Handwashing and Habit Formation: A Test of Rational Addiction

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Handwashing with soap

- High rates of child stunting and mortality worldwide due to bacterial and viral transmission
  - Diarrheal disease, ARI
  - 3.5 million child deaths yearly (UNICEF, WHO 2013)
- Solution: handwashing with soap
  - "the most effective vaccine against childhood infections" (World Bank 2005)
  - potentially most cost-effective method of reducing incidence (Kremer and Zwane 2007)
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Barriers to adoption

- Not information.
- Not resources.

- Repetitive activity.
  - Repeated engagement is costly
  - ...unless it becomes a habit.
- Preventative activity.
  - Returns are not manifested.
  - Returns are in the future.

This applies to many preventative health activities: water treatment, medicine regimens, latrine and cookstove use, etc.

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Hand hygiene in Birbhum, West Bengal

		Mean (%)	N
Hygiene Knowledge	Soap makes hands cleaner than water	94.59	2904
	Soap prevents sickness	80.33	2903
	Soap cleans germs	78.99	2904
	Cold can spread across people	60.7	2903
Hygiene Practice	Eat with hands	100	2903
	Rinse hands before eating	98.83	2900
	Has soap in house	99.76	2903
	Use soap for bathing	90.41	2898
	Wash with soap before eating	13.95	2875
	Reason not wash: no habit	57.09	2454
	Reason not wash: forget	16.87	2454

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Conceptual Framework: Rational Addiction

Becker and Murphy (1988): A Theory of Rational Addiction

1. Habit formation (addiction): intertemporal complementarities in the utility from consumption
   - Marginal utility from consumption today is higher when more has been consumed in the past
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Rational addiction empirical literature

$$c_t = \theta c_{t-1} + \beta\theta c_{t+1} + \delta p_t + \epsilon_t$$

Empirical concerns:

- endogeneity of tax instrument
- serial correlation in prices
- implausibility of future price knowledge

This study

Contributions

1. First experimental test of rational addiction, addressing identification concerns of RA literature
2. First rational habit formation test of a *good* habit
3. Distinguishes role of rewards (incentives) from feedback (monitoring)
4. Significantly improves measurement technology

Why do we care?

1. Child health impact
2. Designing optimal interventions
   - If agents are not rational habit formers, we have a reason to subsidize initial consumption of habitual activities

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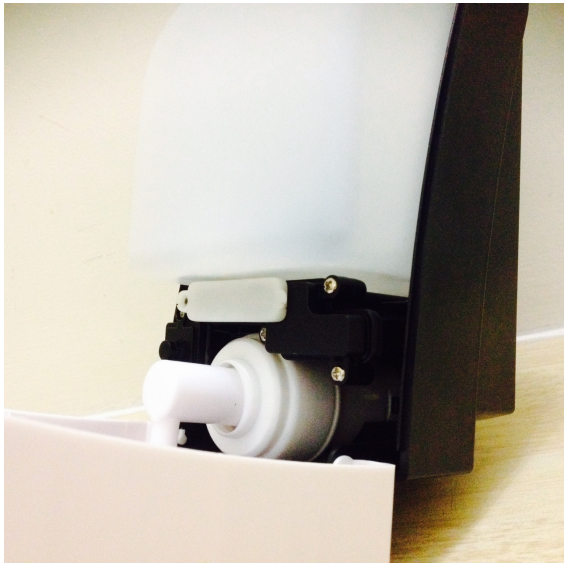
Measurement Technology

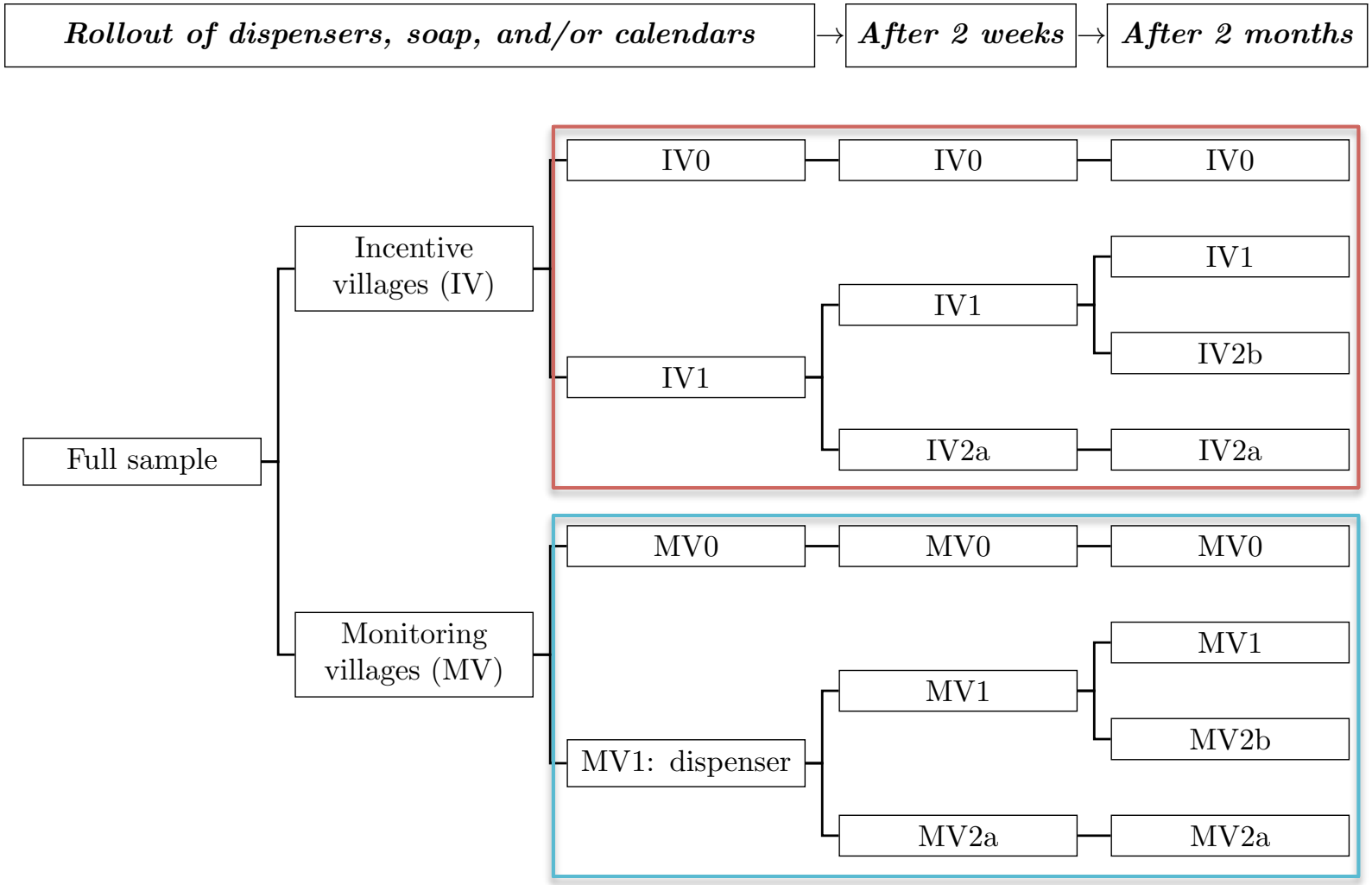


Measurement Technology

Handwashing outcome measure

Dispenser use during the family's self-reported evening mealtime.

Experimental Design



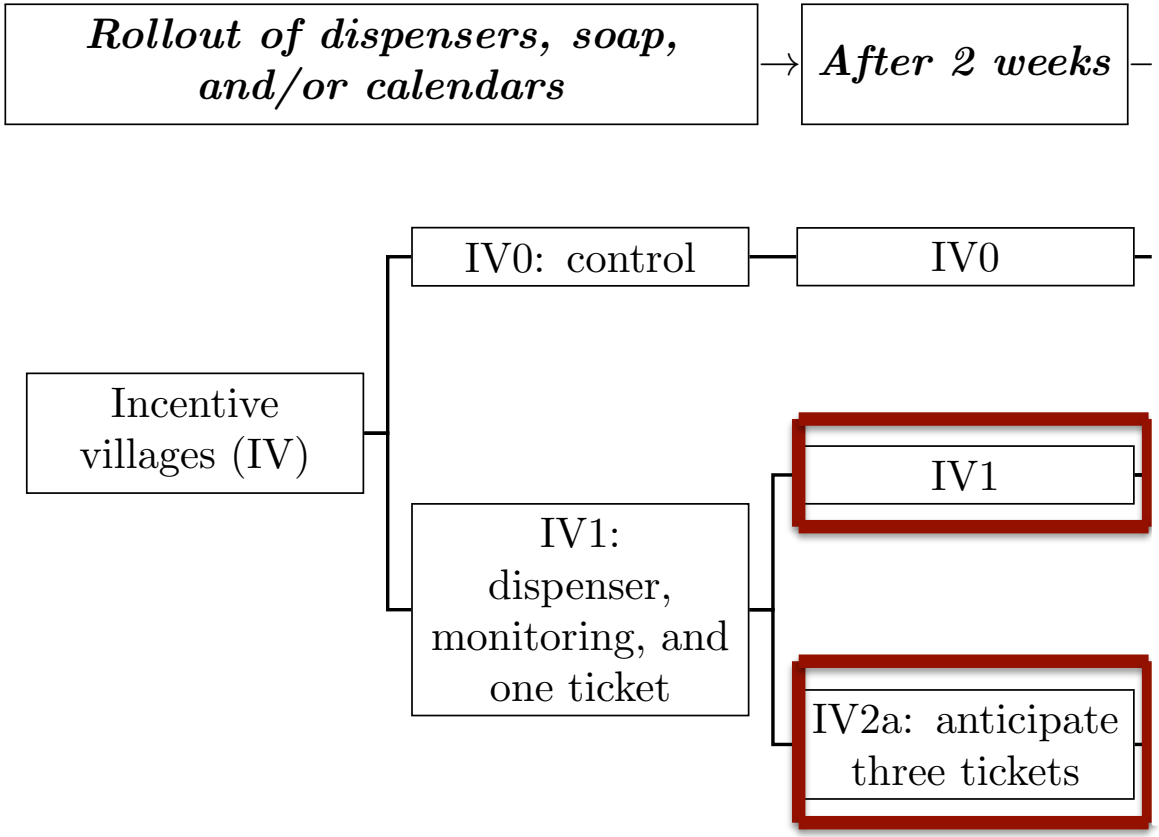
Incentives

Rollout of dispensers, soap, and/or calendars

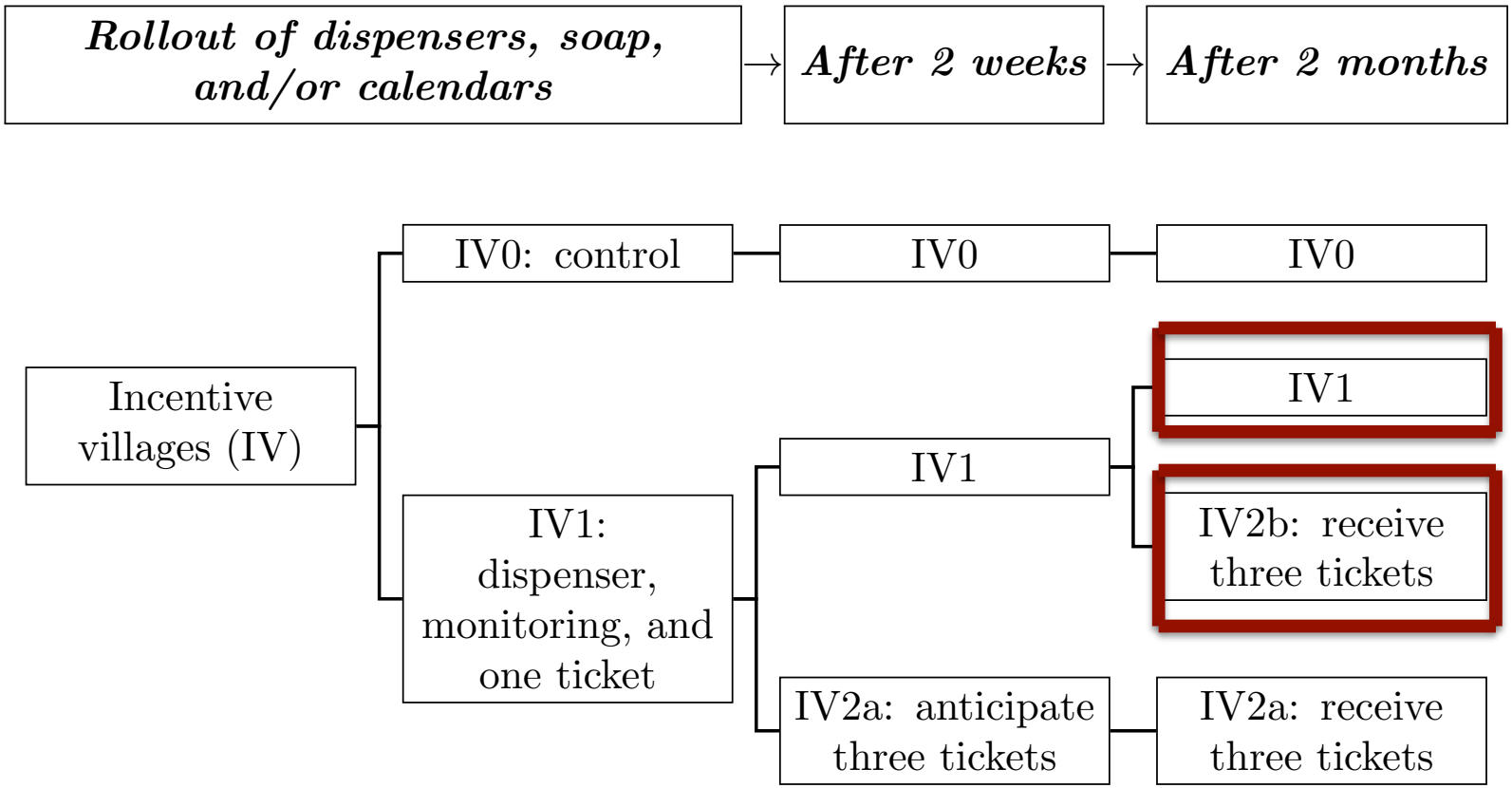
Incentive villages (IV)

- IV0: control
- IV1: dispenser, monitoring, and one ticket

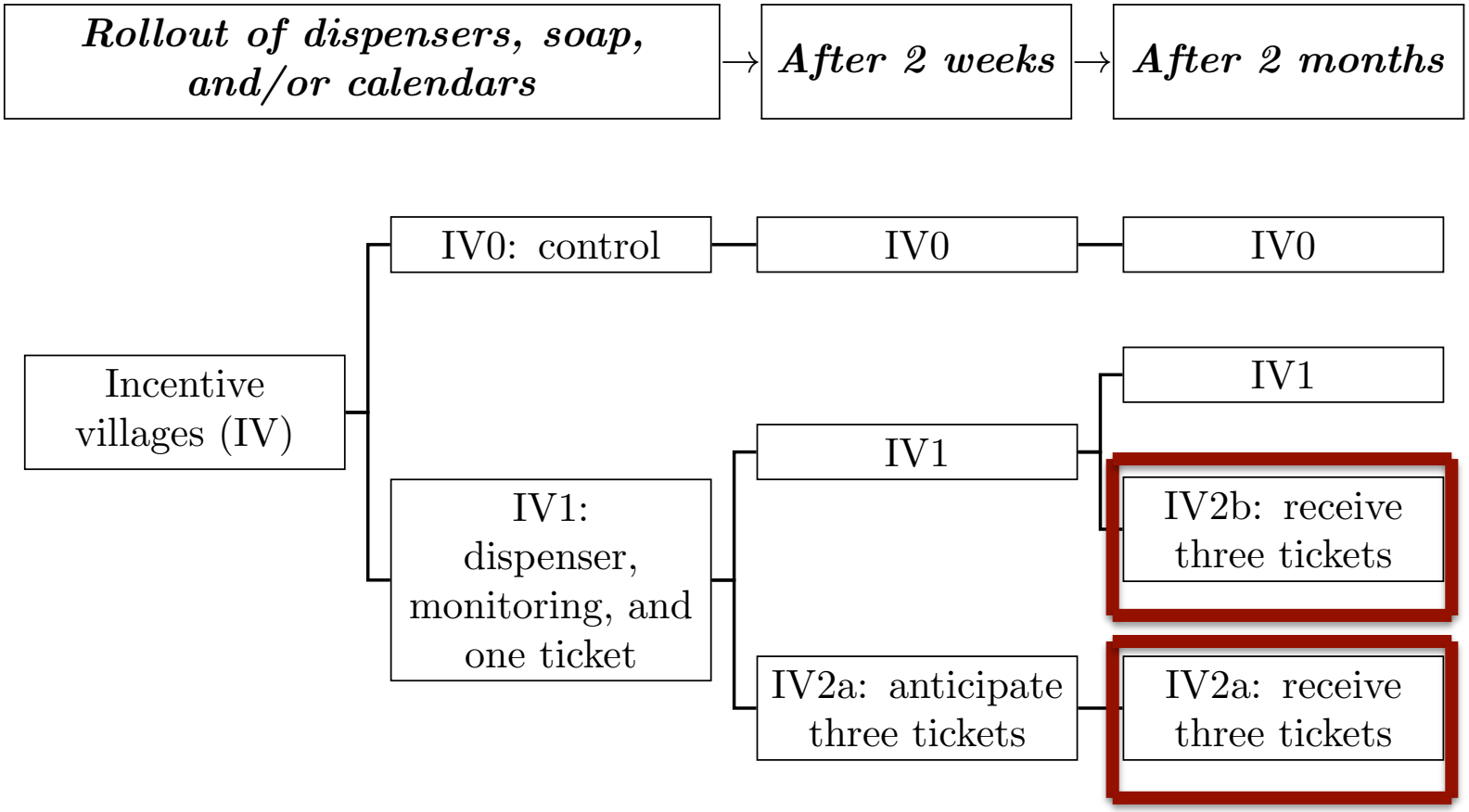
Incentives: rational habit formation



Incentives: pure effect



Incentives: persistence of stock accumulation

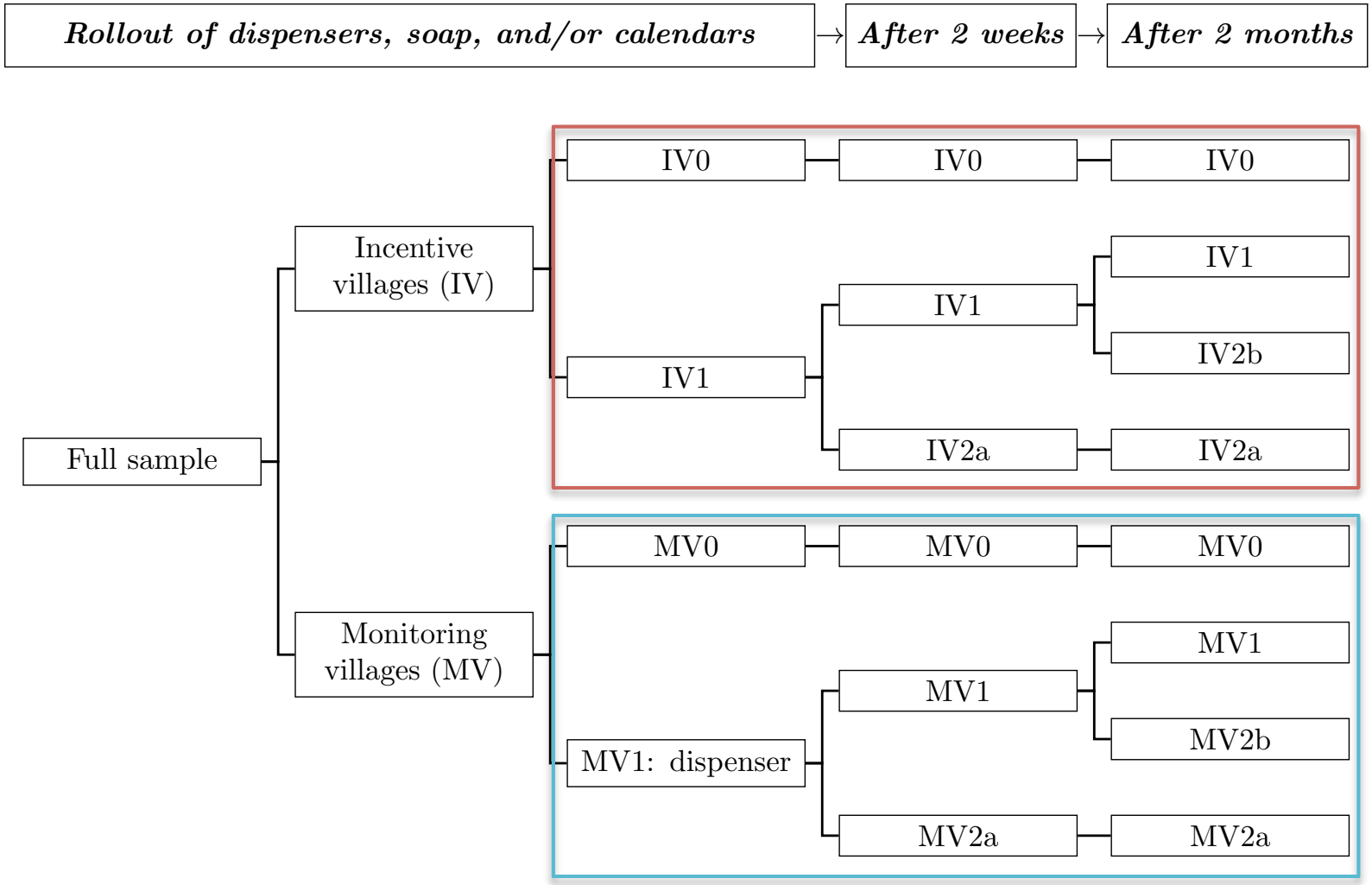


Parallel monitoring experiment

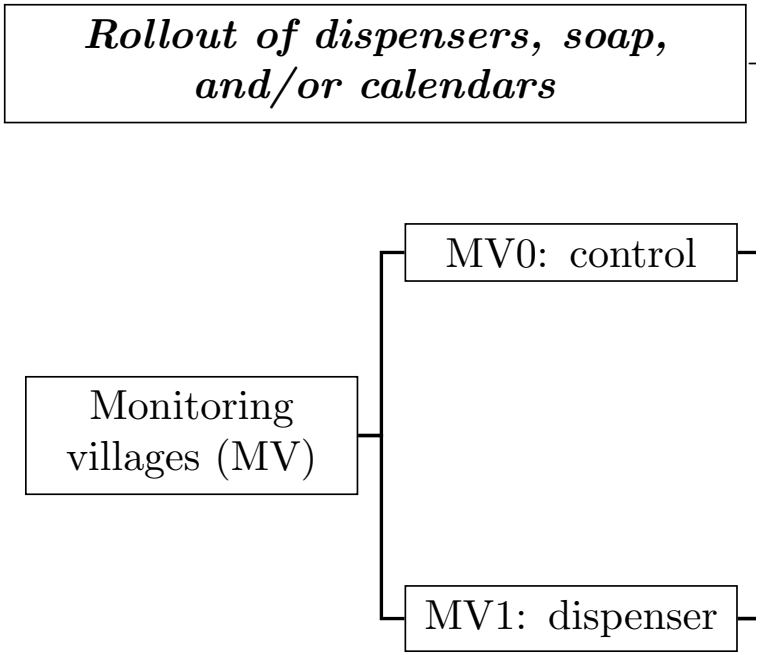
Disentangling:

1. Incentives from feedback alone
2. Rational habit formation drowned out by hidden cost of incentives

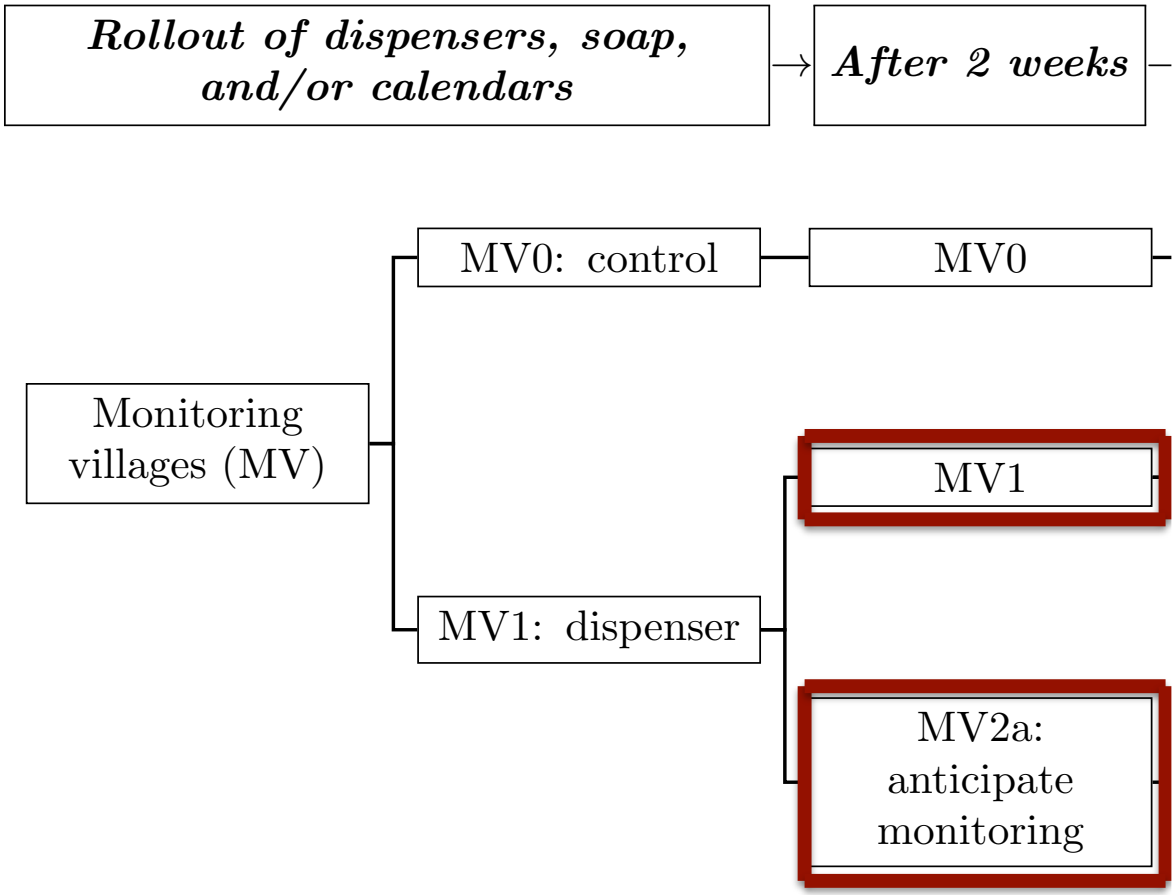
Experimental Design



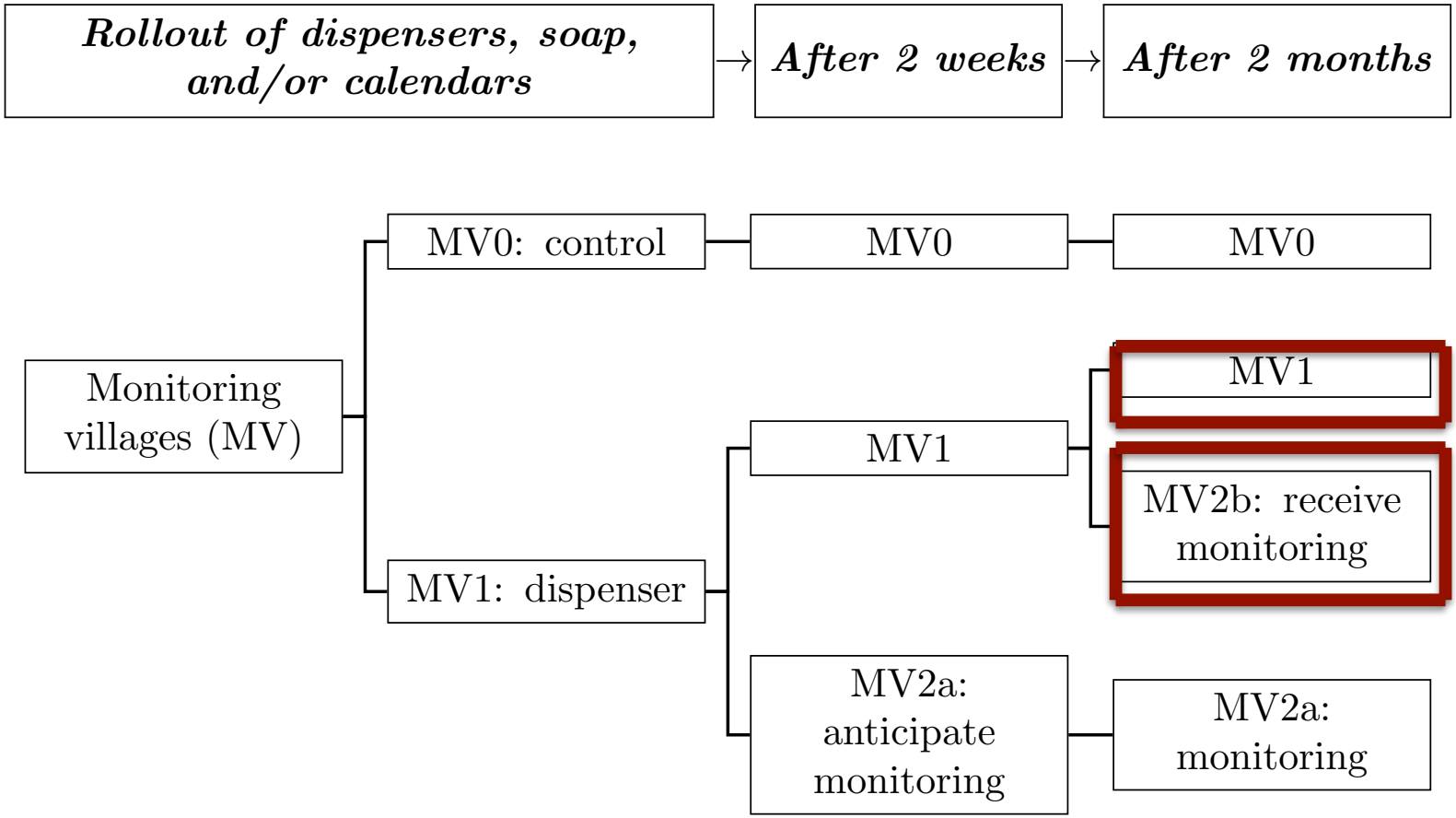
Monitoring


Rollout of dispensers, soap, and/or calendars
Monitoring villages (MV)
MV0: control
MV1: dispenser

Monitoring: rational habit formation



Monitoring: pure effect



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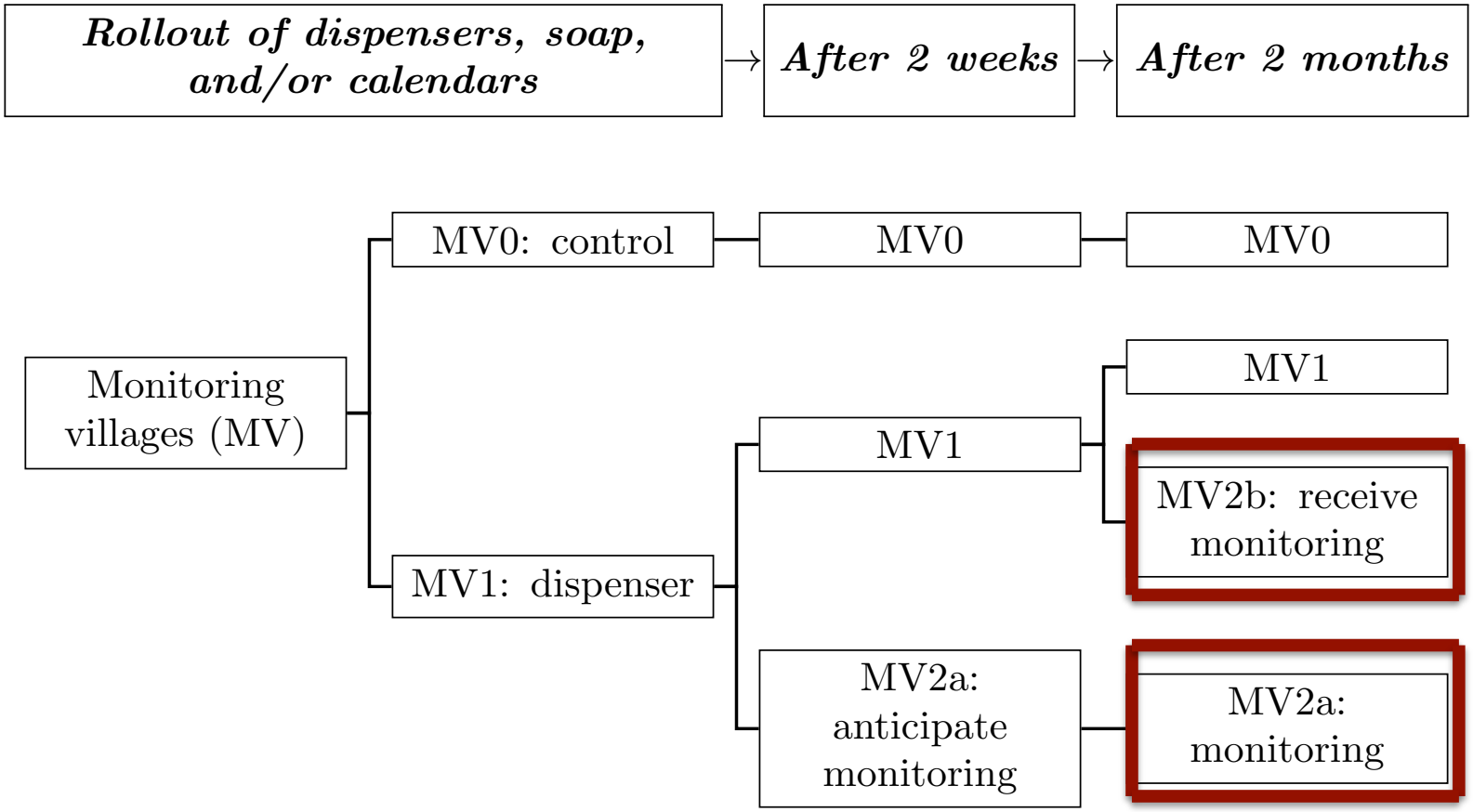
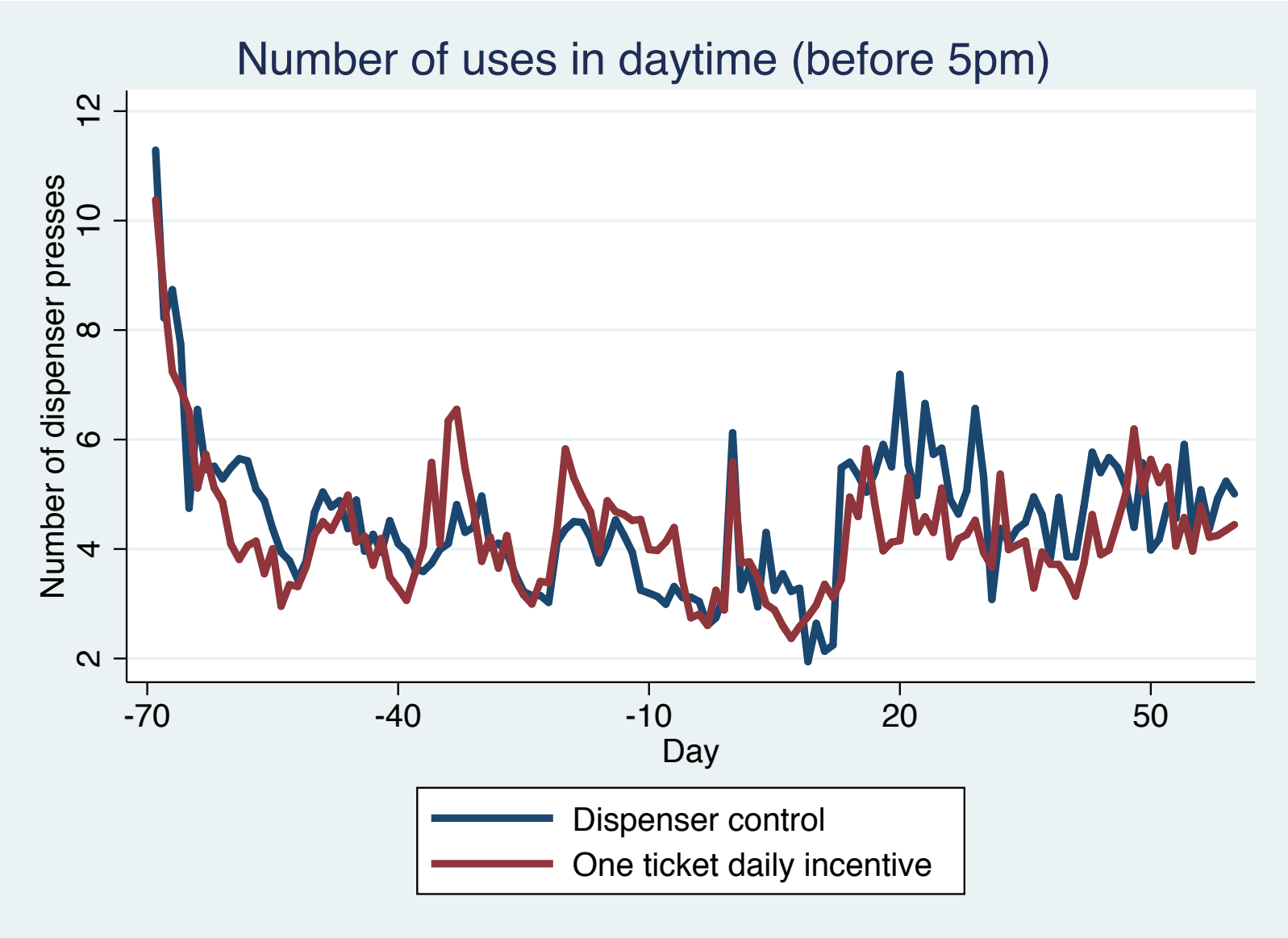
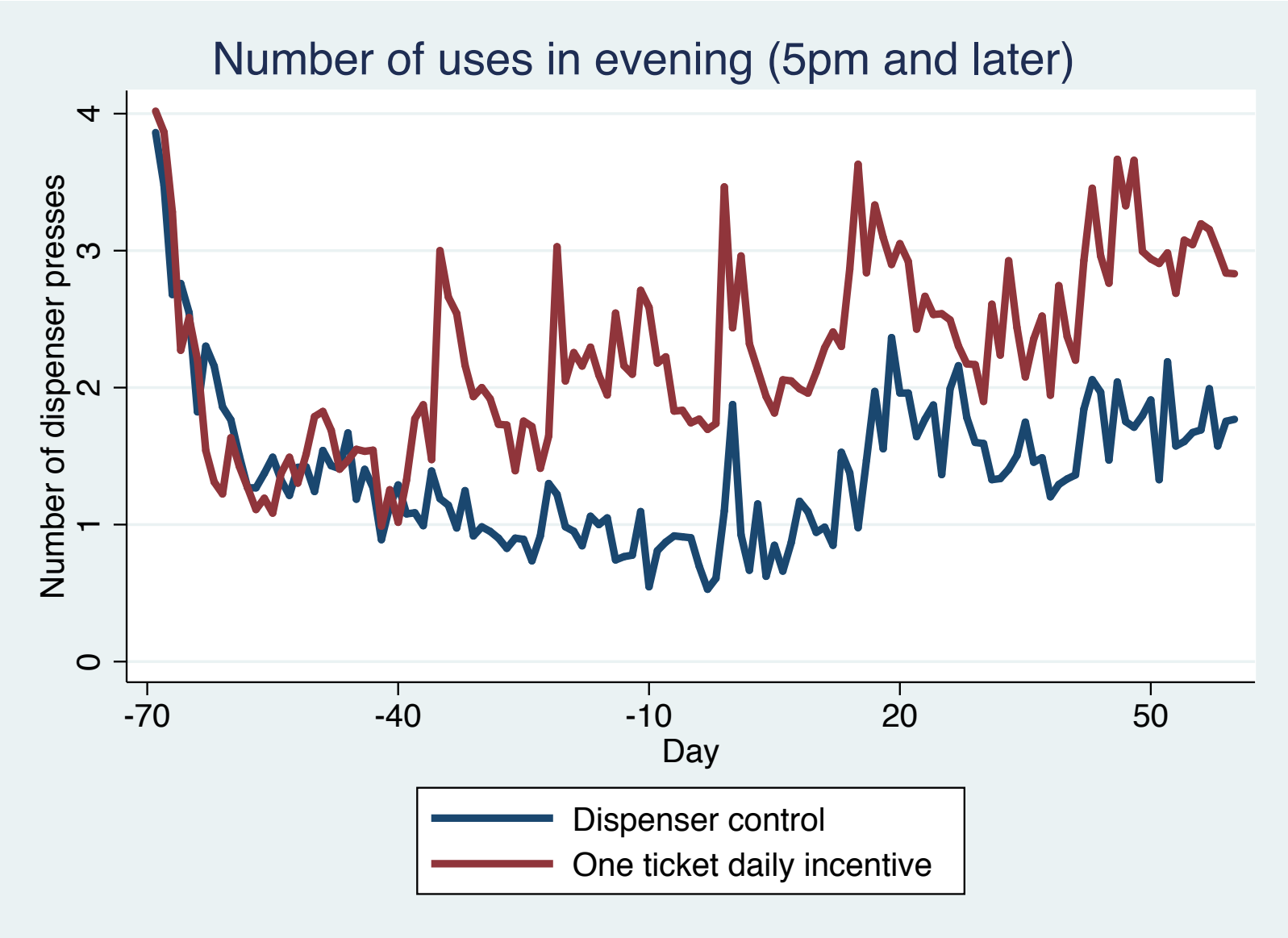


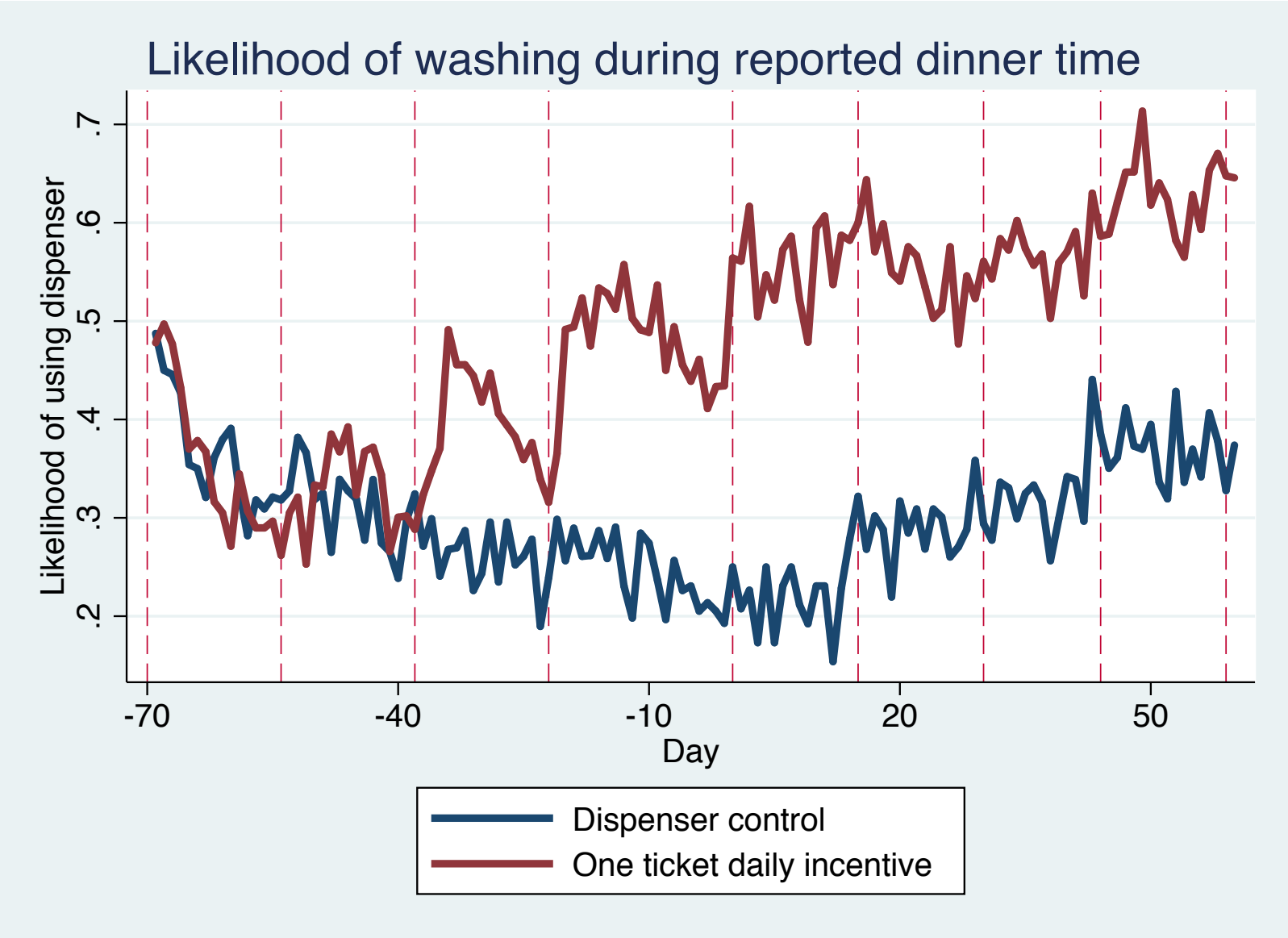
Incentives do not shift daytime use



But do shift evening use



Incentives hit their target



Presentation of results for rational addiction

We first need to identify that:

1. (future) handwashing rates are exogenously shifted
   $\Rightarrow$ the tripling of tickets and monitoring both change handwashing rates
2. handwashing is a habit-forming activity
   $\Rightarrow$ after withdrawal of incentives and monitoring, households continue to wash more than control

Then, examine presence of rational habit formation.

$\Rightarrow$ households anticipating a tripling of tickets or commencement of monitoring wash more than nonanticipating counterparts

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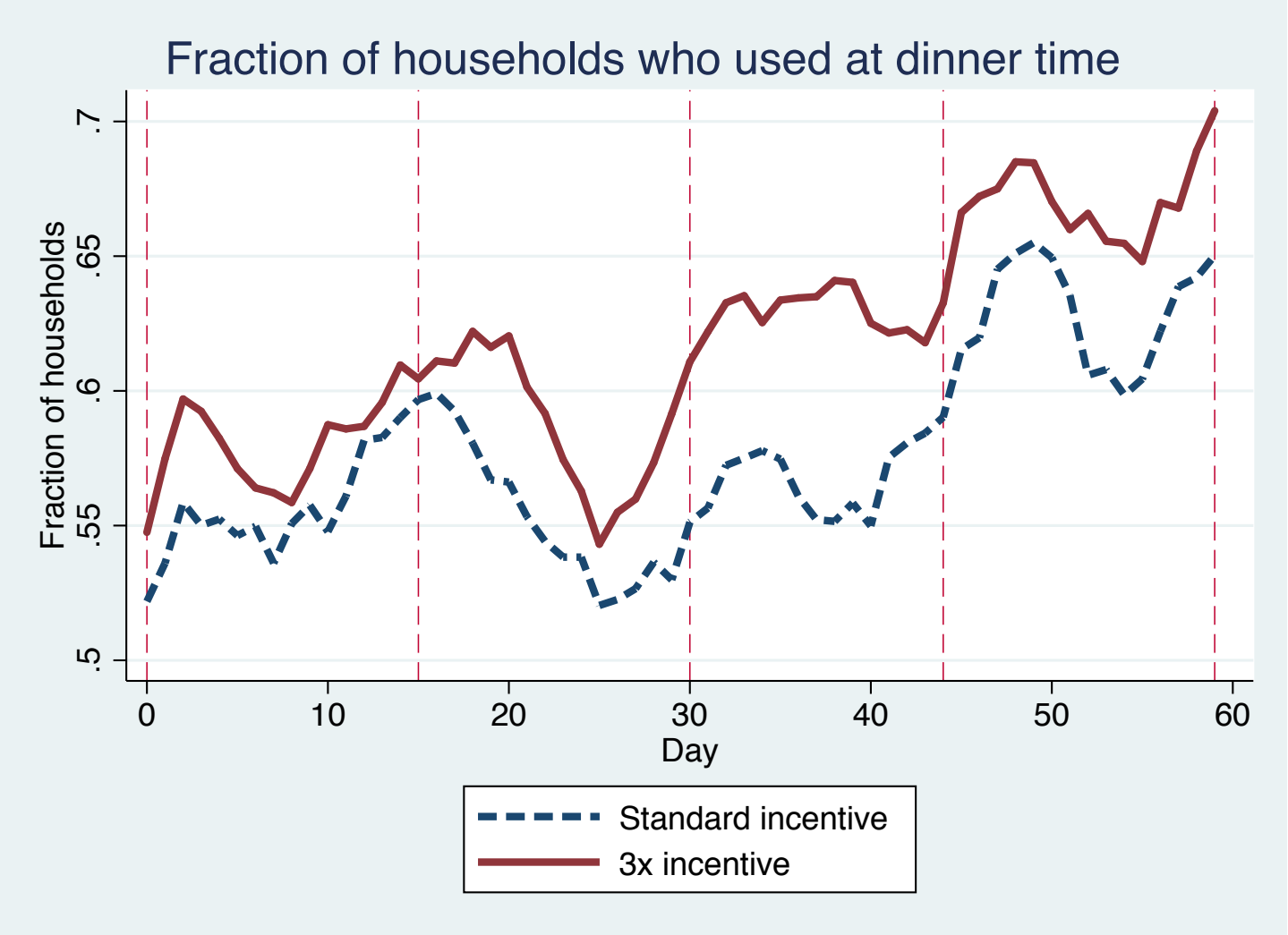
Contemporaneous effects: interventions increase handwashing

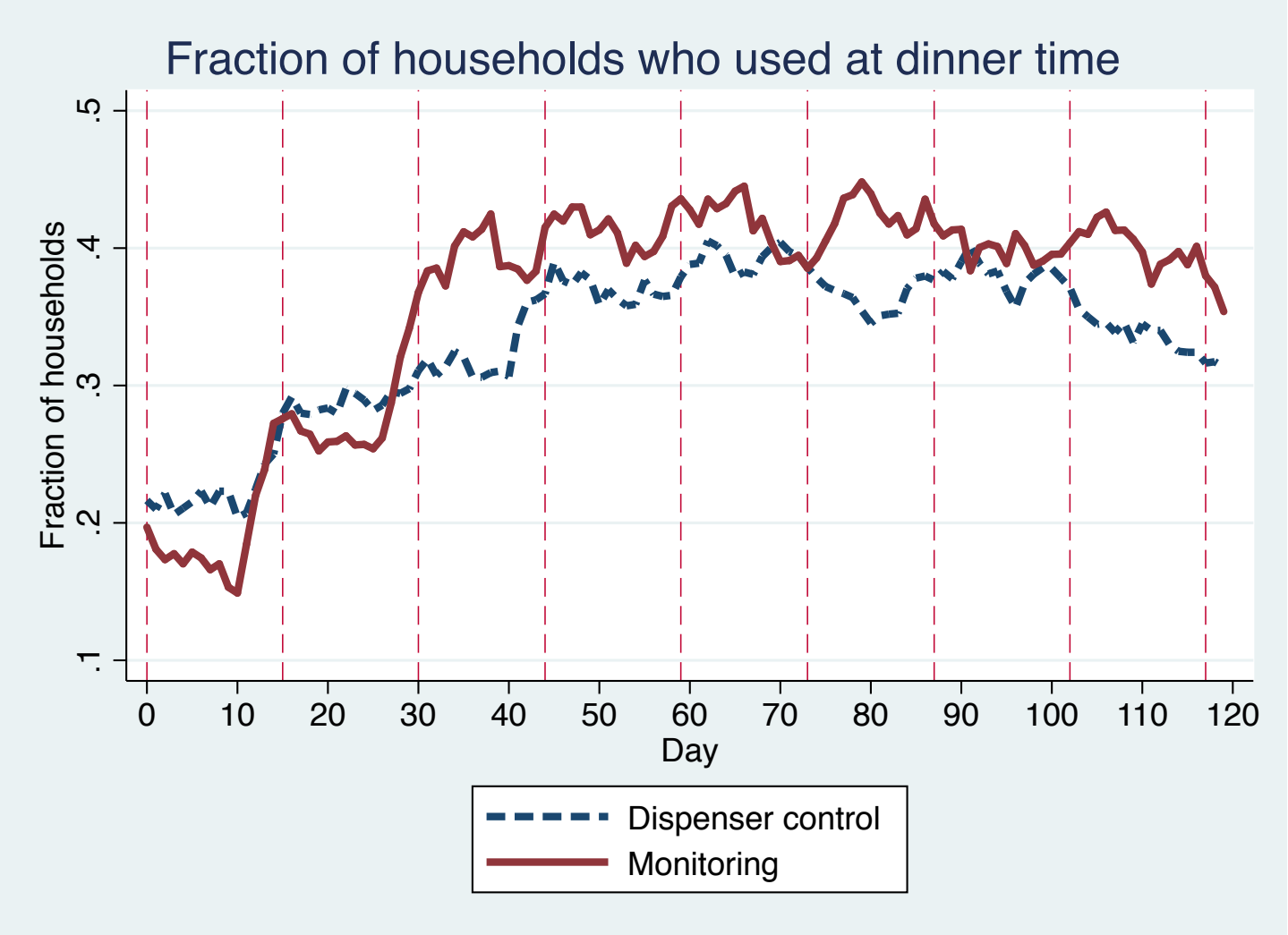
	Likelihood of using during reported dinnertime	
	(1)	(2)
Current triple incentive	0.0503**	
	(0.0261)	
Current monitoring		0.0845***
		(0.0254)
Mean of control group	0.598	0.361
	[0.0217]	[0.0219]
Observations	9,912	19,153

Notes: Observations are at the household-day level. All regressions include village and day fixed effects. p-values adjusted for multiple hypothesis testing using Anderson (2008). *** p<0.01, ** p<0.05, * p<0.1.

Contemporaneous effects: tripling tickets increases handwashing



Contemporaneous effects: monitoring increases handwashing



Habit formation: temporary interventions persist

	Likelihood of using during reported dinnertime	
	(1)	(2)
Former incentives	0.225***	
	[0.0385]	
Former monitoring		0.0959***
		[0.0274]
Mean of control group	0.379	0.267
	[0.0269]	[0.0234]
Observations	7866	9,634

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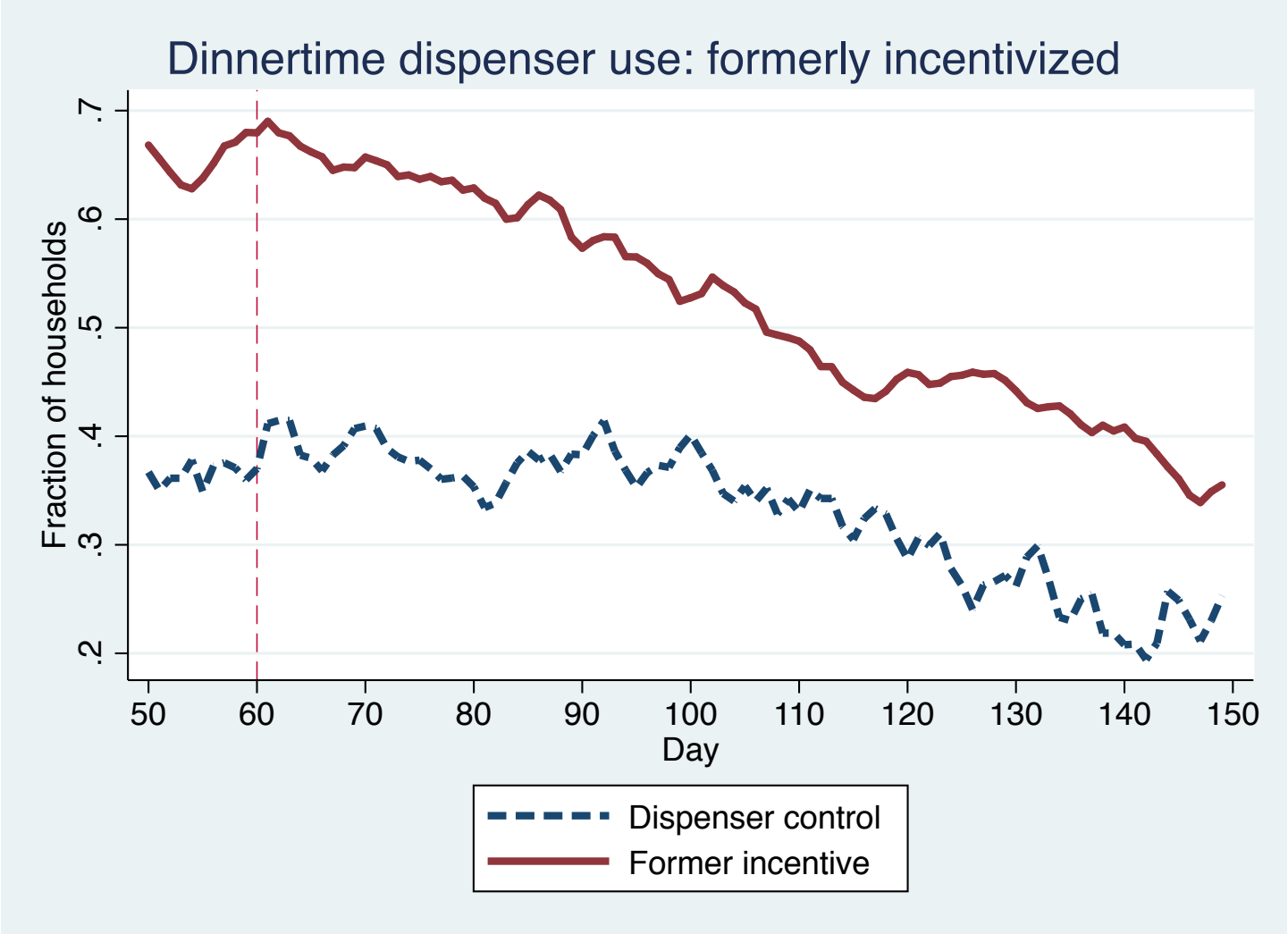
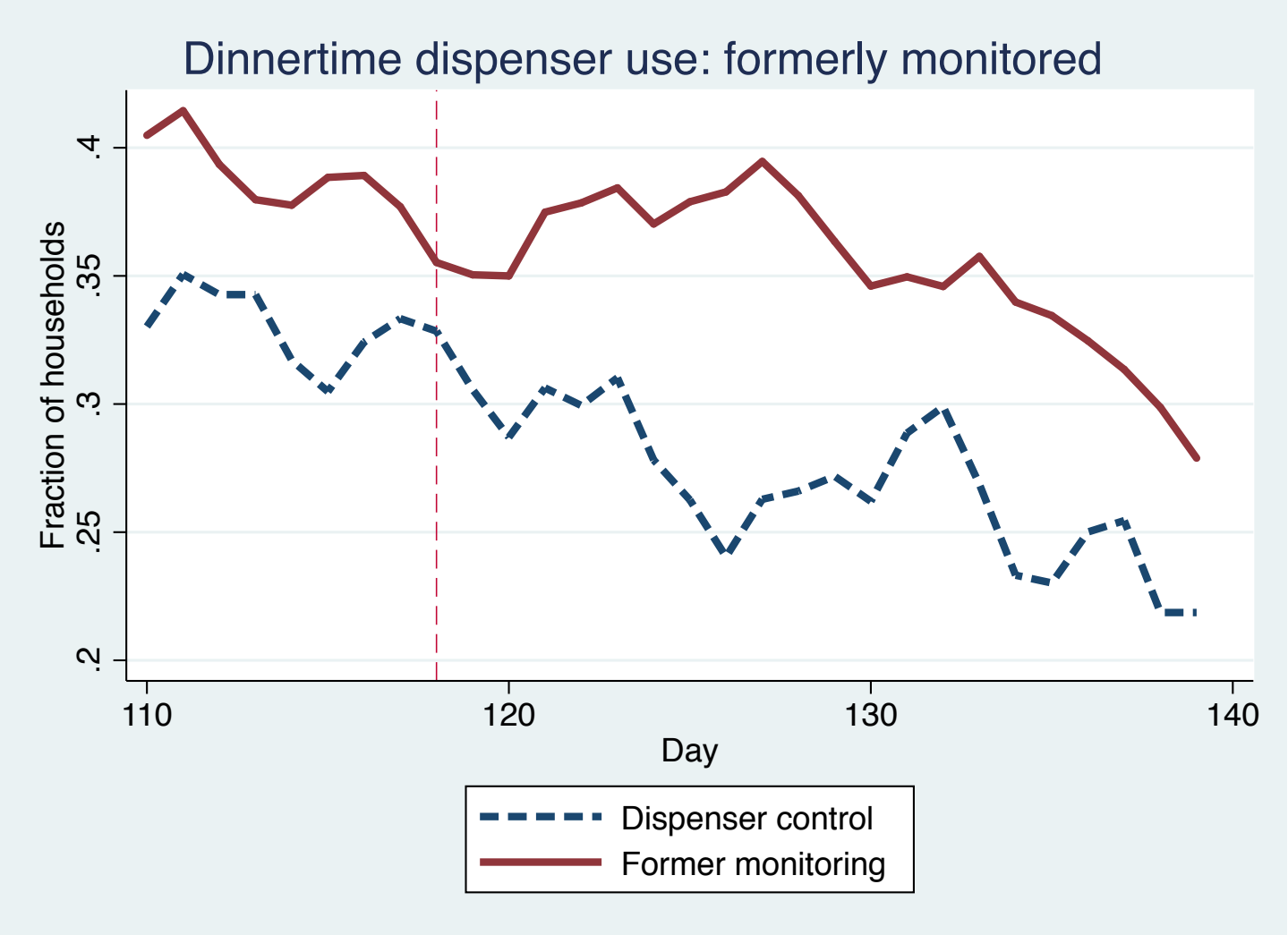
Habit formation: temporary incentive effects persist



Habit formation: temporary monitoring effects persist



Rational habit formation

	Likelihood of using during reported dinnertime			
	(1)	(2)	(3)	(4)
	Day -54 to -1	Day -21 to -1	Day -54 to -1	Day -21 to -1
Anticipated triple incentive	-0.00593	-0.0381		
	[0.0235]	[0.0305]		
Anticipated monitoring			0.052*	0.08**
			[0.0243]	[0.0284]
Mean of control group	0.454	0.536	0.231	0.205
	[0.0197]	[0.0257]	[0.0191]	[0.0218]
Observations	23,273	9,176	16,268	6,297

Notes: Observations are at the household-day level. All regressions include village and day fixed effects. p-values adjusted for multiple hypothesis testing using Anderson (2008). *** p<0.01, ** p<0.05, * p<0.1.

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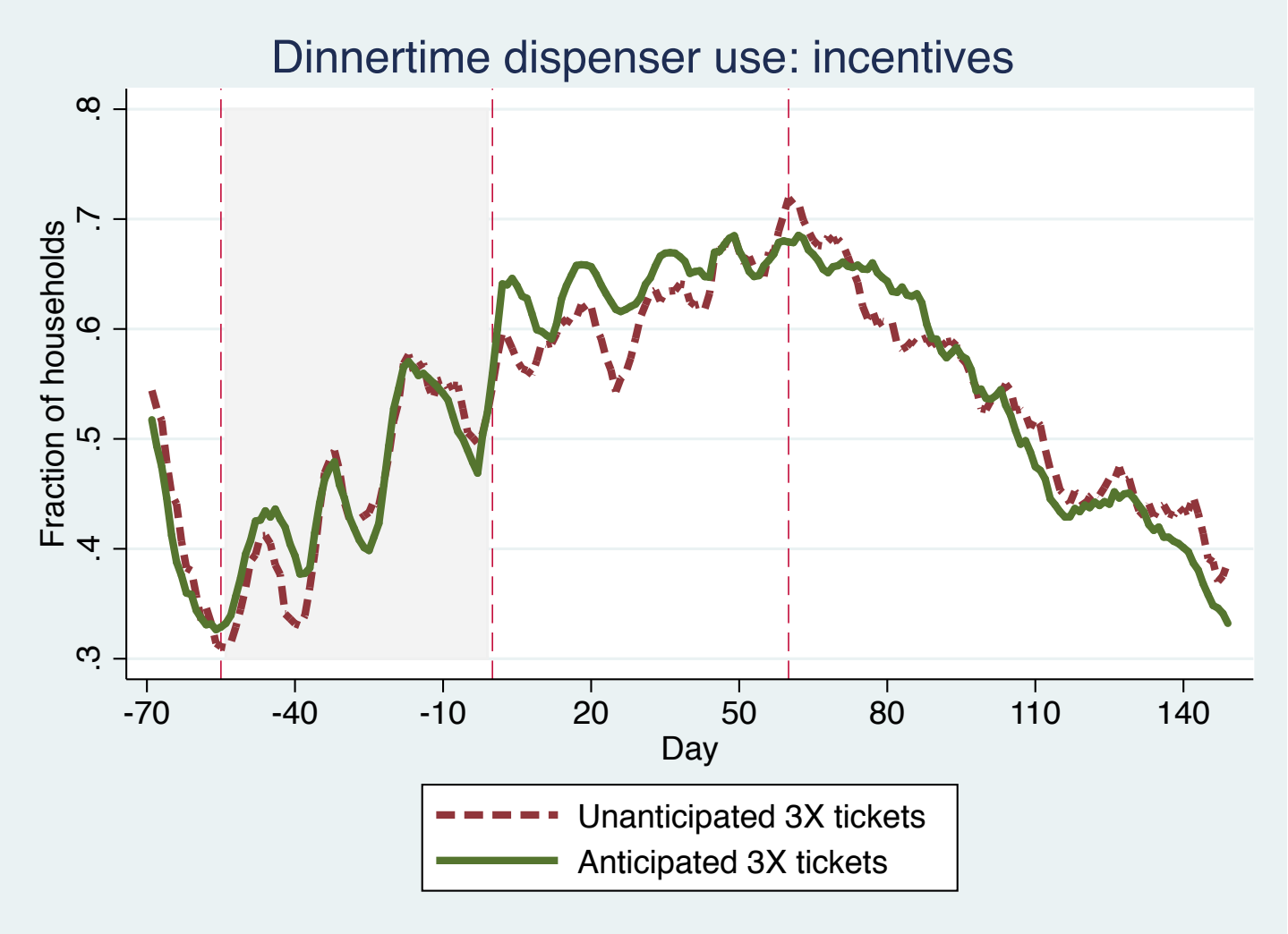
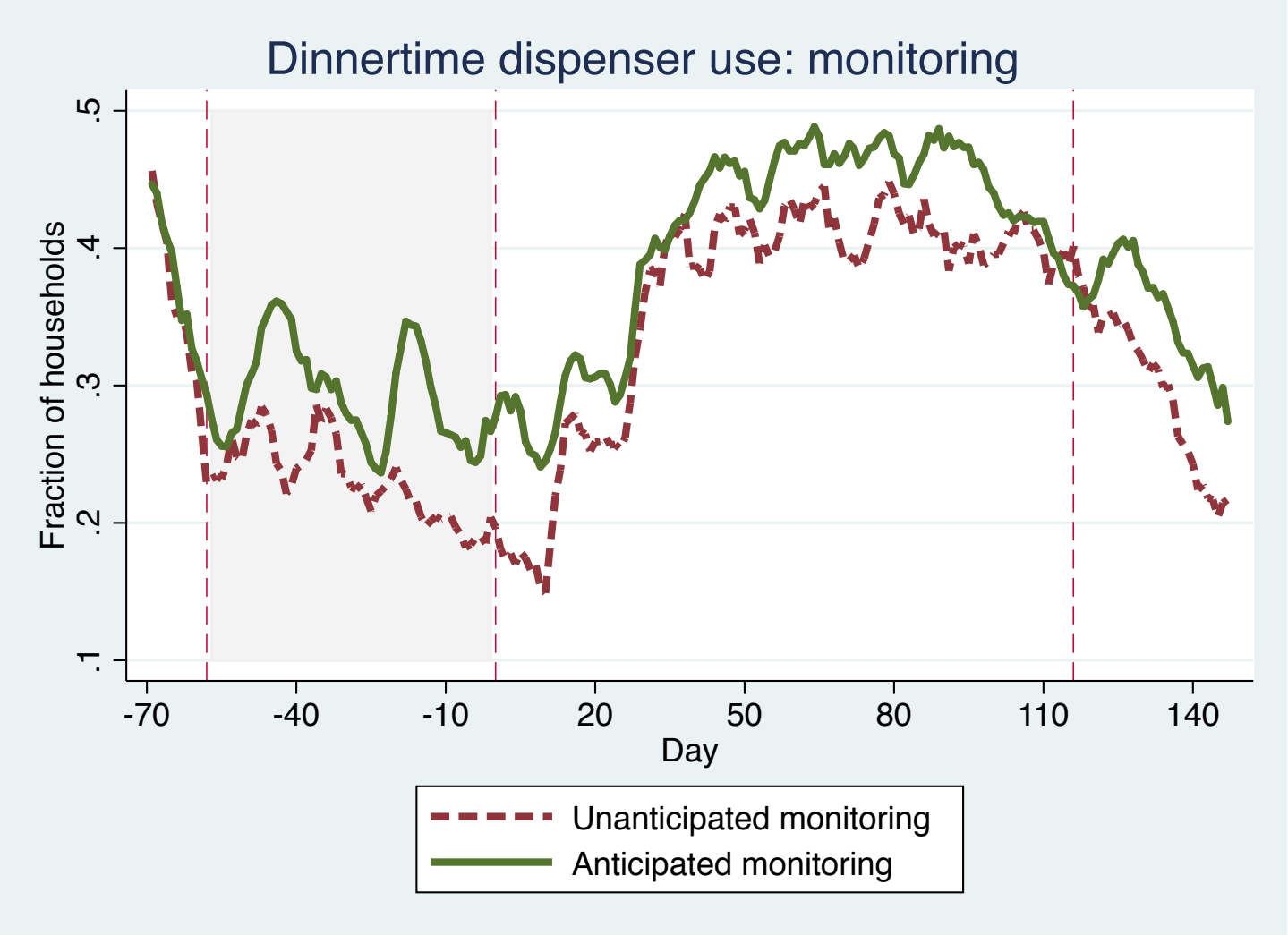
No evidence of rational habit formation in incentives



Strong evidence of rational habit formation in monitoring



Extrinsic v. intrinsic motivation

Why the differences in rational habit formation between incentives and monitoring?

- Loss aversion in monitoring
- Hidden cost of extrinsic rewards in incentives
  - anchoring effects
  - updating of costs (Benabou and Tirole 2003)

Formerly incentivized value soap less

	(1)	(2)
	Willingness to pay (Rs.)	
Treated household	-4.738**	
	[1.935]	
Incentive		-9.060***
		[2.303]
Monitoring		1.415
		[3.705]
Dispenser control		6.011
		[5.243]
Mean of pure control	55.74	55.74
	[1.476]	[1.477]
Observations	2,750	2,750

Notes: Observations are at the household level. All regressions include village level fixed effects. *** p<0.01, ** p<0.05, * p<0.1.

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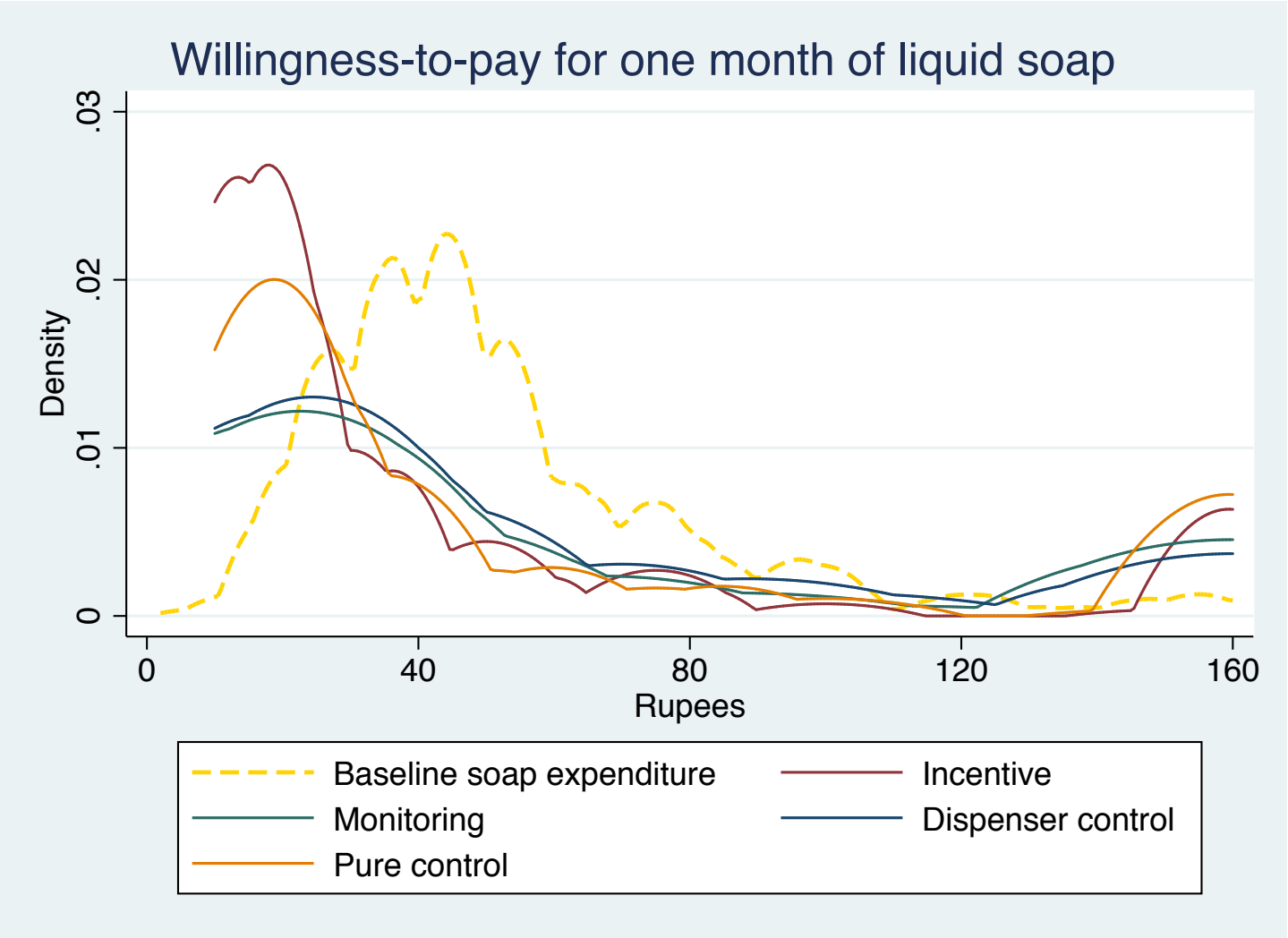

Child health: incidence

	(1)	(2)	(3)	(4)
	Any loose stool	Total days of loose stool	Any ARI symptoms	Total days of ARI
Treated household	-0.0315***	-0.0817***	-0.0393**	-0.204**
	[0.00975]	[0.0236]	[0.0154]	[0.0884]
Mean of pure control	0.100	0.209	0.270	1.247
	[0.00572]	[0.0151]	[0.00886]	[0.0504]
Observations	3,820	3,830	3,830	3,830

Notes: Observations are at the child level. "Treated household" is any household that received a dispenser. p-values adjusted for multiple hypothesis testing using Anderson (2008). *** p<0.01, ** p<0.05, * p<0.1.

Child health: anthropometry

	(1)	(2)	(3)
	Weight for age z-score	Height for age z-score	Mid-arm circ. for age z-score
Treated household	0.135*	0.227*	0.0752*
	[0.0640]	[0.0902]	[0.0518]
Mean of pure control	-2.167	-1.866	-1.365
	[0.0459]	[0.0666]	[0.0432]
Observations	863	862	858

Notes: Observations are at the child level. "Treated household" is any household that received a dispenser. p-values adjusted for multiple hypothesis testing using Anderson (2008). *** p<0.01, ** p<0.05, * p<0.1.

Child health: treatment on the treated estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Any loose stool	Total days of loose stool	Any ARI symptoms	Total days of ARI	Weight for age z-score	Height for age z-score	Mid-arm circ. for age z-score
Dinnertime dispenser use	-0.0637***	-0.164***	-0.0668**	-0.358**	0.254**	0.417**	0.104
	[0.0200]	[0.0485]	[0.0317]	[0.179]	[0.124]	[0.167]	[0.0981]
Mean of pure control	0.100	0.209	0.270	1.247	-2.167	-1.866	-1.365
	[0.00572]	[0.0151]	[0.00886]	[0.0504]	[0.0458]	[0.0665]	[0.0432]
Observations	3,814	3,824	3,824	3,824	861	860	856

Notes: Observations are at the child level for all regressions. Regression shows the treatment on the treated estimates where "treated" is a household who uses the dispenser at dinnertime, which is instrumented for by each of the three treatment groups (incentives, monitoring, and dispenser). p-values adjusted for multiple hypothesis testing using Anderson (2008). *** p<0.01, ** p<0.05, * p<0.1.

To summarize:

1. Financial incentives and monitoring without incentives increases handwashing
2. Handwashing is habitual: effects persist after incentives or monitoring are removed
3. Agents are rational regarding habit formation: anticipation of monitoring increases handwashing
   - ...but not the anticipation of incentives
4. Handwashing alone has substantial impacts on child health: we now have a sense of the production function

Thank you!