Household-Level Responses to the European Energy Crisis

Lassi Ahlvik
University of Helsinki

Tuomas Kaariaho
University of Helsinki

Matti Liski
Aalto University

Iivo Vehviläinen
Aalto University

40th EEA
28 August 2025

Introduction


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Overzealously fighting inflation to help lower-income workers might actually do the opposite.

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Broad question: How do households cope with cost-of-living shocks?

- What are the adjustment margins?
- Do responses vary across households?
- Anticipated vs. unanticipated shocks?

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- What are the adjustment margins?
- Do responses vary across households?
- Anticipated vs. unanticipated shocks?

Three empirical challenges:

- **Challenge 1**: Need household-level data on consumption and other response channels
- **Challenge 2**: Commodity price movements are typically endogenous
- **Challenge 3**: Price changes are faced by all consumers, difficult to find a natural control group

This paper studies the Energy Crisis to overcome the three challenges

Challenge 1: We use Finnish smart-meter data linked to administrative microdata

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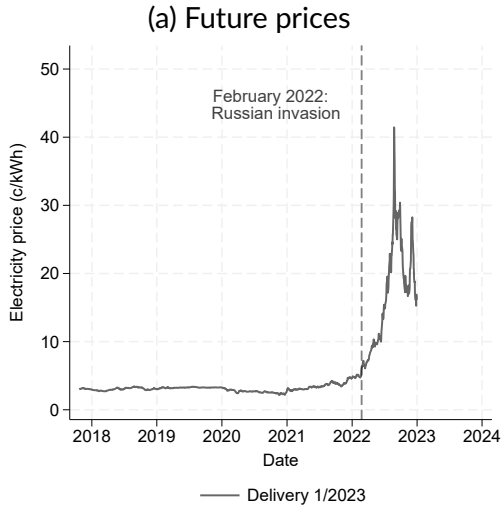
Challenge 2: The price shock triggered by the war was exogenous, large, and unexpected

- Futures prices rose towards Fall 2022



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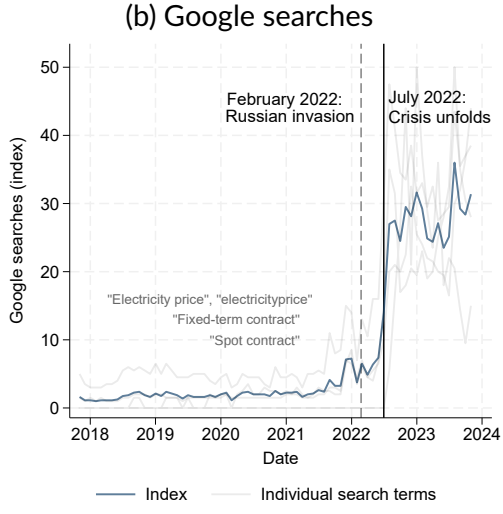

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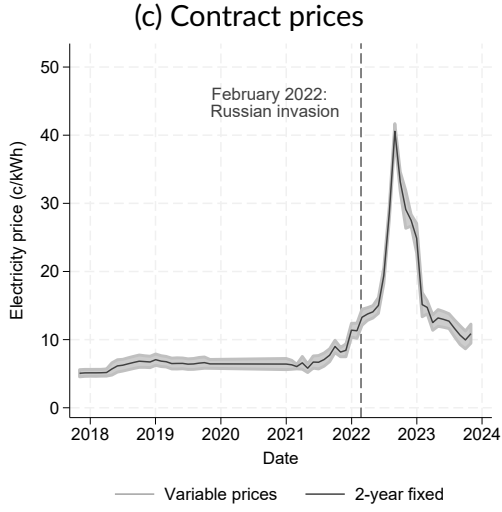

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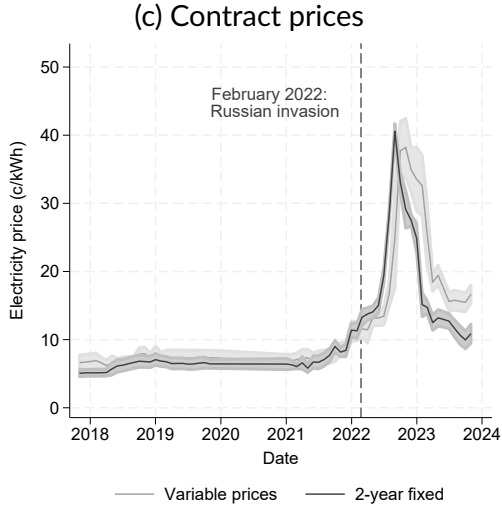

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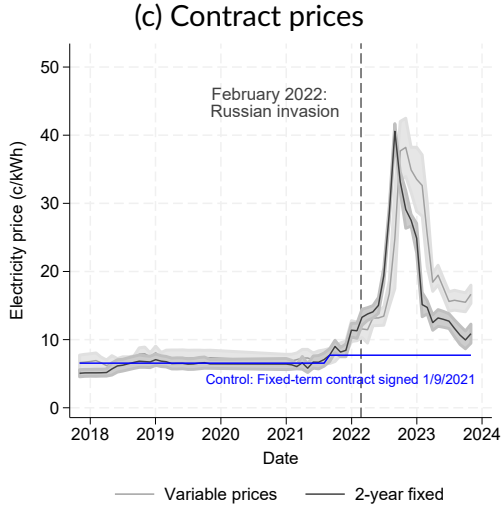

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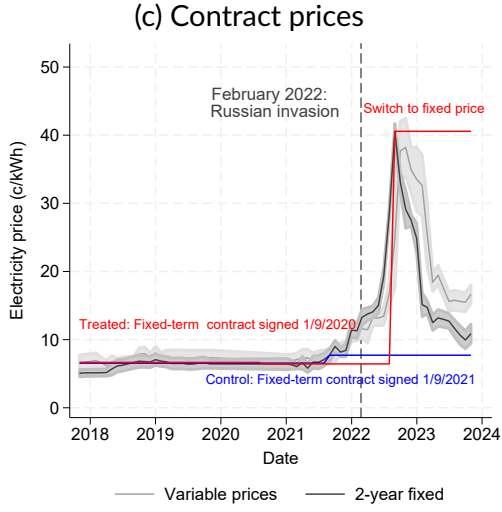

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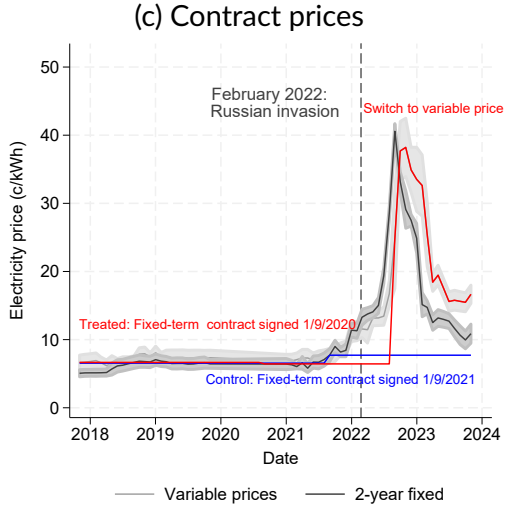

Thought experiment: What if the price of a necessity suddenly rose?

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Household budget constraint:

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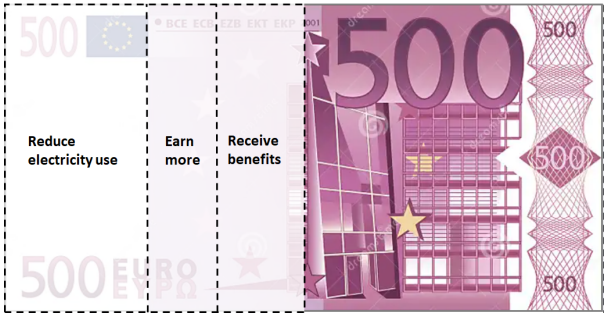

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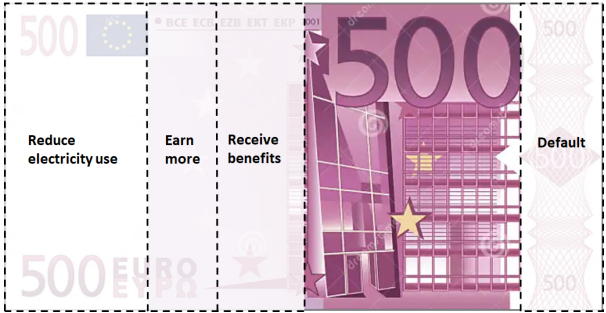

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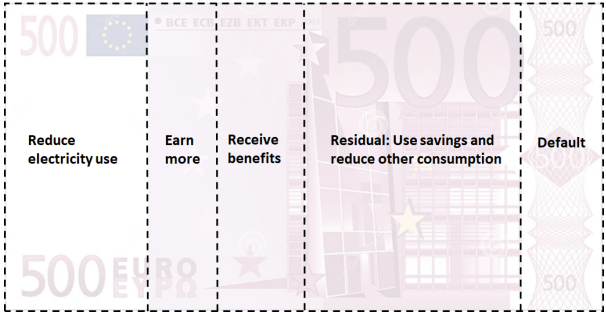

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Data: sample

- Monthly data from March 2022 to June 2023 (16 months)

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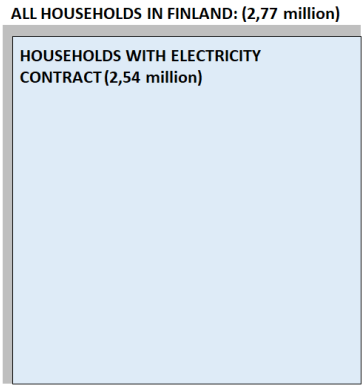

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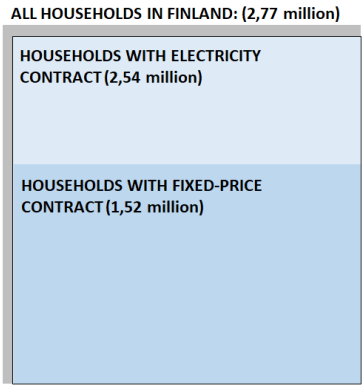

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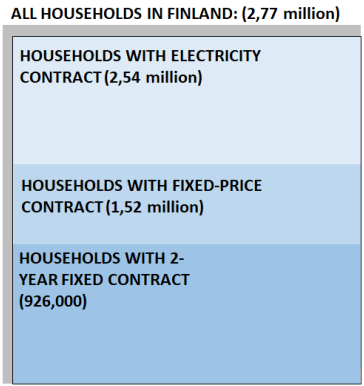

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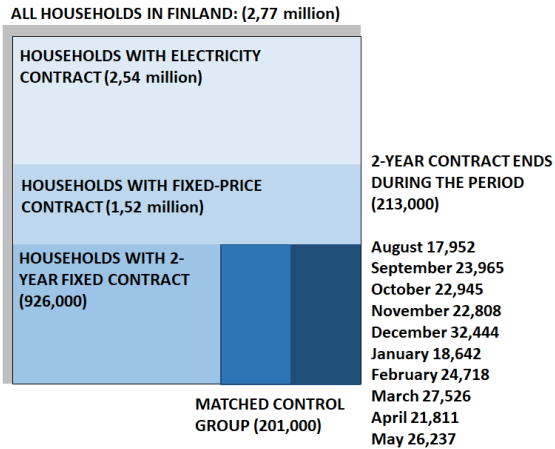

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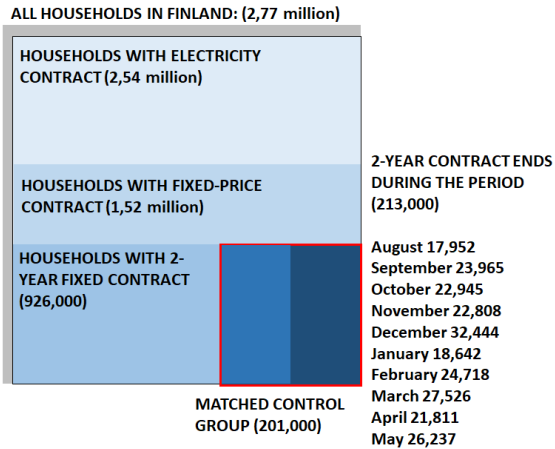

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- Main treatment group: contracts ending between August 2022 and January 2023

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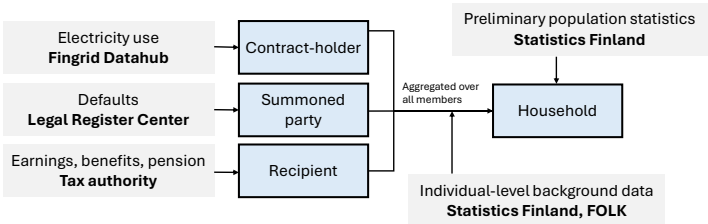

Electricity data from the Fingrid Datahub centralized exchange system

- Monthly consumption, contract type (variable-price or fixed-price), start and end dates
- No price information: We use average prices per month per household type

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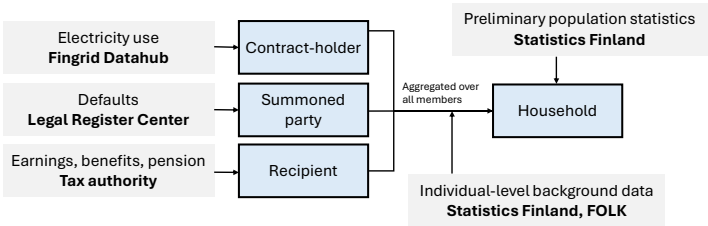

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Earnings and benefits from the Finnish Tax Authority

- Incomes register: Monthly earned income, pension and government benefits
- Lump-sum electricity rebate: 50% support for bills exceeding 90€/month, max 700€

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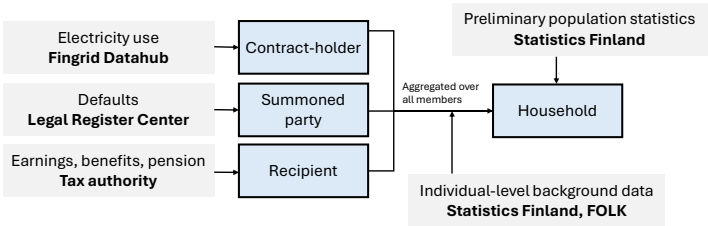

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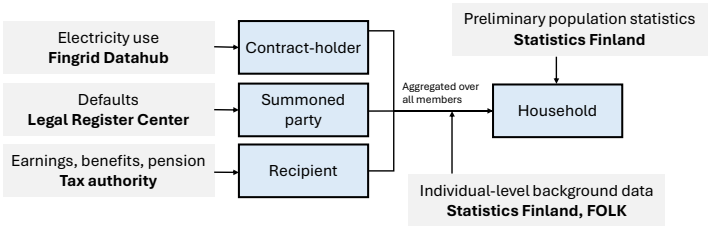

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Residual consumption: Net earnings + Net benefits + Defaults - Electricity use $\times$ price

Empirical approach

1. Event study graphs shown separately for each cohort h (month when contract ends):

$$Y_{it} = \sum_{t=1, t\neq 5}^{16} \beta_t I_{it} + \alpha_i + \gamma_t + \epsilon_{it} \quad (1)$$

- Y_{it} are the dependent variables for household i at time t (in logs or as binary)
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2. Aggregated results use stacked OLS estimation to study the direct impact of the crisis:

$$Y_{iht} = \beta ContractEnds_{iht} + \beta_A Anticipation_{it} + \alpha_{hi} + \gamma_{ht} + \epsilon_{iht} \tag{2}$$

- $ContractEnds_{iht}$: an indicator becoming one after the fixed-term contract ends
- $Anticipation_{it}$: an indicator becoming one between August 2022 and contract ending

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3. Price-elasticity results use 2SLS estimation to study price elasticity ($Price_{iht}$ in logs):

$$Y_{iht} = \beta_p Price_{iht} + \beta_A Anticipation_{it} + \alpha_{hi} + \gamma_{ht} + \epsilon_{iht} \quad (3)$$

$$Price_{iht} = \alpha ContractEnds_{iht} + \alpha'_{hi} + \gamma'_{ht} + \epsilon'_{iht} \quad (4)$$

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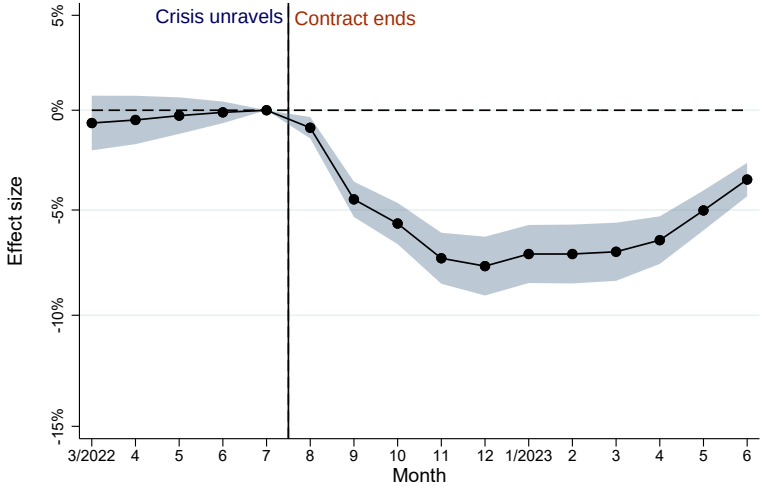

Robustness: Bankrupt retailers

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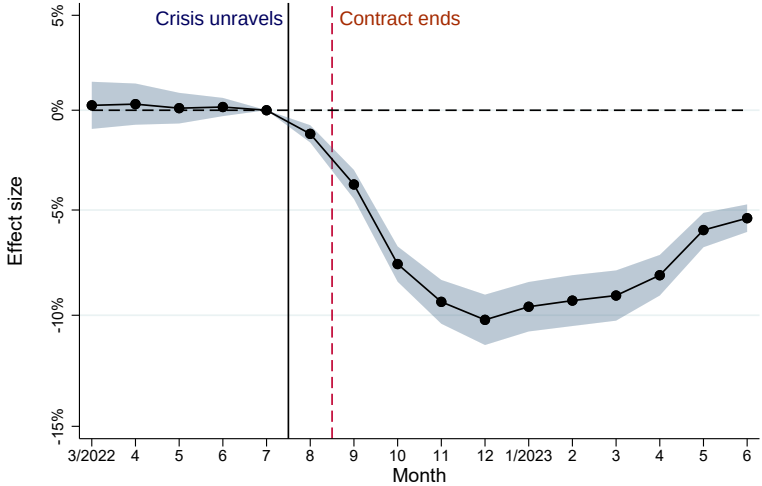

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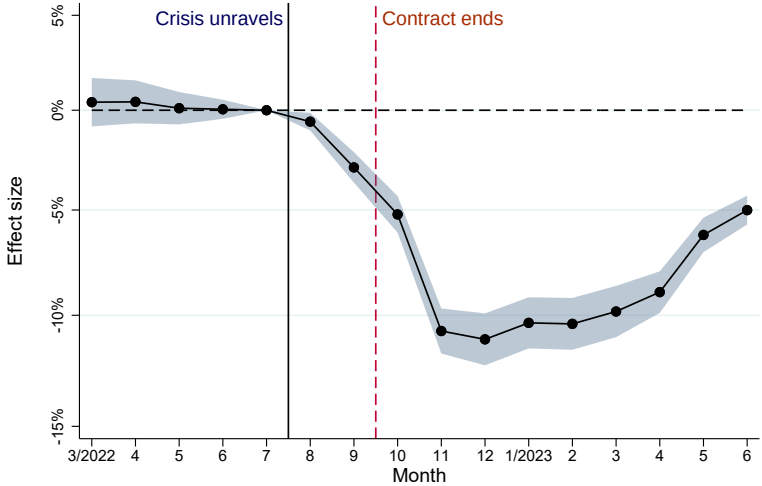

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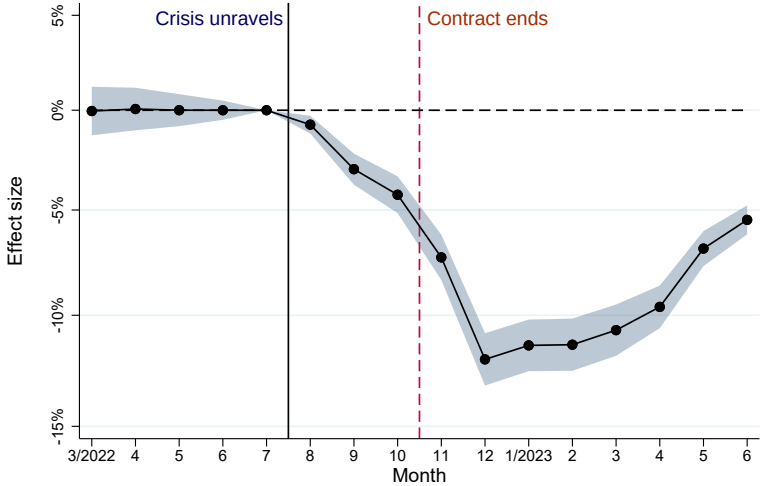

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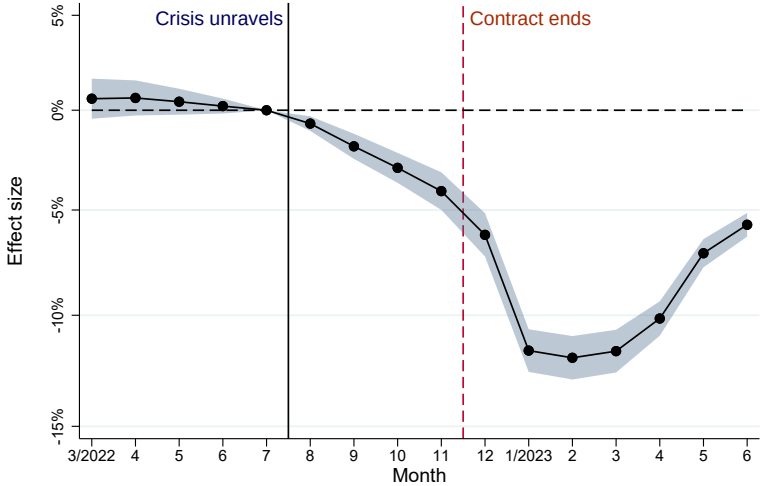

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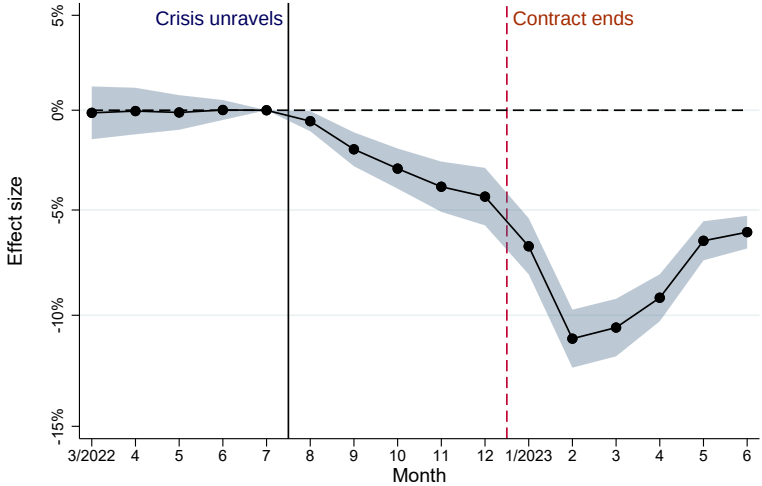

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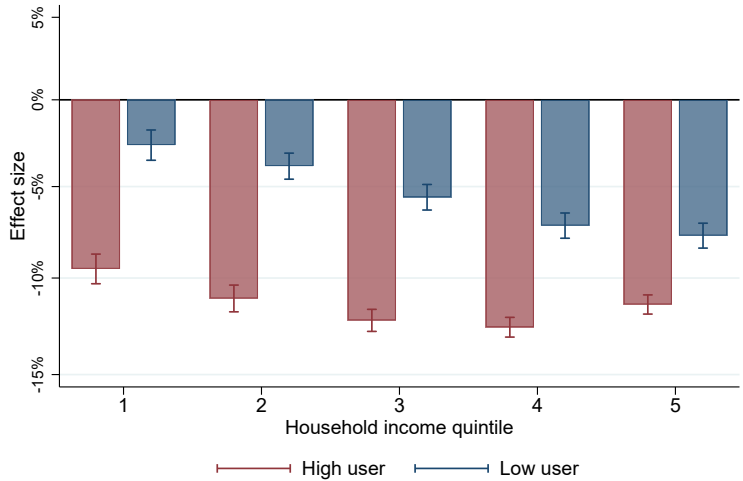

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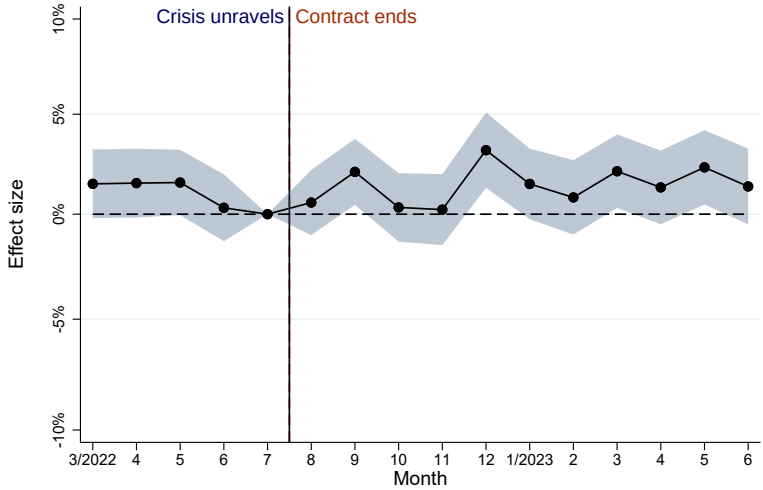
(b) Labor earnings



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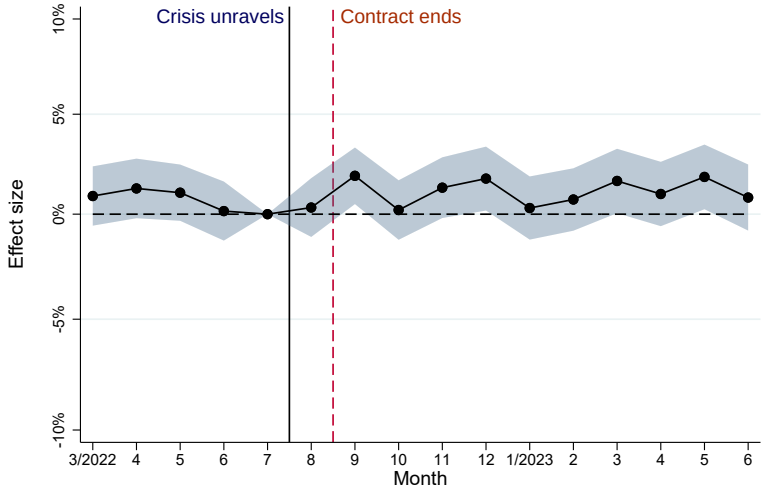

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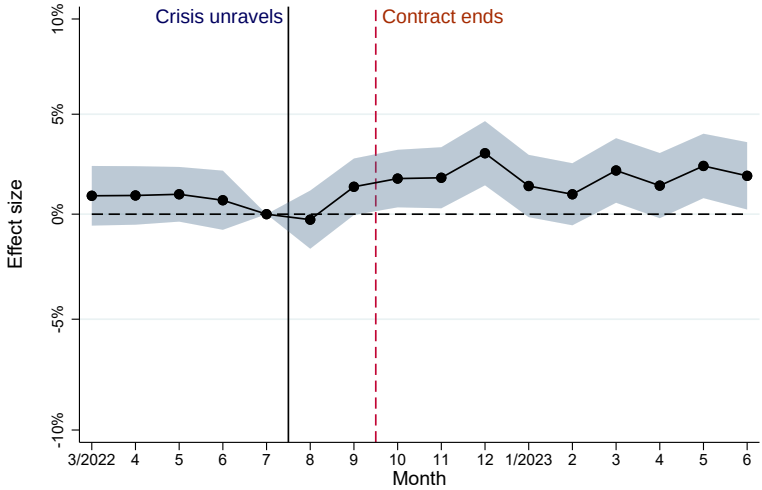

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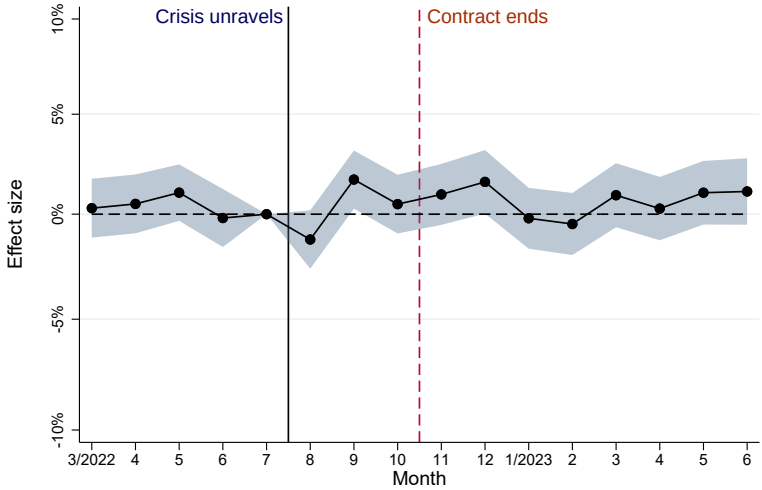

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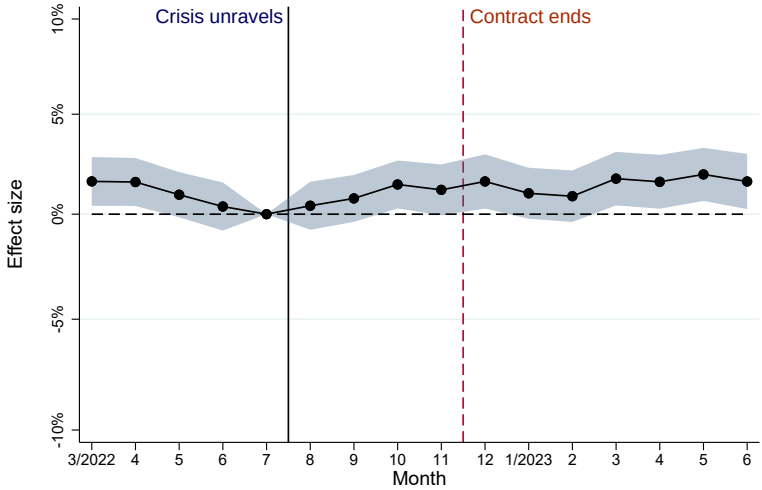

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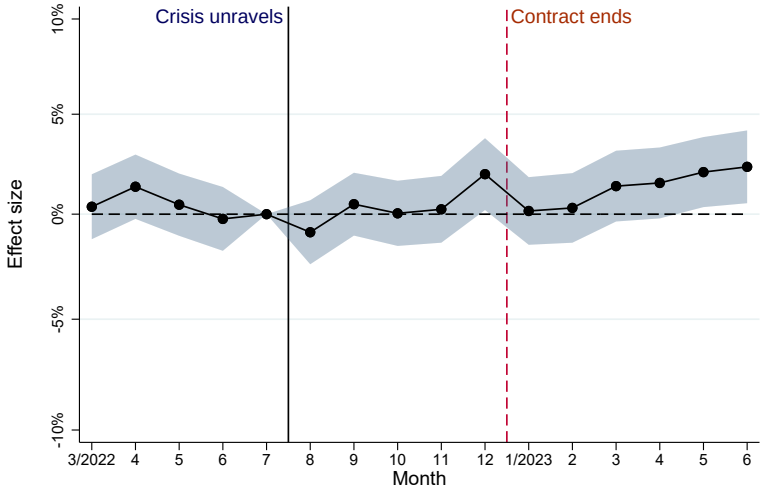

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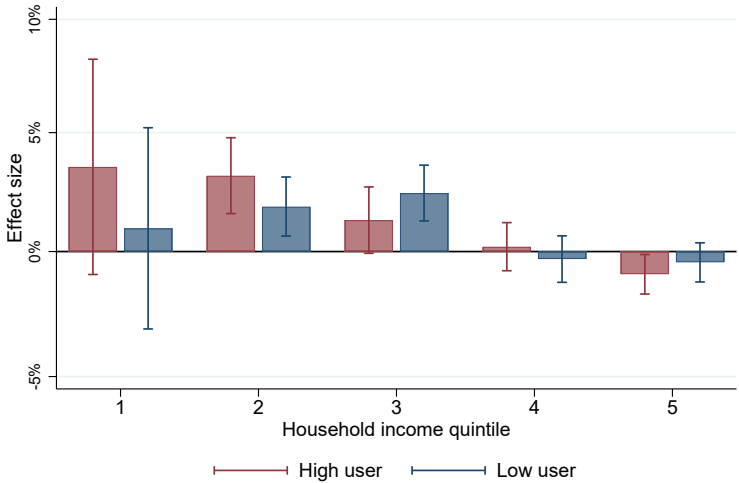

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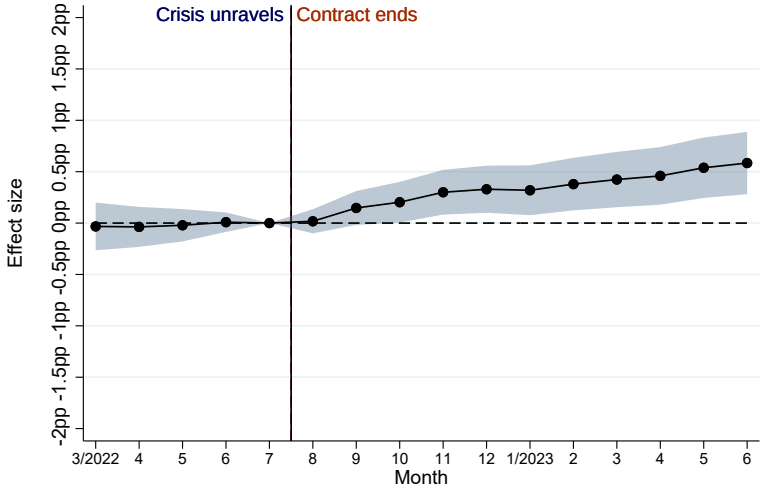
(c) Defaults


Crisis unravels
Contract ends
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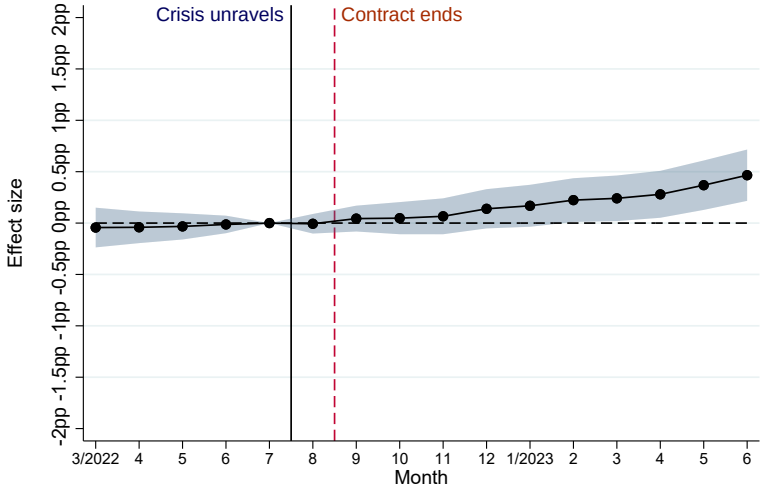
Month

(c) Defaults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Contract ends
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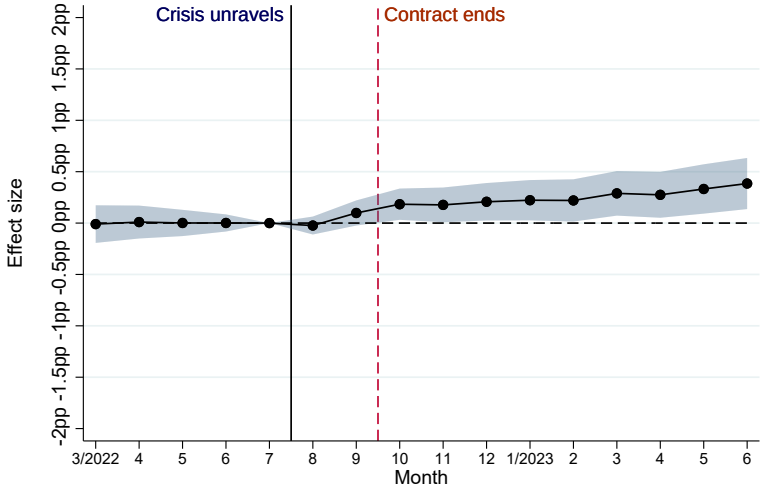
(c) Defaults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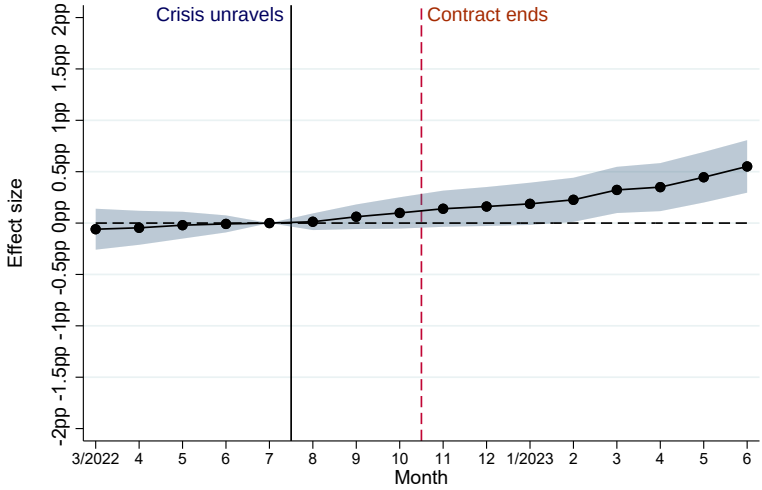
(c) Defaults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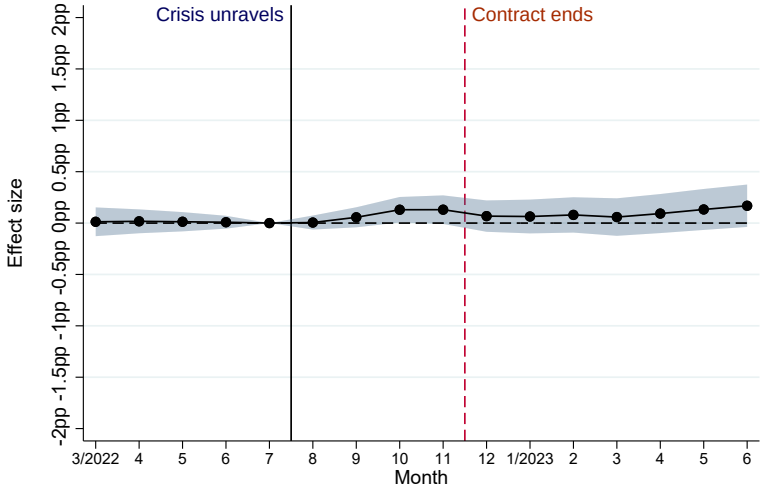
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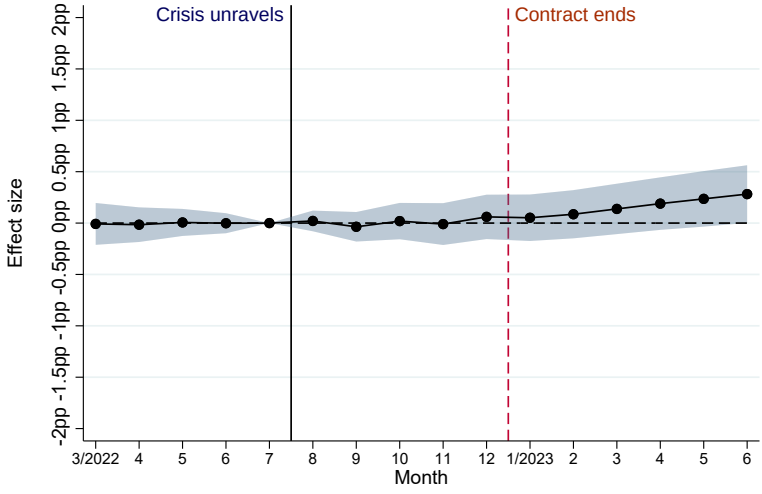
(c) Defaults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Contract ends
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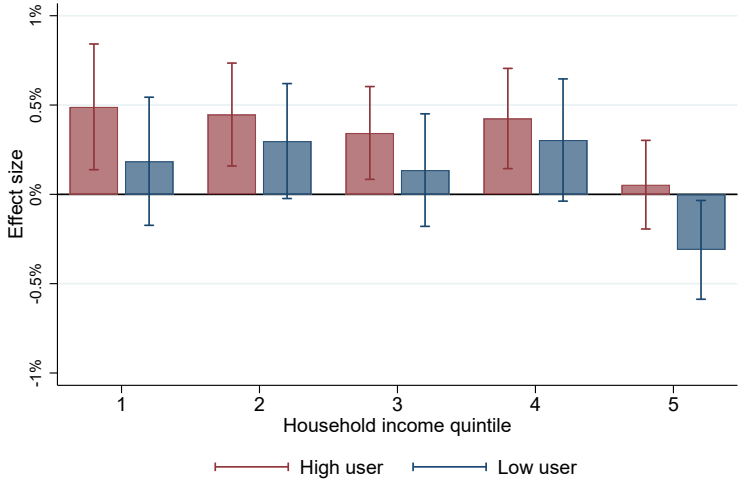
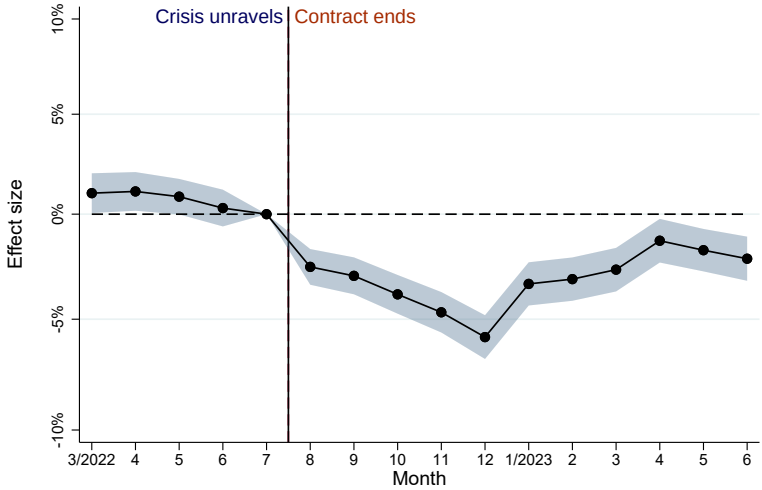
(c) Defaults



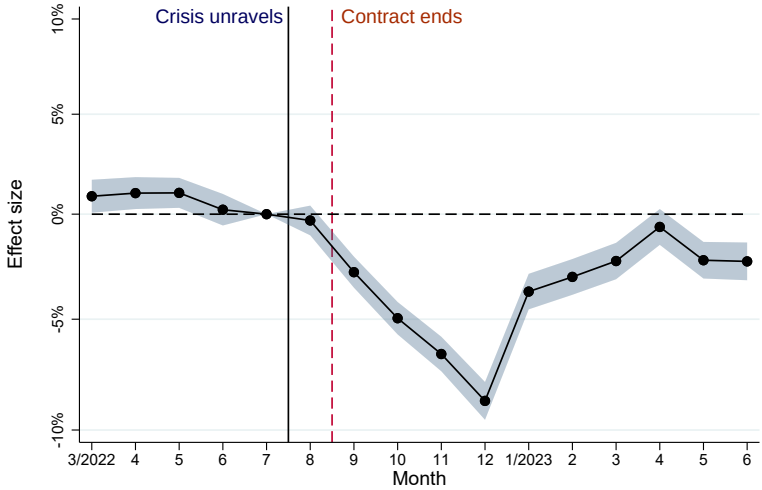
Notes: Effects shown for contracts ending between August and January, controlling for anticipation. High/low-user: above/below median electricity use for a given income quintile.

Robustness: Defaults by debt-to-income ratio

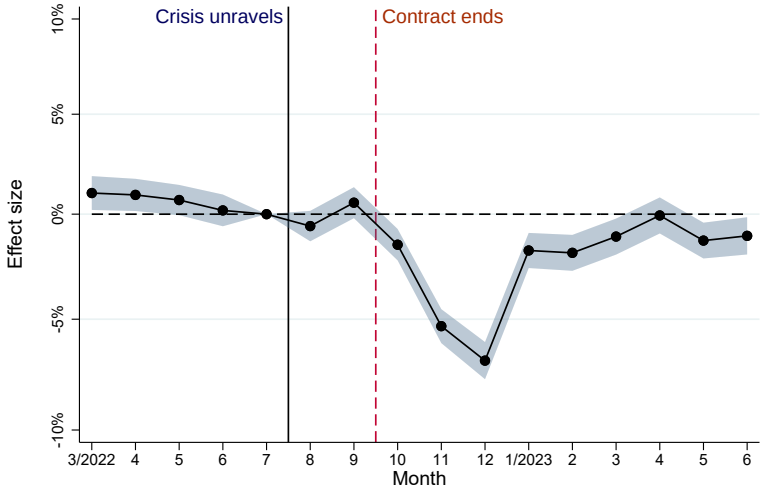
(d) Other consumption



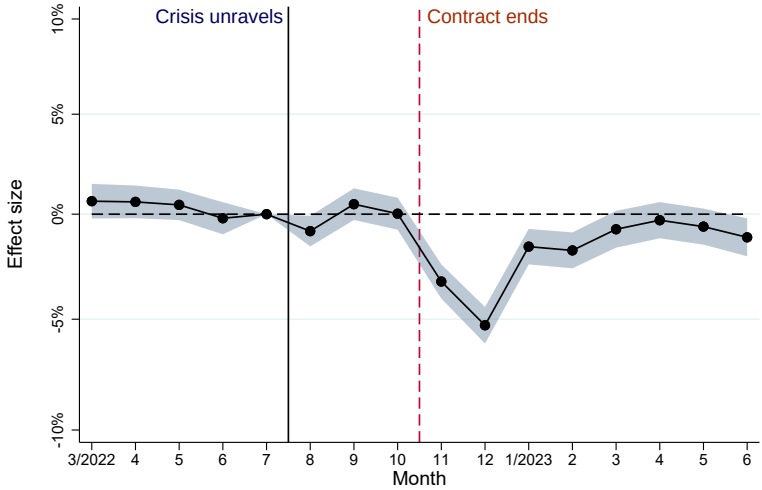
(d) Other consumption



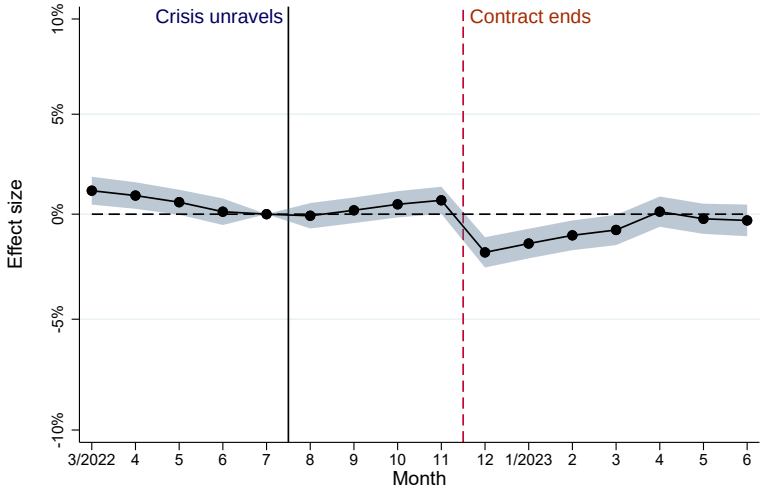
(d) Other consumption



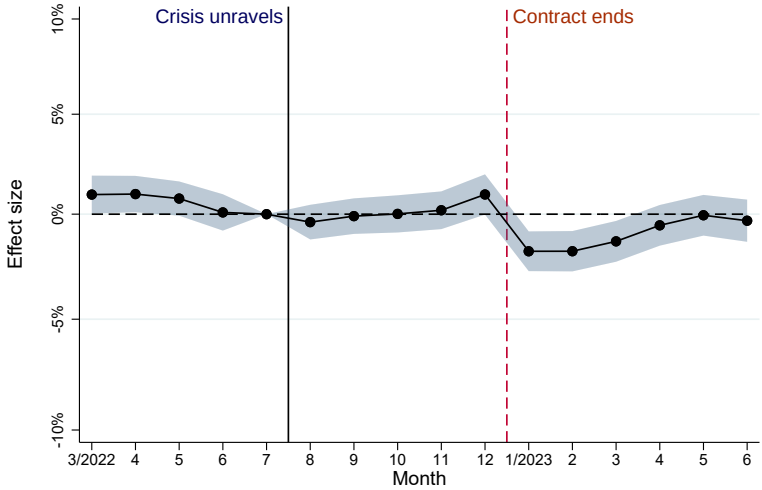
(d) Other consumption



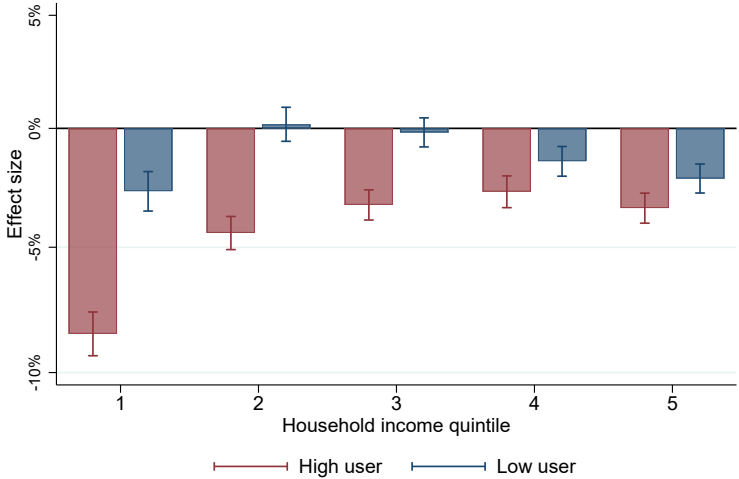
(d) Other consumption



(d) Other consumption



(d) Other consumption



Notes: Effects shown for contracts ending between August and January, controlling for anticipation. High/low-user: above/below median electricity use for a given income quintile.

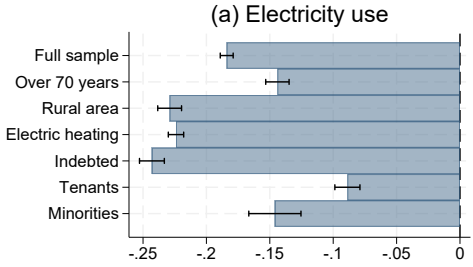
Results as elasticities

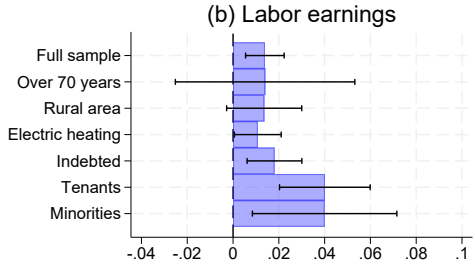
2SLS: Instrument electricity price by the contract ending (August-December)

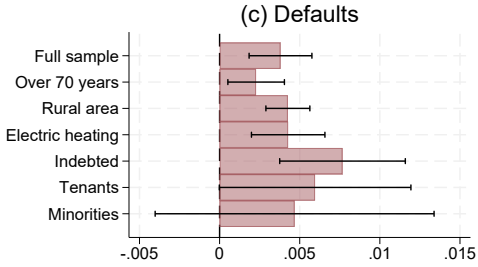
	Electricity use	Labor earnings	Pensions	Benefits	Defaults	Residual consumption
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Full sample						
Price	-0.184***	0.0139**	0.0004	0.143***	0.0039***	-0.0451***
	(0.0026)	(0.0043)	(0.0020)	(0.0127)	(0.0009)	(0.0024)
...x income	-0.0011***	-0.0010***	0.0003***	-0.0013***	-0.0001***	0.0039***
	(0.0001)	(0.0014)	(0.0011)	(0.0031)	(0.0000)	(0.0008)
...x use	-0.0969***	0.0074	-0.0062*	0.402***	0.0046**	-0.0535***
	(0.0043)	(0.0065)	(0.0030)	(0.0209)	(0.0016)	(0.0038)
...x lag	-0.0488***	0.0036	-0.0002	-0.0013	0.0002	0.0021
	(0.0014)	(0.0024)	(0.0010)	(0.0071)	(0.0006)	(0.0013)
Anticipation	-0.0266***	-0.0005	0.0006	-0.0277***	0.0005	-0.0045***
	(0.0011)	(0.0021)	(0.0007)	(0.0049)	(0.0004)	(0.0012)
N	4,228,556	2,404,502	1,885,189	1,876,091	4,230,893	4,110,374

Notes: All columns control for household-stack (*ih*), stack-month (*ht*) and match-id fixed effects. All results also control for post- and treatment- interactions (for example, post-earnings and treatment-earnings). Standard errors, clustered by households, are shown in parentheses. * $p<.05$, ** for $p<.01$, and *** for $p<.001$.

Results as elasticities







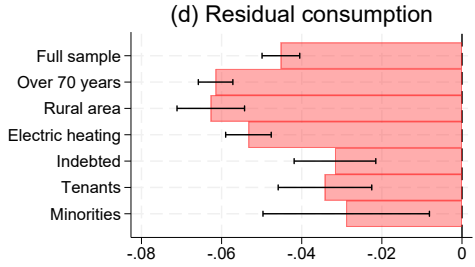


Illustration: Effect of 10c/kWh increase in electricity price

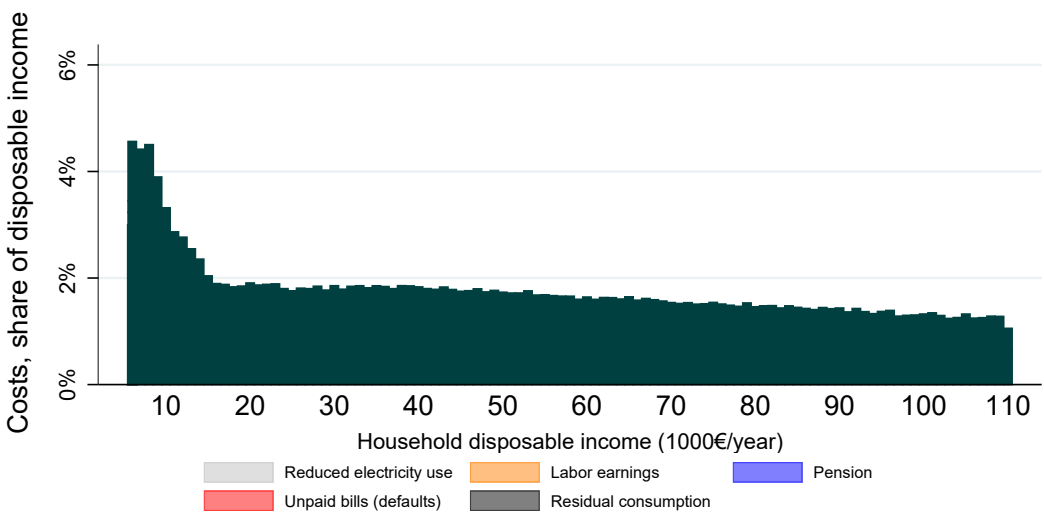
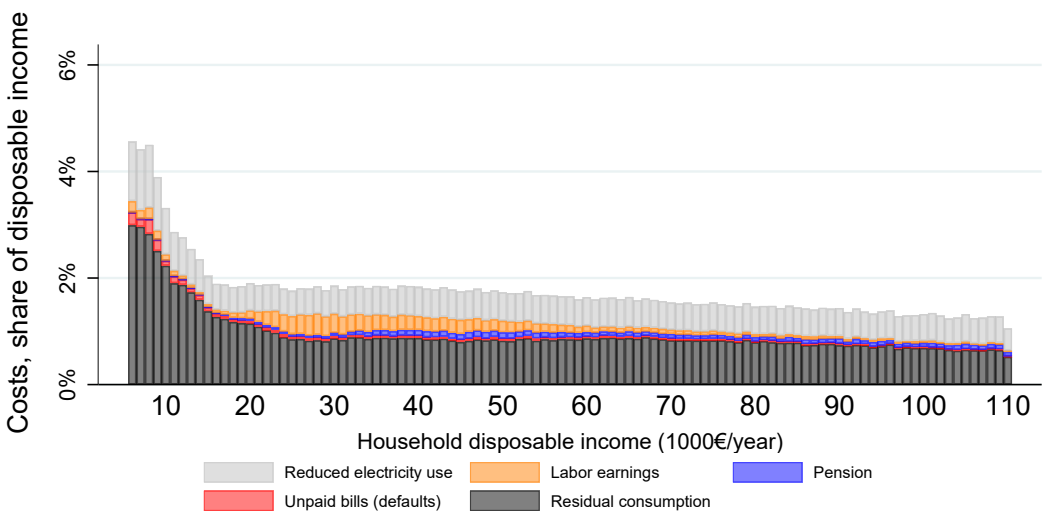


Illustration: Effect of 10c/kWh increase in electricity price



Conclusions: How do households cope with cost-of-living shocks?

1. What are the adjustment margins to electricity price shock?

- Reduce electricity use by 18%, increase labor earning by 1%, increase the number of people with defaults by 4%, cut back other consumption and savings by 5%

2. New channels for why low-income households are hurt more:

- Fewer adjustment margins, leading to more defaults and bigger cutbacks in other spending and consumption

3. Households are forward looking and prepare for future price hikes beforehand, but this doesn't fully eliminate the negative impacts

Thank you

tuomas.kaariaho@helsinki.fi

Additional material

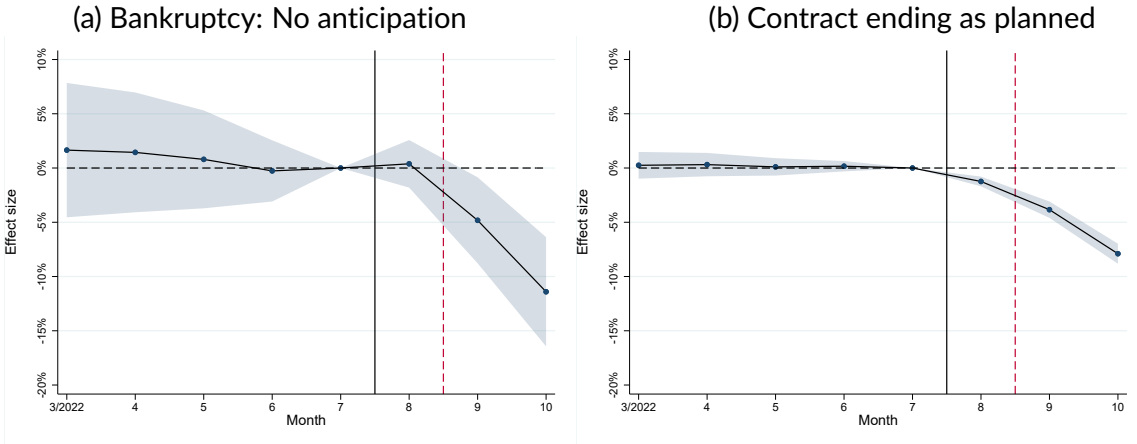


Figure: Robustness for anticipation: Impact of contract termination on electricity consumption for households that are (a) unaware and (b) aware of their contract expiration date.

Back

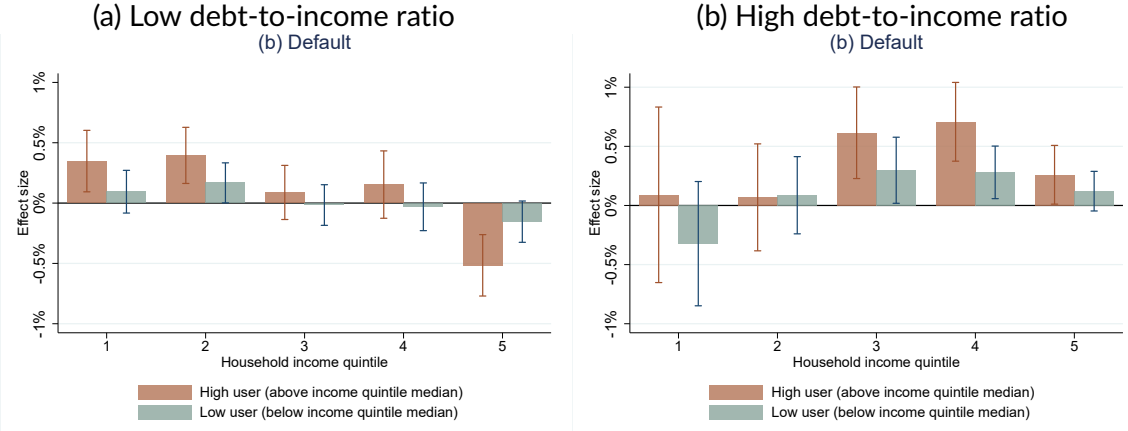


Figure: Robustness for defaults: households whose debt-to-annual income ratio is below one (left) vs. above one (right).

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