Cash Transfer Effects on the Tobacco Consumption: Evidence from Iran's energy subsidy reform 2010

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Introduction

- In 2010 Iran's government launched an energy price reform according which energy price subsidies was stopped, and rolled out the policy by depositing 445000 Rials per person every month in the household head's bank account.

- A critique of cash assistance programs is that beneficiaries may spend the money on *temptation goods* (alcohol and tobacco).
  - According to the Food Stamp Act 1964 any foods for human consumption are permitted except alcoholic beverages, tobacco and food identified on the packages.
  - A particular source of concern is that husband will spend the money on their private goods.

- Cunha (2011) (Mexico):
  cash transfers caused a modest increase in alcohol consumption but no increase in tobacco consumption.

- Maluccio and Flores (2005) (Nicaragua):
  The effect of cash transfers was small and statistically insignificant.
- Haushofer and Shapiro (2015) (Kenya):
  The experiment significantly increased consumption (in range of goods including food, medical and educational expenses and social events.)
  There was no increase in expenditures on temptation goods, such as alcohol and tobacco.
- Haddad (2015) (Iran):
  Households' decisions are made in light of collective bargaining between spouses.
- Lundberg, Pollak and Wales (1997):
  Females are thought to be more likely to invest in their children's human capital.

- This paper uses causal inference strategies to evaluate the effect of the UCT on tobacco use among urban and rural households.

The price subsidy was an inequitable policy

decile/year	2008	2009	2010	2011	2012	2013
1	1	1	1	1	1	1
2	1.52	1.43	1.44	1.42	1.46	1.40
3	1.95	1.76	1.78	1.70	1.73	1.66
4	2.23	2.06	2.03	1.99	2.06	1.91
5	2.57	2.35	2.36	2.23	2.27	2.17
6	2.93	2.56	2.65	2.52	2.56	2.44
7	3.50	3.01	3.06	2.84	3.03	2.88
8	3.90	3.48	3.33	3.24	3.57	3.43
9	5.05	4.30	4.45	4.07	4.39	4.79
10	9.68	9.03	7.51	8.00	9.95	11.25

Table: Relative energy, fuels and transportation expenditures by year and deciles.

The transferred cash was more than energy and transportation expenditures

decile	2010	2011	2012	2013
1	4.37	2.53	2.67	2.13
2	4.44	2.67	2.54	2.28
3	4.29	2.61	2.40	2.25
4	4.08	2.42	2.38	2.12
5	3.70	2.26	2.36	1.97
6	3.46	2.10	2.19	1.83
7	3.14	1.96	1.94	1.63
8	2.95	1.76	1.68	1.40
9	2.35	1.49	1.36	1.07
10	1.51	0.82	0.70	0.49

Table: Relative monthly total subsidy received to energy , fuels and transportation expenditures

year	2008	2009	2010	2011	2012	2013
Rural (mean)	524	539	553	561	557	549
(S. D.)	(328)	(384)	(339)	(367)	(404)	(323)
Rural (mean) if age$\leq$ 40	487	492	498	534	520	503
(S. D.)	(314)	(354)	(368)	(397)	(345)	(366)
Urban (mean)	475	487	490	496	481	461
(S. D.)	(368	(413)	(393)	(405)	(341)	(361)
Urban (mean) if age$\leq$ 40	416	421	428	461	414	402
(S. D.)	(374)	(403)	(396)	(387)	(346)	(412)

Table: Monthly average cigarettes consumption by households.

Analytical framework

- Treatment variable

$$t = \begin{cases} 1 & \text{for} \quad \textit{treated} \\ 0 & \text{for} \quad \textit{untreated} \end{cases} \tag{1}$$

- The potential outcomes of interest

$$y = \begin{cases} y_1 & \text{for} \quad \textit{treated} \\ y_0 & \text{for} \quad \textit{untreated} \end{cases} \tag{2}$$

- We specify the unit's response function $g_1(x)$ and $g_0(x)$ as a function of confounding covariates (x).

- Finally we use $h(D)$ as the response function to the level of treatment (D_i), where $D_i \in [0, 100]$.

Analytical framework

- Given linear forms for $g_0(x)$ and $g_1(x)$ and a three degree polynomial form for the function $h(D) = aD + bD^2 + cD^3$ finally the estimated form for Dose-Response-Function is:

$$\hat{ATE}(D_i) = t[\hat{ATET} + \hat{a}(D_i - \frac{1}{N}\sum_{i=1}^{N} D_i) + \hat{b}(D_i^2 - \frac{1}{N}\sum_{i=1}^{N} D_i^2)$$

$$+ \hat{c}(D_i^3 - \frac{1}{N}\sum_{i=1}^{N} D_i^3)] + (1-t)\hat{ATENT}$$

with $\hat{ATET}(D_i) = \hat{ATE}(D_i)_{D_i>0}$.

Policy design

- Empirical part of this paper uses two parallel causal effect estimations techniques:
  - Dose Response Function
  - Difference-in-Difference
- In energy prices subsidy reform in Iran, all citizens were permitted to apply for cash transfer, but in the first wave of registration some did not apply to receive the cash.

year	treatment group	control group
2010 (year 1)	subsidy=0	subsidy>0
2011 (year 0)	subsidy>0	subsidy>0
2010 (year 1)	subsidy=0	subsidy>0
2012 (year 0)	subsidy>0	subsidy>0

Table: Policy design, program and control groups in HIESs

Data description and sample extraction

- The analysis presented in this paper is based on longitudinal survey data collected at households level over 2010-2012.
- These data are collected annually in all provinces from rural and urban areas.
- Energy subsidy reform started in December 2010 and the cash transfers were paid regularly since the time.

year	2010	2011	2012
number of urban households	18701	18727	18535
number of rural households	19584	19786	19657
number of urban individuals	72441	71461	69576
number of rural individuals	79850	79079	76496

Table: Total number of households and individuals in HIES surveys by year and region

Month	Aban	Azar	Dey	Bahman	Esfand
Number of surveid households	1612	1619	1643	1582	1610
Number of transfer received	94	598	1000	975	996
Percent of transfer received	5.8	36.4	60.8	61.6	61.8

Table: Number and ratio of households with positive reported cash transfers, rural

Month	Aban	Azar	Dey	Bahman	Esfand
Number of surveid households	1566	1517	1551	1565	1500
Number of transfer received	39	466	703	701	913
Percent of transfer received	2.6	30.7	45.3	44.8	60.9

Table: Number and ratio of households with positive reported cash transfers, urban

Dose Calculation

- "Dose" in our study is defined as the total monthly cash transfers over the monthly expenditures on 12 main items in budget survey.

- By definition, the dose should be a non-negative variable in $[0, 100]$ interval for whole sample, but this is not the case in our preliminary definition, we redefine the ratio by:

$$D_i^N = \frac{D_i - \min D_i}{\max D_i - \min D_i} \times 100$$

Decile	1	2	3	4	5	6	7	8	9	10
Rural areas	0.57	0.47	0.42	0.37	0.34	0.36	0.35	0.33	0.25	0.22
Urban areas	0.47	0.40	0.33	0.32	0.28	0.27	0.26	0.20	0.19	0.15

Table: Mean of calculated dose in rural & urban areas by deciles

Impact evaluation using treatment effect

- We apply the *Dose Response Function*, (*DRF*), for data with the following categorization.

  1. Total number of weekly cigarettes consumption in 2010 in which the control group did not received any cash transfer over the year, but the program group received.

  2. Total number of weekly cigarettes in the winter of 2010 with some groups defined in category 1.

  3. Change in the weekly smoked number of cigarettes between 2010 (1389) and 2011 (1390) (or 2012 (1391)) for households surveyed over winter or 12 months in 1389, to capture long run effect of the cash transfers

Dose response (only 2010)

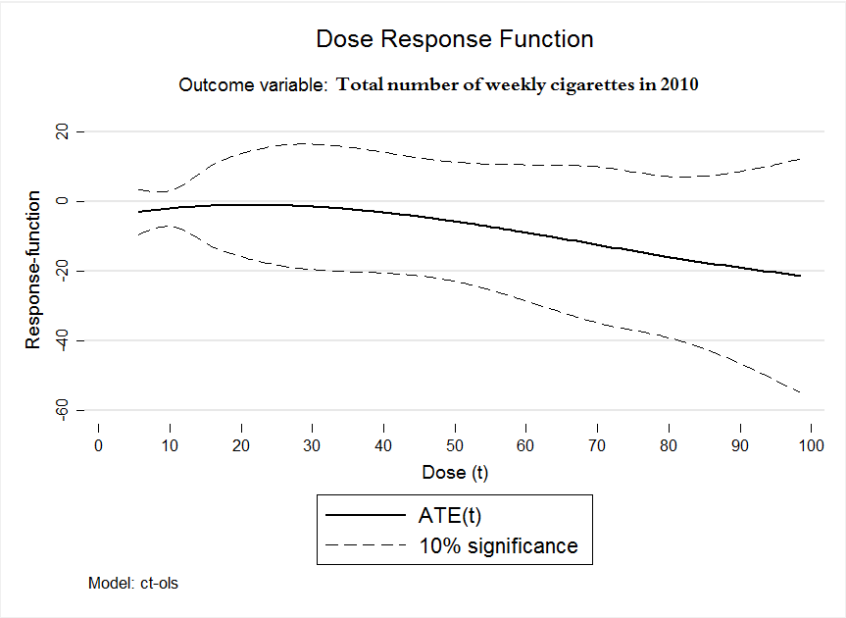

Figure: DRF for winter

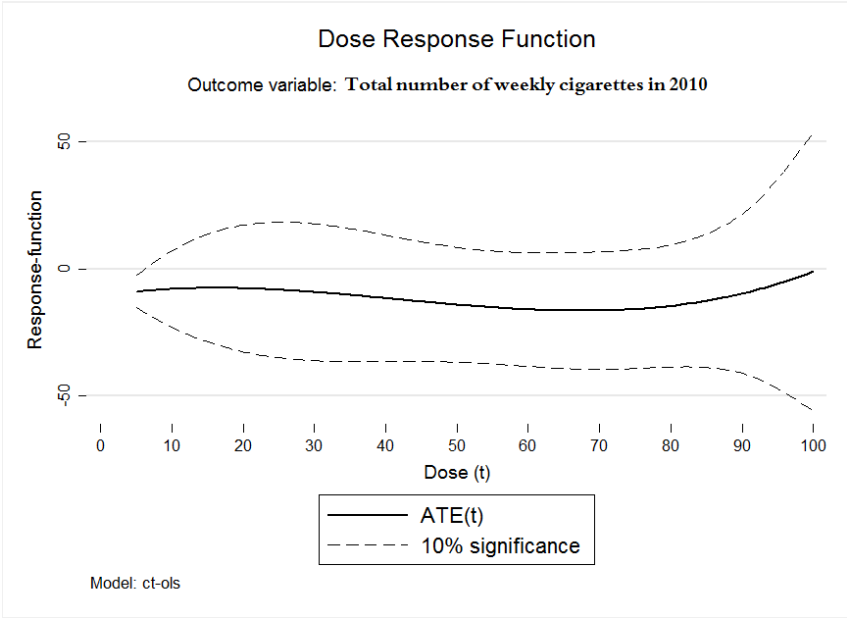

Figure: DRF for whole sample

Figure: DRF for total number of smoked cigarettes, rural households, 2010

Dose response (2010-2011 and 2010-2012)

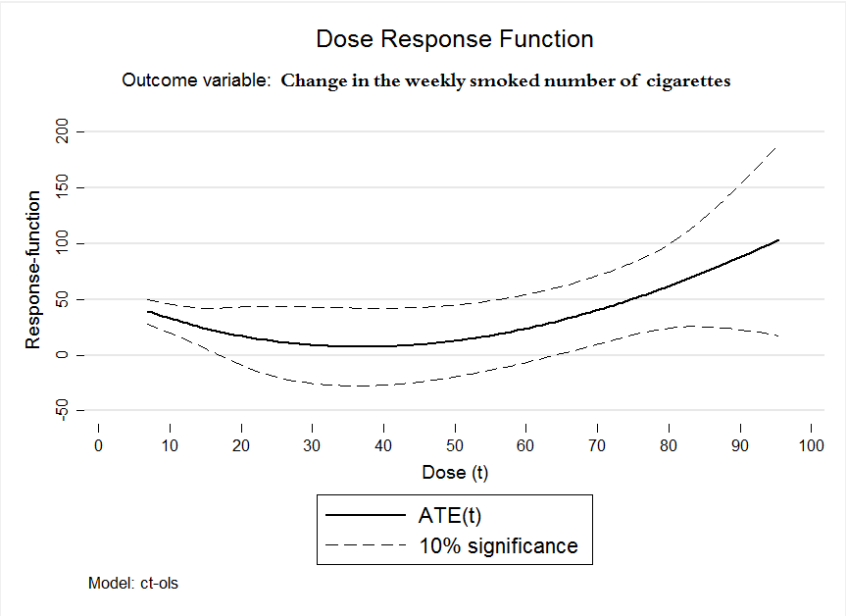

Figure: DRF for change in consumption (winter sample)

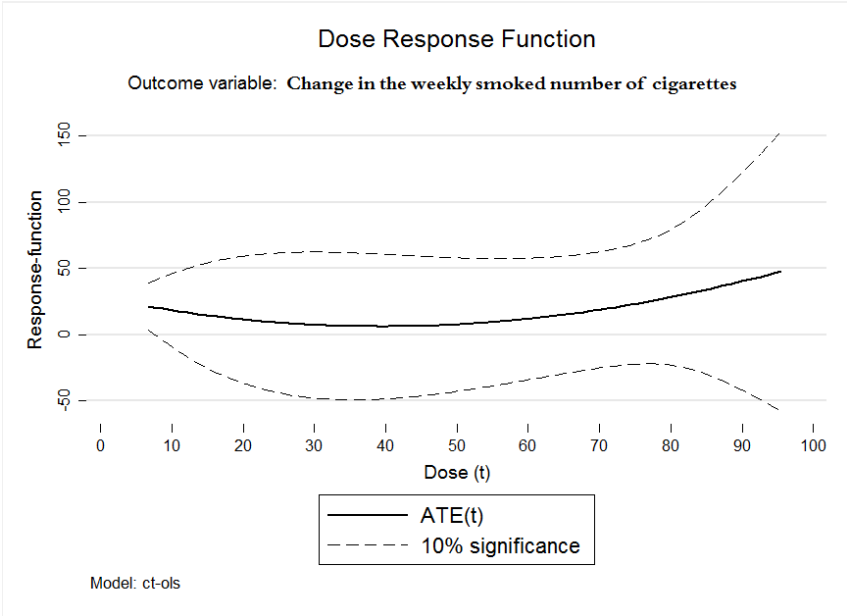

Figure: DRF for change in consumption (whole sample)

Figure: DRF for change in consumption urban households 2010-2011

Balance test and parallel trends

- One must account for systematic differences in baseline characteristics between treated and untreated population when estimating the effect of treatment on outcome of interest.
- Within a strata with the same value of propensity score the probability that treatment level takes a given value, does not depend on the value of household characteristics

Propensity Score Matching results

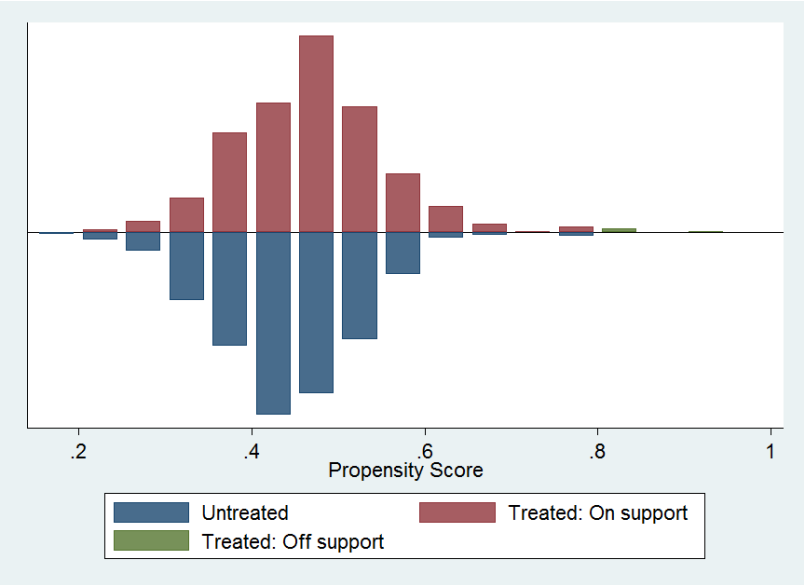

Figure: PSM-winter-rural

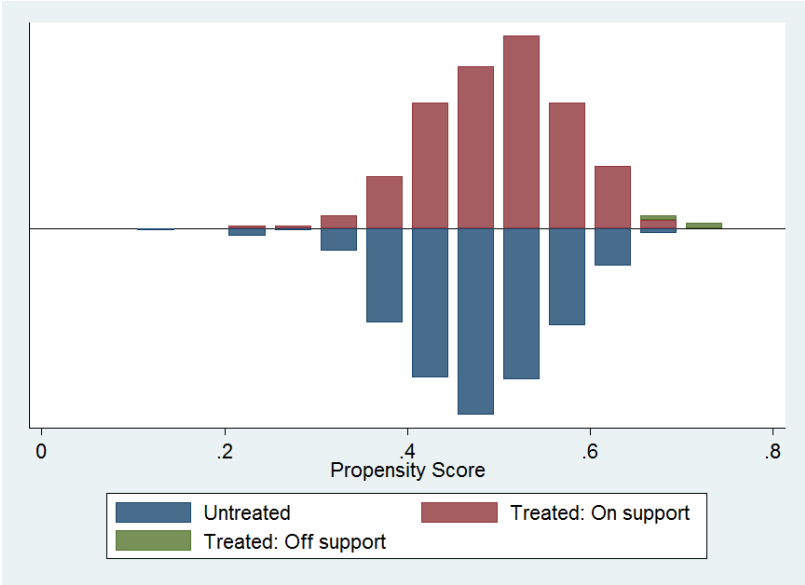

Figure: PSM-winter-urban

Figure: PSM for rural and urban

Diff in Diff (OLS-unconditional)

VARIABLES	(1) Rural 2010-2011	(2) Rural 2010-2012	(3) Urban 2010-2011	(4) Urban 2010-2012
treatment	-12.28	-1.529	-27.70**	-2.074
	(7.999)	(11.69)	(12.29)	(17.37)
time	-4.068	3.741	-1.036	9.443
	(7.112)	(7.555)	(9.344)	(16.07)
treatment*time	10.20	-9.939	5.320	-19.71
	(9.038)	(13.50)	(14.57)	(22.12)
Constant	95.99***	87.82***	94.48***	82.77***
	(6.873)	(7.999)	(9.718)	(11.68)
Observations	682	350	304	168

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table: Unconditional Difference in difference estimation for the winter scenario. Households surveyed in winters 2010-2011 and 2010-2012

Diff in Diff (OLS-conditional)

VARIABLES	(1) Rural 2010-2011	(2) Rural 2010-2012	(3) Urban 2010-2011	(4) Urban 2010-2012
treatment	10.27*	6.604	-10.41	-29.24*
	(5.240)	(7.793)	(8.074)	(16.03)
time	-0.925	-6.687	-16.57*	-28.96
	(6.851)	(6.965)	(9.681)	(17.54)
treatment×time	-0.212	-3.369	12.85	26.65*
	(7.091)	(7.136)	(11.11)	(15.54)
Log_cigarette_price	-27.71***	-28.01***	-21.66***	-25.87***
	(4.413)	(5.398)	(5.174)	(8.373)
SchoolingYears	-2.185***	-3.063***	-4.248***	-3.025***
	(0.670)	(0.847)	(0.710)	(1.156)
Log_Expenditures	21.94***	25.22***	15.35***	29.20***
	(4.209)	(5.104)	(5.415)	(8.679)
Constant	-257.1	-831.6***	-345.2	-514.7
	(206.8)	(279.6)	(432.9)	(452.3)
Observations	1,274	686	680	346

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table: Conditional Difference in Difference (by OLS) estimation. Households surveyed in whole years 2010-2011 and 2010-2012

Diff in Diff (OLS-Heckman)

VARIABLES	(1) consumption 2010-2011	(2) participation 2010-2011	(3) consumption 2010-2012	(4) participation 2010-2012
treatment	-6.009	-0.204**	62.83	-0.269**
	(25.08)	(0.0943)	(84.44)	(0.135)
time	-1.506	0.0361	-34.92	0.159
	(9.665)	(0.0847)	(53.83)	(0.128)
treatment*time	-11.35	0.224	-68.36	-0.330
	(29.01)	(0.125)	(103.9)	(0.175)
SchoolingYears	-0.894	-0.0238***	-1.196	-0.0112
	(3.178)	(0.00876)	(2.342)	(0.0124)
Log_cigarette_price	-25.24***		-33.90**	
	(6.398)		(15.60)	
Log_Expenditures	17.65		51.11	
	(24.76)		(77.06)	
Constant	-310.0	-2.363	-401.7	-1.854
	(596.2)	(1.878)	(1,557)	(2.745)
Observations	2,328	2,328	1,358	1,358

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table: Difference in Difference (by Heckman) estimation. Households surveyed in rural in winters 2010-2011 and 2010-2012

Parallel Trends: 2010-2011

- The presence of any difference in time trends in the pre-treatment periods (e.g. years -2, -1) in the outcome of interest between the treatment and control group would raise significant concerns about the validity of the difference-in-differences results.

	(1) Rural	(2) Urban
VARIABLES	2011-2012	2011-2012
treatment	6.205	-11.15
	(8.578)	(12.94)
time	-7.479	5.085
	(5.737)	(7.336)
treatment*time	12.10	13.01
	(9.080)	(13.17)
Constant	100.0***	81.57***
	(5.134)	(6.750)
Observations	671	376
R-squared	0.007	0.008

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Concluding remarks

- The findings from *Dose Response Function* by no means do not confirm any significant inclination of households' head toward anti-social expenditures.
- The similar insignificant evidence are observed by unconditional and conditional *diff-in-diff* regressions for urban and rural areas.
- We also showed that the propensity scores are well balanced between the program and control groups, and there are parallel trends for the binary treatment identification strategies.
- Finally it was clear that educational attainment, prices and monthly earnings are the main determinants of demand for cigarettes in rural and urban areas.

Thanks for your attention