth Certificate | Different Control States
- Declines were largest in:
  - **Higher-poverty** counties: 17.2% vs. 8.1% By Poverty
  - Low-educ, Black, and unmarried mothers (from birth certificate) By Maternal Characteristic
  - Groups with **smaller benefit packages** By Type | Targeting Figure
    - Children: 16.9%
    - Women: 10.2%
    - Infants: 6.9%

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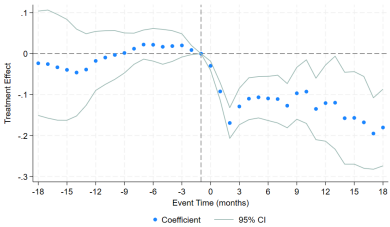
Participation Decline: Mechanisms

- Participation decline means either:
  - (1) Pre-reform enrollees skip clinic visits
  - (2) Would-be participants don't enroll

- **Initial decline** tracks staggered issuance of EBT cards
  - Well-publicized reform, larger drop among children
  - → pre-reform enrollees drop out

- **Persistent drop** suggests ongoing costs or barriers
  - No changes in enrollment or clinic procedures
  - → Focus on benefit shopping experience

Event-Study: WIC Participation



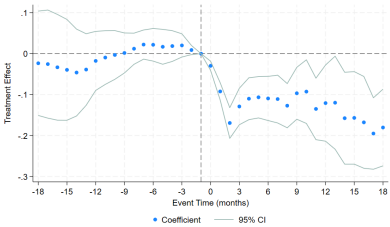
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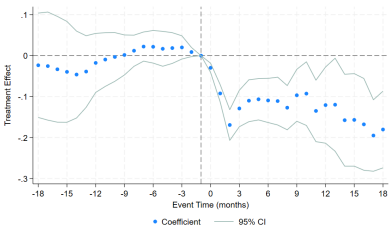
Event-Study: WIC Participation



Participation Decline: Mechanisms

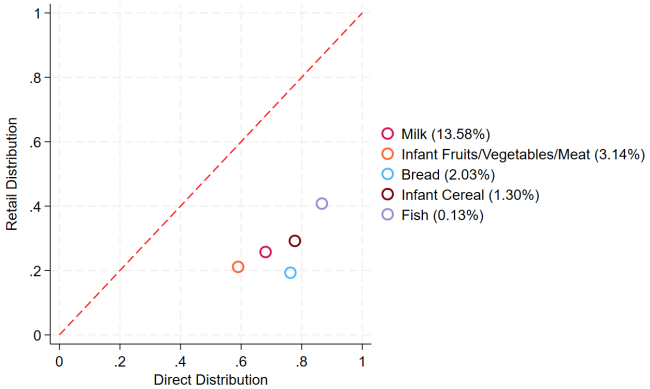
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Event-Study: WIC Participation



WIC Food Redemption Share (pre- vs. post-reform periods)

- **Redemption Share** ($\downarrow$) = number of units redeemed / maximum units issued



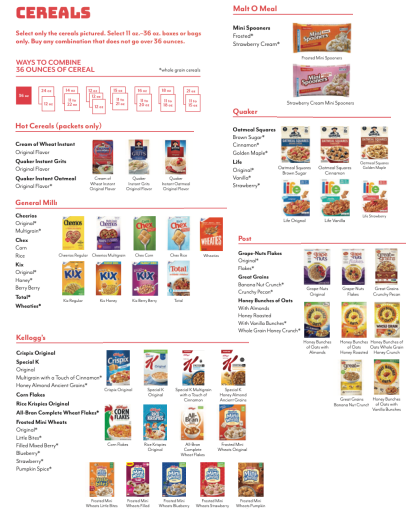
Further evidence of new barriers during shopping experience

WIC Retail Shopping Experience

Wal-Mart PB Example | MS WIC Guide

- **WIC food rules are complex and restrictive**
  - Brand, size, ingredient, weight
  - Small errors lead to rejection at checkout
- **Burden extends to experienced participants**
  - Frequent rule changes (e.g., at age 1) and product turnover UPC Turnover
  - Incomplete labeling (Barnes et al. 2023)
  - Stockouts; database errors
- **Surveys find shopping is a top burden**
  - Common complaints: confusion, stockouts, checkout rejections (Leone et al. 2022; Barnes et al. 2023; USDA 2023; WIC 2017)

WIC Shopping Rules Example

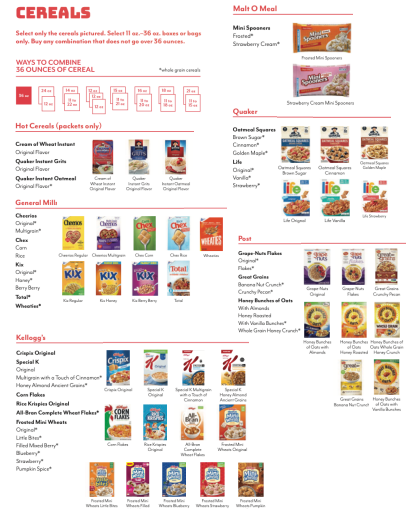


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WIC Shopping Rules Example



Distribution Centers Offered Simpler Shopping Experience

- **Structured and supportive environment**
  - Clear signage, grouped products
  - Staff guided participants
- **Low time and cognitive burden**
  - MSDH report: 15-minute visits common; staff helped participant navigate rules
  - Staff helped load groceries
  - Some centers offered play areas for children

Photos from Jackson WIC Center



More Images

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Photos from Jackson WIC Center



More Images

Participant Feedback on Distribution Centers

- **Positive sentiment toward distribution centers**
  - Google reviews: 754 ratings and 293 text reviews
  - Average rating: 4.1/5.0
  - Sentiment analysis: positive (67%), neutral (18%), negative (15%) feedback

- **Reviews describing retail shopping as harder**
  - *I miss picking up my WIC [at distribution centers]. Grocery stores are not as easy. WIC is very limited on items at the stores.* (Melissa 2023)
  - *I miss the location being open & the helpful lady that worked there. This location is now closed.* (Butler 2022)

Review Highlights



Sentiment Analysis

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Review Highlights



Service Quality: Shared and WIC-Specific Store Amenities

- Shared amenities (WIC and non-WIC)
  - Travel distance
    - Distance to food sites *declined* by 1.5 mi (30%) post-reform
    - All areas—urban/rural, high/low poverty—saw improvements View Travel Distance Results
  - Opening hours: centers mostly restricted to weekday business hours
  - Refrigeration

Outline

1 Introduction

2 Institutional Background

3 Conceptual Framework

4 Data

5 Empirical Strategy

6 Results: Participation

7 Results: WIC Program Costs

Per-Person Program Costs Decline After Retail Transition (in 2023 dollars)

- **Food-Related Costs:**
  (i) food benefits
  (ii) warehousing and distributing food
- **Nutrition Services and Administration (NSA) Costs:**
  clinic operations
  (e.g., nutrition education, breastfeeding promotion, vendor management, client services)

	Category of Program Costs	
	Food-Related (73%)	NSA (27%)
During Rollout	45.877***	1.142
	(10.725)	(0.810)
After Rollout	-29.966***	1.037*
	(7.704)	(0.540)
Pre-Period Mean	67.424	22.112

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Event Study Graphs | Full Estimates

Per-Person Program Costs Decline After Retail Transition (in 2023 dollars)

- **Total per-participant costs** declined **after** the rollout ($28.9 ↓ (32% drop))
  - Driven by large drop in **food procurement and distribution costs** ($30 ↓ (44% drop))
  - **NSA (clinic) costs** remained relatively stable (∼$1, not statistically significant)

- Food-related costs: (i) food benefits, (ii) warehousing and distribution (e.g., leases, staff)
- **Disaggregated food-only cost** data shows: Food Cost Event Study Graph and Estimates
  - Temporary spike during rollout
  - Long-run costs remained stable post-rollout due to offsetting changes:
    - (↑) per-unit food prices Average Food Price
      : lower costs due to competitive bidding before transition (cf. change in product composition)
    - (↓) food redemption rates

⇒ Decline in food-related costs from eliminating **warehousing and distribution expenses**

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Conclusion

- After the transition to **retail distribution** from direct distribution in **MS WIC**:
- **Decline in Participation**
  - Information or enrollment frictions
  - Travel burdens
  - Shopping burden
- **Decline in Program Costs**
  - Costs for running warehouses (e.g., rent, utilities, salaries for the staff)
  - Food benefits
  - Administrative costs (e.g., certification, benefit issuance, clinic services)
- $\Rightarrow$ **Contracting out** made the program more efficient but discouraged participation, possibly because retail stores are less service-oriented than public servants.

WIC Food Packages (Infants)

Back

Type	Fully Formula Fed		Partially Breastfed		Fully Breastfed	
	I and III	**II and III**	**I and III**	**II and III**	**I**	**II**
Foods	A: 0-3 months B: 4-5 months	6-11 months	A: 0-3 months B: 4-5 months	6-11 months	0-5 months	6-11 months
WIC Formula	A: 806 fl. oz. B: 884 fl. oz.	624 fl. oz.	A: 364 fl. oz. B: 442 fl. oz.	312 fl. oz.	N/A	N/A
Infant cereal	N/A	8 oz.	N/A	8 oz.	N/A	16 oz.
Infant fruit & veg	N/A	128 oz.	N/A	128 oz.	N/A	128 oz.
Infant meat	N/A	N/A	N/A	N/A	N/A	40 oz.

WIC Food Packages (Children and Women)

Back

Type	**Children**	**Women**		
Foods	A: 12-23 mths B: 2-4 yrs	A: Pregnant B: Breastfeed (Part.) (up to 1 yr)	Postpartum (up to 6 mths)	Breastfeed (Full) (up to 1 yr)
Juice	64 fl. oz.	64 fl. oz.	64 fl. oz.	64 fl. oz.
Milk	A: 12 qt. B: 14 qt.	16 qt.	16 qt.	16 qt.
Cereal	36 oz.	36 oz.	36 oz.	36 oz.
Eggs	1 dozen	1 dozen	1 dozen	2 dozen
Fruit & Veg	$26	A: $47 B: $52	$47	$52
Wheat bread	24 oz.	48 oz.	48 oz.	48 oz.
Fish (canned)	6 oz.	A: 10 oz. B: 15 oz.	10 oz.	20 oz.
Legumes	1 lb./64 oz.	1 lb./64 oz.	1 lb./64 oz.	1 lb./64 oz.
Peanut butter	18 oz.	18 oz.	18 oz.	18 oz.



Figure: WIC Distribution Center

Back

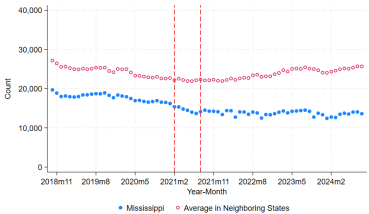


Figure: Retail Grocer

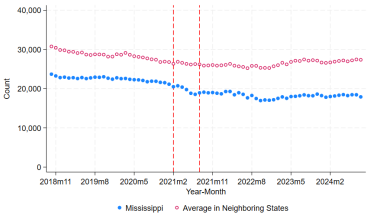
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WIC Participation Trends Over Time by Type

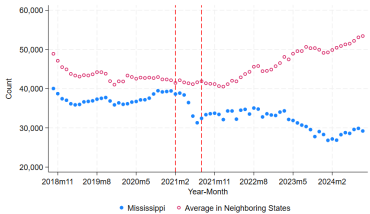
Back



(a) Women (22%)



(b) Infants (29%)



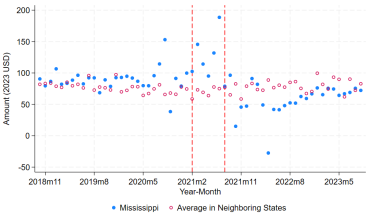
(c) Children (49%)

- Blue dots = Mississippi; red dots = average of AL, AR, LA, TN
- Red dashed lines = rollout period (Feb-Aug 2021)

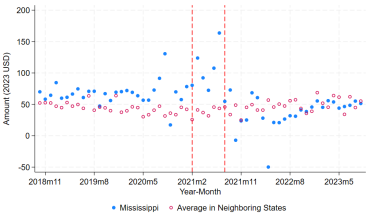
WIC Program Costs Trends Over Time by Category

Back

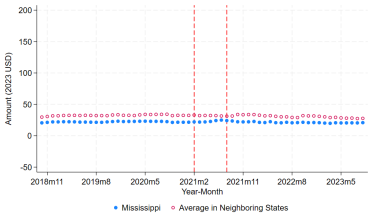
- Per-Participant Costs (in 2023 dollars)



(a) Total



(b) Food-Related (73%)

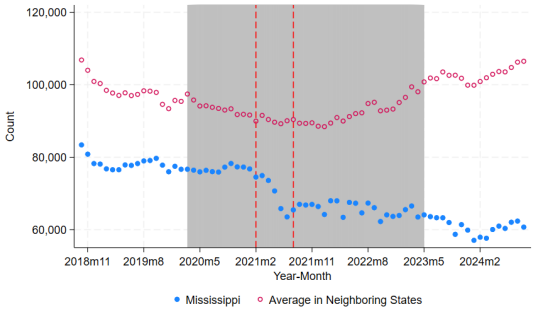


(c) Clinic Operations (27%)

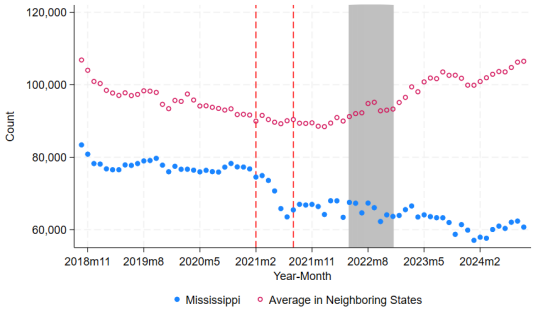
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WIC Participation and Potential Confounders

Back



(a) COVID-19 Pandemic

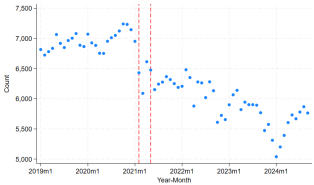


(b) Infant Formula Shortage

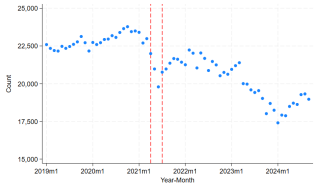
- Blue dots = Mississippi; red dots = average of AL, AR, LA, TN
- Gray shading = pandemic (Mar 2020-May 2023); Formula shortage begins May 2022.
- Red dashed lines = rollout period (Feb-Aug 2021)

WIC Participation Trends by Timing of Reform Rollout

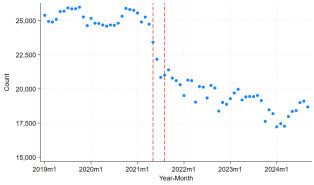
Back



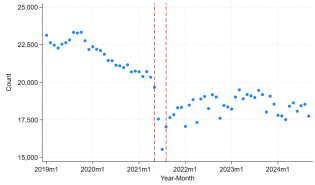
(a) Wave 1: Feb 2021



(b) Wave 2: Apr 2021



(c) Wave 3: May 2021



(d) Wave 4: May/Jun 2021

State-Level Controls: Medicaid Variables

Back

- **Postpartum Coverage Extension** (American Rescue Plan Act (ARPA))
  - Extension of Medicaid/CHIP postpartum coverage to 12 months following pregnancy
  - Centers for Medicare and Medicaid Services (CMS) approval date
    - LA and TN (Apr 2022), AL (Jan 2023), MS (Dec 2023)
- **Work Requirements**
  - AR is the only state people lost coverage due to the work requirement (vs. IN, MI, NH, UT).
    - AR (from June 2018 to Dec 2021)
    - CMS approved Arkansas Section 1115 waiver request in Dec 2021.
- **Coverage for Lawful Immigrants** (Immigrant Childrens Health Improvement Act (ICHIA))
  - Removal of wait period: covers lawfully residing immigrants without a 5-year waiting period
    - AR (Jan 2018): children and pregnant women
    - LA (Apr 2019): children only

Participation Results by Method

	DCDH	TWFE		DiD	
	(1)	(2)	(3)	(4)	(5)
Post	-0.127***	-0.121***		-0.139***	
	(0.033)	(0.031)		(0.023)	
During Rollout			-0.110***		-0.013
			(0.025)		(0.029)
After Rollout			-0.135***		-0.178***
			(0.042)		(0.022)
Geographic Unit	county	county		state	
Pre-Period Mean (MS)	964.059	964.059		77,664.5	
Observations	5,788	5,788		360	

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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Robustness Checks

	County-Level DCDH				State-Level DiD
	(1) Baseline	(2) Formula Shortage	(3) No Controls	(4) EA	(5) Part. Count
Post	-0.127***	-0.108***	-0.129***	-0.125***	-10170.38***
	(0.033)	(0.024)	(0.034)	(0.035)	(1808.827)
CONTROLS					
Unemployment	YES	YES	NO	YES	YES
Medicaid Policies	YES	YES	NO	YES	YES
Expiration of EA	NO	NO	NO	YES	NO
Pre-Period Mean	964.059	964.059	964.059	964.059	77,664.5
Observations	5,788	3,360	5,788	5,788	360

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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Participation Results by Maternal Characteristic

- Outcome: whether the mother has ever received WIC foods during pregnancy
- DID estimate for asinh(pregnant women): -0.097***

		Maternal Characteristic			
	(1) Total	(2) Hispanic	(3) Black	(4) Low-Educated	(5) Unmarried
Post	-0.029***	-0.032	-0.045**	-0.034**	-0.045***
	(0.010)	(0.041)	(0.018)	(0.016)	(0.016)
Pre-Period Mean (MS)	0.449	0.404	0.610	0.596	0.620
Observations	1,586,464	155,638	459,320	704,169	765,067

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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Participation Results with Different Control States

Census Region	South			Midwest		Northeast		West	
Census Division	(1) E.S. Central	(2) W.S. Central	(3) South Atlantic	(4) E.N. Central	(5) W.N. Central	(6) New England	(7) Middle Atlantic	(8) Mountain	(9) Pacific
Post	-0.126***	-0.152***	-0.103***	-0.099***	-0.101***	-0.117***	-0.112***	-0.099***	-0.095***
	(0.022)	(0.032)	(0.029)	(0.019)	(0.020)	(0.023)	(0.037)	(0.020)	(0.019)
Pre-Period Mean (MS)	964.059	964.059	964.059	964.059	964.059	964.059	964.059	964.059	964.059
Number of Control States	3	4	9	5	7	6	3	8	5
Observations	5,719	5,788	6,133	5,857	5,995	5,926	5,719	6,064	5,857

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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Participation Results by County Poverty

- Outcome: inverse hyperbolic sine of participant counts (i.e., asinh(counts))
- DID estimate for total participation: -0.127***

	(1) Low-Poverty Counties	(2) High-Poverty Counties
Post	-0.081***	-0.172***
	(0.028)	(0.034)
Pre-Period Mean	1003.84	924.28
Observations	2,894	2,894

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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Participation Results by Type

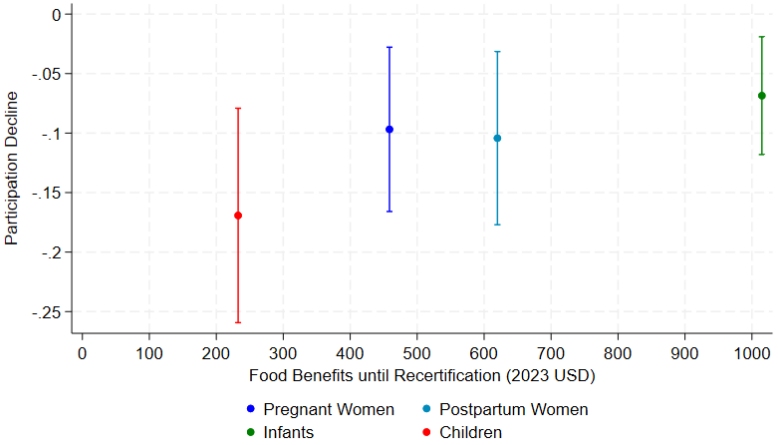
- Outcome: inverse hyperbolic sine of participant counts (i.e., asinh(counts))
- DID estimate for total participation: -0.127***

				Type of Women Participants		
	(1) Women	(2) Infants	(3) Children	(4) Pregnant	(5) Breastfeeding	(6) Postpartum
Post	-0.102***	-0.069***	-0.169***	-0.097***	-0.098**	-0.104***
	(0.026)	(0.025)	(0.046)	(0.035)	(0.040)	(0.037)
Pre-Period Mean	212.651	279.444	464.001	79.496	38.094	95.062
Observations	5,788	5,788	5,788	5,788	5,788	5,788

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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Targeting by Continuation Value



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Time Series Graph for Turnover in WIC-Eligible Products



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Distribution Center Photos







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Sentiment Analysis

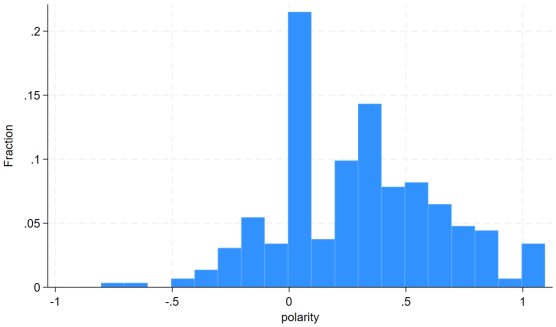


Figure: Polarity Score [-1, 1]

Reviews on WIC Warehouses by Sentiment

- **polarity score** obtained using TextBlob
- positive: (0, 1]
- neutral : 0
- negative: [-1, 0)

Sentiment	Frequency	Share (%)
Positive	197	67.24
Neutral	53	18.09
Negative	43	14.68
TOTAL	293	100

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Change in Distance to Food Sites

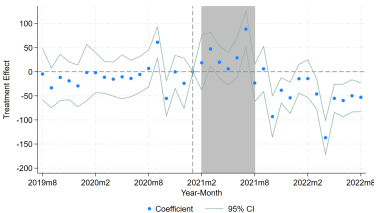
- Outcome: distance from block group centroid to the nearest WIC food site
- Food sites: distribution centers in 2020 and WIC stores in 2022

	(1)	(2)	(3)	(4)	(5)	(6)
Year= 2022	-1.5428***	-2.2930***	-1.7524***	-3.0295***	-1.3319***	-1.7318***
	(0.1192)	(0.1899)	(0.1118)	(0.2137)	(0.2109)	(0.2843)
Year= 2022×High Pov.		0.9262***		1.5274***		0.5103
		(0.2358)		(0.2470)		(0.3835)
Observations	4,512	4,512	2,058	2,058	2,454	2,454
Dep Var Mean (in 2020)	5.27	5.27	2.94	2.94	7.61	7.61
Sample	All	All	Urban	Urban	Rural	Rural

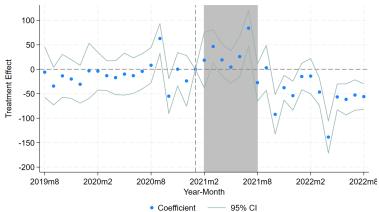
Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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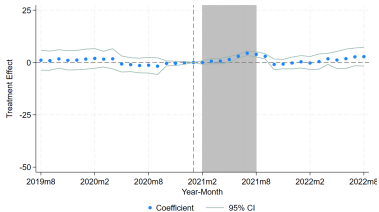
Per-Person Program Costs Decline After Retail Transition (in 2023 dollars)



Program Costs



Food-Related Costs (73%)



NSA Costs (27%)

- **Food-Related Costs:** food benefits; warehousing and distributing food
- **Nutrition Services and Administration (NSA) Costs**
  - clinic operations: nutrition education, breastfeeding promotion, client services, vendor management

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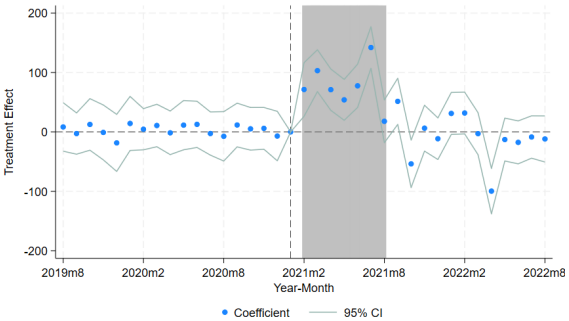
Per-Person Program Costs Decline After Retail Transition (in 2023 dollars)

	Total		Category of Program Costs: Food-Related (73%)		NSA (27%)	
	(1)	(2)	(3)	(4)	(5)	(6)
Post	-5.810		-6.878		1.069**	
	(9.578)		(9.499)		(0.485)	
During Rollout		47.019***		45.877***		1.142
		(11.094)		(10.725)		(0.810)
After Rollout		-28.929***		-29.966***		1.037*
		(7.772)		(7.704)		(0.540)
Pre-Period Mean	89.536		67.424		22.112	

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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Disaggregated Per-Participant Food Benefit Costs



Event-Study: Food Benefit Costs

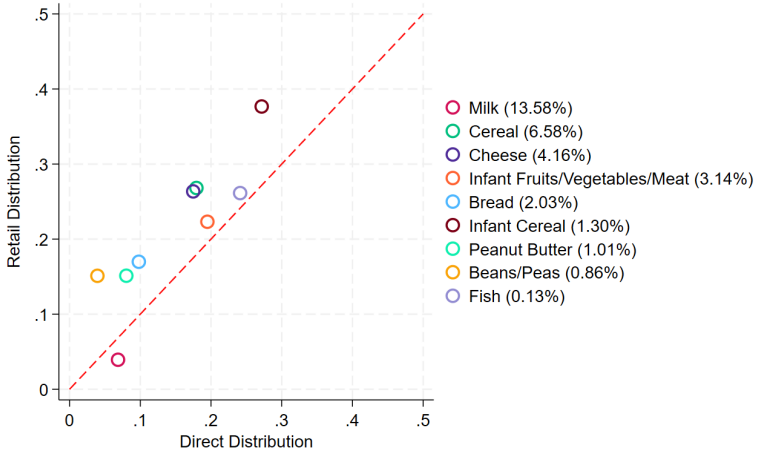
	(1)	(2)
Post	21.706***	
	(8.207)	
During Rollout		85.491***
		(11.342)
After Rollout		1.302
		(5.647)
Pre-Period Mean	45.535	

Standard errors in parentheses;
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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Average Price per Unit (pre- vs. post-reform periods)

- **Average Price** (↑) = total amounts redeemed (in $) / total units redeemed (in ounces)



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