Macroeconomic Shock and Gender Gap in Health Outcomes: Evidence from India

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Motivation

- Gender gap in health outcomes in India
  - A higher percentage of women are underweight and anemic than men.
- Women and girls face discrimination in various aspects.
  - Discrimination in prenatal care, breastfeeding, vaccination, etc.
- Less is known how a macroeconomic shock affects gender gap in health outcomes.

What We do In the Paper

- Utilize the timing of the 2016 demonetization policy.
  - Announcement came as a surprise
  - Overnight made 86 % of cash in circulation ineffective for transactions.
  - Had an unfavorable impact on GDP, employment, business revenue, household income, and consumption expenditure.
- Use the National Family Health Survey-4
  - Nationally representative sample
  - Collects health data and other relevant information of households and its members.
  - Two states Arunachal and Jharkhand have data both pre- and post-demonetization.
- Employ household fixed effects to estimate within household gender difference in short-run health outcomes.

Results preview

Following Demonetization:

- Women's hemoglobin count (altitude adjusted) decreases relative to men's.
- Women's BMI only decreases relative to men's in three weeks after demonetization.
- Women consume iron-rich foods less frequently than men.
- Weak impact on girls' weight for height relative to boys'.
- Girls' hemoglobin count (altitude adjusted) decreases significantly three weeks after demonetization.
- No systematic gender difference in consumption of various food items among children.

Background: 2016 Demonetization Policy

- Announced on November 8, 2016
- Policy took effect immediately
- Made 500 and 1000 rupee bills ineffective for transactions
- 86 % of total currency in circulation.
- Holders of these bills faced two choices:
  1. Exchange the old bills for newly issued currency in the denominations of 500 and 2000 rupee
  2. Deposit their cash into their bank account(s)
- Took the currency circulation about a year to reach the pre-demonetization level

Background: 2016 Demonetization Policy (continued)

- Cash performs an essential function
- Indian economy: large informal sector and adoption of digital payments at its infancy.
- Impacts of demonetization:
  - 2 % decline in GDP (Chowdow-Reiech et al. 2020)
  - About 3 % decline in employment (Chowdow-Reiech et al. 2020; Vyas 2018)
  - 20 % decline in business revenue (Banerjee and Kala, 2017)
  - About 15 % decline in household income (Zhu et al. 2018)
  - A decline in Consumption expenditure (Wadwa 2019)

Background: Status of Women in India

- On average, a woman in India face discrimination throughout their lives.
- Economic shocks intensify gender gap in child survival (Rose 1999).
- Missing women (Sen 1990).
- Adult women account for a larger fraction of missing women (Anderson and Ray 2012)
- Norm: Women should eat last (Coffey et al. 2018)
  - Associated with worse physical and mental health outcomes. (Hathi et al. 2021)

Data: Indian National Family Health Survey-4

- Nationally Representative sample
- Health and other relevant data available for:
  - All adult women (aged 15-49)
  - Adult men of 15 % of surveyed households (aged 15-54)
  - Children Under age 5
- Restrict Sample to Non-pregnant women only
- Pre-demonetization data: Households interviewed between October 5, 2016 to November 8, 2016
- Post-demonetization data: Households interviewed between November 15, 2016 to December 4, 2016

Summary Characteristics

Table: Summary Statistics [Combined Sample]

Variable	Mean	St. Dev.
Panel A: Female Sample		
Age	30.19	9.68
1(Edu. $\geq$ primary)	0.62	0.48
Hemoglobin (g/dL)	11.76	1.62
Height (in cm.)	150.33	5.41
BMI	21.42	3.36
N	7580	
Panel B: Male Sample		
Age	32.14	11.01
1(Edu. $\geq$ primary)	0.77	0.42
Hemoglobin (g/dL)	14.09	1.81
Height (in cm.)	159.97	6.66
BMI	21.61	3.22
N	1456	
Panel C: Household Characteristics		
1(Has bank account)	0.90	0.30
1(Has BPL card)	0.50	0.50
1(Rural)	0.80	0.40
Wealth Index	2.30	1.25
N	6235	

T-tests Pre and Post Demonetization

Table: T-tests [Combined Sample]

Variable	Pre	Post	Pre-Post	S.e	p-value
Panel A: Female Sample					
Age	30.2065	30.0552	0.151	0.3341	0.65
1(Edu. $\geq$ primary)	0.6114	0.7014	-0.090***	0.0167	0.00
Hemoglobin (g/dL)	11.7394	11.9031	-0.164***	0.0559	0.00
Height (in cm.)	150.2454	150.9385	-0.693***	0.1865	0.00
BMI	21.3793	21.6858	-0.306***	0.1159	0.01
N	6619	961			
Panel B: Male Sample					
Age	31.9687	33.3371	-1.368	0.8801	0.12
1(Edu. $\geq$ primary)	0.7621	0.8258	-0.064*	0.0337	0.06
Hemoglobin (g/dL)	14.0538	14.3433	-0.290**	0.1445	0.05
Height (in cm.)	159.7308	161.6511	-1.920***	0.5306	0.00
BMI	21.5467	22.0613	-0.515**	0.2570	0.05
N	1278	178			
Panel C: Household Characteristics					
1(Has bank account)	0.8943	0.9219	-0.028**	0.0114	0.02
1(has BPL card)	0.5037	0.5118	-0.008	0.0189	0.67
1(Rural)	0.8034	0.7968	0.007	0.0150	0.66
Wealth Index	2.2631	2.5489	-0.286***	0.0470	0.00
N	5428	807			

Empirical Strategy: Adult Sample

We estimate the following regression equation for individual 'i' living in household 'j':

$$O_{ij} = \alpha + \beta Female_i + \gamma Post_j \times Female_i + X^{'}\Sigma + \theta_j + \epsilon_{ij} \quad (1)$$

- Female takes the value of 1 if a respondent is female and 0 otherwise.
- Post takes the value of 1 if the household was interviewed after November 14.
- X is vector of individual characteristics such as age and education.
- θ_j household fixed effects.
- Outcomes of interest: Altitude adjusted hemoglobin and Body Mass Index (BMI).

Results: Short Run Health Outcomes (Adult Men and Women)

Table: Demonetization and outcomes (hemoglobin levels and BMI)

	Panel A:	
	Depvar: Altitude-adjusted hemoglobin (g/dL)	
Female	-2.268***	-2.242***
	(0.06353)	(0.06674)
Female * Post	-0.490***	-0.488***
Household Fixed Effects	Yes	Yes
Additional controls	No	Yes
N	9036	9036
R^2	0.357	0.357
	Panel B:	
	Depvar: Body Mass Index	
Female	-0.487***	-0.142
	(0.1336)	(0.1311)
Female * Post	-0.0100	0.0521
	(0.4217)	(0.4209)
Household Fixed Effects	Yes	Yes
Additional controls	No	Yes
N	9036	9036
R^2	0.00617	0.150

Balance Test

Table: Balance Test [Combined Sample, Household Fixed Effects]

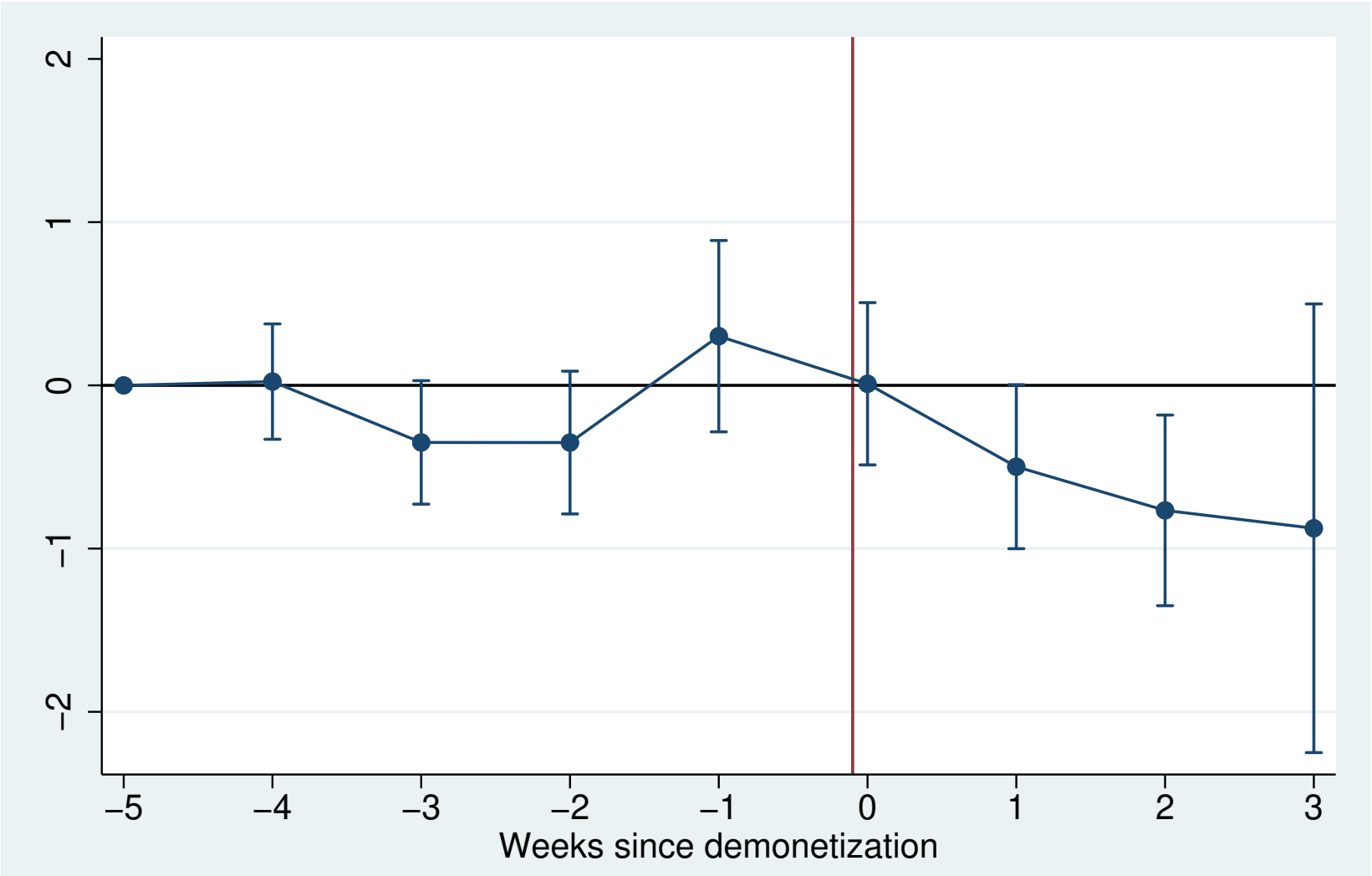
	(1) $\mathbf{1}$(Edu. $\geq$ primary)	(2) Height	(3) Age
Female	-0.172***	-9.718***	-2.334***
	(0.01805)	(0.3250)	(0.3756)
Female * Post	0.00332	-1.209	-0.659
	(0.05514)	(0.8583)	(0.9008)
N	9036	9036	9036
R^2	0.0358	0.446	0.00813

Standard errors (clustered at the PSU level) in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

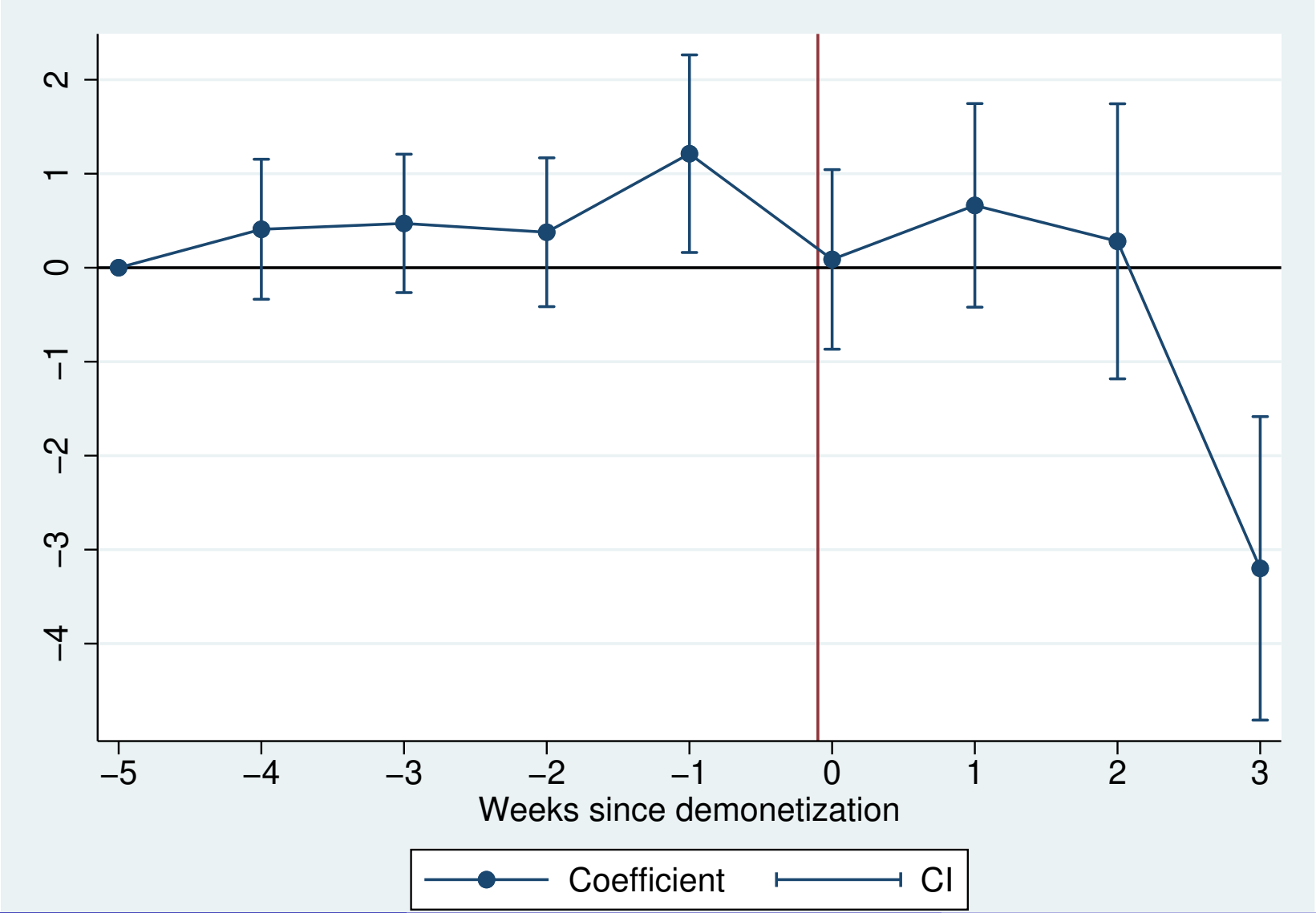
Event Study–Gender Gap in Hemoglobin Count (Adult Sample)

Figure: Coefficients on hemoglobin by weeks since demonetization for adults



Event Study–Gender Gap in BMI (Adult Sample)

Figure: Coefficients on BMI by weeks since demonetization for adults



Discussion: Gender Gap in Adult Outcomes

- Women health outcomes deteriorate relative to men.
- Two possibilities:
  - Both men and women were affected but women were disproportionately more affected.
  - There was no impact on men, but only women's health worsen.
- Gender gap in consumption of various food items.

Absolute change Men Vs Women–Hemoglobin Outcome: Jharkhand Sample

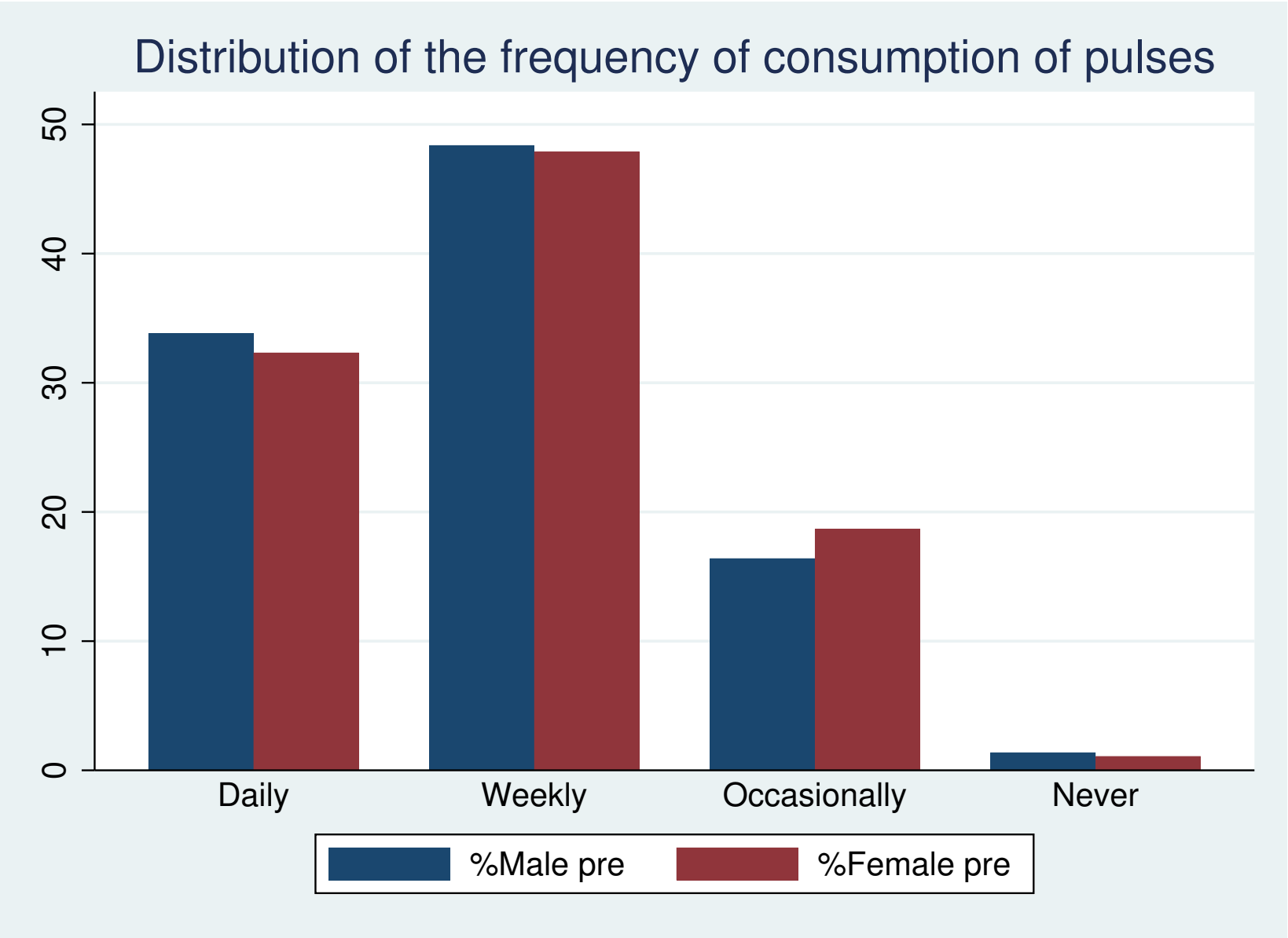
	*Depvar:*Altitude-adjusted hemoglobin (g/dL)		
Panel A: All adult women			
Post	-0.309**	-0.246**	-0.311**
	(0.1329)	(0.1216)	(0.1397)
Controls:			
Background characteristics	No	Yes	Yes
District FE	No	No	Yes
N	2829	2829	2829
R^2	0.00514	0.0471	0.0645
Panel B: All adult men			
Post	0.0632	0.165	0.00304
	(0.2730)	(0.2271)	(0.2147)
		(0.007434)	(0.007563)
Controls:			
Background characteristics	No	Yes	Yes
District FE	No	No	Yes
N	742	742	742
R^2	0.000144	0.0864	0.130

Absolute change Men Vs Women–BMI Outcome: Jharkhand Sample

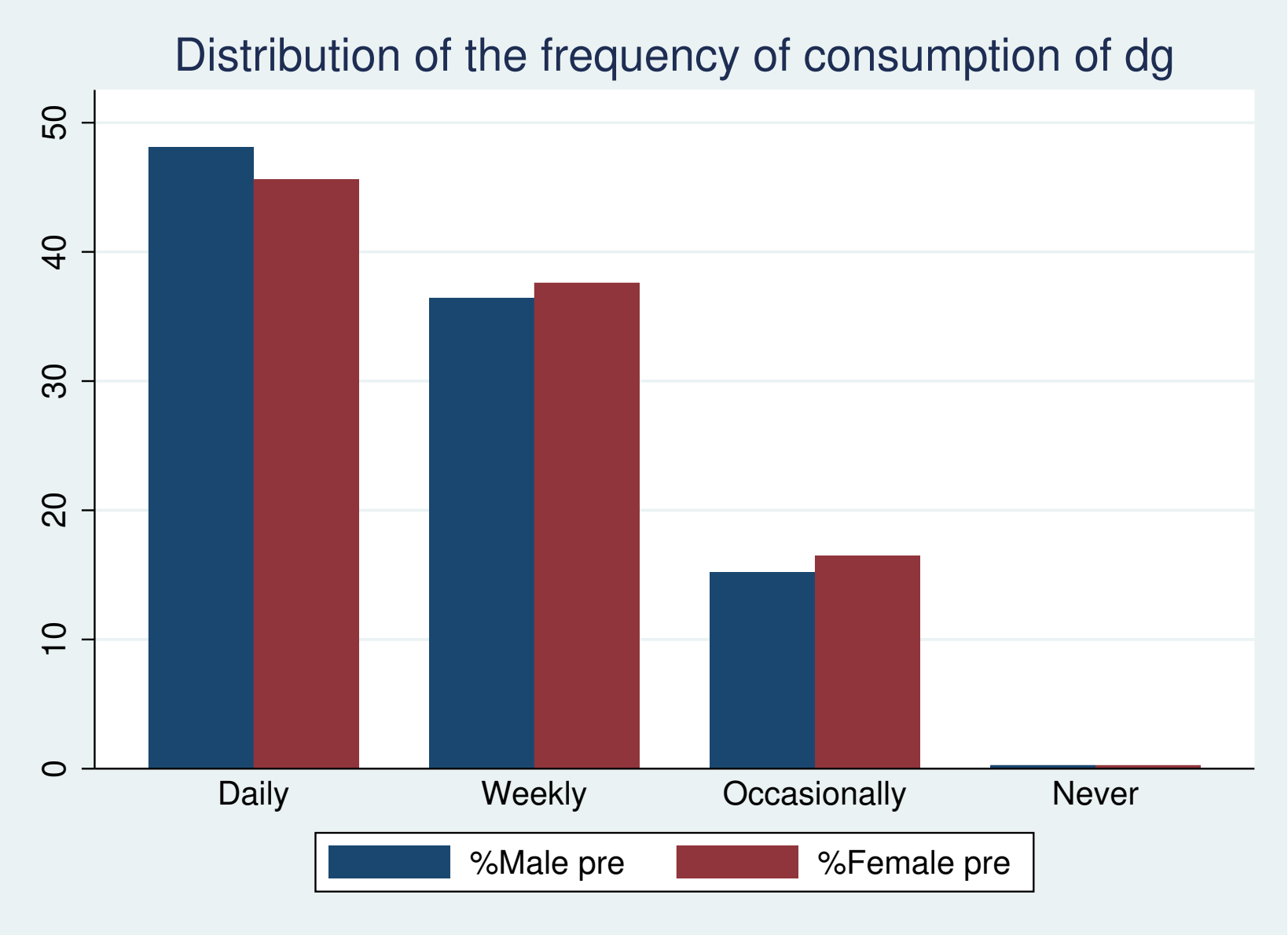
Table: Demonetization and BMI levels of non-pregnant women and men [Jharkhand Sample]

	Depvar: Body Mass Index (BMI)		
Panel A: All adult women			
Post	-0.265	-0.126	-0.215
	(0.3465)	(0.2402)	(0.2879)
Background characteristics	No	Yes	Yes
District FE	No	No	Yes
N	2829	2829	2829
R^2	0.000858	0.161	0.172
Panel B: All adult men			
Post	-0.128	-0.356	0.0974
	(0.5481)	(0.4763)	(0.5694)
Controls:			
Background characteristics	No	Yes	Yes
District FE	No	No	Yes
N	742	742	742
R^2	0.000215	0.127	0.172

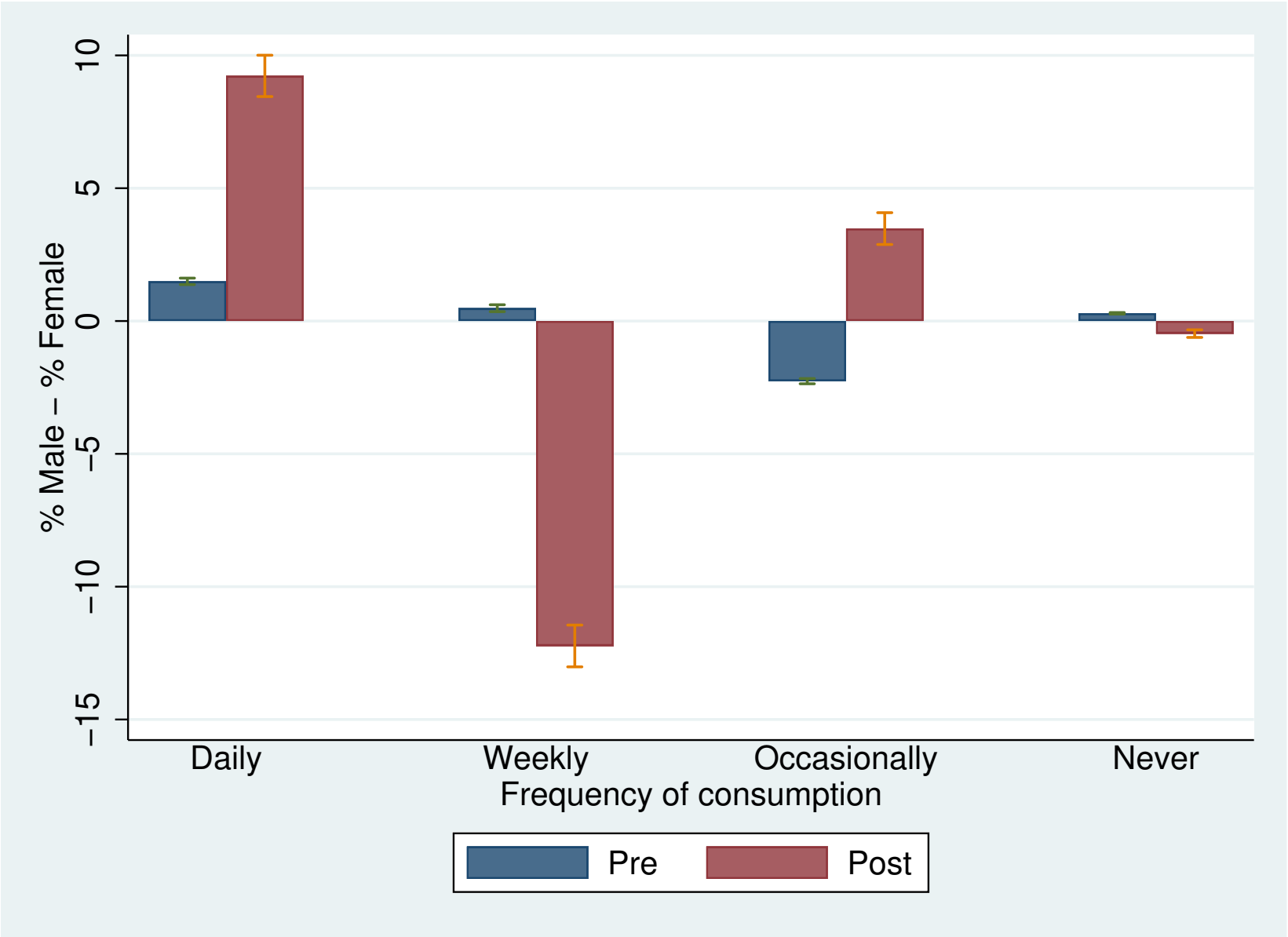
Pre-demonetization Consumption Pattern: Pulses



Pre-demonetization Consumption Pattern: Dark Green Leafy Vegetables

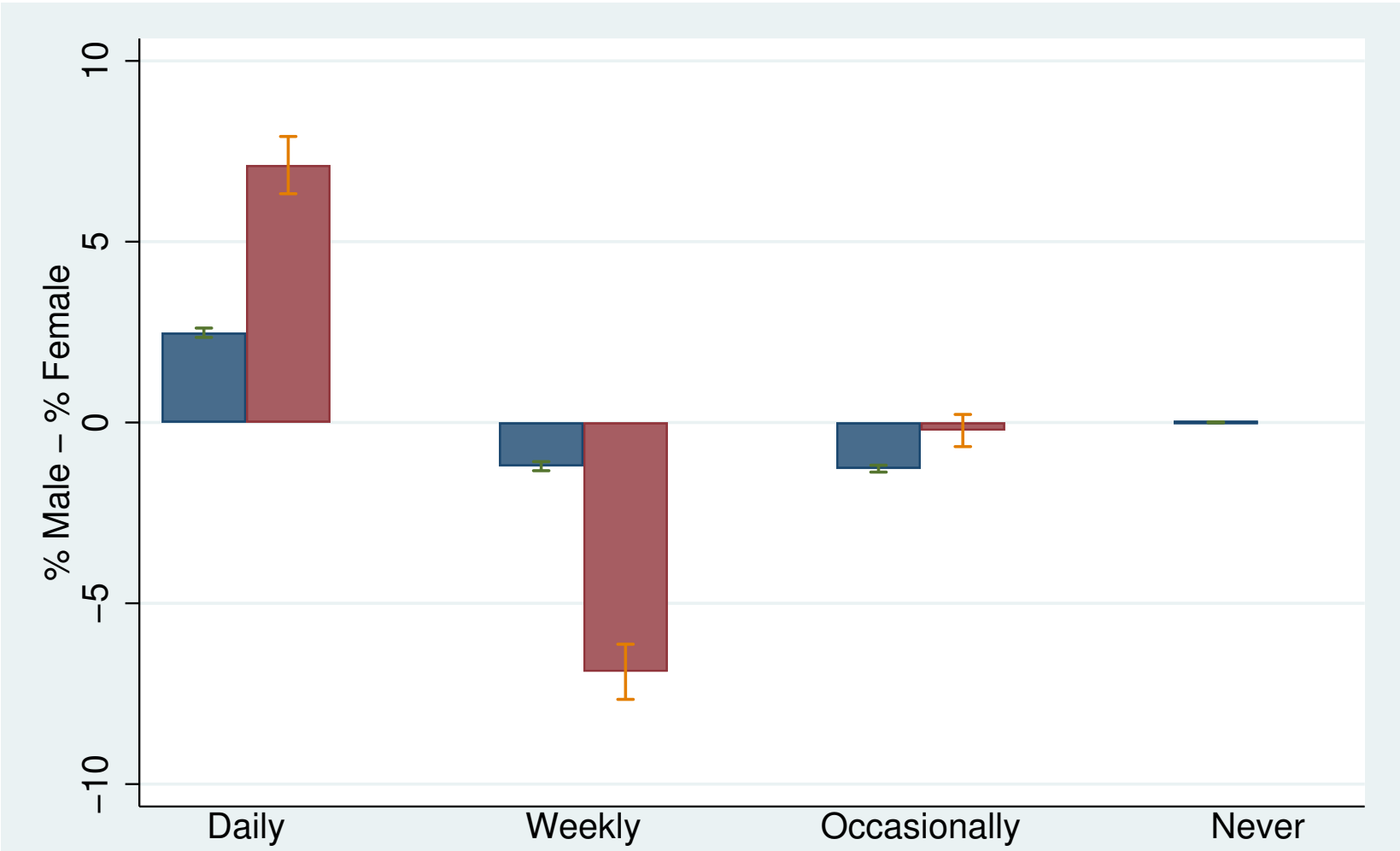


Gender Gap in Consumption Frequnecy Pre and Post Demonetization: Pulses



Gender Gap in Consumption Frequnecy Pre and Post Demonetization: Dark Green Leafy Vegetables

Figure: Frequency of consumption of dark green leafy vegetables by gender before and after demonetization: Adult sample



Empirical Strategy: Child Sample

We estimate the following regression equation for child 'i' born in birth order 'b' in household 'j':

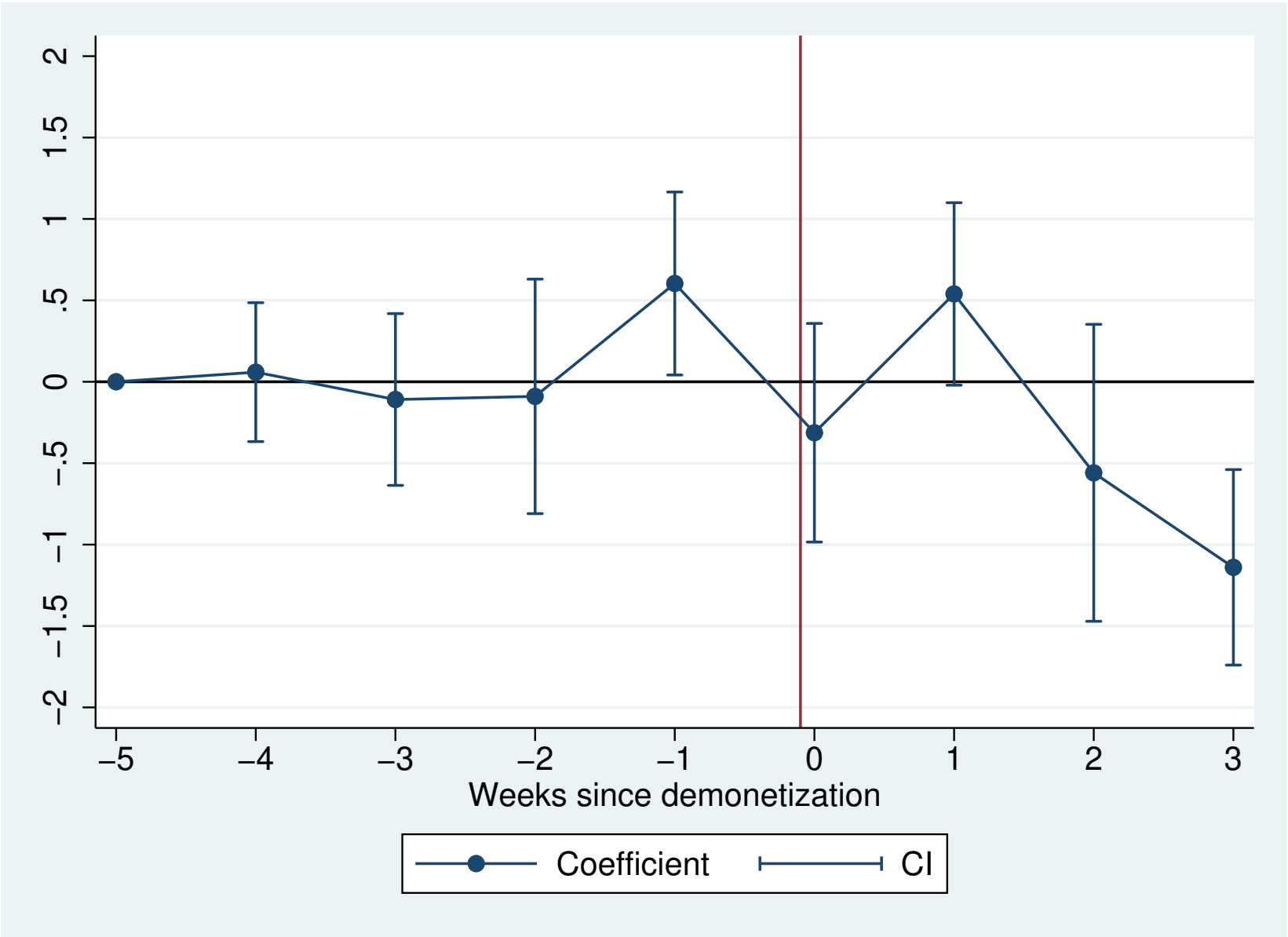
$$O_{ibj} = \alpha + \beta Girl_i + \gamma Post_j \times Girl_i + \delta_b + \theta_j + \epsilon_{ij} \quad (2)$$

- Girl takes the value of 1 if the child is girl and 0 otherwise.
- Post takes the value of 1 if the household was interviewed after November 14.
- δ_b birth order fixed effects.
- θ_j household fixed effects.

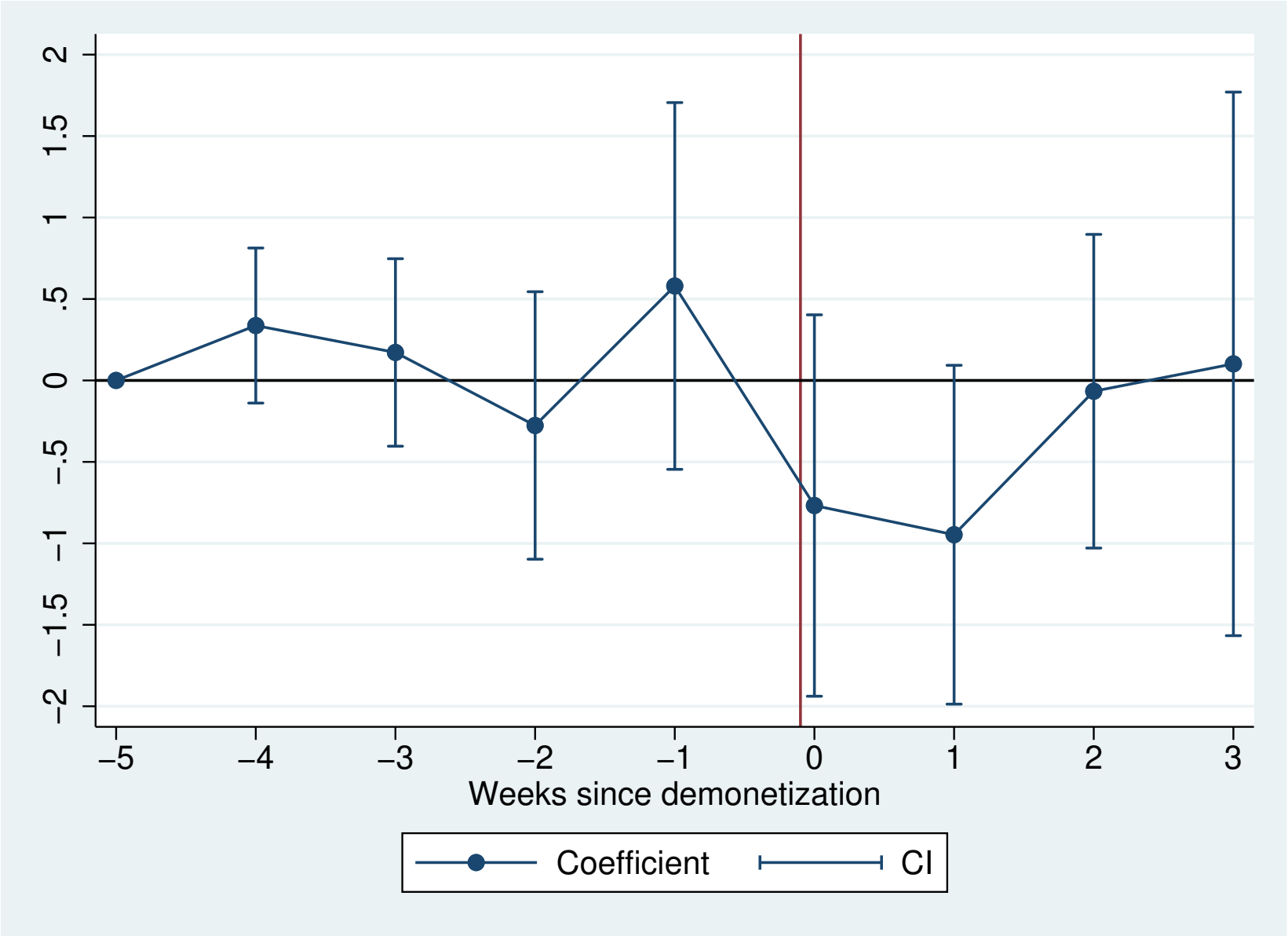
Results: Child Outcomes

	Panel A:	
	Depvar: Altitude-adjusted hemoglobin (g/dL)	
Girl	-0.136	-0.118
	(0.09129)	(0.09186)
Girl * Post	-0.131	-0.120
	(0.2631)	(0.2671)
Birthorder Fixed Effects	No	Yes
Hhd. Fixed Effects	Yes	Yes
N	2425	2425
R^2	0.170	0.177
	Panel B:	
	Depvar: Weight-for-height Z-scores	
Girl	0.292***	0.290***
	(0.1068)	(0.1085)
Girl * Post	-0.620	-0.627*
	(0.3785)	(0.3785)
Birthorder Fixed Effects	No	Yes
Household Fixed Effects	Yes	Yes
N	2425	2425
R^2	0.0375	0.0381
	Panel C:	
	Depvar: Height-for-age Z-scores	
Girl	-0.0389	-0.0442
	(0.1345)	(0.1368)
Girl * Post	0.192	0.176
	(0.3219)	(0.3215)
Birthorder Fixed Effects	No	Yes
Household Fixed Effects	Yes	Yes
N	2425	2425
R^2	0.0208	0.0373

Event Study–Gender in Hemoglobin (Child Sample)



Event Study–Gender in BMI (Child Sample)



Gender Gap in Consumption Frequency Pre- and Post-Demonetization

- Notable increase in gender gap for dark green leafy vegetables and bread and grains.
- Less precise. ⏩ Figures

Discussion: Policy Implications

- Nutritional deficiencies are leading causes of deaths and the loss of Daily Adjusted Life Year (DALY).
- Iron deficiency alone accounts for 3.3 decline in DALY.
- High priority for India: alleviation of nutritional deficiency.
- Macroeconomic shock can derail India from achieving that goal.
- Policy Implications:
  - Consideration of vulnerable groups.
  - Macroeconomic fluctuations.

Discussion: Limitations

- Limited post-demonetization data
- Results not generalizable to entire India

Conclusion

- Evidence of macroeconomic shock and gender gap in health outcomes.
- Gender gap in consumption of iron rich foods.

Figure: Coefficients on hemoglobin by weeks since demonetization for adults

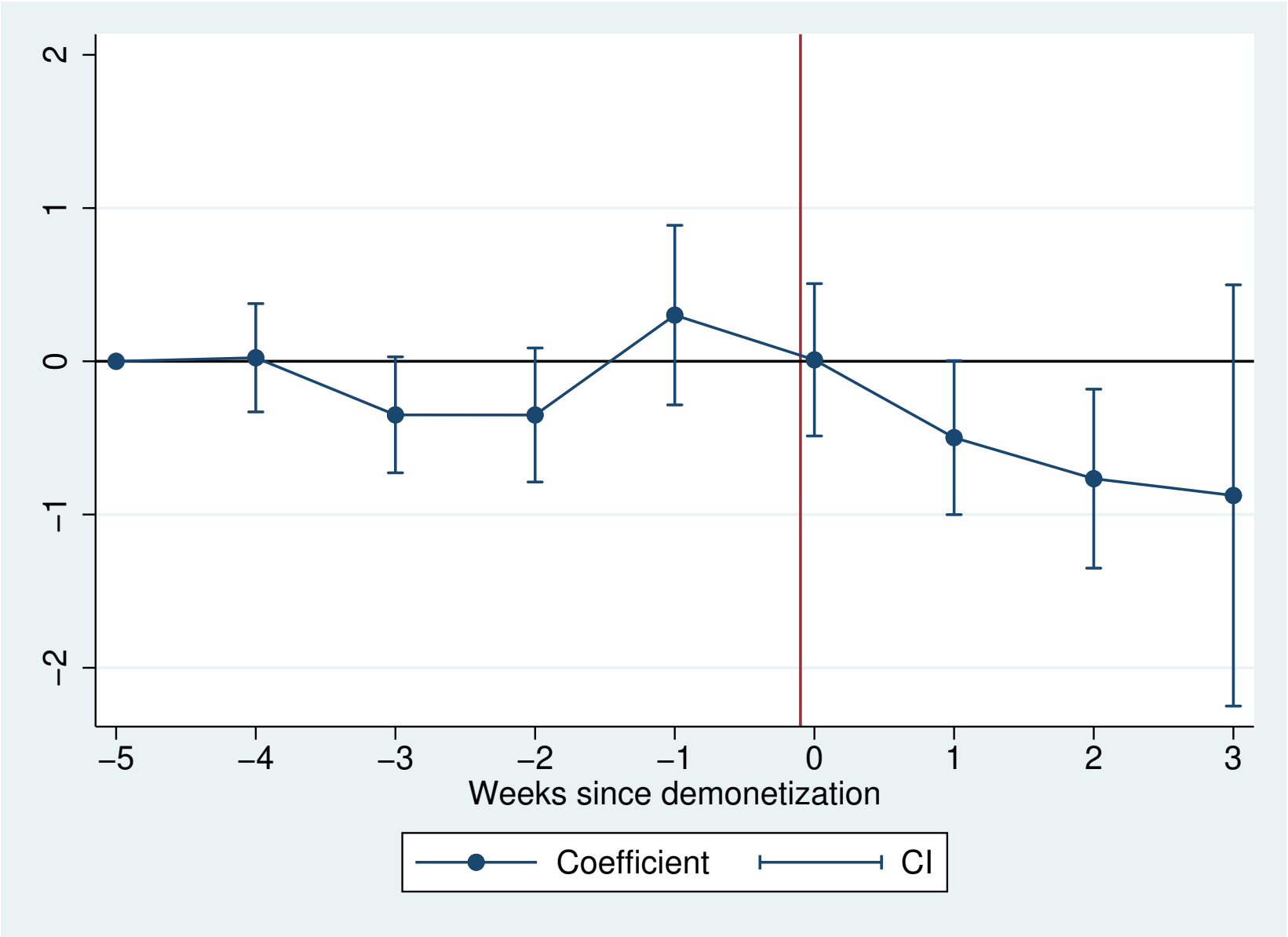


Figure: Coefficients on BMI by weeks since demonetization for adults

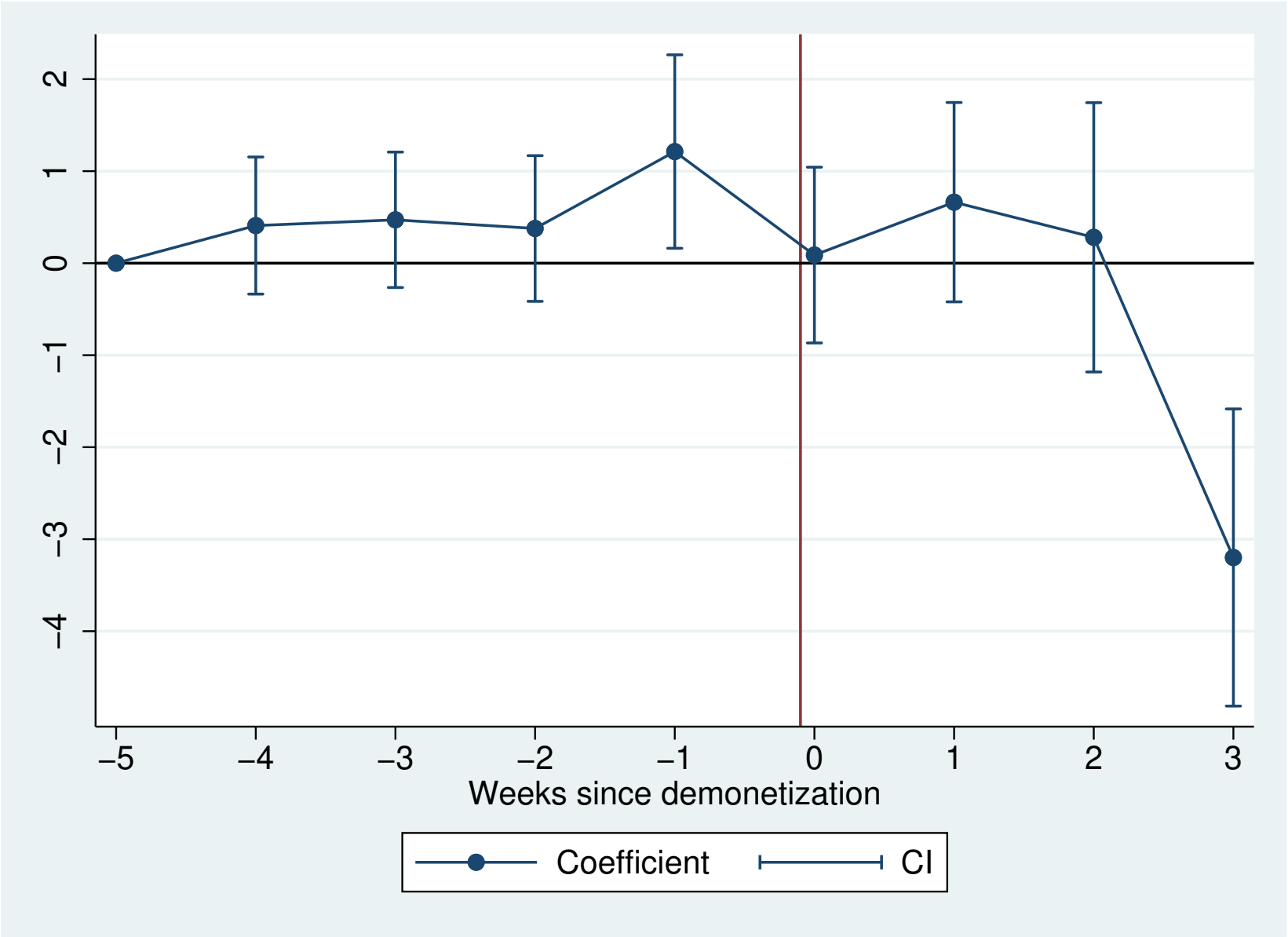


Figure: Coefficients on hemoglobin by weeks since demonetization for children aged 6-59 months

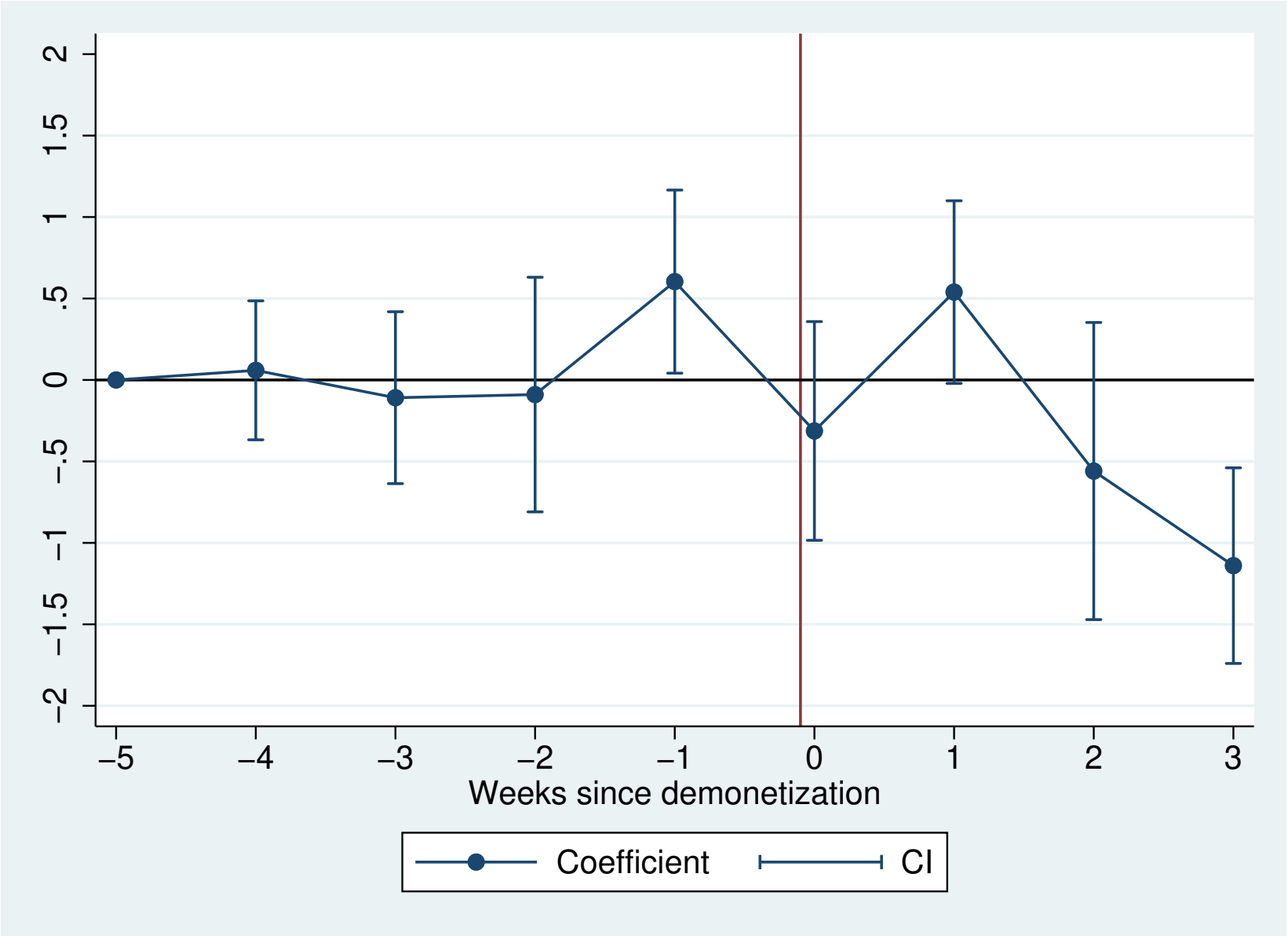


Figure: Coefficients on weight-for-height by weeks since demonetization for children aged 6-59 months

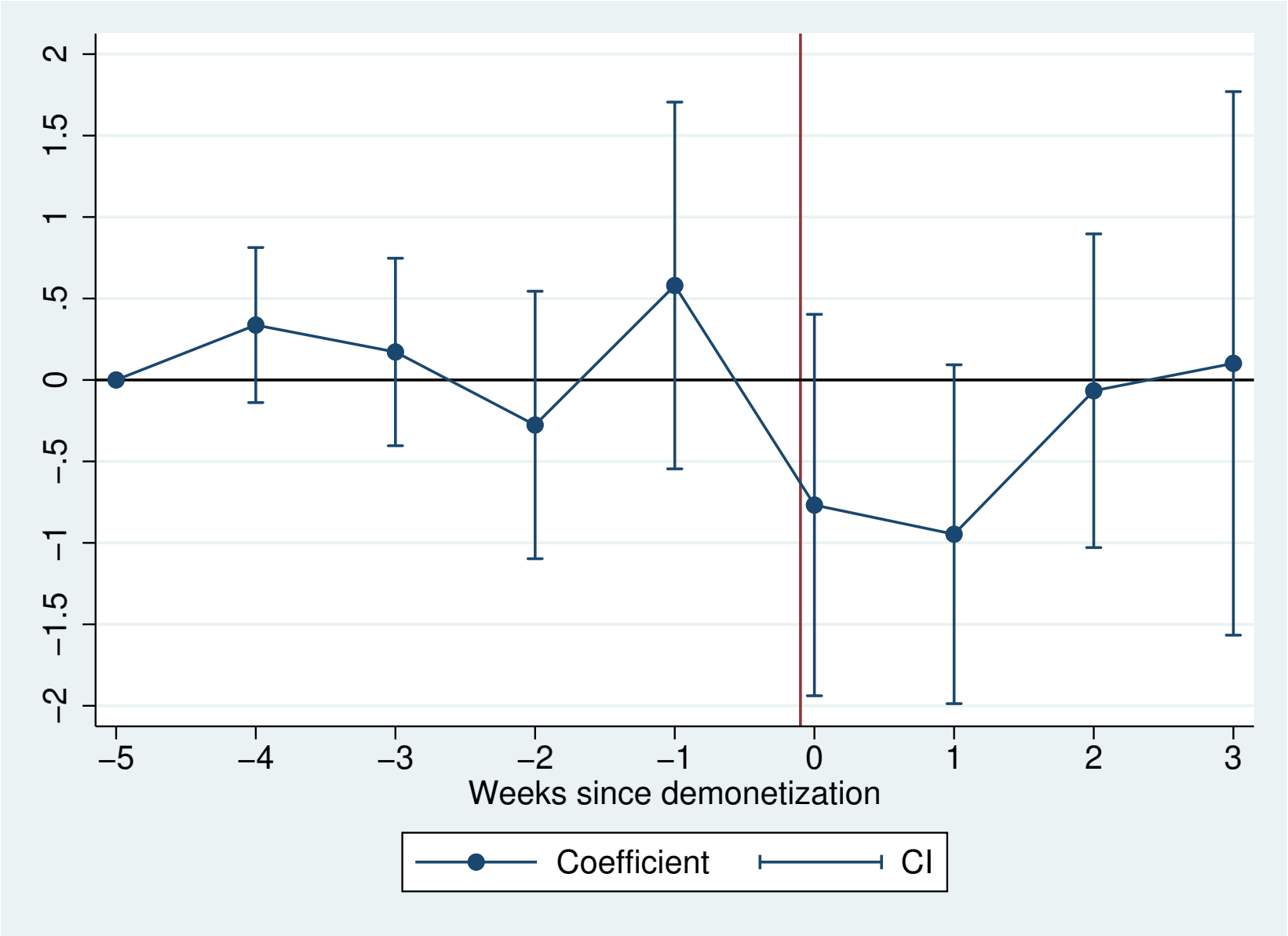


Figure: Coefficients on height-for-age by weeks since demonetization for children aged 6-59 months

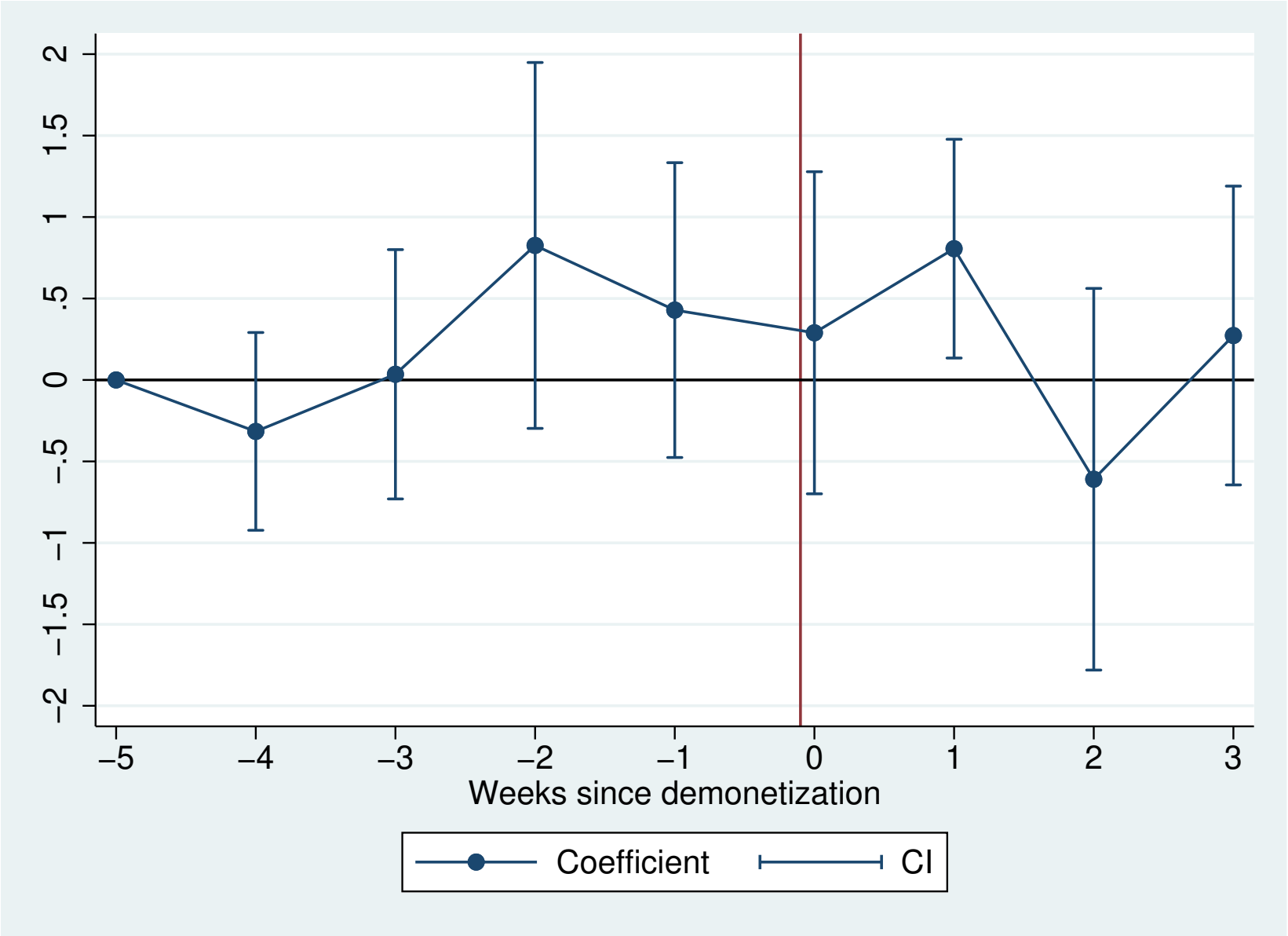


Figure: Coefficients on height-for-age by weeks since demonetization for children aged 12-59 months

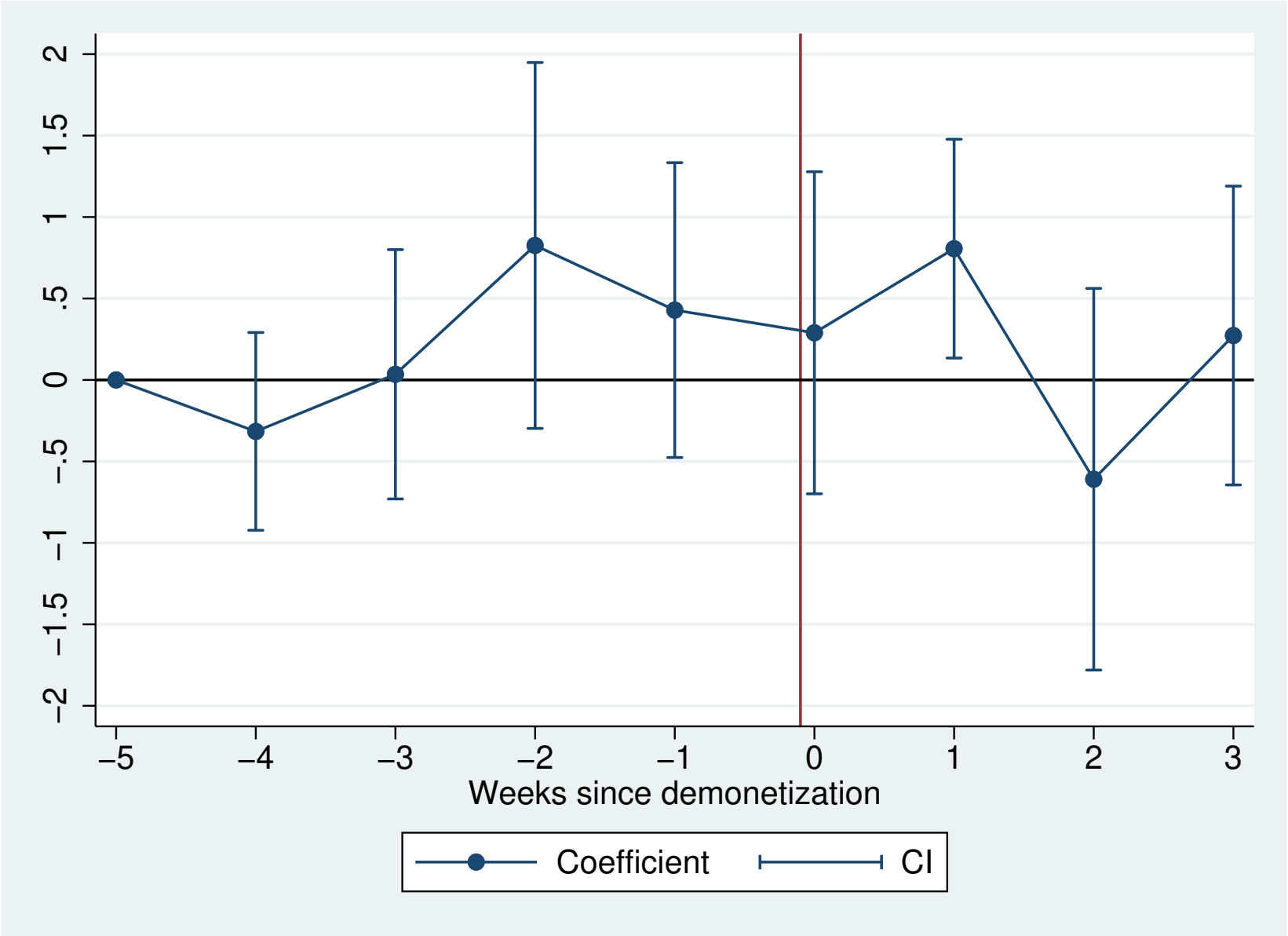
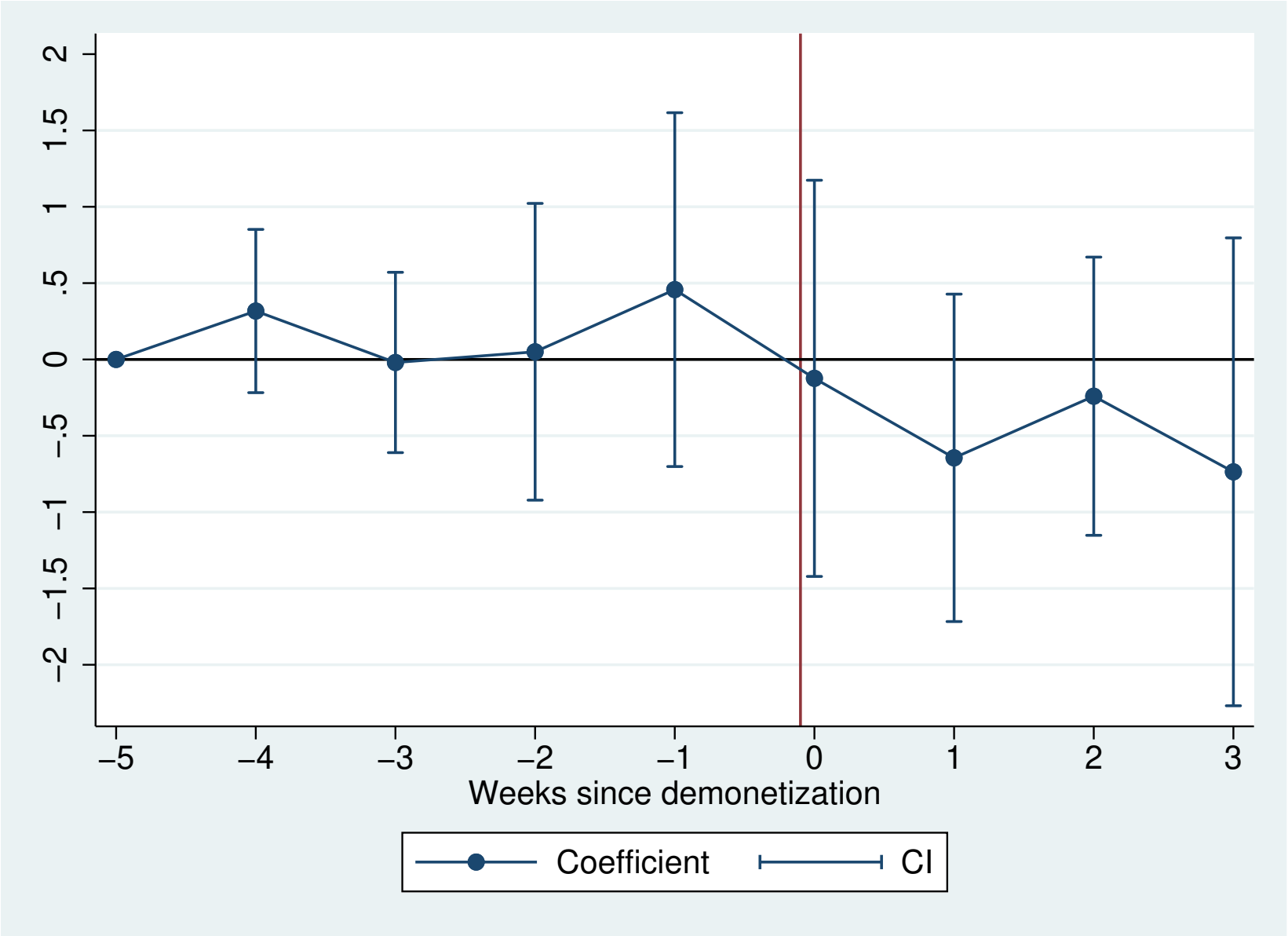


Figure: Coefficients on weight-for-height by weeks since demonetization for children aged 12-59 months



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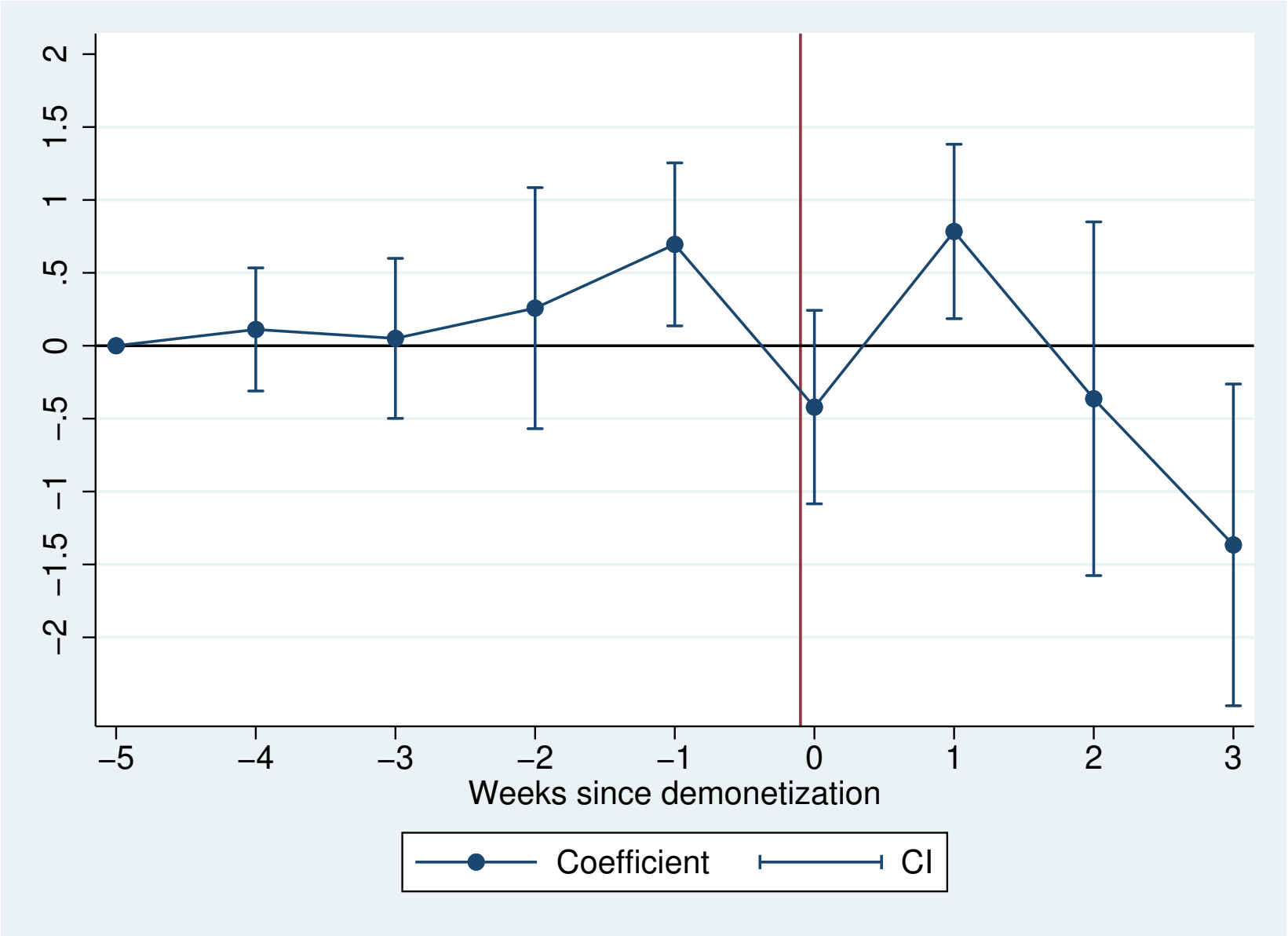

Figure: Frequency of consumption of pulses by gender pre-demonetization: Adult sample

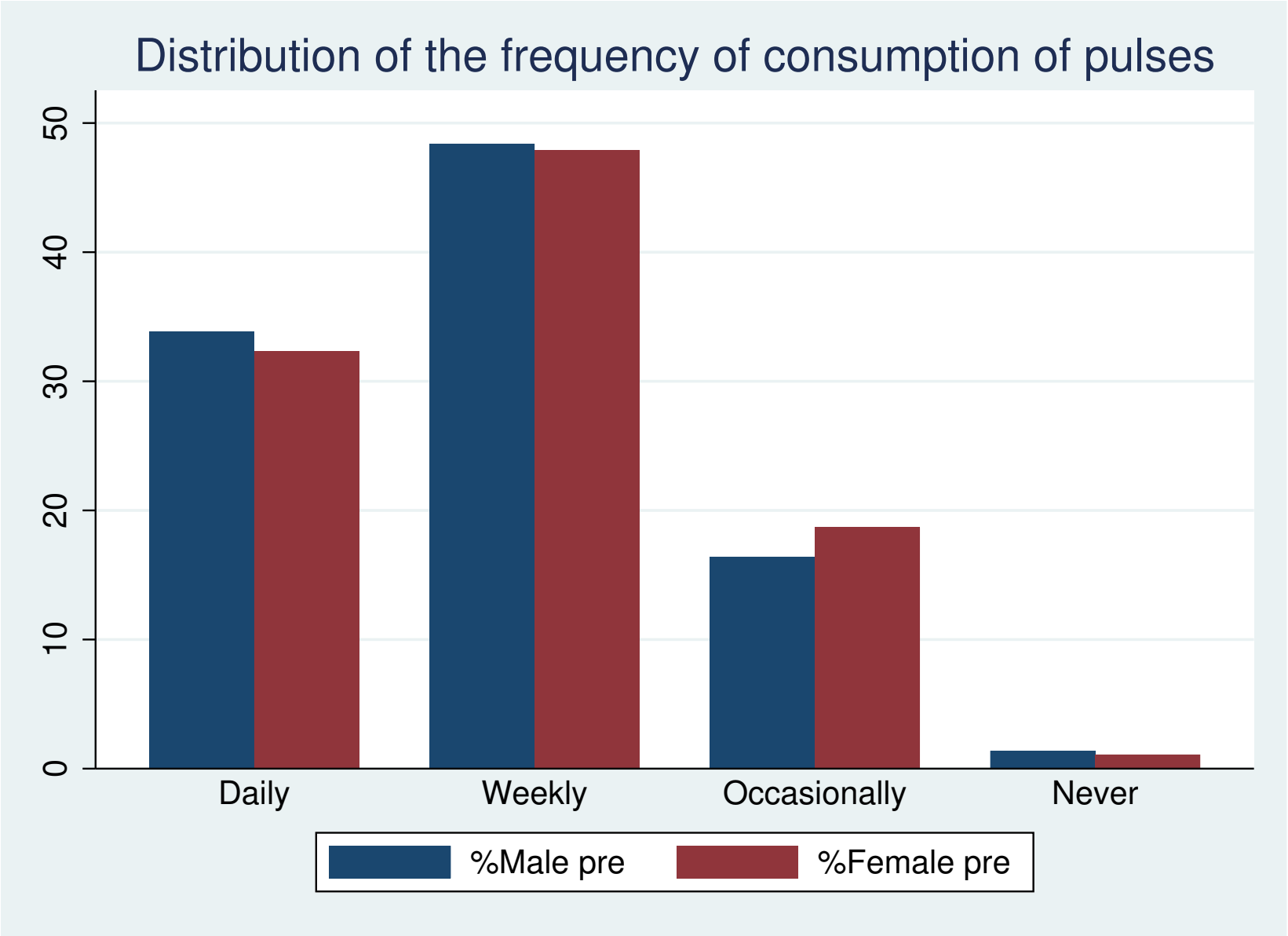

Figure: Frequency of consumption of dark green leafy vegetables by gender pre-demonetization: Adult sample

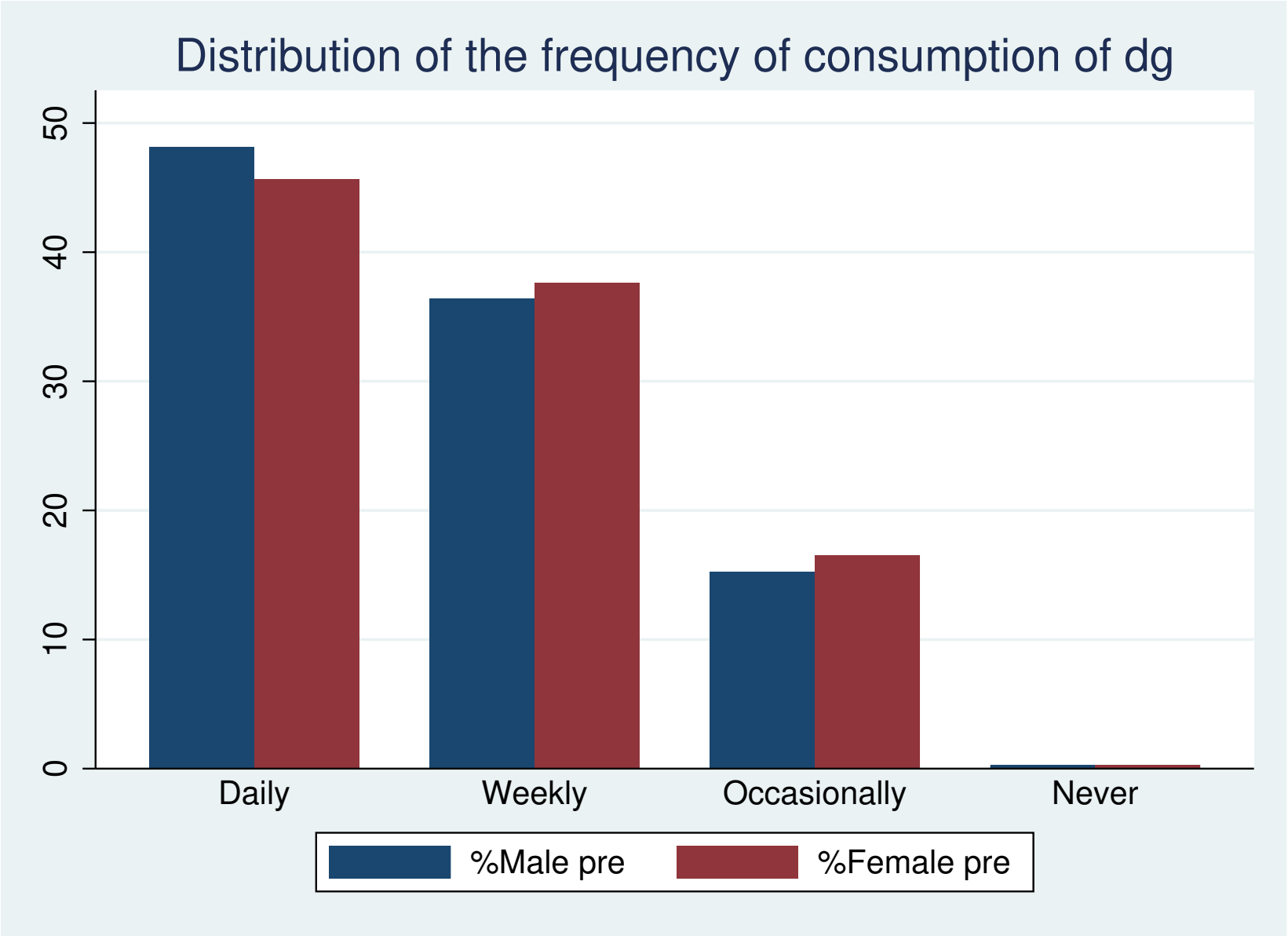

Figure: Frequency of consumption of milk or curd by gender pre-demonetization: Adult sample

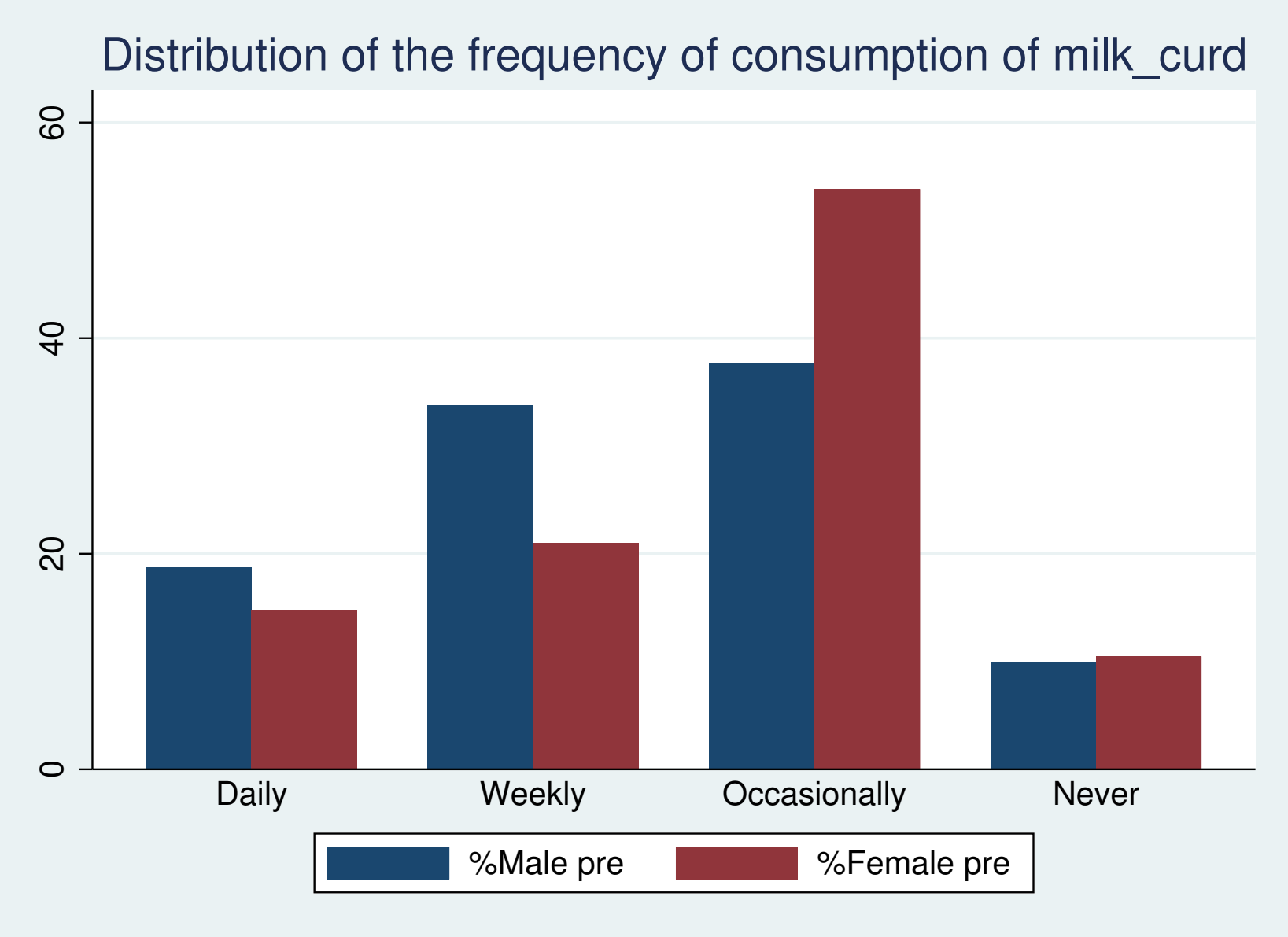

Figure: Frequency of consumption of fruits by gender pre-demonetization: Adult sample

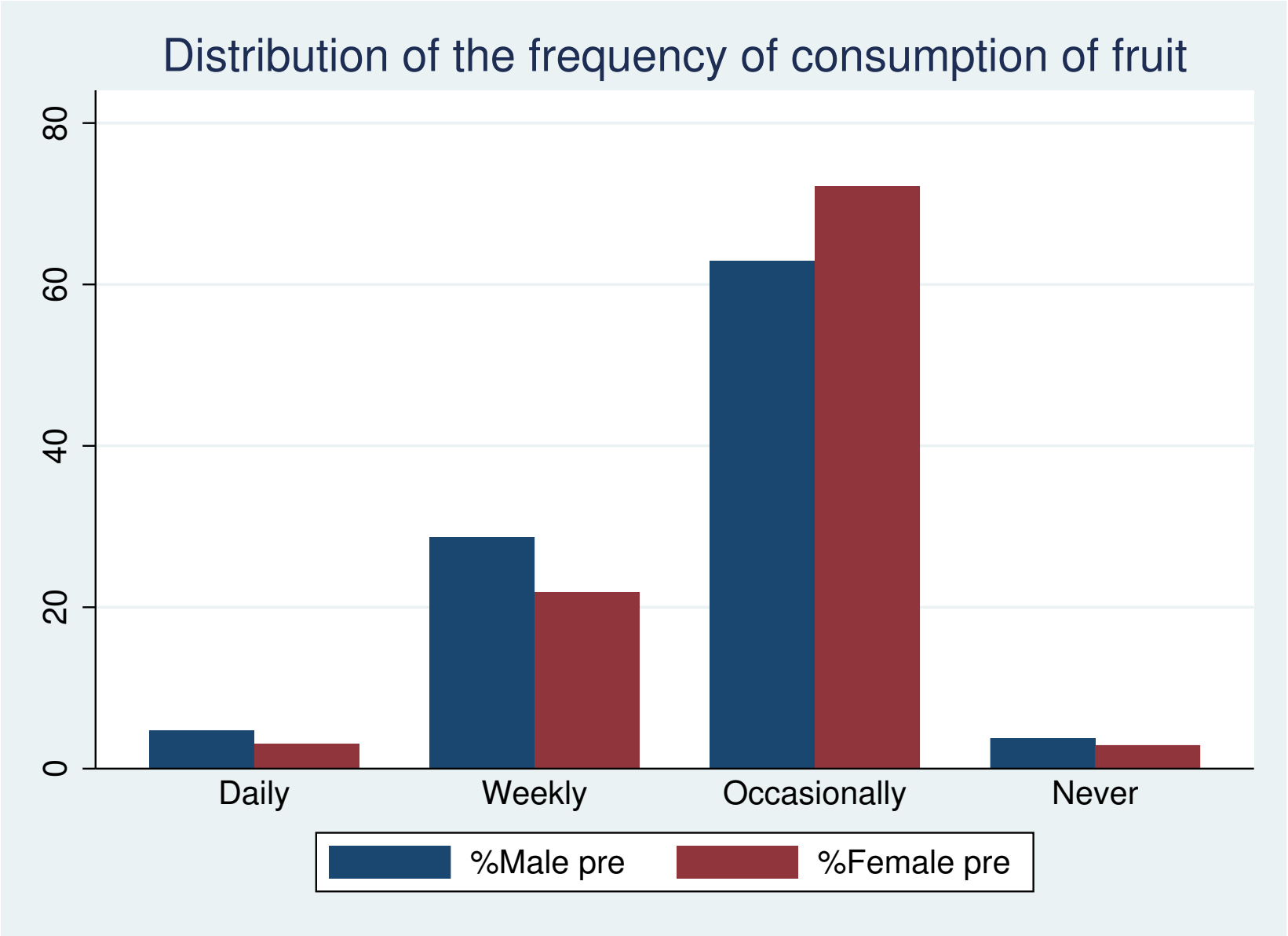

Figure: Frequency of consumption of fish by gender pre-demonetization: Adult sample

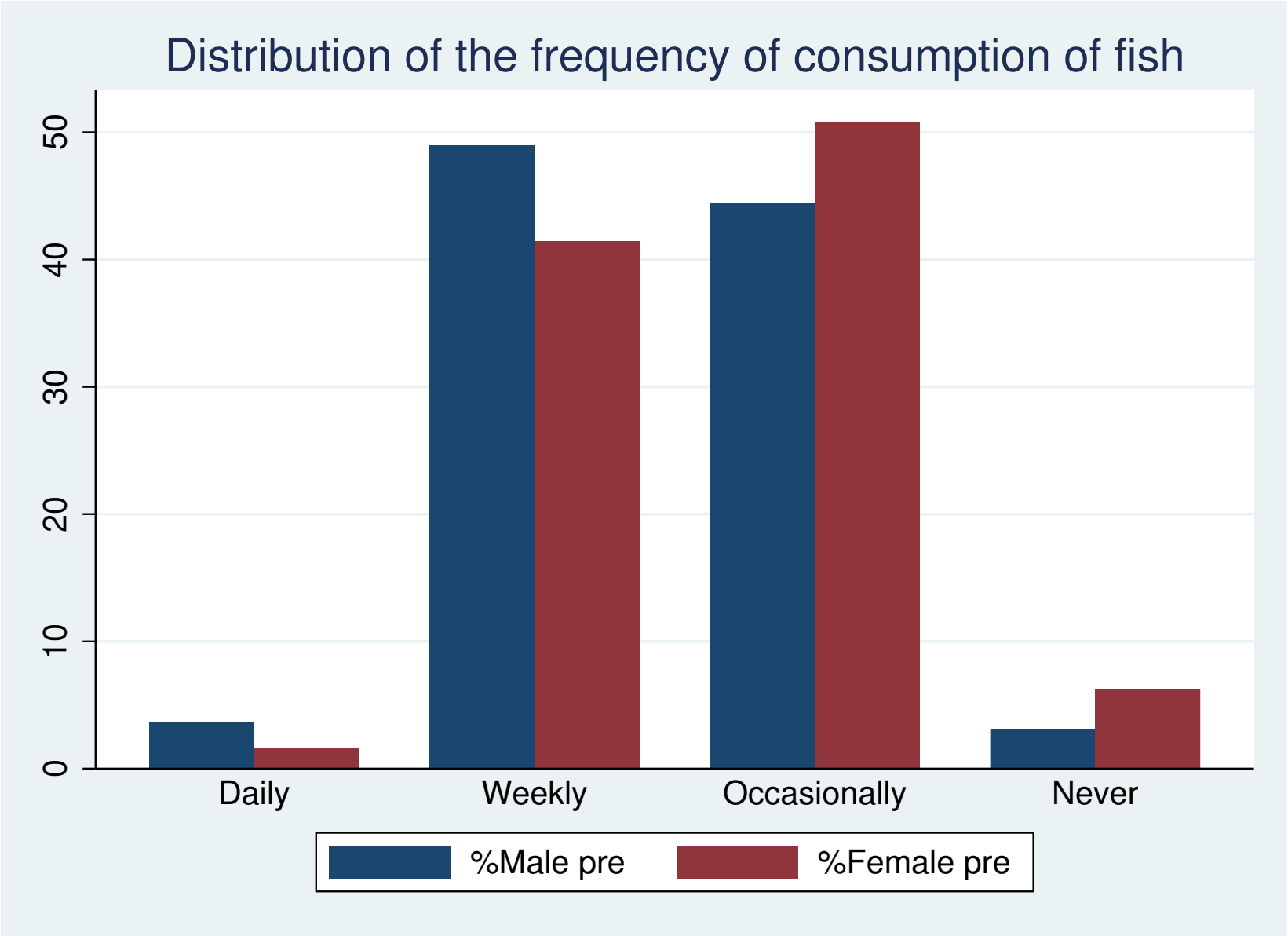

Figure: Frequency of consumption of meat by gender before and after demonetization: Adult sample

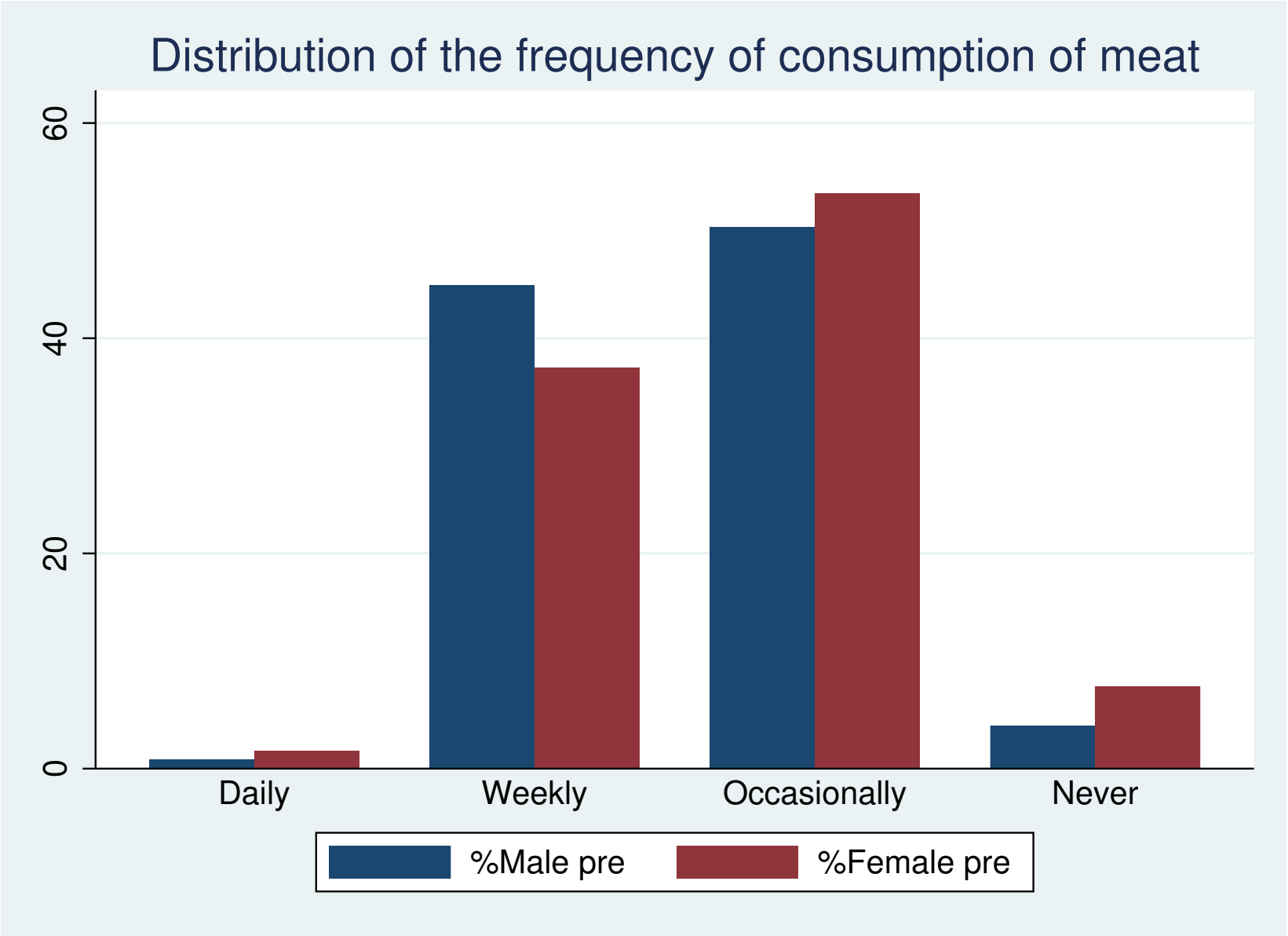

Figure: Frequency of consumption of fried foods by gender before and after demonetization: Adult sample

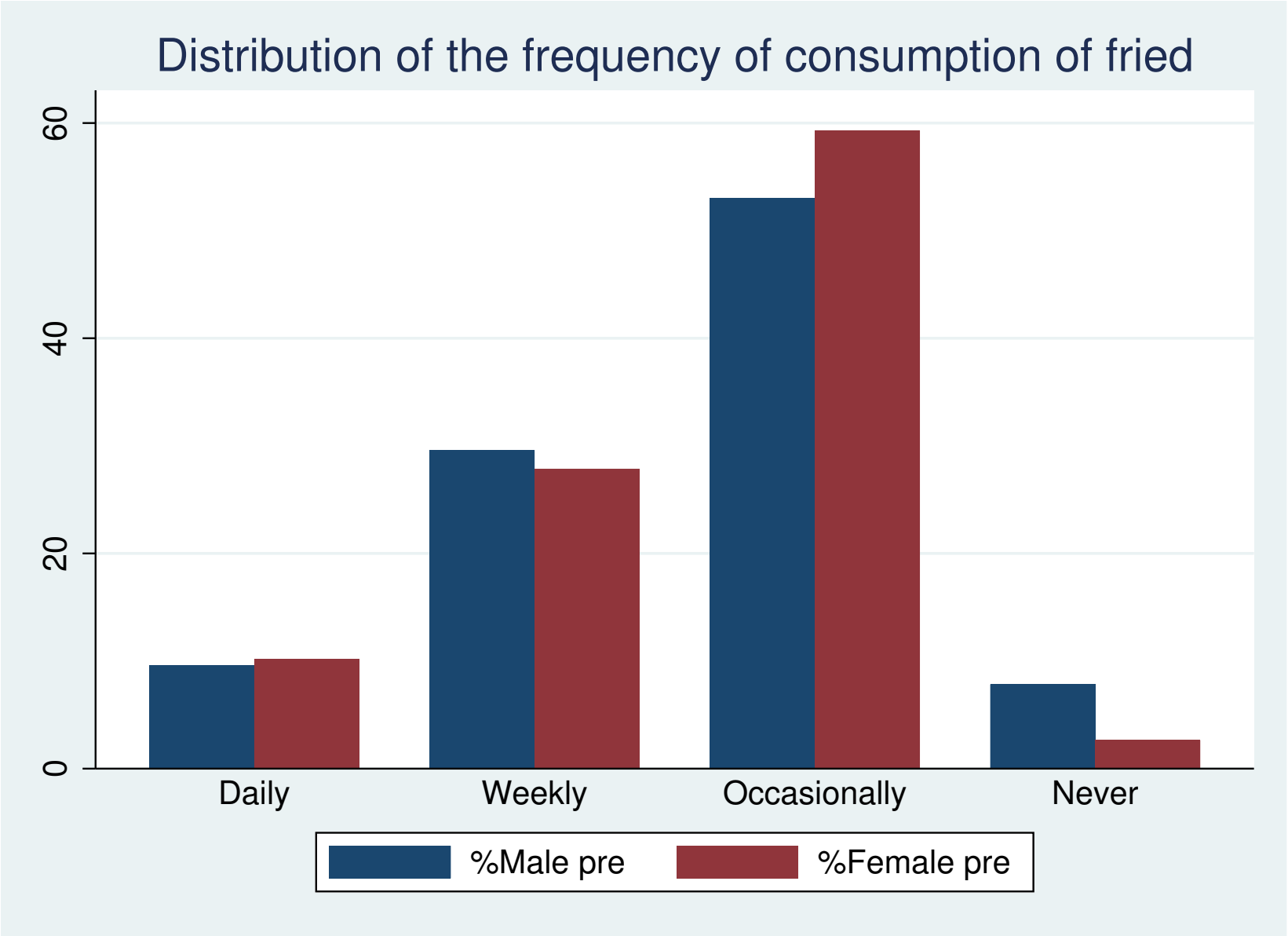

Figure: Frequency of consumption of eggs by gender before demonetization: Adult sample

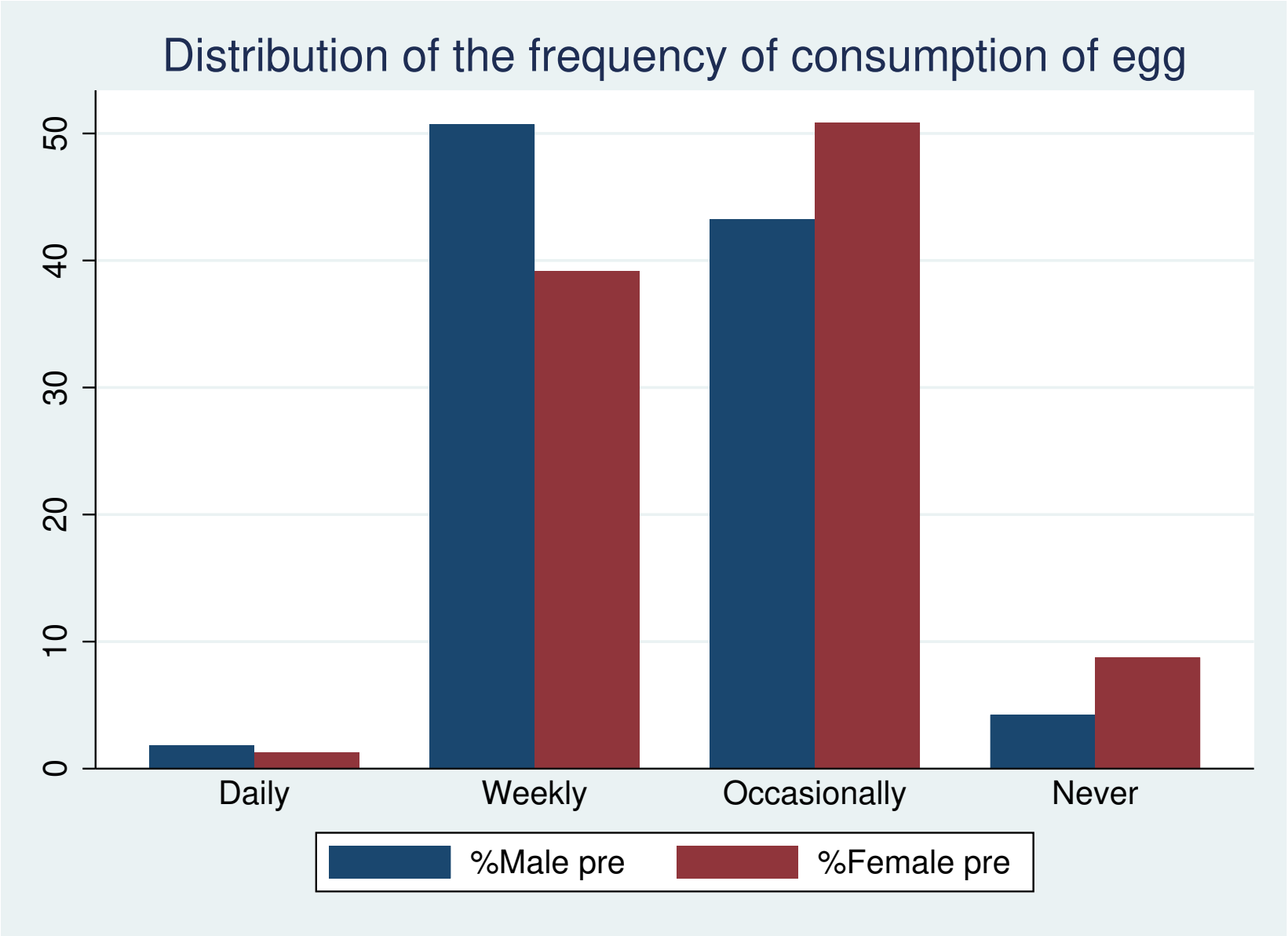

Figure: Frequency of consumption of aerated drinks by gender before demonetization: Adult sample

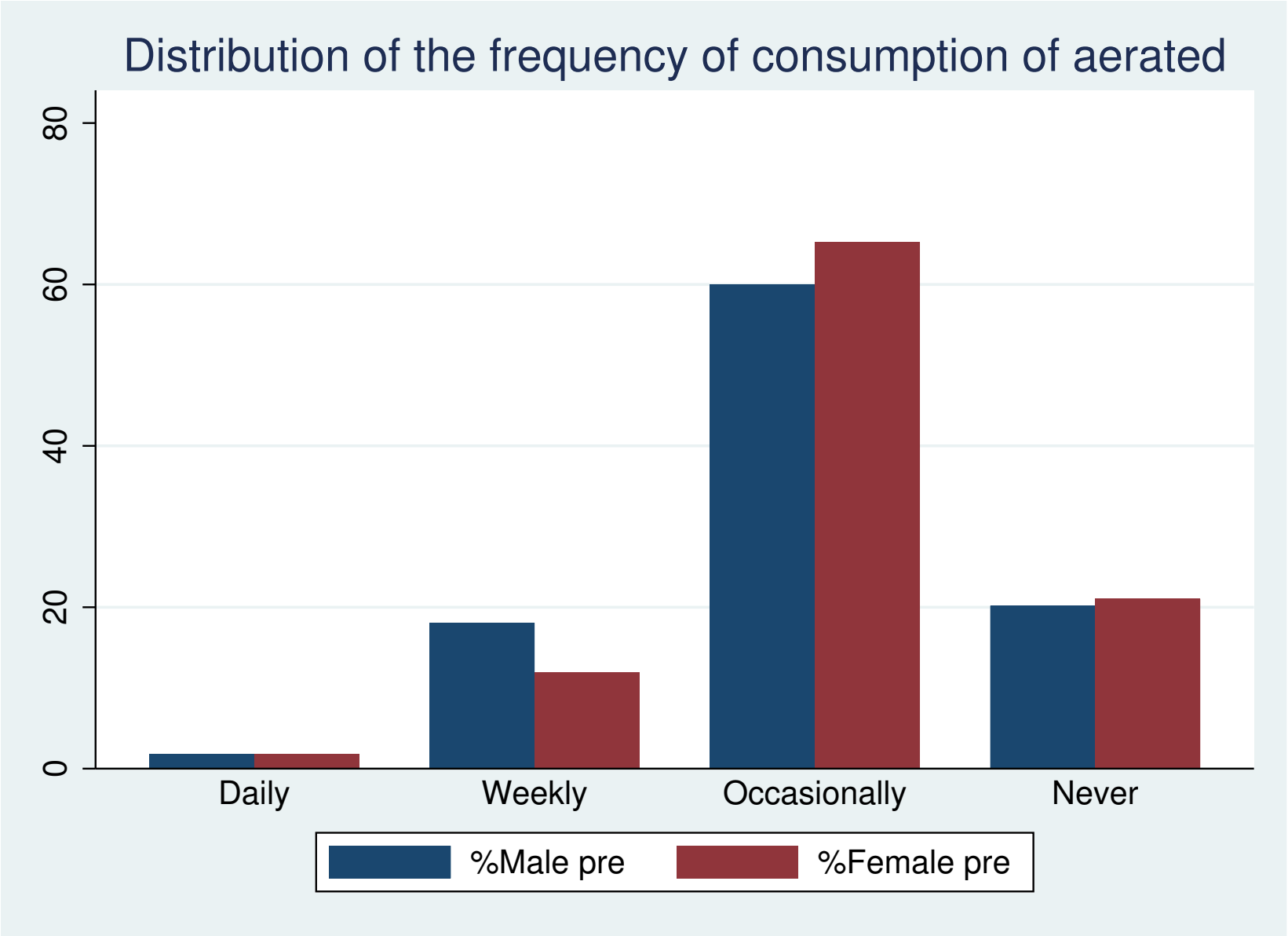

Figure: Frequency of consumption of pulses by gender before and after demonetization: Adult sample

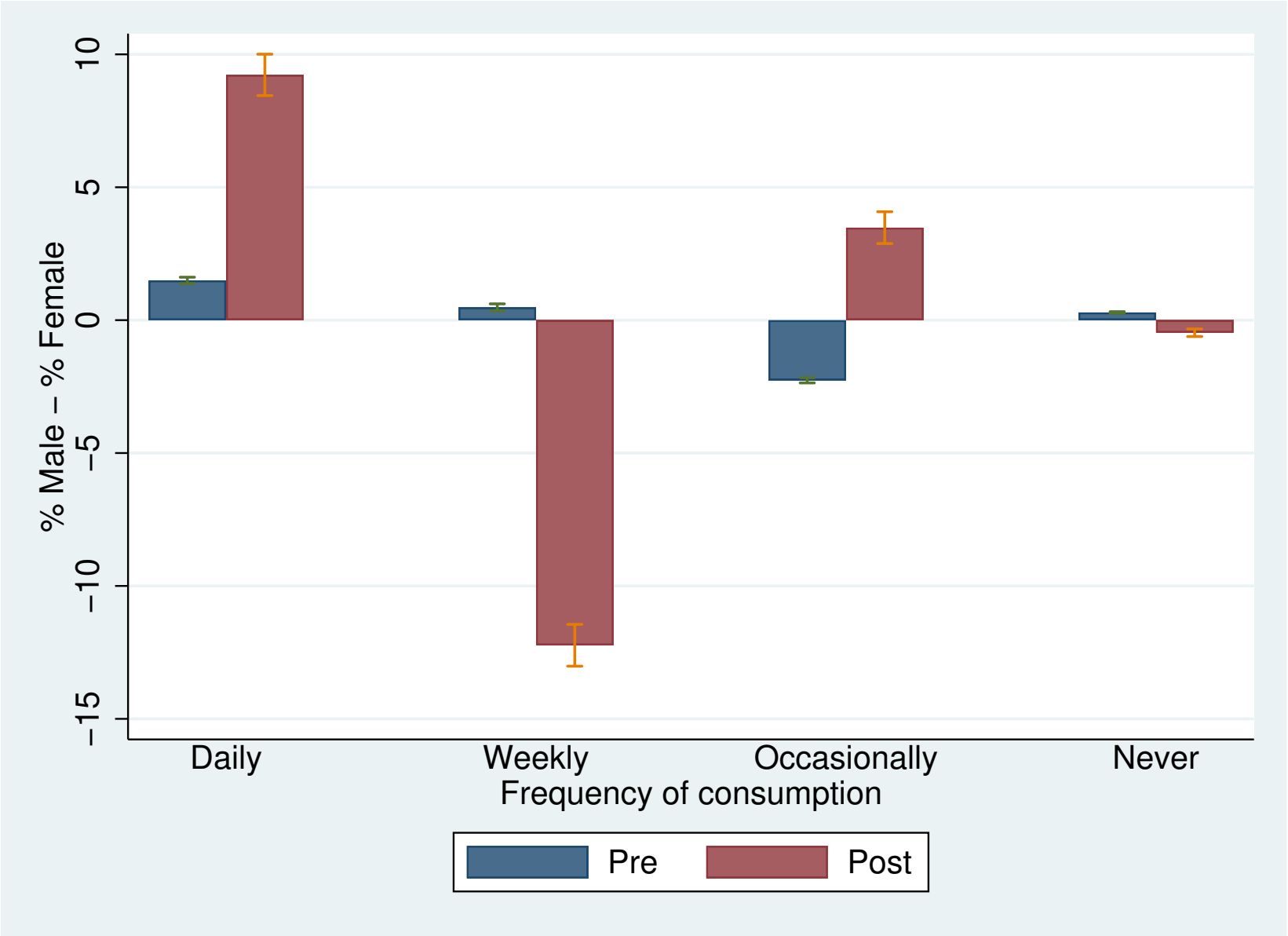

Figure: Frequency of consumption of dark green leafy vegetables by gender before and after demonetization: Adult sample

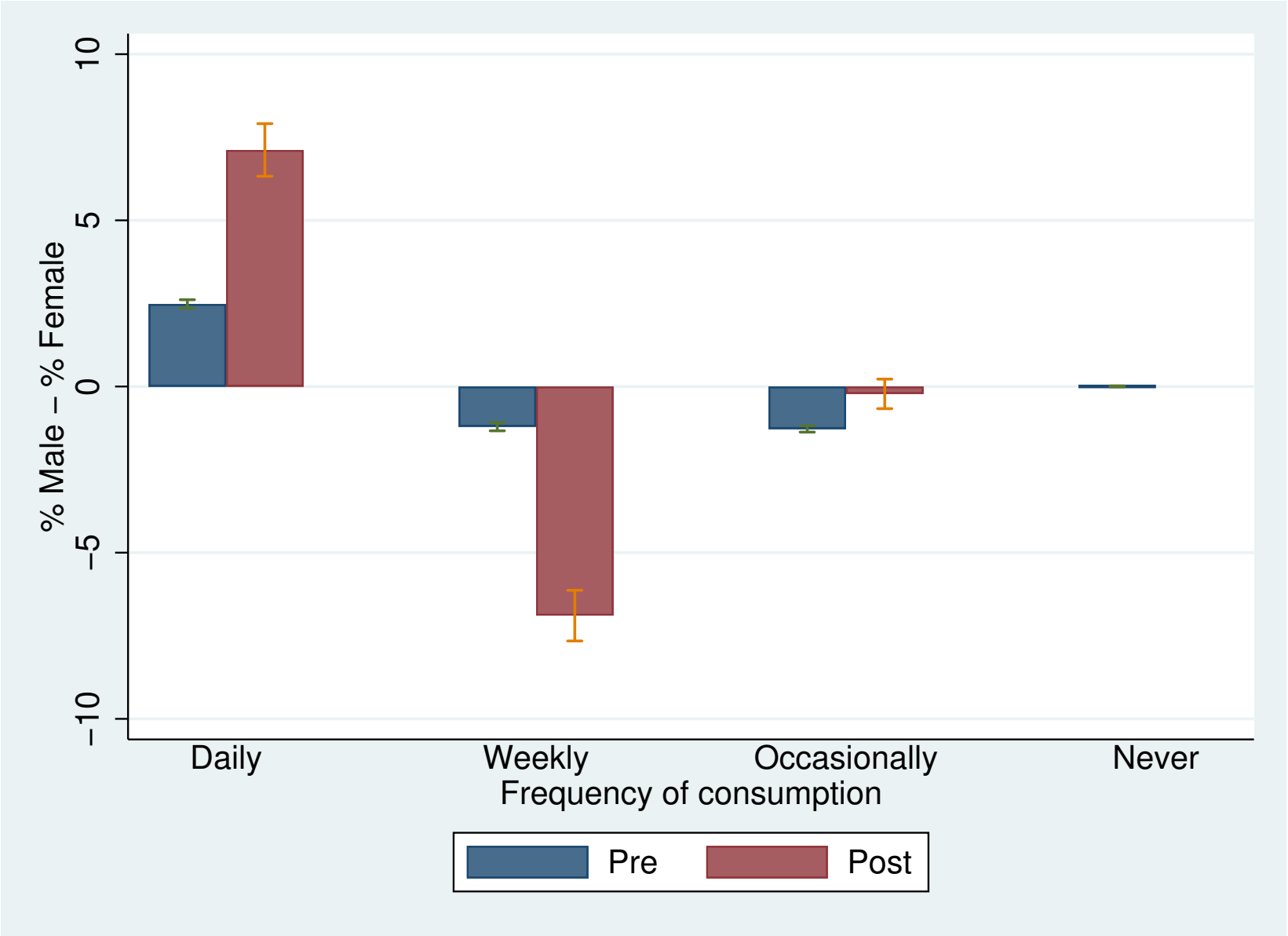

Figure: Frequency of consumption of milk or curd by gender before and after demonetization: Adult sample

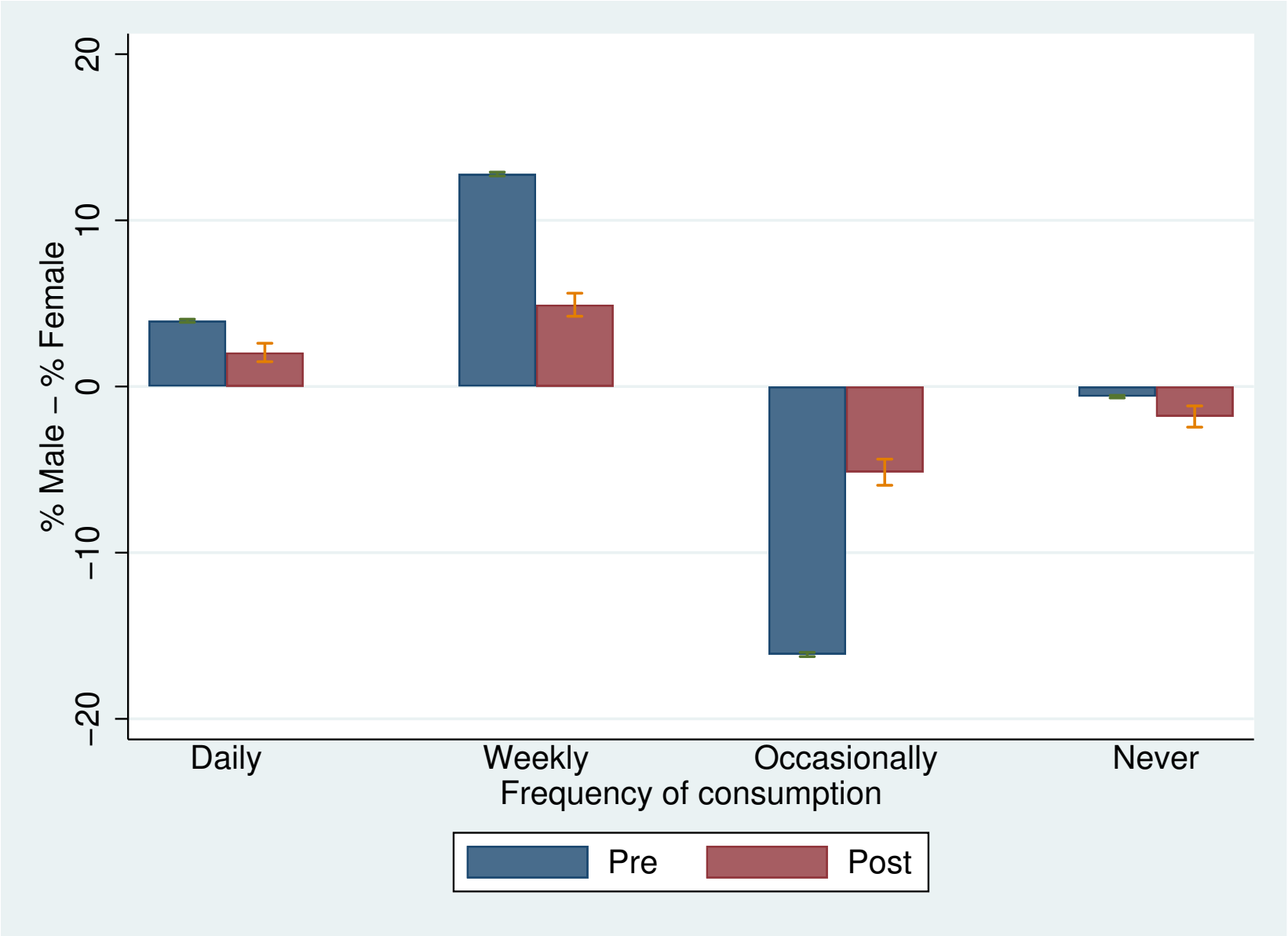

Figure: Frequency of consumption of fruits by gender before and after demonetization: Adult sample

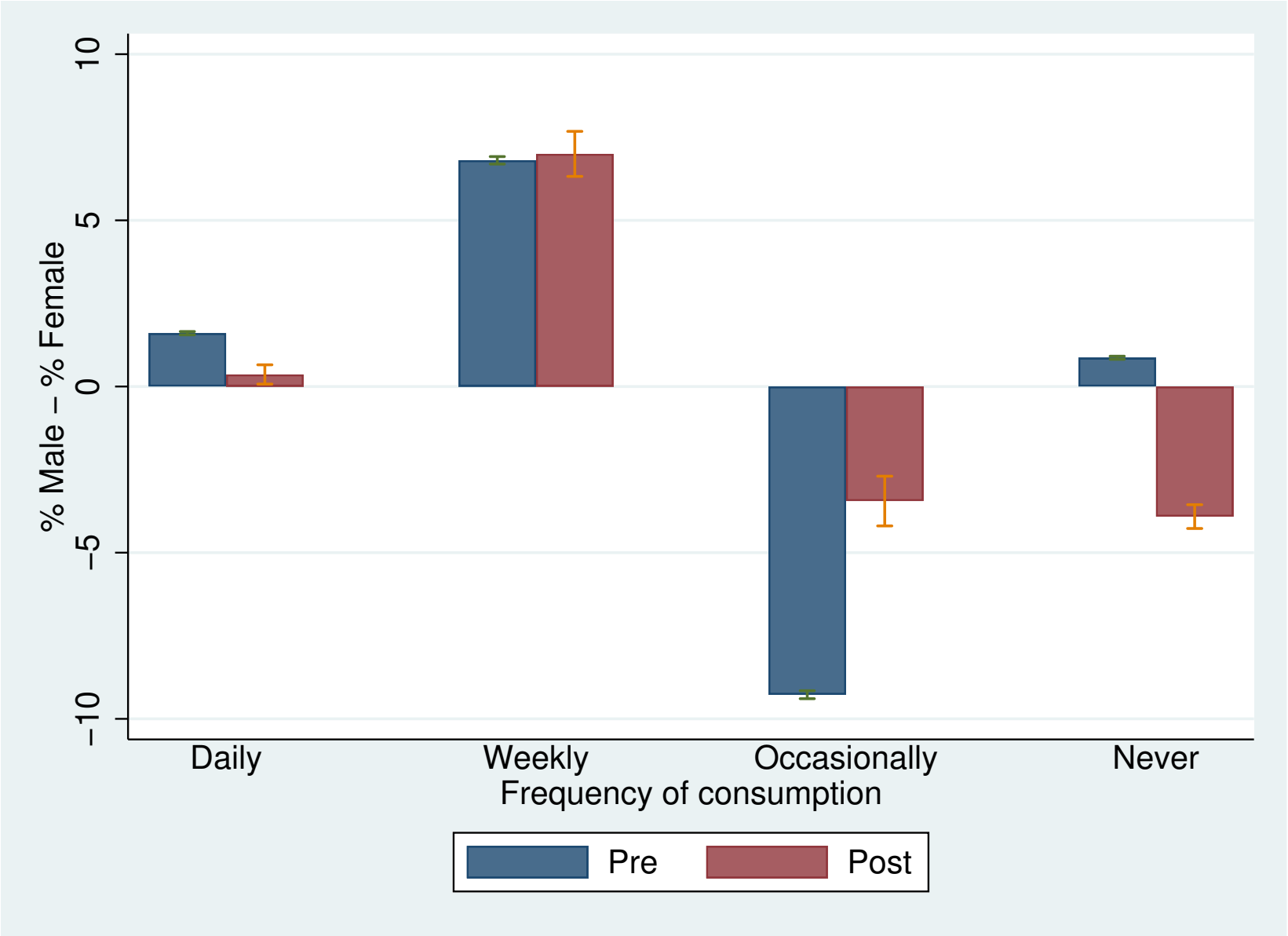

Figure: Frequency of consumption of fish by gender before and after demonetization: Adult sample

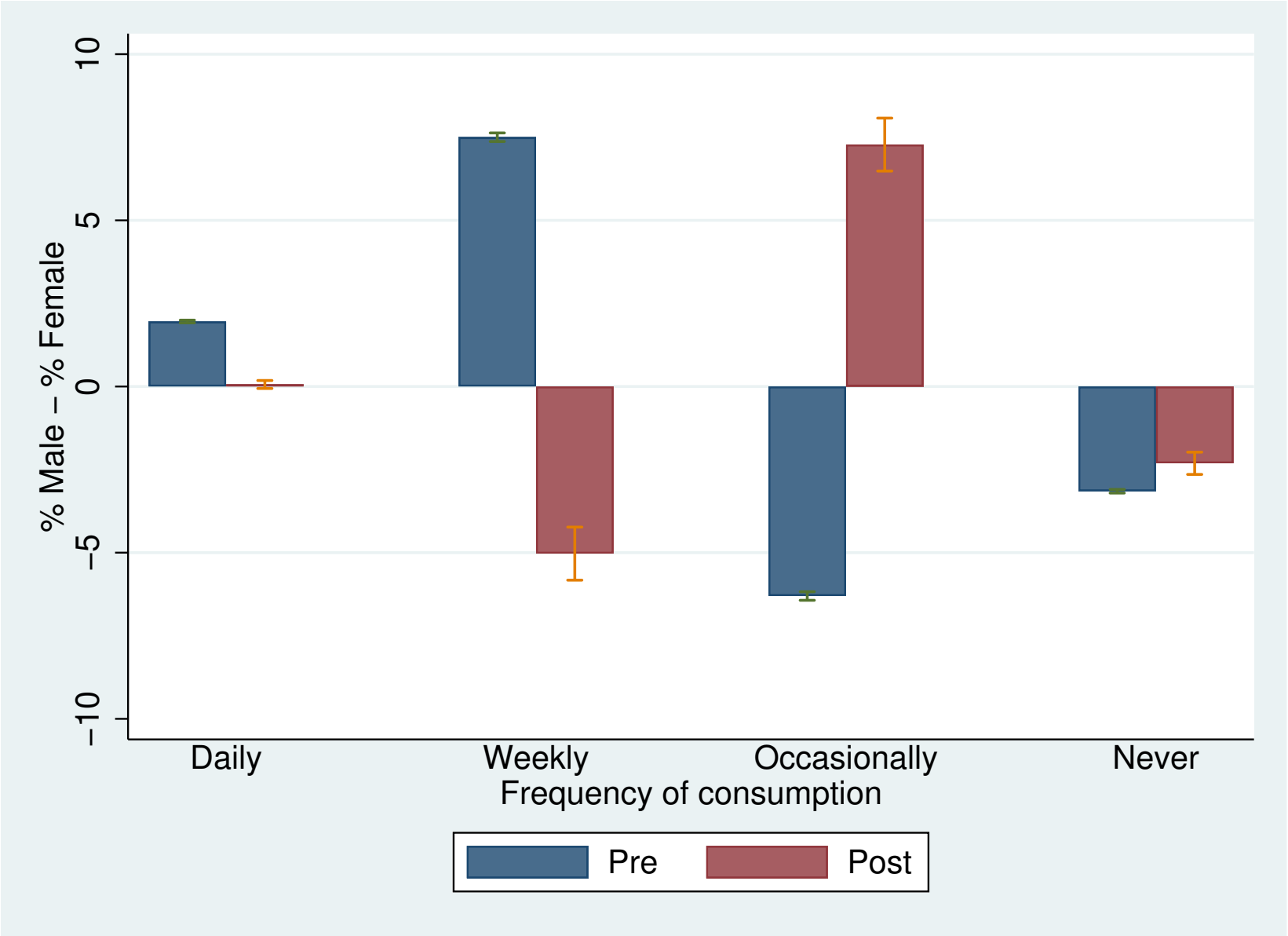

Figure: Frequency of consumption of meat by gender before and after demonetization: Adult sample

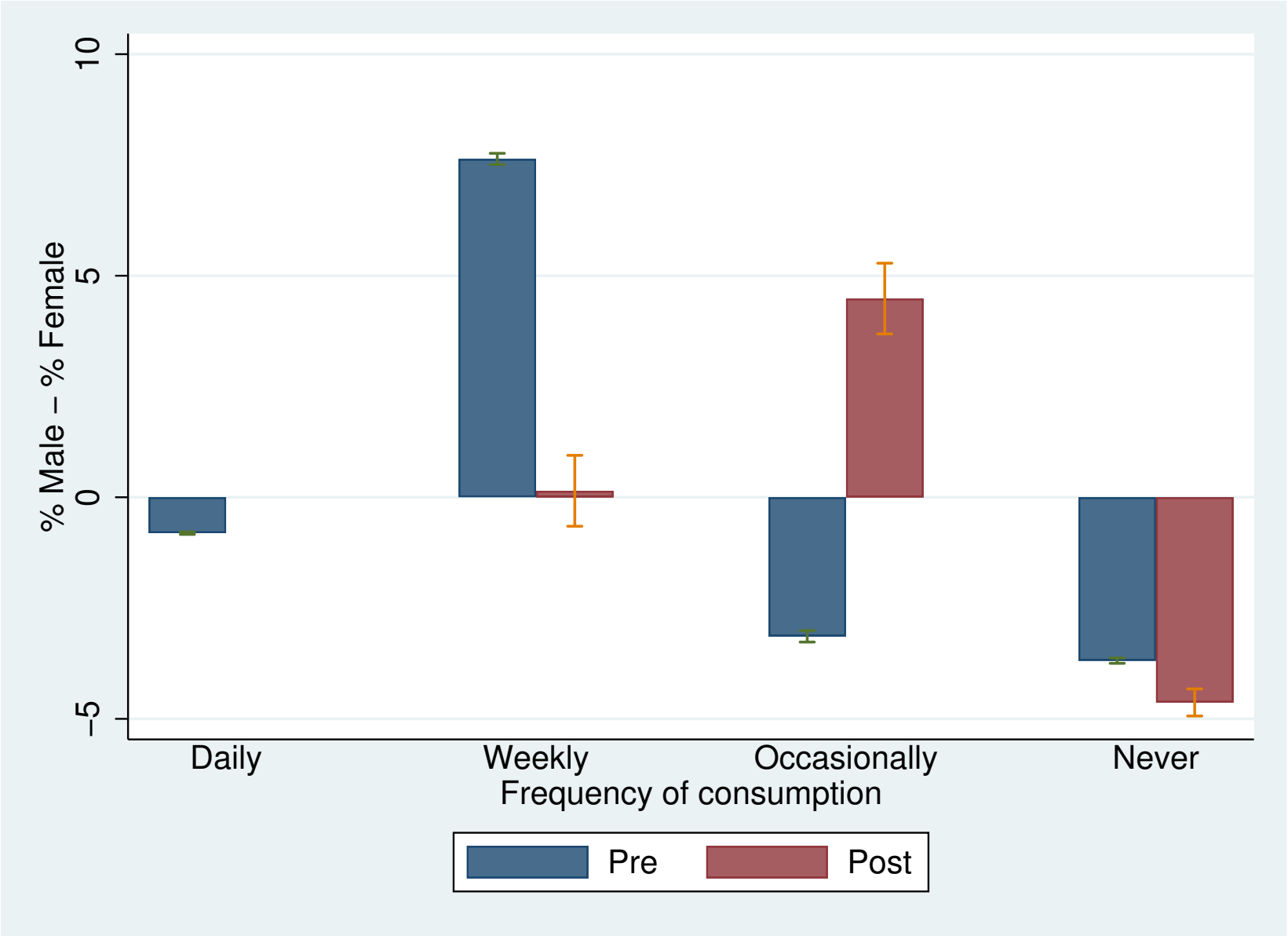

Figure: Frequency of consumption of fried foods by gender before and after demonetization: Adult sample

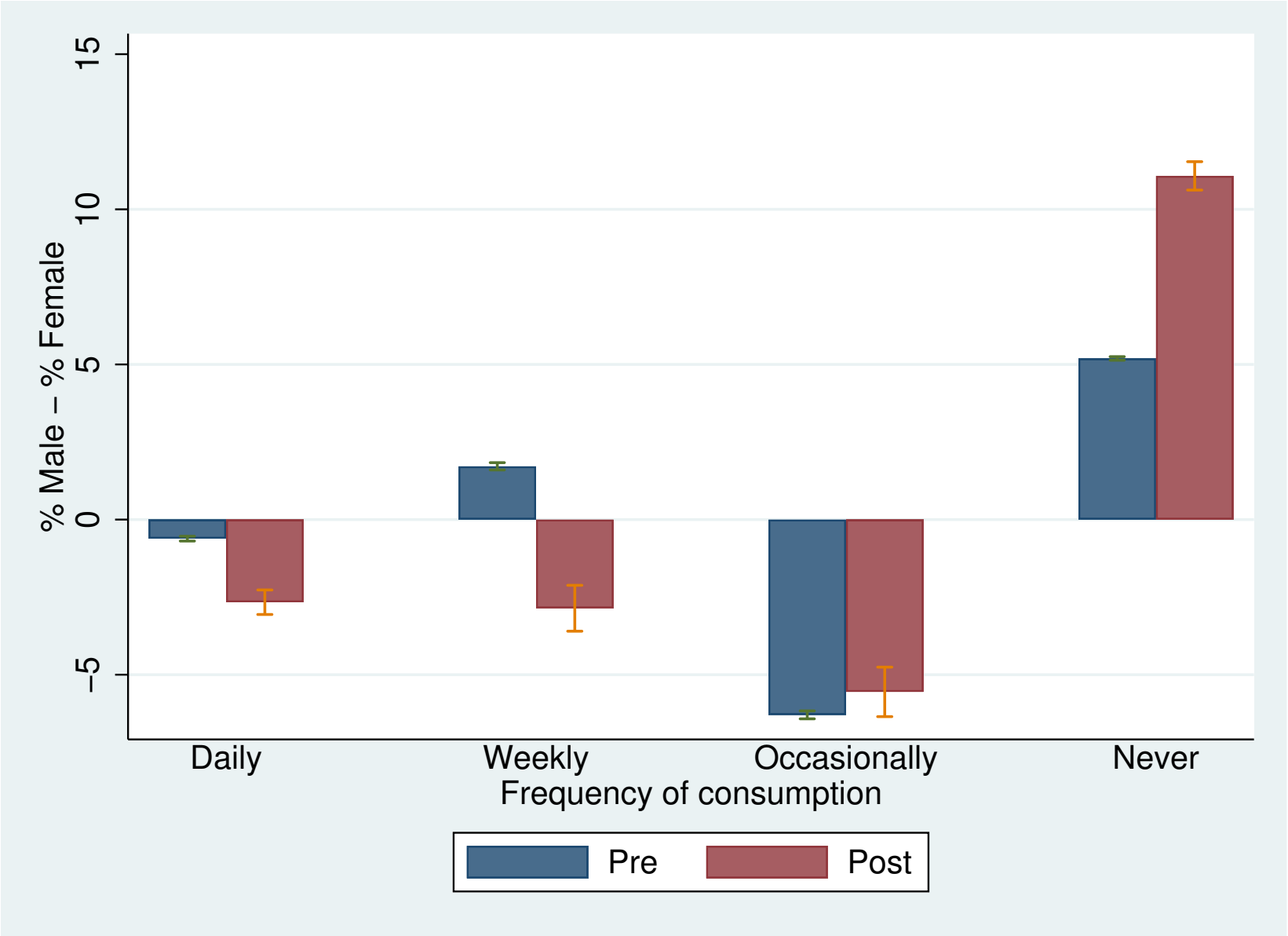

Figure: Frequency of consumption of eggs by gender before and after demonetization: Adult sample

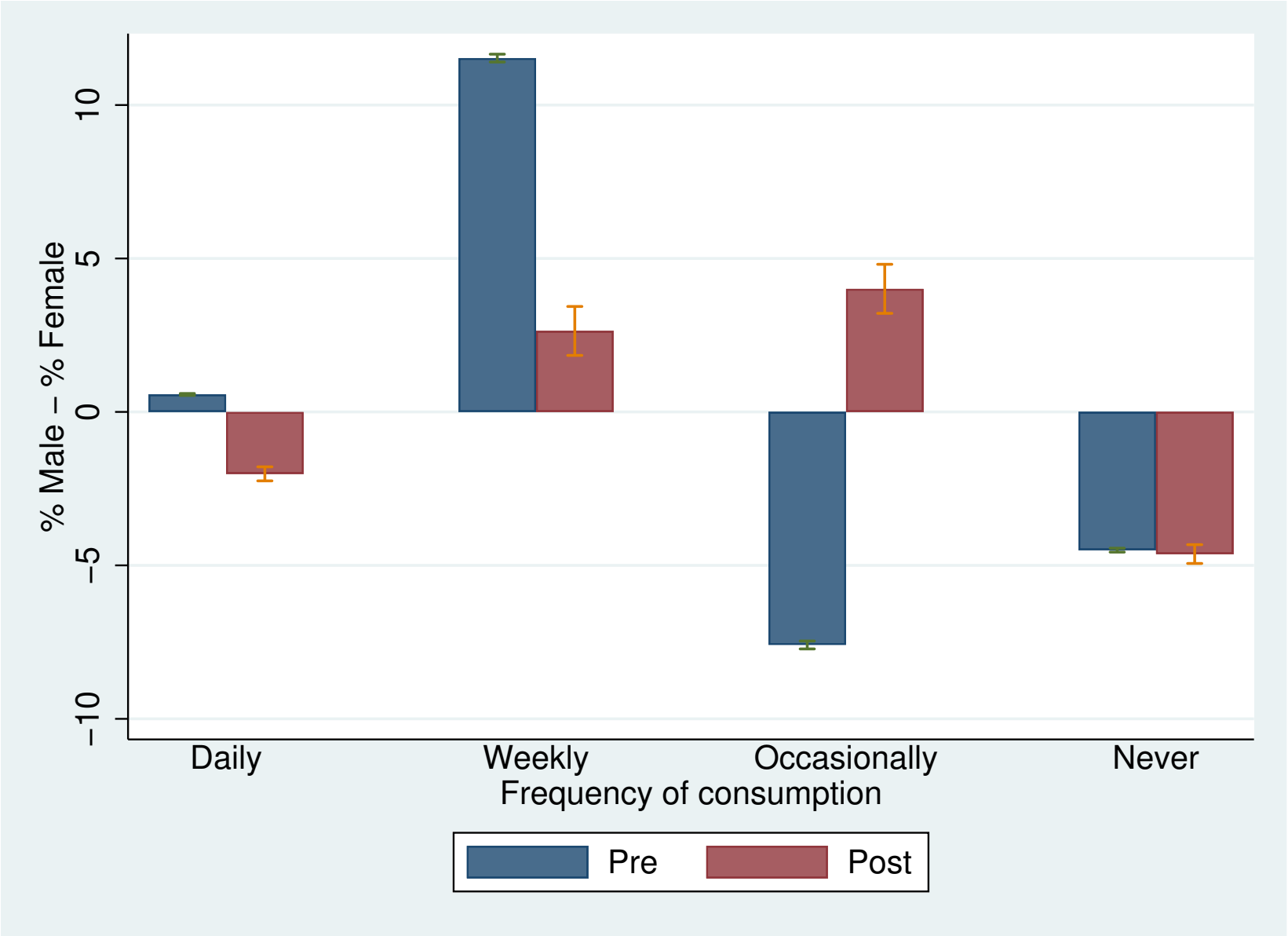

Figure: Frequency of consumption of aerated drinks by gender before and after demonetization: Adult sample

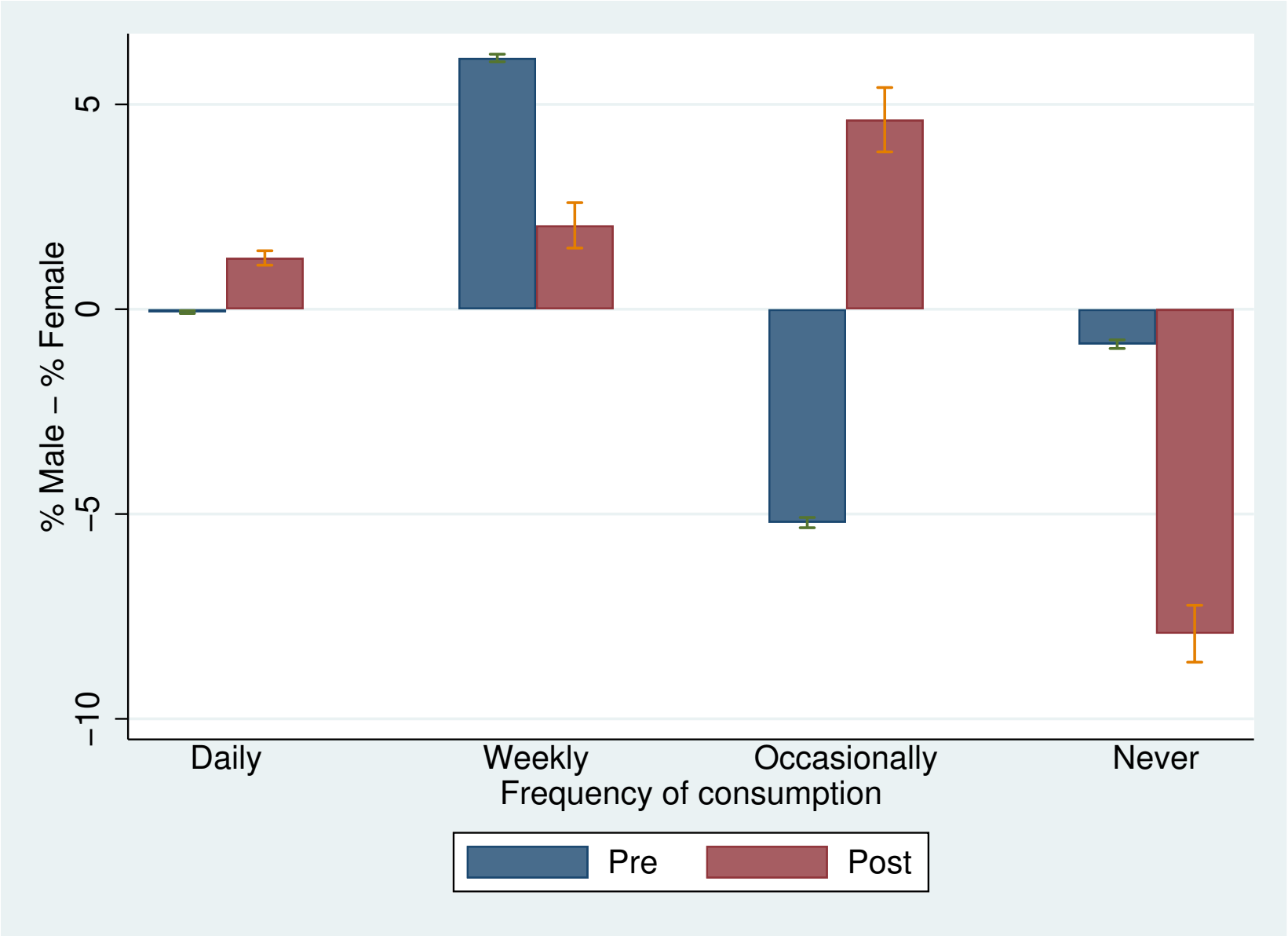

Figure: Male-female gap in the consumption of bread and grains amongst children before and after demonetization

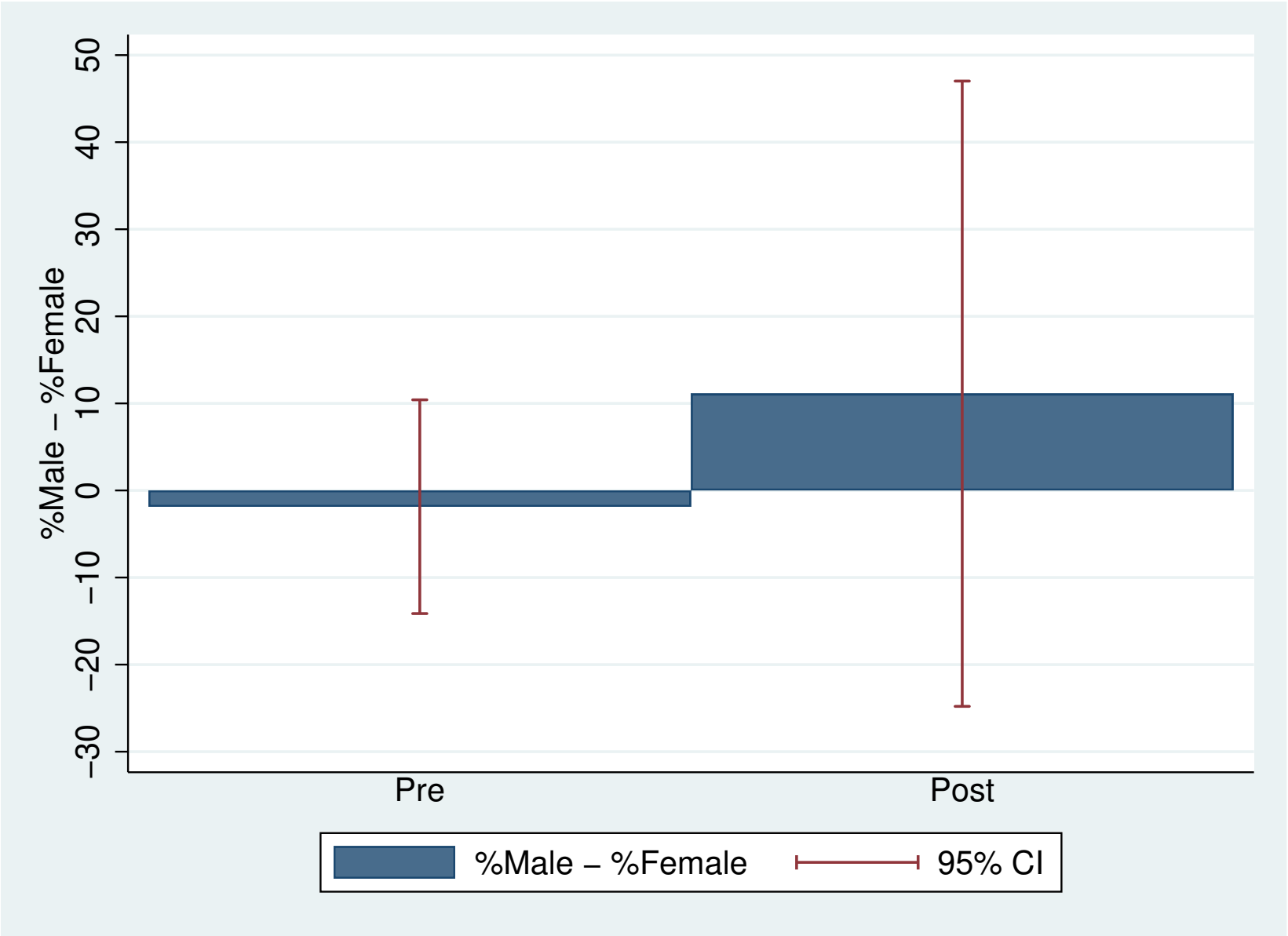

Figure: Male-female gap in the consumption of dark green leafy vegetables amongst children before and after demonetization

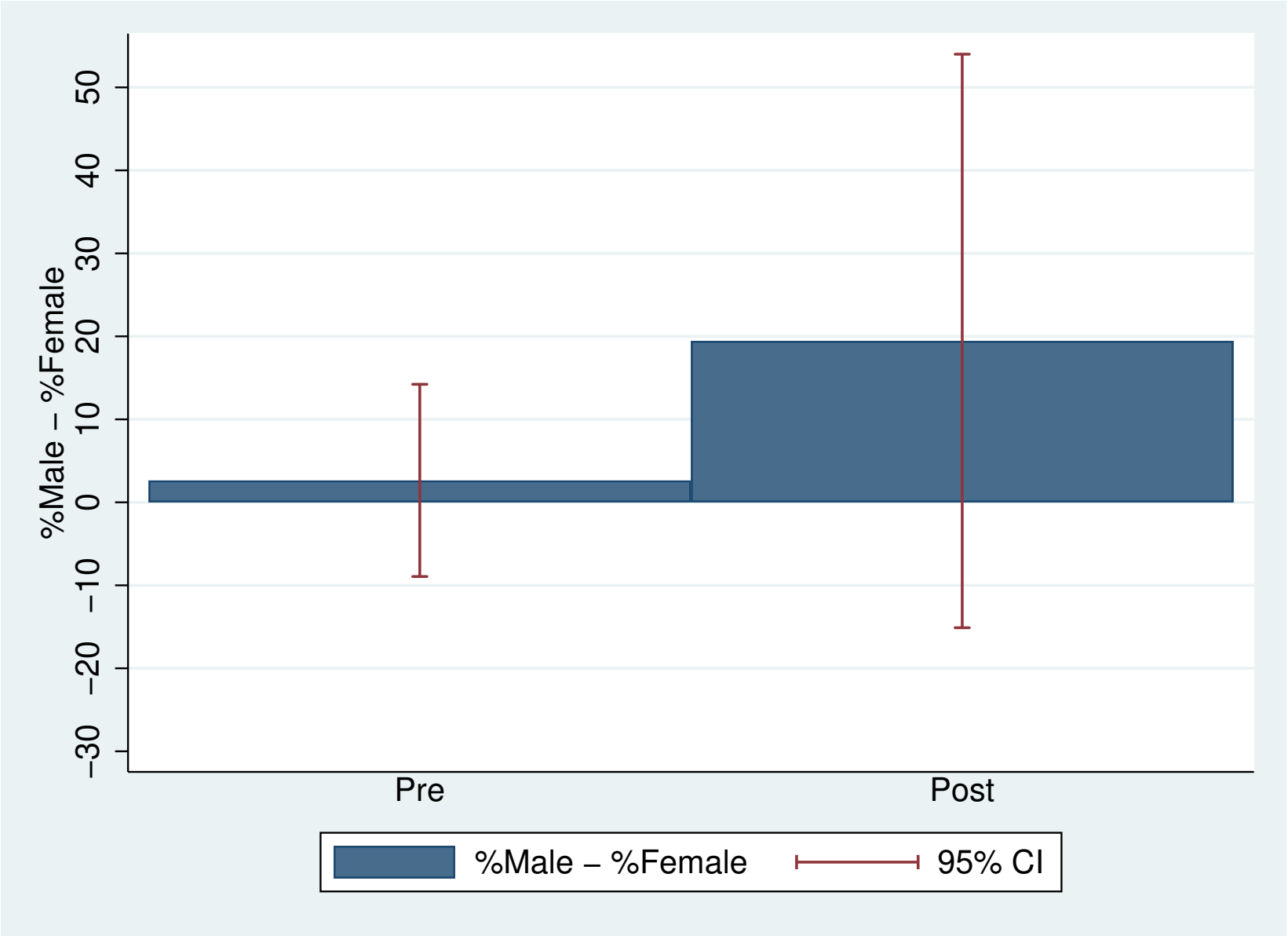

Figure: Male-female gap in the consumption of milk amongst children before and after demonetization

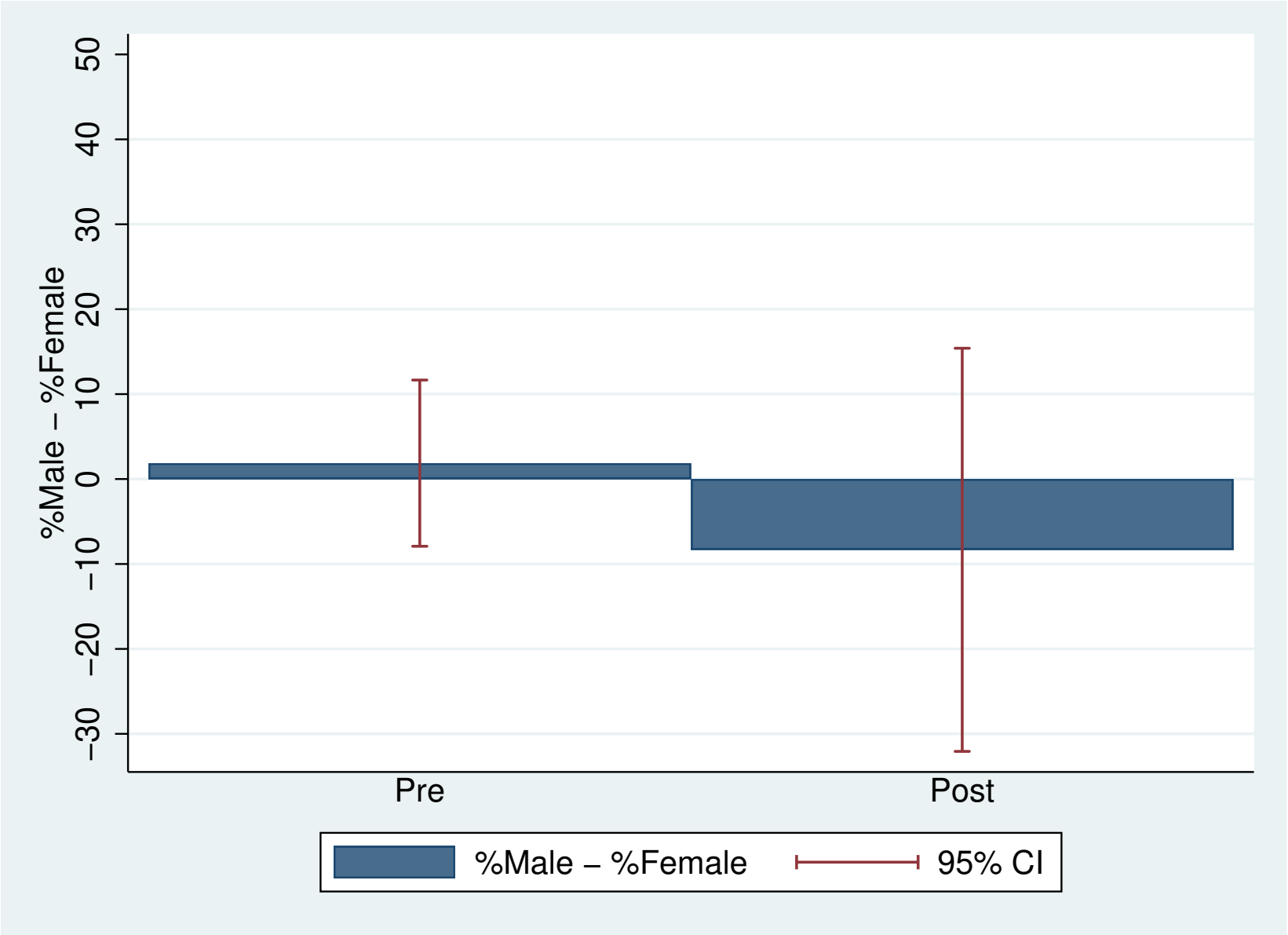

Figure: Male-female gap in the consumption of baby formula amongst children before and after demonetization

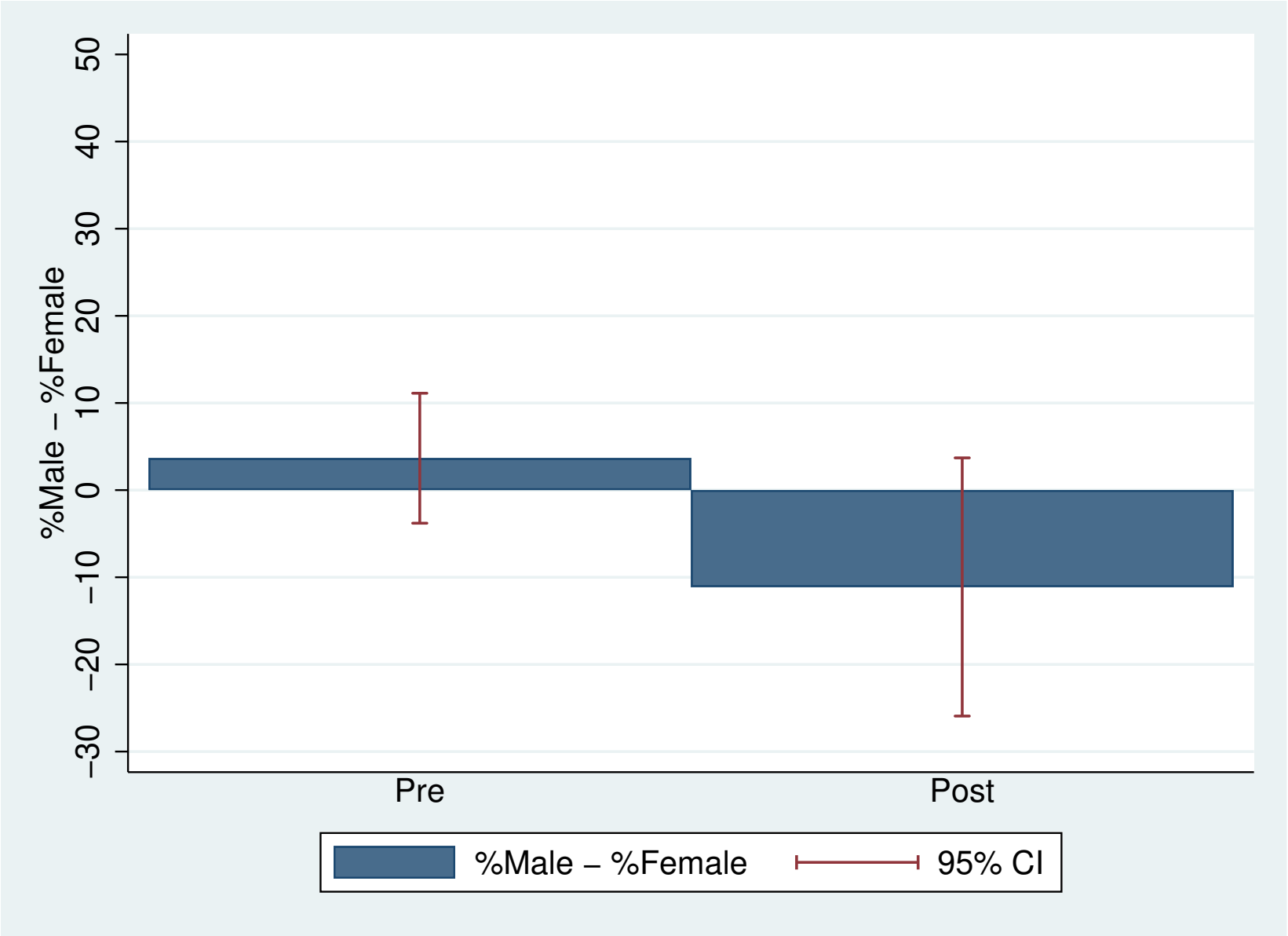

Figure: Male-female gap in the consumption of potatoes amongst children before and after demonetization

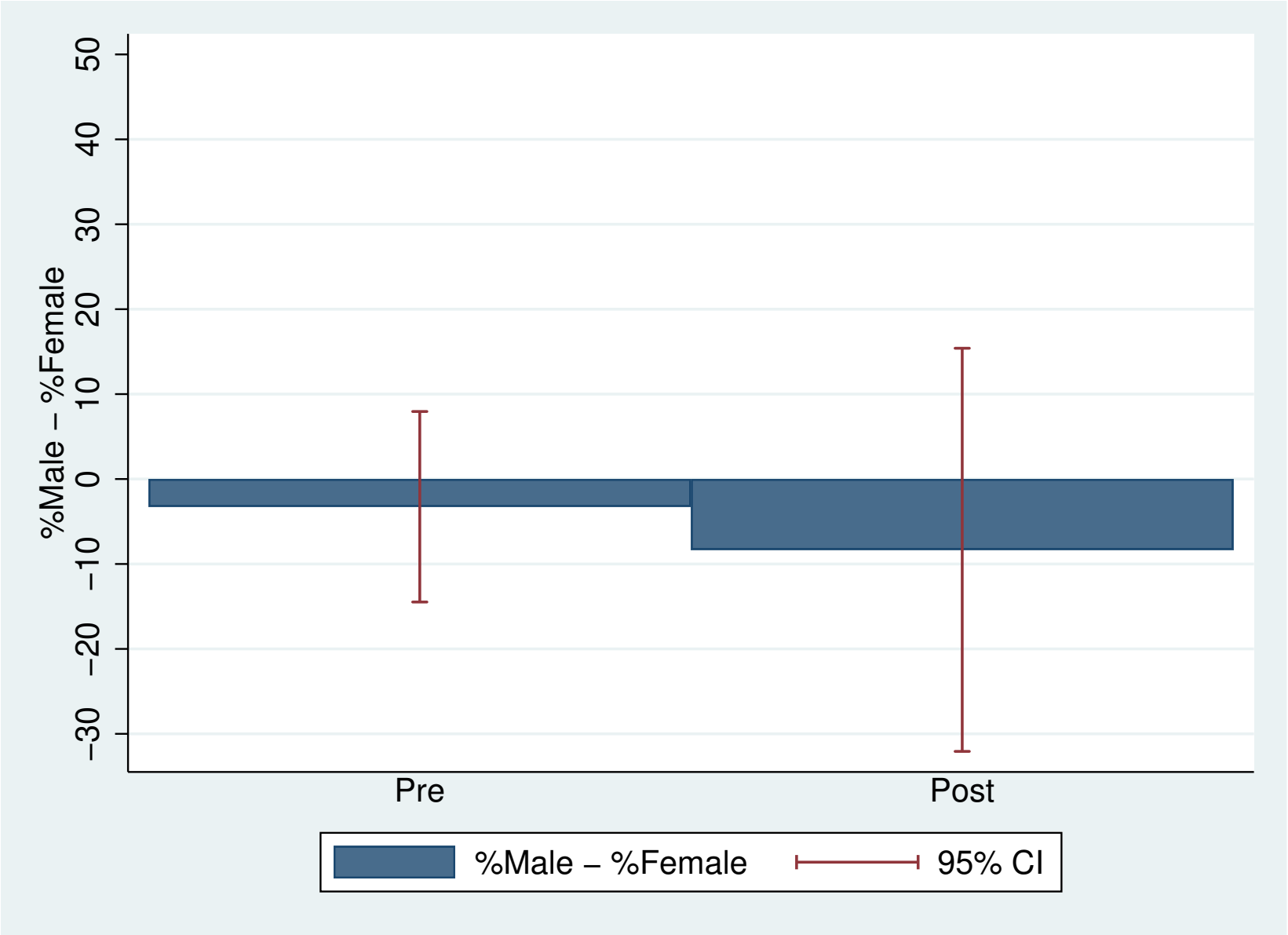

Figure: Male-female gap in the consumption of chicken or duck amongst children before and after demonetization

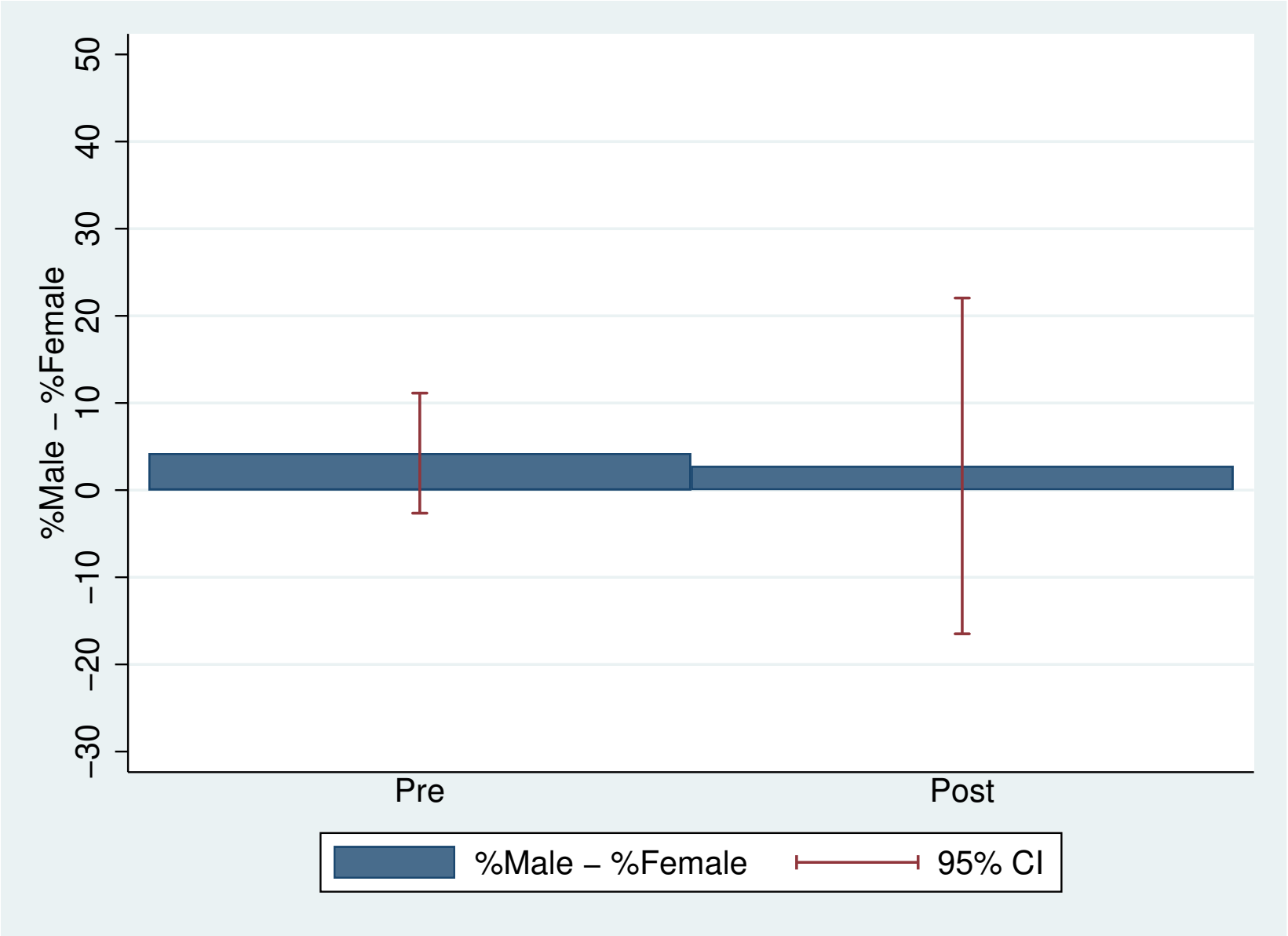

Figure: Male-female gap in the consumption of fish amongst children before and after demonetization

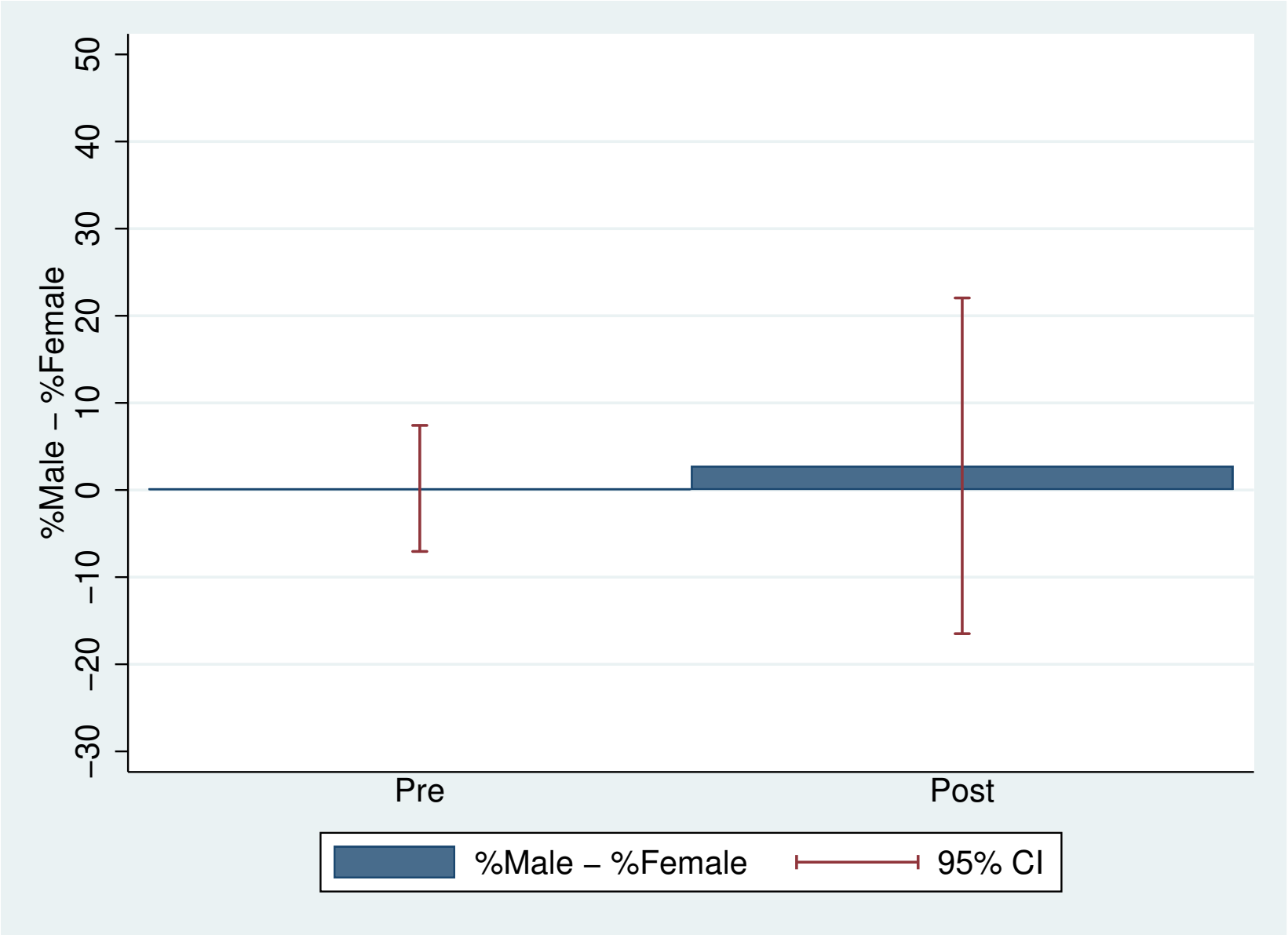

Figure: Male-female gap in the consumption of liver or heart of any animal amongst children before and after demonetization

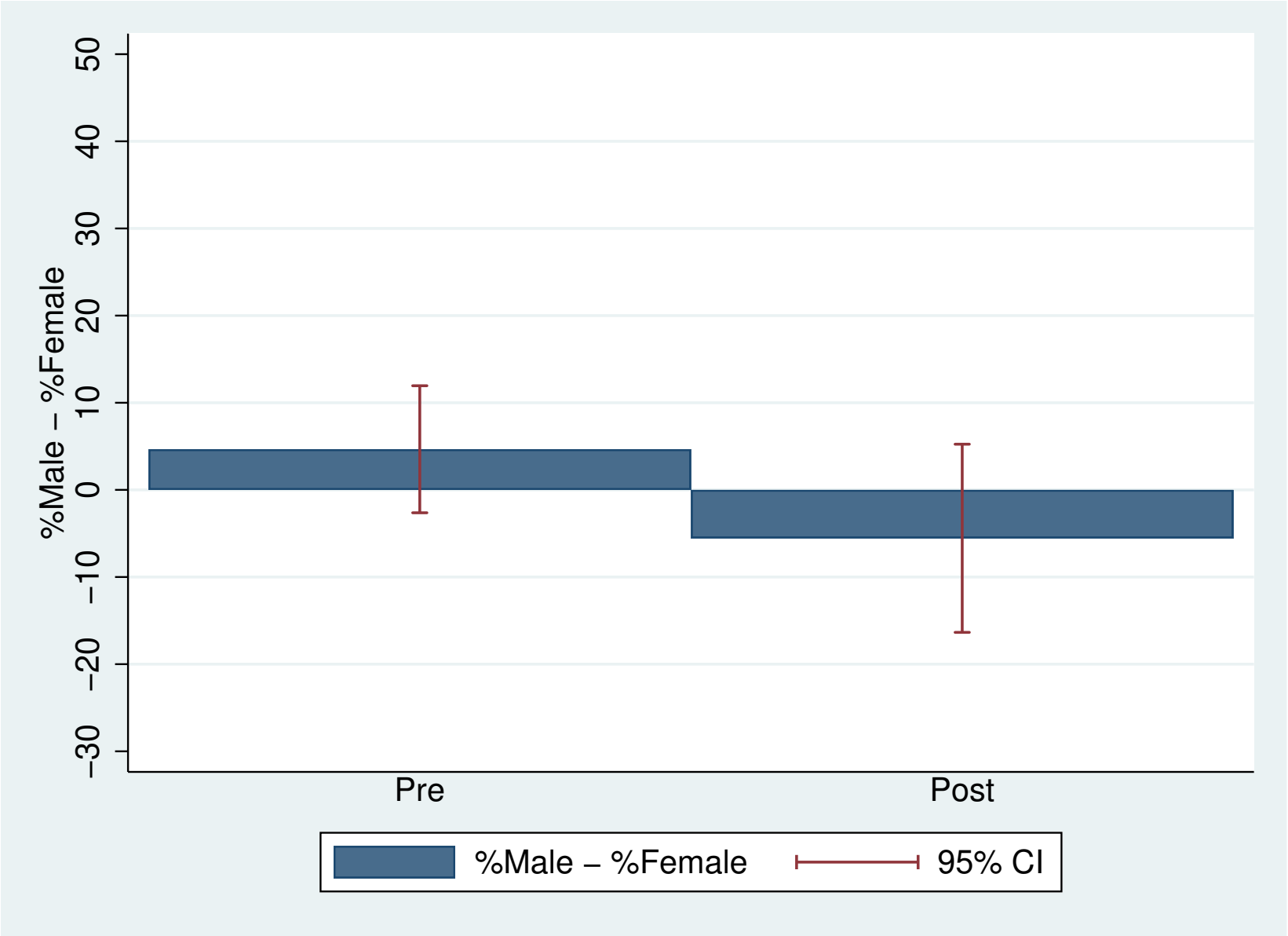

Figure: Male-female gap in the consumption of lentils amongst children before and after demonetization

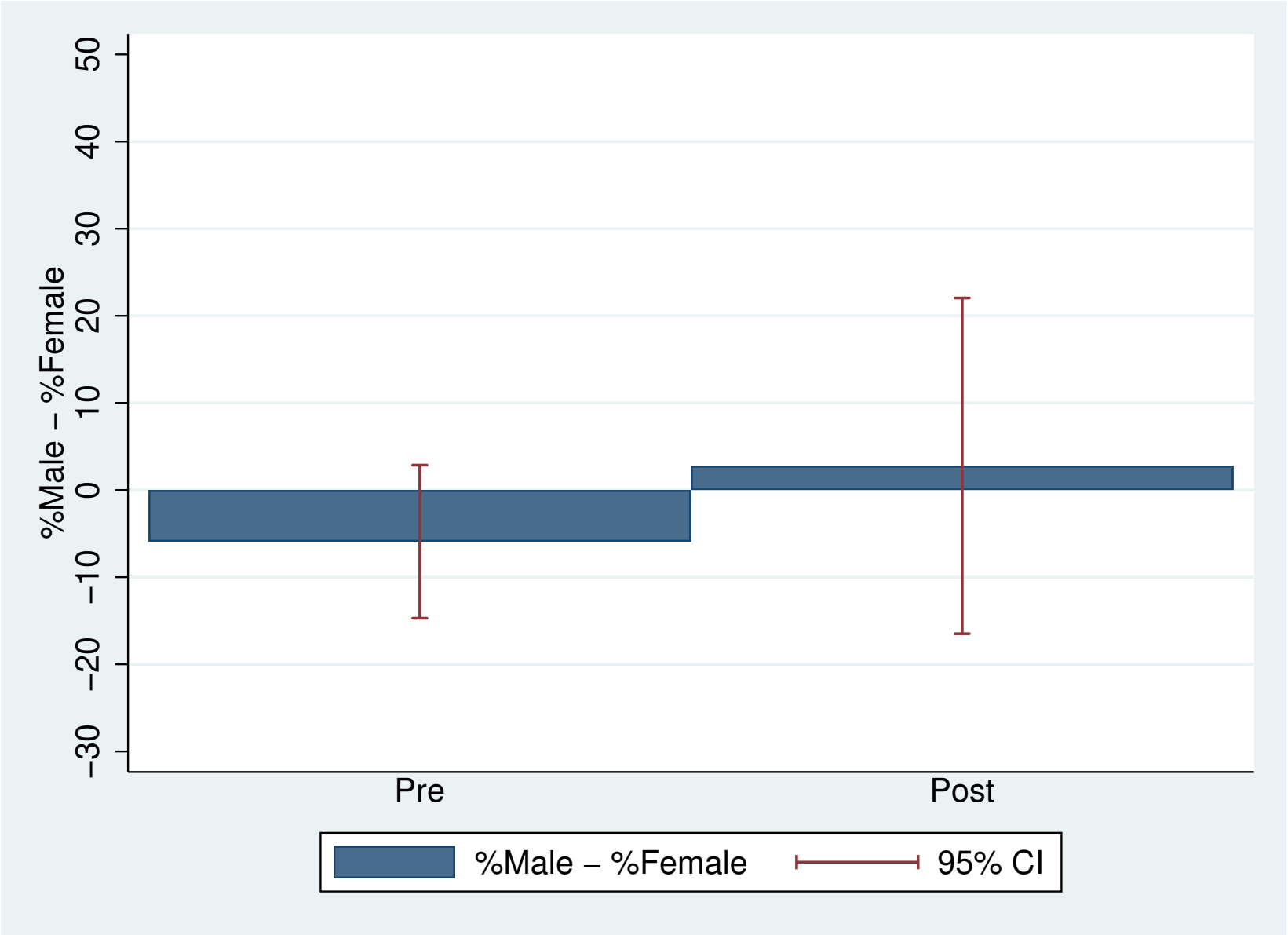

Figure: Male-female gap in the consumption of eggs amongst children before and after demonetization

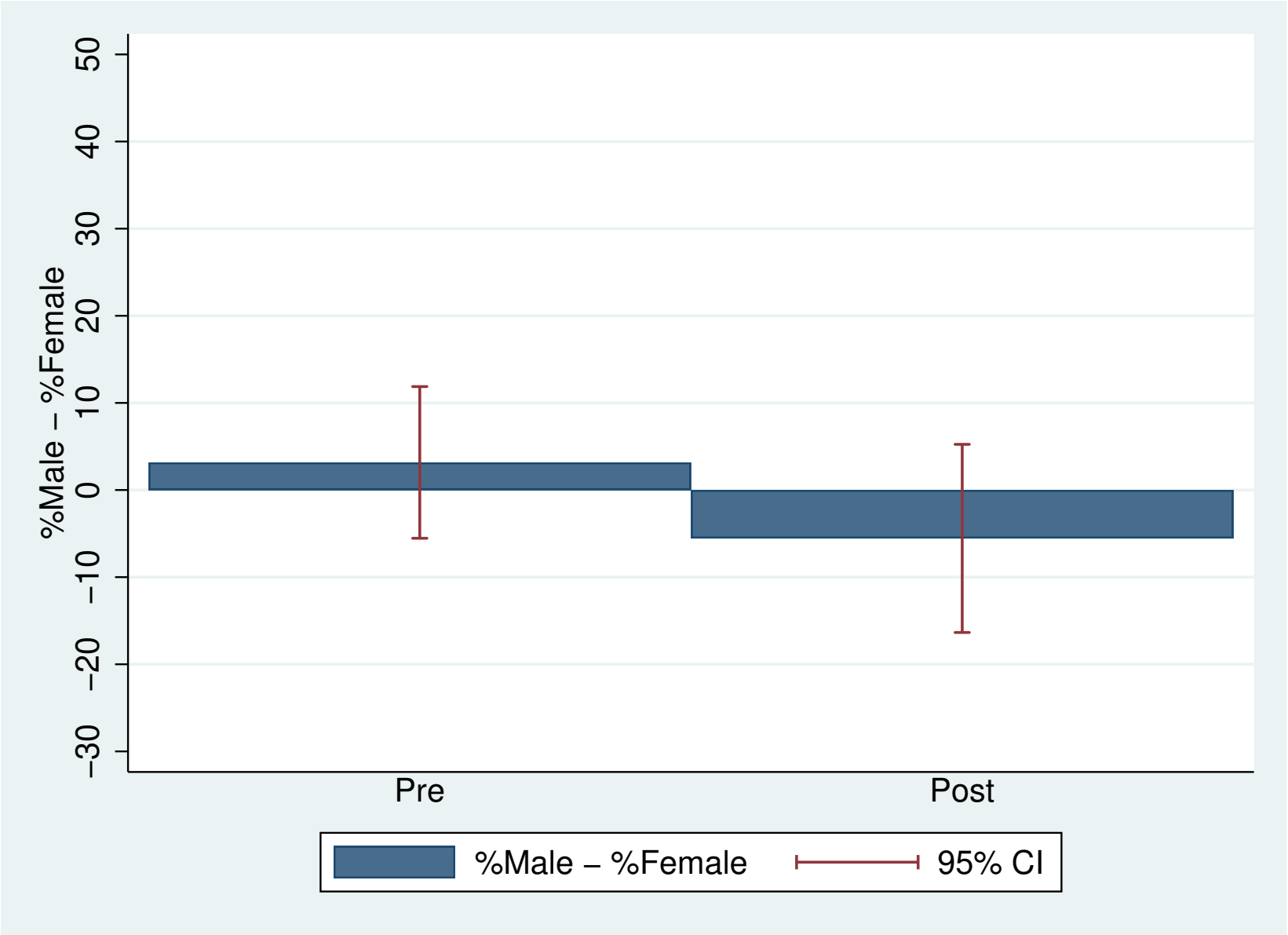

Figure: Male-female gap in the consumption of pumpkin amongst children before and after demonetization

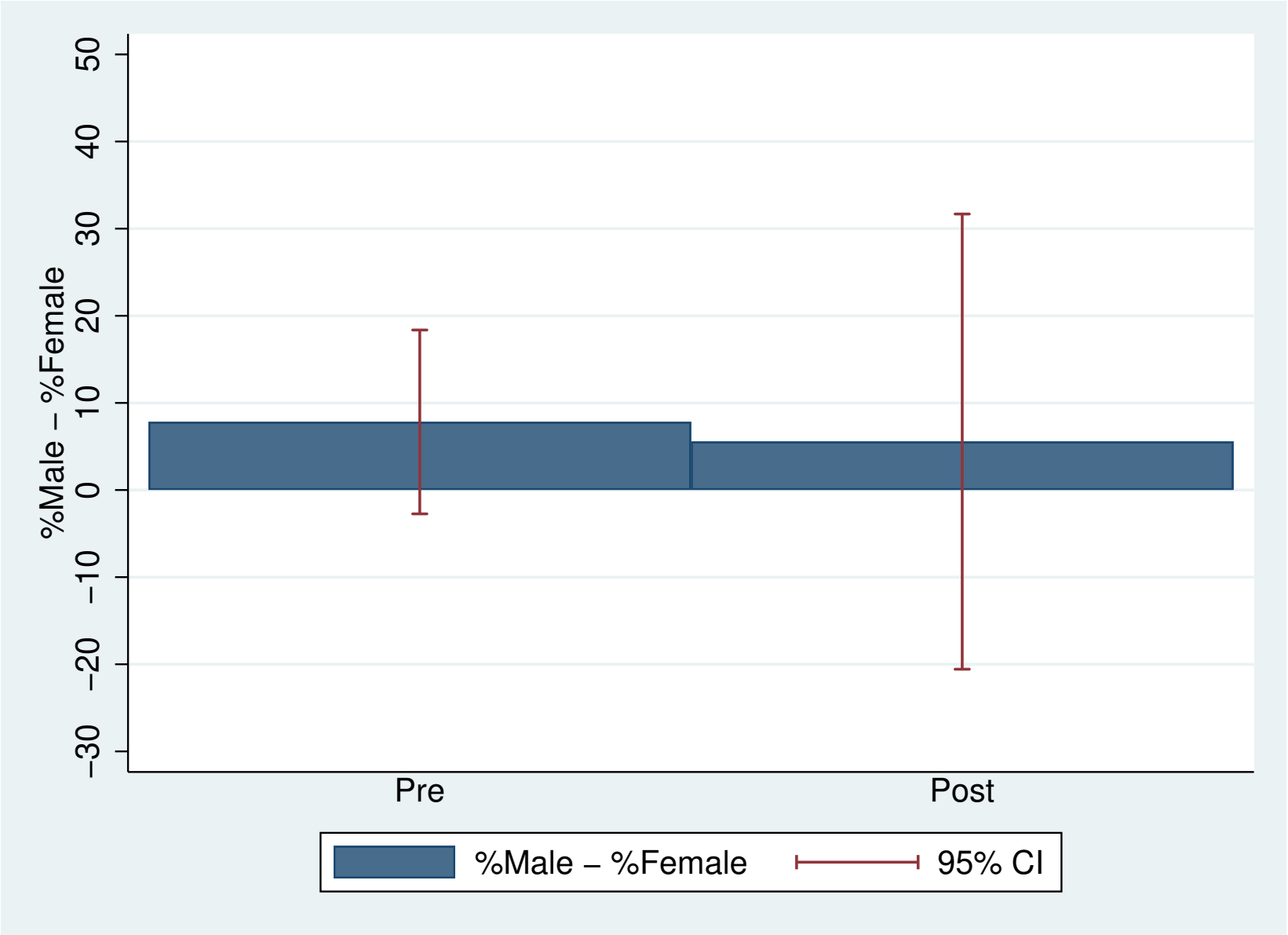

Figure: Male-female gap in the consumption of Vitamin A-rich foods amongst children before and after demonetization