

ONLINE APPENDIX for Issuance and Incidence: SNAP Benefit

Cycles and Grocery Prices*

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March 12, 2021

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A Optimal Pricing Model

To assess the implications for optimal pricing of the SNAP-induced, within-month variation in sales we estimate above, we use a simple model of retailer profits, similar to the one employed by [DellaVigna and Gentzkow \(2019\)](#). For simplicity, we assume pricing decisions occur at the store, rather than chain, level (or, equivalently, that each chain is comprised of a single store), as we are interested in variation in pricing over time within a given store, rather than across stores within a chain (as in [DellaVigna and Gentzkow \(2019\)](#)).

Grocers have local market power, which follows evidence that customers are constrained due to travel costs and perishable foods (e.g., [Ellickson, Houghton, and Timmins 2013](#); [Ellickson 2006](#)). For a given grocer, consumer demand for product j in week w is described by $Q_{jw} = k_j (P_{jw})^{\eta_{jw}}$, where Q_{jw} is the units of product j that are sold in week w , k_j is a product-specific scale term, and η_{jw} is the retailer's price elasticity for product j in week w , $\eta_{jw} = \frac{\partial Q_{jw}}{\partial P_{jw}} \frac{P_{jw}}{Q_{jw}}$. Stores face product-specific marginal costs c_j and fixed costs C_j , which do not vary by week. The retailer sets weekly prices to maximize:

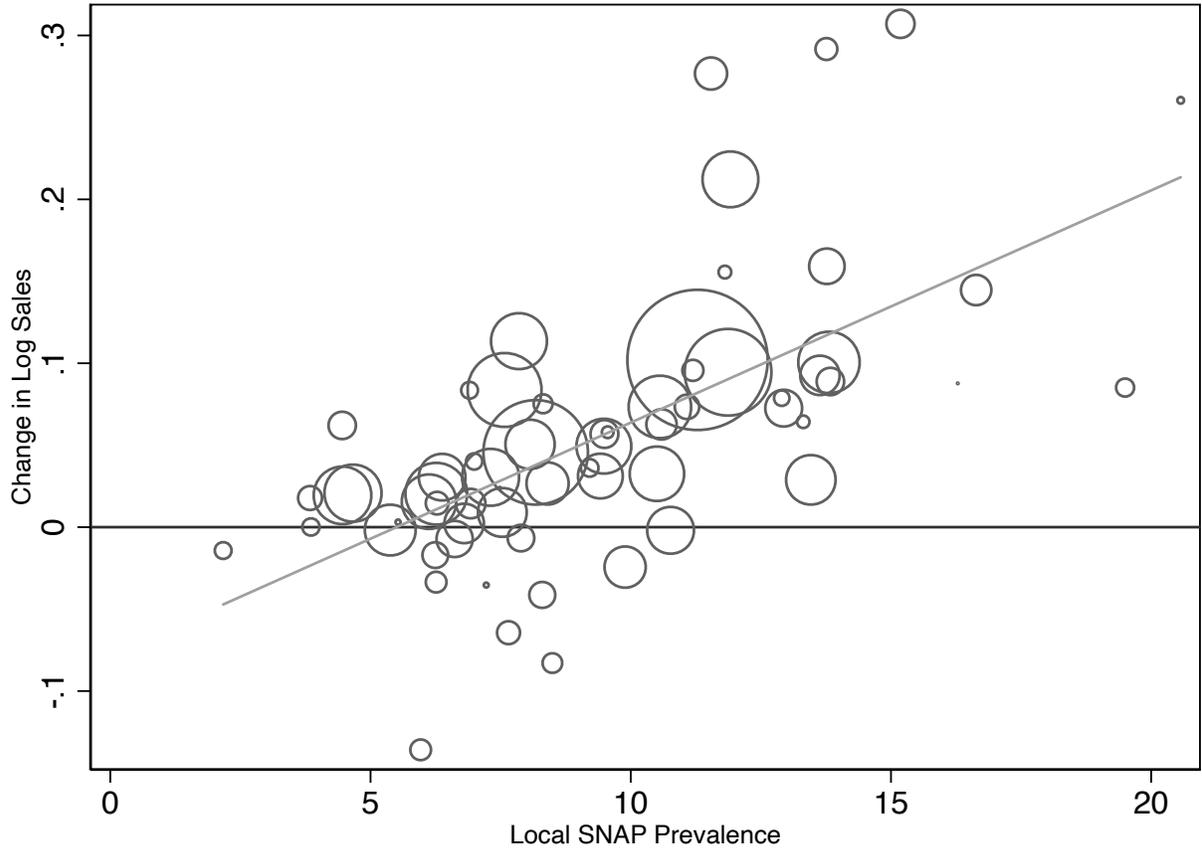
$$\max_{\{P_{jw}\}} \sum_j (P_{jw} - c_j) Q_{jw}(P_{jw}) - \sum_j C_j \quad (1)$$

The first order conditions to this maximization problem imply $P_{jw} = c_j \frac{\eta_{jw}}{1 - \eta_{jw}}$, or, taking logs, $\log P_{jw} = \log c_j + \log\left(\frac{\eta_{jw}}{1 - \eta_{jw}}\right)$. Hence, the percent change in the optimal price for product j between week w and week w' is approximately given by

$$\log P_{jw'} - \log P_{jw} = \log\left(\frac{\eta_{jw'}}{1 - \eta_{jw'}}\right) - \log\left(\frac{\eta_{jw}}{1 - \eta_{jw}}\right) \quad (2)$$

Substituting the estimated coefficients from Table ?? into Equation 2 yields our predicted optimal price change between weeks in which all SNAP benefits are issued and weeks in which no benefits are issued.

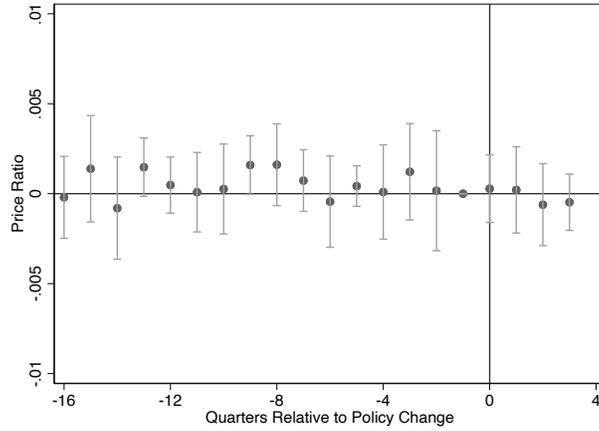
Figure A.1: Chain-Level Food Sales Cyclicity by SNAP Prevalence



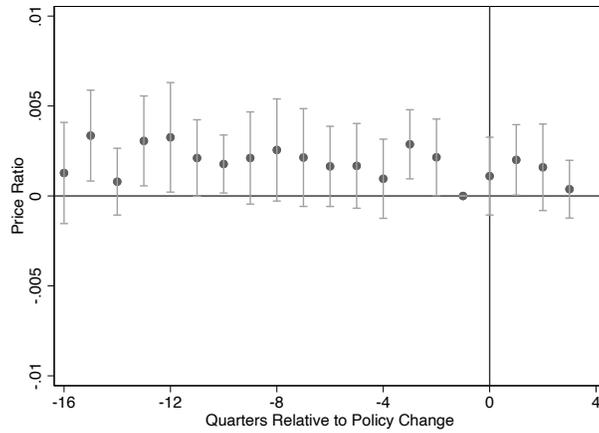
Notes: The figure displays the estimated effect of SNAP issuance on log food expenditures by local SNAP prevalence at the grocery chain level. Each circle corresponds to one grocery store chain; the size of each circle reflects the average annual sales per chain. Local SNAP prevalence refers to the average estimated share of the population that are SNAP recipients across the ZIP codes in which the grocery stores belonging to a chain are located. Log food expenditures are aggregated across products using weights derived from purchases by SNAP-eligible shoppers. Change in log sales refers to the estimated coefficient on SNAP Issuance Share, which is defined as the share of SNAP benefits issued during a given week of the month in the jurisdiction in which a store is located. The effect of SNAP issuance on log food expenditures is estimated from a specification that controls for store-year-month and year-month-week fixed effects, as well as the interaction of calendar week with log state population, log gross domestic product, and unemployment rate (corresponding to Column 3 in Table ??). The estimated slope of the best linear-fit is 0.013, with standard error 0.002.

Figure A.2: Price Ratio Event-Study

(a) All Stores

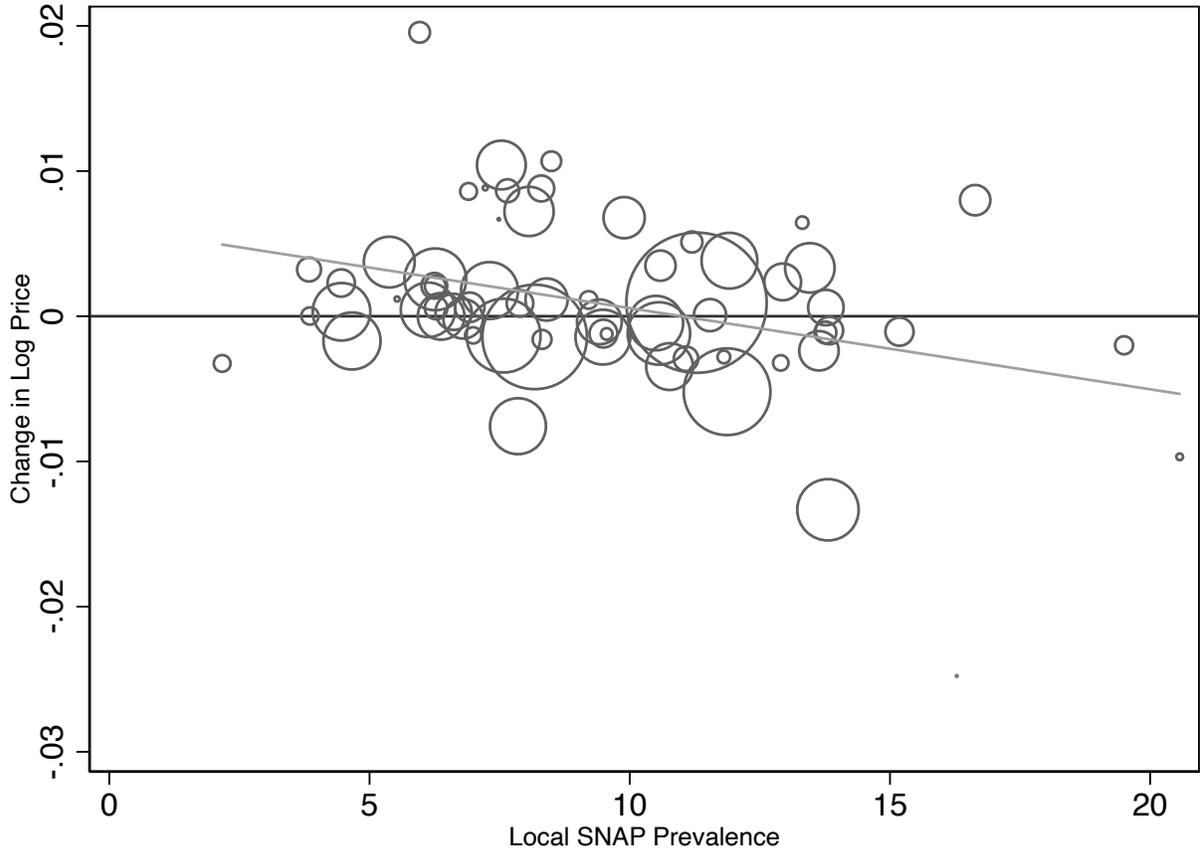


(b) High-SNAP Stores



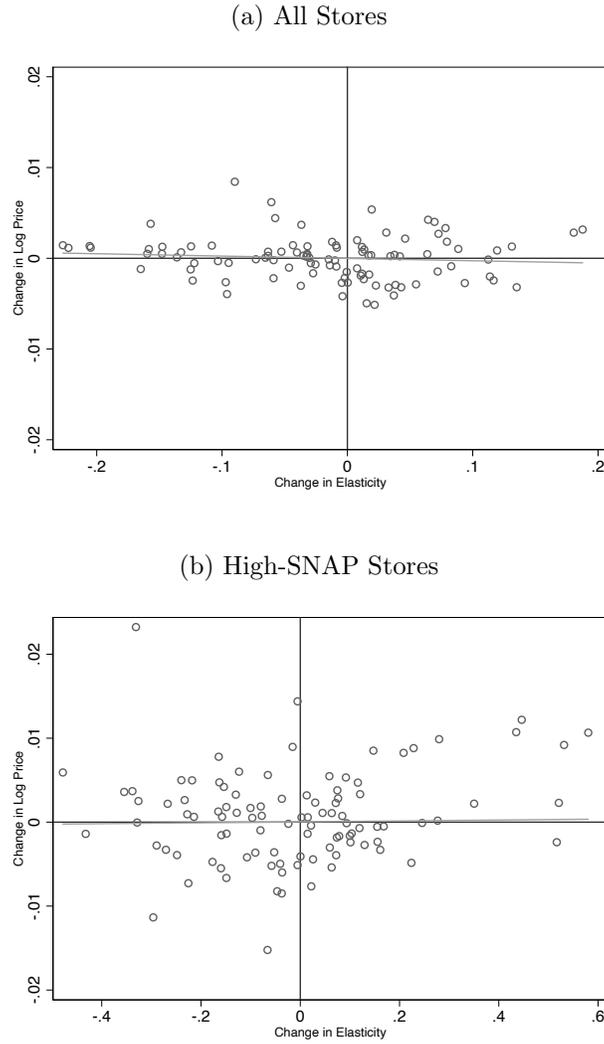
Notes: The figure displays the event-study analysis of the effect of policy reforms that staggered SNAP issuance on food prices. The outcome is the ratio of average log food prices in calendar weeks one and two to average log food prices across all four weeks of the month. Log food prices are aggregated across products using weights derived from purchases by SNAP-eligible shoppers. The estimates reflect the effect of policy reforms in the ten states that expanded the share of benefits issued during the third and fourth calendar weeks of the month during our sample period (see Appendix Table A.1). The analysis excludes the two states (Oklahoma and Virginia) that altered the share of SNAP benefits issued across calendar weeks during our sample period but that did not expand the share of benefits issued during the third and fourth calendar weeks of the month. The analysis also excludes Idaho, which reformed its issuance schedule during our sample period but did not alter the share of benefits issued across calendar weeks. The estimated effects are derived from a specification that controls for store-year-month and year-month-week fixed effects and that omits a coefficient for the effect of the intervention in the quarter prior to implementation (the reference period). Panel A contains all stores in the sample; Panel B is limited to stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. The brackets surrounding the estimated effects reflect the 95% confidence interval from standard errors clustered by state.

Figure A.3: Chain-Level Food Price Cyclicity by SNAP Prevalence



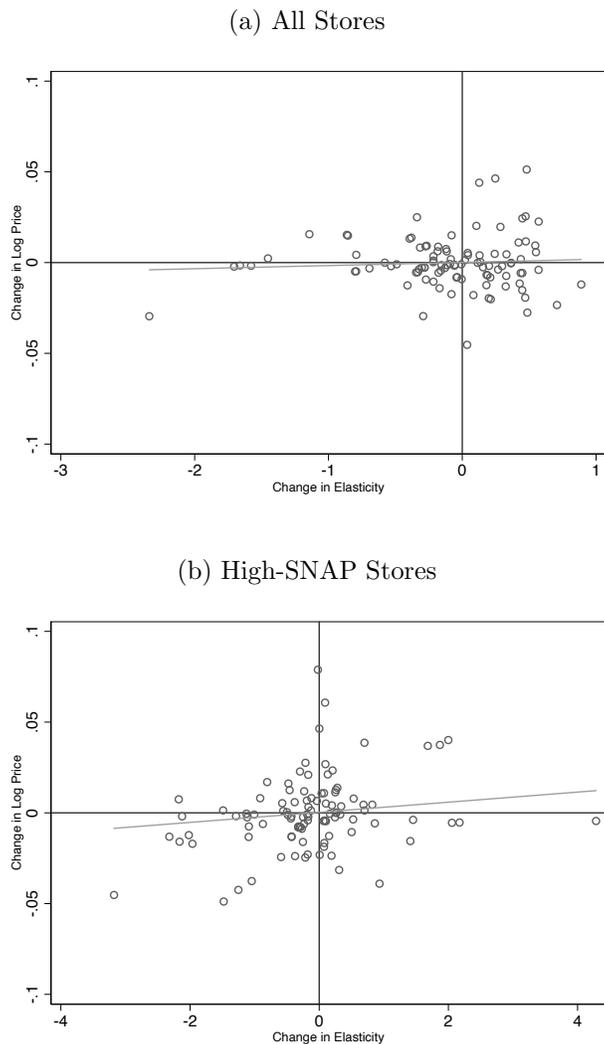
Notes: The figure displays the estimated effect of SNAP issuance on log prices by local SNAP prevalence at the grocery chain level. Each circle corresponds to one grocery store chain; the size of each circle reflects the average annual sales per chain. Local SNAP prevalence refers to the average estimated share of the population that are SNAP recipients across the ZIP codes in which the grocery stores belonging to a chain are located. Prices in a store-week correspond to an index of product-level log prices; the index uses weights derived from purchases by SNAP-eligible shoppers. Change in log prices refers to the estimated coefficient on SNAP Issuance Share, which is defined as the share of SNAP benefits issued during a given week of the month in the jurisdiction in which a store is located. The effect of SNAP issuance on log prices is estimated from a specification that controls for store-year-month and year-month-week fixed effects, as well as the interaction of calendar week with log state population, log gross domestic product, and unemployment rate (corresponding to Column 3 in Table ??). The estimated slope of the best linear-fit is -0.0004, with standard error 0.0003.

Figure A.4: The Effect of SNAP Issuance on Elasticities versus Prices by Product



Notes: The figure plots the relationship between the effect of SNAP issuance on a product’s price elasticity and the effect of SNAP issuance on the products price. Each point represents one of the top 100 food products by expenditure share among SNAP-eligible shoppers, subject to the limitation that the product was purchased in at least 80% of store-weeks. The x-axis represents the estimated effect of Issuance Share on a products price elasticity; it corresponds to the η coefficient in (??). The y-axis represents the estimated effect of Issuance Share on the log of a products price during a given store-week. Issuance Share reflects the share of SNAP benefits issued during a given week of the month in the jurisdiction in which a store is located. Each estimate is obtained from a product-specific regression and controls for store-year-month and year-month-week fixed effects, as well as interactions of calendar week with state-year measures of log population, log GDP per capita, and unemployment rate. All estimates are obtained from specifications that are weighted by average annual store volume. Panel A contains all stores in the sample; Panel B is limited to stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. The estimated slope of the best linear-fit is -0.0026, with standard error 0.0028 in Panel A and 0.0046 with standard error 0.0026 in Panel B.

Figure A.5: The Effect of SNAP Issuance on Elasticities versus Prices by Product Among One-Policy Chains



Notes: The figure plots the relationship between the effect of SNAP issuance on a product’s price elasticity and the effect of SNAP issuance on the products price among chains facing a single SNAP issuance policy in each of their stores during a given week. Each point represents one of the top 100 food products by expenditure share among SNAP-eligible shoppers, subject to the limitation that the product was purchased in at least 80% of store-weeks. The x-axis represents the estimated effect of Issuance Share on a products price elasticity; it corresponds to the η coefficient in (??). The y-axis represents the estimated effect of Issuance Share on the log of a products price during a given store-week. Issuance Share reflects the share of SNAP benefits issued during a given week of the month in the jurisdiction in which a store is located. Each estimate is obtained from a product-specific regression and controls for store-year-month and year-month-week fixed effects, as well as interactions of calendar week with state-year measures of log population, log GDP per capita, and unemployment rate. All estimates are obtained from specifications that are weighted by average annual store volume. Panel A contains all stores in the sample; Panel B is limited to stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. The estimated slope of the best linear-fit is 0.0017, with standard error 0.0027 in Panel A and 0.0057, with standard error 0.0019 in Panel B.

Table A.1: SNAP Issuance Schedule by State, 2006-2014

State	Issuance Days			Reform Date	State	Issuance Days			Reform Date
	2006	2014	2014			2006	2014	2014	
AL	4-18	4-23	9/1/13	NC	3-12	3-21 (odd)	7/1/11		
AZ	1-13			ND	1				
AR	4, 5, 8-13			NV	1				
CA	1-10			NE	1-5				
CO	1-10			NH	5				
CT	1-3			NJ	1-5				
DE	5-11	2-17	3/1/13	NM	1-20				
DC	1-10			NY	1-9				
FL	1-15			OH	1-10	2-20 (even)	2/28/14		
GA	5-14	5-23 (odd)	9/1/12	OK	1	1, 5, 10	4/1/11		
ID	1-5	1	9/1/09	OR	1-9				
IA	1-10			PA	1st 10 business				
IL	1	1,3,4-10,13,17,20	3/1/14	RI	1				
IN	1-10	5-23 (odd)	2/1/14	SC	1-10	1-19	9/1/12		
KY	1-10			SD	10				
KS	1-10			TN	1-10	1-20	10/1/12		
LA	1-14			TX	1,3,5-7,9,11-13,15				
ME	10-14			UT	5, 11, 15				
MD	6-15			VA	1	1, 4, 7, 9	10/1/12		
MA	1,2,4,5,7,8,10,11,13,14			WA	1-10				
MI	1-9	3-21 (odd)	1/1/11	WV	1-9				
MN	4-13			WI	2,3,5,6,8,9,11,12,14,15				
MS	5-19			WY	1-4				
MO	1-22			VT	1				
MT	2-6								

Notes: The table displays the calendar days on which SNAP benefits are issued, by state, at the start of our sample period (2006), the end of our sample period (2014), and the date of any change in the issuance schedule, if applicable. States that issue benefits on multiple days allocate benefits across issuance days according to Social Security Number (AR, CO, LA, MA, NE, NM, NC, OR, TN, and WI), case number (AL, CA, FL, GA, KY, MI, MN, MS, MT, NJ, NY, OH, OK, PA, SC, TX, VA, and WA), last name (AZ, CT, DE, DC, IN, IA, KS, MD, UT, WV, and WY), birth year (ID), or birth month (ME). Two states use a combination of last name and case type (IL) or birth month (MO). Illinois changed issuance schedules three times during our sample period: once on 3/1/10 (from day 1 to days 1,3,4,7,8,10,11,14,17,19,21,23), then on 6/1/2013 (to 1-10), then again on 3/1/2014 (to 1,3,4,5,6,7,8,9,10,13,17,20). New York City follows a different issuance schedule than the rest of NY: benefits are issued over 13 different days excluding Sundays and holidays during the first two weeks of each month. In Ohio, staggering is optional by county with 15 percent of the smallest counties choosing not to stagger. In Pennsylvania, benefits are made available over the first 10 business days of the month (excluding weekends and holidays) with each county choosing one, two, or ten issuance days.

Table A.2: SNAP Issuance and Food Expenditure Cyclicalilty by State Policy Reform

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	AL	DE	GA	IL	IN	MI	NC	OH	OK	SC	TN	VA
<i>Panel A: All Stores</i>												
Issuance	0.0279***	0.0290***	0.0493***	0.0397***	0.0781*	0.0812***	0.0329***	0.0312***	0.0246***	0.0039	0.0546**	0.0212***
Share	(0.0079)	(0.0090)	(0.0142)	(0.0131)	(0.0440)	(0.0274)	(0.0048)	(0.0053)	(0.0048)	(0.0195)	(0.0220)	(0.0037)
N	2,758,368	2,744,496	2,881,844	2,857,932	2,780,332	2,779,744	3,036,804	2,866,100	2,726,732	2,858,760	2,843,840	2,975,012
<i>Panel B: High-SNAP Stores</i>												
Issuance	0.0722***	0.0542***	0.1490***	0.2961*	0.1885**	0.1991***	0.0249**	0.0229	0.0560***	-0.0195	0.1730***	0.0900***
Share	(0.0219)	(0.0090)	(0.0235)	(0.1566)	(0.0841)	(0.0338)	(0.0106)	(0.0155)	(0.0083)	(0.0573)	(0.0437)	(0.0249)
N	149,032	143,772	164,380	152,612	148,192	153,772	169,232	159,412	144,560	162,864	157,840	155,448

Notes: The table shows the estimated effect of SNAP issuance on log food expenditures, separately for each state that altered its SNAP issuance schedule during our sample period. In each column, the analysis is restricted to the specified state and the set of states that did not alter their issuance schedule during our sample period. The analysis excludes one state (Idaho), which reformed its issuance schedule during our sample period but did not alter the share of benefits issued across weeks of the month. Log food expenditures are aggregated across products using weights derived from purchases by SNAP-eligible shoppers. Issuance Share reflects the share of SNAP benefits issued during a calendar week in the jurisdiction in which a store is located. Panel A contains all stores in the sample; Panel B is limited to stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. All columns correspond to the difference-in-differences specification reported in Column 5 of Table ??; they include store by year by month fixed effects, year by month by week fixed effects, store by calendar week fixed effects, and interactions of calendar week with state-year measures of log population, log GDP per capita, and unemployment rate. All specifications are weighted by average annual store volume. Standard errors, reported in parentheses, are clustered by state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3: Expenditure Cyclical Robustness Checks

	No Store Weights		Total Food Sales		Weight by Last Name		Drop Non-Uniform	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Panel A: All Stores</i>								
Issuance Share	0.0621*** (0.0090)	0.0588*** (0.0127)	0.0535*** (0.0080)	0.0708*** (0.0108)	0.0559*** (0.0085)	0.0621*** (0.0122)	0.0544*** (0.0092)	0.0606*** (0.0122)
N	4156952	4156920	4156952	4156920	4156952	4156920	3308704	3308704
<i>Panel B: High-SNAP Stores</i>								
Issuance Share	0.1823*** (0.0266)	0.1370*** (0.0361)	0.1964*** (0.0347)	0.2033*** (0.0257)	0.1872*** (0.0306)	0.1681*** (0.0325)	0.1766*** (0.0268)	0.1724*** (0.0304)
N	281,704	281,704	281,704	281,704	281,704	281,704	204,216	204,216

10

Calendar Week * Store No Yes No Yes No Yes No Yes

The table contains robustness checks for the analyses measuring the effect of SNAP issuance on log food expenditures at a given store in a given week of the month. Issuance Share reflects the share of SNAP benefits issued during a calendar week in the jurisdiction in which a store is located. Columns 1 and 2 present unweighted results; all other columns report results that are weighted by store volume. In Columns 3 and 4, the outcome is the log of total food expenditures; in all other columns, the outcome is log food expenditures aggregated across products using weights derived from purchases by SNAP-eligible shoppers. In Columns 5 and 6, Issuance Share is defined to account for the national distribution of last names from the 2010 Census for the following states: Arizona, Connecticut, Delaware, District of Columbia, Iowa, Kansas, Indiana, Utah, West Virginia, Wyoming. Columns 7 and 8 exclude these states from the analysis, along with: Louisiana (which distributes benefits to elderly/disabled recipients on different days), Maryland (which distributes benefits based on the first three letters of the recipients last name), Missouri (which distributes benefits based on last name and birth month), Ohio (in which staggering is optional by county with 15 percent of the smallest counties choosing not to stagger), and South Carolina (which added new recipients non-uniformly after increasing the number of issuance days in 2012). All columns include store by year by month fixed effects, year by month by week fixed effects, and interactions of calendar week with state-year measures of log population, log GDP per capita, and unemployment rate. Columns 2, 4, 6, and 8 additionally include calendar week by store fixed effects. Panel A contains all stores in the sample; Panel B is limited to stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. Standard errors, reported in parentheses, are clustered by state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.4: Food Expenditure Cyclicity by SNAP Issuance Policy

	<u>Week 1</u>	<u>Week 2</u>	<u>Weeks 1 & 2</u>	<u>Weeks 1-3+</u>
	(1)	(2)	(3)	(4)
<i>Panel A: All Stores</i>				
Week 2	-0.0619*** (0.0063)	0.0151 (0.0265)	-0.0293*** (0.0060)	-0.0300* (0.0151)
Week 3	-0.0654*** (0.0081)	0.0215 (0.0241)	-0.0416*** (0.0079)	-0.0205 (0.0199)
Week 4	-0.0306** (0.0112)	0.0072 (0.0111)	-0.0278*** (0.0067)	-0.0039 (0.0101)
N	565,470	55,834	3,105,655	430,127
<i>Panel B: High-SNAP Stores</i>				
Week 2	-0.1528*** (0.0395)	0.0860** (0.0060)	-0.0093 (0.0216)	0.0056 (0.0254)
Week 3	-0.2184*** (0.0241)	0.0666 (0.0118)	-0.0975*** (0.0285)	-0.0251 (0.0431)
Week 4	-0.1905*** (0.0073)	0.0077 (0.0069)	-0.1306*** (0.0221)	-0.0648* (0.0329)
N	16,933	3,845	219,262	41,699

Notes: The table shows within-month expenditure patterns by state SNAP issuance policy. Log food expenditures are aggregated across products using weights derived from purchases by SNAP-eligible shoppers. Column 1 includes stores located in states that issue all benefits during the first week of the month. Column 2 includes stores located in states that issue all benefits during the second week of the month. Column 3 includes stores located in states that issue benefits on days spanning the first two weeks of the month. Column 4 includes stores located in states that issue benefits on days spanning three or more weeks during the month. Stores located in states that switch policies during our sample period are classified according to the policy that is in place during a given store-month. Panel A contains all stores in the sample; Panel B is limited to stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. All columns include store by year by month fixed effects. All specifications are weighted by average annual store volume. Standard errors, reported in parentheses, are clustered by state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5: The Effect of SNAP Issuance on Non-Food Expenditure Cyclicalities

	Non-Food Grocery		Alcohol	
	(1)	(2)	(3)	(4)
<i>Panel A: All Stores</i>				
Issuance Share	0.0080* (0.0045)	-0.0062 (0.0066)	0.0082 (0.0064)	-0.0296 (0.0332)
N	4,156,812	4,156,812	4,000,060	4,000,060
<i>Panel B: High-SNAP Stores</i>				
Issuance Share	0.0300*** (0.0107)	0.0035 (0.0079)	0.0106 (0.0087)	0.0197 (0.0119)
N	281,704	281,704	270,496	270,496
Calendar Week * Store	No	Yes	No	Yes

Notes: The table shows the effect of SNAP issuance on non-food expenditures at a given store in a given calendar week. Columns 1 and 2 present results for non-food grocery items. Columns 3 and 4 present results for alcohol products. Log expenditures are aggregated across products within these categories using weights derived from purchases by SNAP-eligible shoppers. Issuance Share reflects the share of SNAP benefits issued during a given week of the month in the jurisdiction in which a store is located. Panel A contains all stores in the sample; Panel B is limited to stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. All columns include store by year by month fixed effects, year by month by week fixed effects, and interactions of calendar week with state-year measures of log population, log GDP per capita, and unemployment rate. Columns 2 and 4 additionally include calendar week by store fixed effects. All specifications are weighted by average annual store volume. Standard errors, reported in parentheses, are clustered by state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.6: SNAP Issuance and Food Price Cyclicity by State Policy Reform

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	AL	DE	GA	IL	IN	MI	NC	OH	OK	SC	TN	VA
<i>Panel A: All Stores</i>												
Issuance	-0.0045***	-0.0047***	-0.0019	-0.0024	-0.0015	-0.0007	-0.0010	-0.0015	-0.0046***	-0.0018	0.0017	-0.0011
Share	(0.0008)	(0.0008)	(0.0014)	(0.0023)	(0.0025)	(0.0022)	(0.0015)	(0.0023)	(0.0007)	(0.0029)	(0.0042)	(0.0023)
N	2,758,368	2,744,496	2,881,844	2,857,932	2,780,332	2,779,744	3,036,804	2,866,100	2,726,732	2,858,760	2,843,840	2,975,012
<i>Panel B: High-SNAP Stores</i>												
Issuance	-0.0028***	-0.0028***	-0.0022***	0.0003	-0.0001	-0.0004	0.0017	0.0019	-0.0029***	0.0013	0.0040	0.0007
Share	(0.0008)	(0.0009)	(0.0004)	(0.0024)	(0.0020)	(0.0019)	(0.0015)	(0.0030)	(0.0008)	(0.0034)	(0.0025)	(0.0026)
N	149,032	143,772	164,380	152,612	148,192	153,772	169,232	159,412	144,560	162,864	157,840	155,448

Notes: The table shows the estimated effect of SNAP issuance on log food prices, separately for each state that altered its SNAP issuance schedule during our sample period. In each column, the analysis is restricted to the specified state and the set of states that did not alter their issuance schedule during our sample period. The analysis excludes one state (Idaho), which reformed its issuance schedule during our sample period but did not alter the share of benefits issued across weeks of the month. Log food prices are measured using an index of product-level log prices; the index is derived from purchases by SNAP-eligible shoppers. Issuance Share reflects the share of SNAP benefits issued during a calendar week in the jurisdiction in which a store is located. Panel A contains all stores in the sample; Panel B is limited to stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. All columns correspond to the difference-in-differences specification reported in Column 5 of Table ??; they include store by year by month fixed effects, year by month by week fixed effects, store by calendar week fixed effects, and interactions of calendar week with state-year measures of log population, log GDP per capita, and unemployment rate. All specifications are weighted by average annual store volume. Standard errors, reported in parentheses, are clustered by state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.7: The Effect of SNAP Issuance on Food Expenditure Cyclicalilty by Product Group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Bread	Cheese	Frozen Meals	Frozen Meat	Juice	Deli	Milk	Produce	Snacks	Soda
<i>Panel A: All Stores</i>										
Issuance Share	0.0386*** (0.0053)	0.0562*** (0.0113)	0.0893*** (0.0133)	0.0895*** (0.0158)	0.0476*** (0.0072)	0.0594*** (0.0123)	0.0211*** (0.0034)	0.0388*** (0.0066)	0.0637*** (0.0111)	0.0542*** (0.0112)
N	4,156,336	4,155,920	4,154,500	4,144,288	4,156,596	4,156,044	4,155,896	4,155,160	3,715,204	3,715,152
<i>Panel B: High-SNAP Stores</i>										
Issuance Share	0.1406*** (0.0234)	0.2262*** (0.0387)	0.2881*** (0.0487)	0.3041*** (0.0536)	0.1657*** (0.0294)	0.2199*** (0.0358)	0.0755*** (0.0122)	0.1581*** (0.0296)	0.2336*** (0.0436)	0.1649*** (0.0293)
N	281,656	281,632	281,448	281,340	281,684	281,656	281,632	281,556	251,860	251,856

Notes: The table shows the effect of SNAP issuance on log expenditures in the specified product group at a given store in a given week of the month. Expenditures are aggregated across products within the specified product group using weights derived from purchases by SNAP-eligible shoppers. The displayed product groups are those that correspond to the greatest share of expenditures among SNAP-eligible customers during our sample period. These product groups include: bread and baked goods; cheese; prepared foods frozen; unprepared meat, poultry, seafood-frozen; juice, drinks canned, bottled; packaged meat deli; milk; fresh produce; snacks; carbonated beverages. Issuance Share reflects the share of SNAP benefits issued during a calendar week in the jurisdiction in which a store is located. Panel A contains all stores in the sample; Panel B is limited to stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. All columns include store by year by month fixed effects, year by month by week fixed effects, and interactions of calendar week with state-year measures of log population, log GDP per capita, and unemployment rate. All specifications are weighted by average annual store volume. Standard errors, reported in parentheses, are clustered by state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.8: The Effect of SNAP Issuance on Food Price Cyclicity by Product Group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Bread	Cheese	Frozen Meals	Frozen Meat	Juice	Deli	Milk	Produce	Snacks	Soda
<i>Panel A: All Stores</i>										
Issuance Share	0.0012 (0.0008)	0.0012 (0.0013)	0.0011 (0.0016)	0.0008 (0.0014)	-0.0000 (0.0005)	-0.0003 (0.0012)	-0.0002 (0.0004)	0.0009 (0.0009)	0.0012 (0.0009)	-0.0000 (0.0019)
N	4,156,336	4,155,920	4,154,500	4,144,288	4,156,596	4,156,044	4,155,896	4,155,160	3,715,204	3,715,152
<i>Panel B: High-SNAP Stores</i>										
Issuance Share	0.0018* (0.0011)	0.0014 (0.0019)	0.0034* (0.0018)	0.0012 (0.0014)	0.0008 (0.0008)	0.0013 (0.0020)	-0.0013** (0.0006)	0.0021 (0.0014)	0.0032 (0.0025)	-0.0001 (0.0035)
N	281,656	281,632	281,448	281,340	281,684	281,656	281,632	281,556	251,860	251,856

Notes: The table shows the effect of SNAP issuance on log prices in the specified product group at a given store in a given week of the month. Prices in a store-week correspond to an index of product-level log prices; the index is derived from purchases of products in the specified product group by SNAP-eligible shoppers. The displayed product groups are those that correspond to the greatest share of expenditures among SNAP-eligible customers during our sample period. These product groups include: bread and baked goods; cheese; prepared foods frozen; unprepared meat, poultry, seafood-frozen; juice, drinks canned, bottled; packaged meat deli; milk; fresh produce; snacks; carbonated beverages. Issuance Share reflects the share of SNAP benefits issued during a calendar week in the jurisdiction in which a store is located. Panel A contains all stores in the sample; Panel B is limited to stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. All columns include store by year by month fixed effects, year by month by week fixed effects, and interactions of calendar week with state-year measures of log population, log GDP per capita, and unemployment rate. All specifications are weighted by average annual store volume. Standard errors, reported in parentheses, are clustered by state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.9: Effect of SNAP Issuance on Expenditure and Price Cyclicalilty, High SNAP-Share Product Modules

	Sales		Price	
	(1)	(2)	(3)	(4)
<i>Panel A: All Stores</i>				
Issuance Share	0.1457*** (0.0179)	0.1706*** (0.0253)	0.0003 (0.0011)	0.0013 (0.0027)
N	3,870,000	3,870,000	3,870,000	3,870,000
<i>Panel B: High-SNAP Stores</i>				
Issuance Share	0.3816*** (0.0614)	0.3662*** (0.0527)	0.0002 (0.0009)	0.0024 (0.0032)
N	278,040	278,040	278,040	278,040
Calendar Week * Store	No	Yes	No	Yes

Notes: The table shows the effect of SNAP issuance on sales and prices for food products corresponding to modules that tend to be purchased by SNAP-eligible customers at a high rate relative to SNAP-ineligible customers. To select these modules, using the Consumer Panel we estimate, for each module, the share of all food expenditures that the module represents, separately for SNAP-eligible and ineligible customers. The sample underlying the analysis in the table corresponds to the products in the ten modules with the largest ratio of these two shares. These modules are: cracklins, frosting, frozen orange juice, candy gifts, lard, powdered milk, flavor enhancers, potted meat, syrup, and Vienna sausage. Log food expenditures (columns 1 and 2) are aggregated across products using weights derived from purchases by SNAP-eligible shoppers. Log food prices (columns 3 and 4) correspond to an index of product-level log prices derived from purchases by SNAP-eligible shoppers. Issuance Share reflects the share of SNAP benefits issued during a calendar week in the jurisdiction in which a store is located. Panel A contains all stores in the sample; Panel B is limited to stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. All columns include store by year by month fixed effects, year by month by week fixed effects, and interactions of calendar week with state-year measures of log population, log GDP per capita, and unemployment rate. Columns 2 and 4 additionally include calendar week by store fixed effects. All specifications are weighted by average annual store volume. Standard errors, reported in parentheses, are clustered by state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.10: Price Cyclical Robustness Checks

	No Store Weights		Weight by Last Name		Drop Non-Uniform	
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Panel A: All Stores</i>						
Issuance Share	0.0003 (0.0004)	0.0011 (0.0008)	-0.0000 (0.0004)	0.0009 (0.0009)	0.0001 (0.0004)	0.0007 (0.0010)
N	4156952	4156952	4156952	4156952	3308704	3308704
<i>Panel B: High-SNAP Stores</i>						
Issuance Share	0.0011 (0.0008)	0.0005 (0.0014)	0.0009 (0.0007)	0.0013 (0.0014)	0.0003 (0.0007)	0.0004 (0.0014)
N	281,704	281,704	281,704	281,704	204,216	204,204
Calendar Week * Store	No	Yes	No	Yes	No	Yes

The table contains robustness checks for the analyses measuring the effect of SNAP issuance on log food prices at a given store in a given week of the month. Prices in a store-week correspond to an index of product-level log prices; the index is derived from purchases by SNAP-eligible shoppers. Issuance Share reflects the share of SNAP benefits issued during a calendar week in the jurisdiction in which a store is located. Columns 1 and 2 present unweighted results; all other columns report results that are weighted by store volume. In Columns 3 and 4, Issuance Share is defined to account for the national distribution of last names from the 2010 Census for the following states: Arizona, Connecticut, Delaware, District of Columbia, Iowa, Kansas, Indiana, Utah, West Virginia, Wyoming. Columns 5 and 6 exclude these states from the analysis, along with: Louisiana (which distributes benefits to elderly/disabled recipients on different days), Maryland (which distributes benefits based on the first three letters of the recipients last name), Missouri (which distributes benefits based on last name and birth month), Ohio (in which staggering is optional by county with 15 percent of the smallest counties choosing not to stagger), and South Carolina (which added new recipients non-uniformly after increasing the number of issuance days in 2012). All columns include store by year by month fixed effects, year by month by week fixed effects, and interactions of calendar week with state-year measures of log population, log GDP per capita, and unemployment rate. Columns 2, 4, 6, and 8 additionally include calendar week by store fixed effects. Panel A contains all stores in the sample; Panel B is limited to stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. Standard errors, reported in parentheses, are clustered by state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.11: Missing Price Data Robustness Check

	Over 80% Captured				Over 90% Captured			
	(1) Sales	(2) Sales	(3) Price	(4) Price	(5) Sales	(6) Sales	(7) Price	(8) Price
<i>Panel A: All Stores</i>								
Issuance Share	0.0540*** (0.0093)	0.0685*** (0.0130)	0.0001 (0.0004)	0.0011 (0.0011)	0.0489*** (0.0137)	0.1029*** (0.0336)	0.0002 (0.0006)	-0.0001 (0.0017)
N	2,345,996	2,345,984	2,345,996	2,345,984	285,516	285,516	285,516	285,516
<i>Panel B: High-SNAP Stores</i>								
Issuance Share	0.2029*** (0.0340)	0.2127*** (0.0251)	0.0011 (0.0007)	0.0021 (0.0017)	0.1665*** (0.0393)	0.2955*** (0.0880)	0.0008 (0.0006)	0.0026 (0.0016)
N	156,448	156,440	156,448	156,440	19,844	19,844	19,844	19,844
Calendar Week * Store	No	Yes	No	Yes	No	Yes	No	Yes

Notes: The table investigates the importance to our results of the fact that the Nielsen Retail Scanner data does not include price data for products in store-weeks in which the product was not purchased. Columns 1-4 restrict the analysis to stores for which we observe prices for at least 80% of expenditures during the sample period. Columns 5-8 restrict the analysis to stores for which we observe prices for at least 90% of expenditures during the sample period. The outcome in Columns 1, 2, 5, and 6 is log food expenditures at a given store in a given week of the month. The outcome in Columns 3, 4, 7, and 8 is log food prices at a given store in a given week of the month. Prices in a store-week correspond to an index of product-level log prices; the index is derived from purchases by SNAP-eligible shoppers. Issuance Share reflects the share of SNAP benefits issued during a calendar week in the jurisdiction in which a store is located. All columns include store by year by month fixed effects, year by month by week fixed effects, and interactions of calendar week with state-year measures of log population, log GDP per capita, and unemployment rate. Columns 2, 4, 6, and 8 additionally include calendar week by store fixed effects. Panel A contains all stores in the sample; Panel B is limited to stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. Standard errors, reported in parentheses, are clustered by state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.12: The Effect of SNAP Issuance on Coupon Usage and Discount Receipt

	Coupon Use		Discount Receipt	
	(1)	(2)	(3)	(4)
<i>Panel A: All Stores</i>				
Issuance Share	0.0001 (0.0003)	-0.0009 (0.0008)	0.0012 (0.0009)	-0.0022 (0.0033)
N	2,434,518	2,434,518	2,434,518	2,434,518
Mean, Dep. Var.	0.0448	0.0448	0.4227	0.4227
<i>Panel B: High-SNAP Stores</i>				
Issuance Share	-0.0018 (0.0014)	0.0003 (0.0035)	-0.0049 (0.0064)	0.0125 (0.0097)
N	146,638	146,638	146,638	146,638
Dep Var Mean	0.0389	0.0389	0.3920	0.3920
Calendar Week * Store	No	Yes	No	Yes

Notes: The table shows the effect of SNAP issuance on coupon use and discount receipt in a given store in a given week of the month using data from the Consumer Panel. Columns 1 and 2 present results for the effect of SNAP issuance on the average value of coupons as a share of expenditures per shopping trip. Columns 3 and 4 present results for the effect of SNAP issuance on the average share per shopping trip of expenditures on items for which the panelist reported receiving a discounted price deal. Both outcomes use panelist weights to calculate the average across trips. Issuance Share reflects the share of SNAP benefits issued during a given week of the month in the jurisdiction in which a store is located. Panel A contains shopping trips at all stores in the sample; Panel B is limited to shopping trips at stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. All columns include store by year by month fixed effects, year by month by week fixed effects, and interactions of calendar week with state-year measures of log population, log GDP per capita, and unemployment rate. Columns 2 and 4 additionally include calendar week by store fixed effects. All specifications are weighted by average annual store volume. Standard errors, reported in parentheses, are clustered by state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.13: The Effect of SNAP Issuance on Non-Food Price Cyclicity

	Non-Food Grocery		Alcohol	
	(1)	(2)	(3)	(4)
<i>Panel A: All Stores</i>				
Issuance Share	0.0010 (0.0006)	0.0028** (0.0010)	-0.0002 (0.0005)	0.0038* (0.0022)
N	4,156,812	4,156,812	4,000,060	4,000,060
<i>Panel B: High-SNAP Stores</i>				
Issuance Share	0.0008 (0.0007)	0.0022* (0.0012)	-0.0001 (0.0005)	0.0007 (0.0013)
N	281,704	281,704	270,496	270,496
Calendar Week * Store	No	Yes	No	Yes

Notes: The table shows the effect of SNAP issuance on non-food prices at a given store in a given week of the month. Prices in a store-week correspond to an index of product-level log prices; the index is derived from purchases by SNAP-eligible shoppers. Columns 1 and 2 present results for non-food grocery items. Columns 3 and 4 present results for alcohol products. Log prices are aggregated across products within these categories using an index derived from purchases by SNAP-eligible shoppers. Issuance Share reflects the share of SNAP benefits issued during a calendar week in the jurisdiction in which a store is located. Panel A contains all stores in the sample; Panel B is limited to stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. All columns include store by year by month fixed effects, year by month by week fixed effects, and interactions of calendar week with state-year measures of log population, log GDP per capita, and unemployment rate. Columns 2 and 4 additionally include calendar week by store fixed effects. All specifications are weighted by average annual store volume. Standard errors, reported in parentheses, are clustered by state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.14: The Effect of SNAP Issuance on Sales and Prices, 100 Product Sample

	Quantity		Price	
	(1)	(2)	(3)	(4)
<i>Panel A: All Stores</i>				
Issuance Share	0.0642*** (0.0086)	0.0902*** (0.0142)	0.0000 (0.0008)	0.0002 (0.0017)
N	379,212,892	379,212,892	379,212,892	379,212,892
<i>Panel B: High-SNAP Stores</i>				
Issuance Share	0.2016*** (0.0298)	0.2195*** (0.0302)	0.0007 (0.0014)	-0.0011 (0.0026)
N	24,576,132	24,576,132	24,576,132	24,576,132
Calendar Week * Store	No	Yes	No	Yes

Notes: The table shows the effect of SNAP issuance on sales and prices for the top 100 food products by expenditure share among SNAP-eligible shoppers, subject to the limitation that the product was purchased in at least 80% of store-weeks. The unit of observation is a product-store-week. In Columns 1 and 2, the outcome is the log quantity of food products purchased. In Columns 3 and 4, the outcome is the log food price per product. Issuance Share reflects the share of SNAP benefits issued during a calendar week in the jurisdiction in which a store is located. Panel A contains all stores in the sample; Panel B is limited to stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. All columns include product-store-year-month fixed effects and product-year-month-week fixed effects, and interactions of product by calendar week with state-year measures of log population, log GDP per capita, and unemployment rate. Columns 2 and 4 additionally include product by calendar week by store fixed effects. All specifications are weighted by average annual store volume. Standard errors, reported in parentheses, are clustered by state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.15: Price Imputation Robustness Check

	(1)	(2)
<i>Panel A: All Stores</i>		
Issuance Share	0.0000 (0.0007)	0.0000 (0.0017)
N	396,074,068	396,074,068
<i>Panel B: High-SNAP Stores</i>		
Issuance Share	0.0008 (0.0014)	-0.0010 (0.0025)
N	26,155,896	26,155,896
Calendar Week * Store	No	Yes

Notes: This table provides a robustness check on estimates of the effect of SNAP issuance on prices. Unlike prior specifications, products that are not purchased during one or more weeks in a given store-month are not excluded from the analysis; rather we impute the price of such products from the average price for the specified product in the specified week in stores belonging to the same chain and located in the same state. This analysis is performed for the 100 food products used in the elasticity analysis and described in Table ???. The unit of observation is a product-store-week. The outcome is the log food price per product. Issuance Share reflects the share of SNAP benefits issued during a calendar week in the jurisdiction in which a store is located. Panel A contains all stores in the sample; Panel B is limited to stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. Both columns include product-store-year-month fixed effects and product-year-month-week fixed effects, and interactions of product by calendar week with state-year measures of log population, log GDP per capita, and unemployment rate. Column 2 additionally includes product by calendar week by store fixed effects. All specifications are weighted by average annual store volume. Standard errors, reported in parentheses, are clustered by state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.16: First Stage Effect of DMA Price Instrument on Product Price

	(1)	(2)
<i>Panel A: All Stores</i>		
DMA Price	0.9434*** (0.0001)	0.9430*** (0.0001)
N	379,212,892	379,212,892
<i>Panel B: High-SNAP Stores</i>		
DMA Price	0.9117*** (0.0003)	0.9102*** (0.0004)
N	24,576,132	24,576,132
Calendar Week * Store	No	Yes

Notes: The table presents the first stage effect of the Designated Market Areas (DMA) price instrument on product prices. The unit of observation is a product-store-week. The analysis is restricted to the top 100 food products by expenditure share among SNAP-eligible shoppers, subject to the limitation that the product was purchased in at least 80% of store-weeks. The outcome is the log product price. DMA price refers to the log of the average price of the product across stores in the same chain but located in other DMAs. Panel A contains all stores in the sample; Panel B is limited to stores for which we estimate that the share of SNAP recipients in the ZIP code is at least 20%. All columns include product-store-year-month fixed effects and product-year-month-week fixed effects, and interactions of product by week of the month with state-year measures of log population, log GDP per capita, and unemployment rate. Column 2 additionally includes product by calendar week by store fixed effects. All specifications are weighted by average annual store volume. Standard errors, reported in parentheses, are clustered by state. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.