Fuel Subsidies and Government Energy Assistance: Evidence from Ukraine

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Fuel Subsidies

FUEL SUBSIDIES =

- …when fuels or electricity are sold at price below the marginal (average) cost of producing and delivering them
- …or when the price of fuel does not include the value of the externalities created by consumption (Kotchen, 2021)

- Imposed by governments to help poorer households, achieve full electrification, protect the standard of living and health of the population
- Cons:
  - Expensive (1-7% of GDP; 6.3% of global GDP in 2015, Coady et al., 2018)
  - Unsustainable
  - Excessive consumption → environmental consequences, energy security issues
  - Insufficient revenue → poor quality service, insufficient investment in infrastructure (McRae, 2015; Goncharuk and Cirella, 2020)
  - Favor wealthy households?

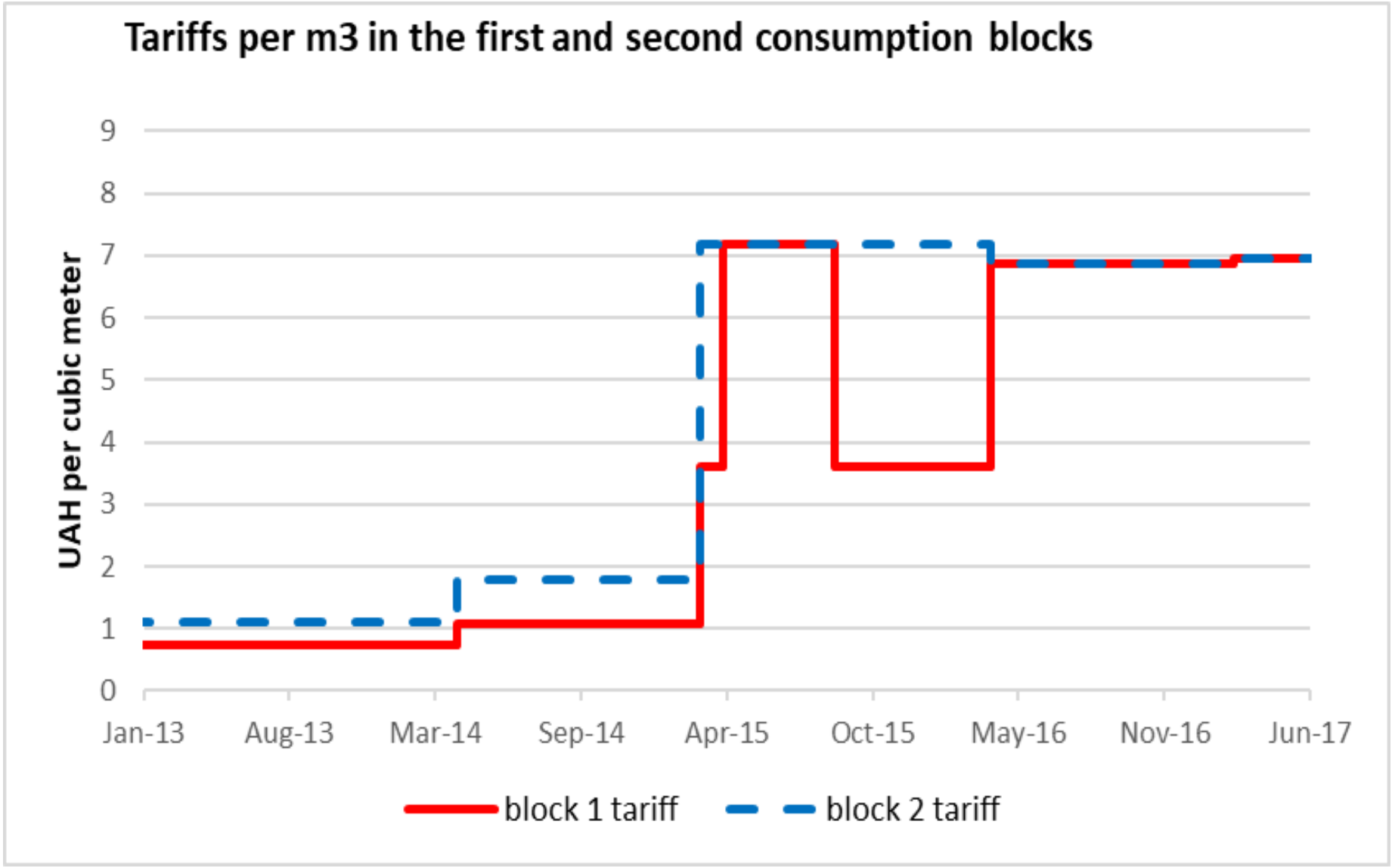
Current Trends

- Fuel subsidies are being eliminated or reduced through energy pricing reforms
- Examples:
  - Argentina since 2016 (Giuliano et al., 2020)
  - Kuwait since 2016 (Busheiri and Wohlgenant, 2012; Shehabi, 2017; Gelan, 2018)
  - Ukraine (2015) (Alberini et al., 2019, 2020)
  - Armenia (2010) (Krauss, 2016)
  - Carbon tax (or other climate policies)
- Immediate consequences to households
  - energy bill burden
  - fuel poverty
- Should these reforms be gradual, targeted, accompanied by energy assistance?

Ukraine

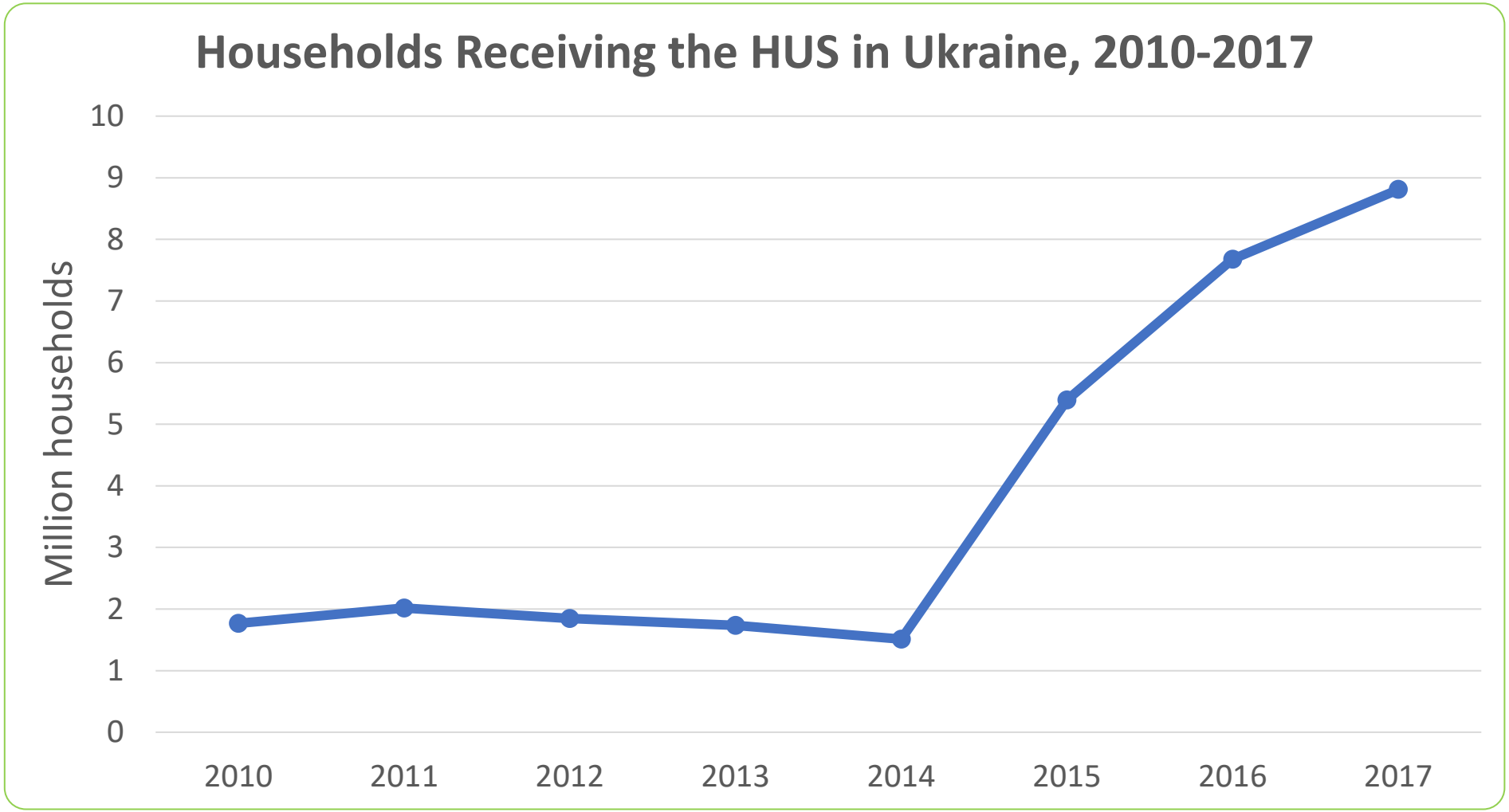
- A transition economy
- Poor (GDP per capita ≈ 1/3 of the EU average)
- Recent internal turmoil and difficulties with Russia
- Energy-inefficient economy
- Heavy dependence on fossil fuels (over 2/3 of energy sources)
- …and they are *imported*
- Building stock in poor condition and energy-inefficient

Residential gas tariffs in Ukraine since 2013



Ukraine's Energy Assistance Program—the Housing and Utility Subsidy (HUS)

- Existed before 2015
- Revamped in 2016
- Big jump in participation in 2015-16
- In 2017 and 2018, 50% of the households get the HUS
- Largest social assistance program in Ukraine (13% of all assistance in 2016; 2.5% of GDP)



How does the HUS work?

- Deducted from the utility bills (not cash transfer, at least not until May 2019)
- Has two parts:
  - Bills that would be paid if consumption = “normative consumption,”…
  - minus an adjustment proportional to income
- Bills covered:
  - Electricity
  - Natural gas
  - District heating
  - Water and sewage

Research Questions

1. Did the HUS provide relief to the most vulnerable segments of the population?
2. …or did it end up helping heavy (and potentially wealthy) consumers, who were already heavily subsidized before the tariff reform?
3. Are there alternate designs of the HUS that perform better in terms of welfare effects and government costs?

Data

- Ukraine's Household Budget Survey, 2014-2019 (Source: Ukrstat)
- Gas tariffs (NERC, Ukrstat)
- CPI at national and oblast level (Ukrstat)
- Heating degree days, annual and at oblast level

Selected Sample

- Households that use **natural gas for space heating** (some 50% of all)
- SF homes and units in MF buildings
- Can estimate a demand function for natural gas in 2017 and 2018
- Avg. usage 800 m^3/year

Key findings

- No substitution into other fuels
- Gas consumption not strongly correlated with income (see slide)
- HUS was generous
  - All HUS: 17% of pre-HUS income in 2017 and 2018
  - Gas HUS: 10% of pre-HUS income in 2017 and 2018
- HUS received by households at all levels of income (see slide)

Gas consumption not strongly correlated with income

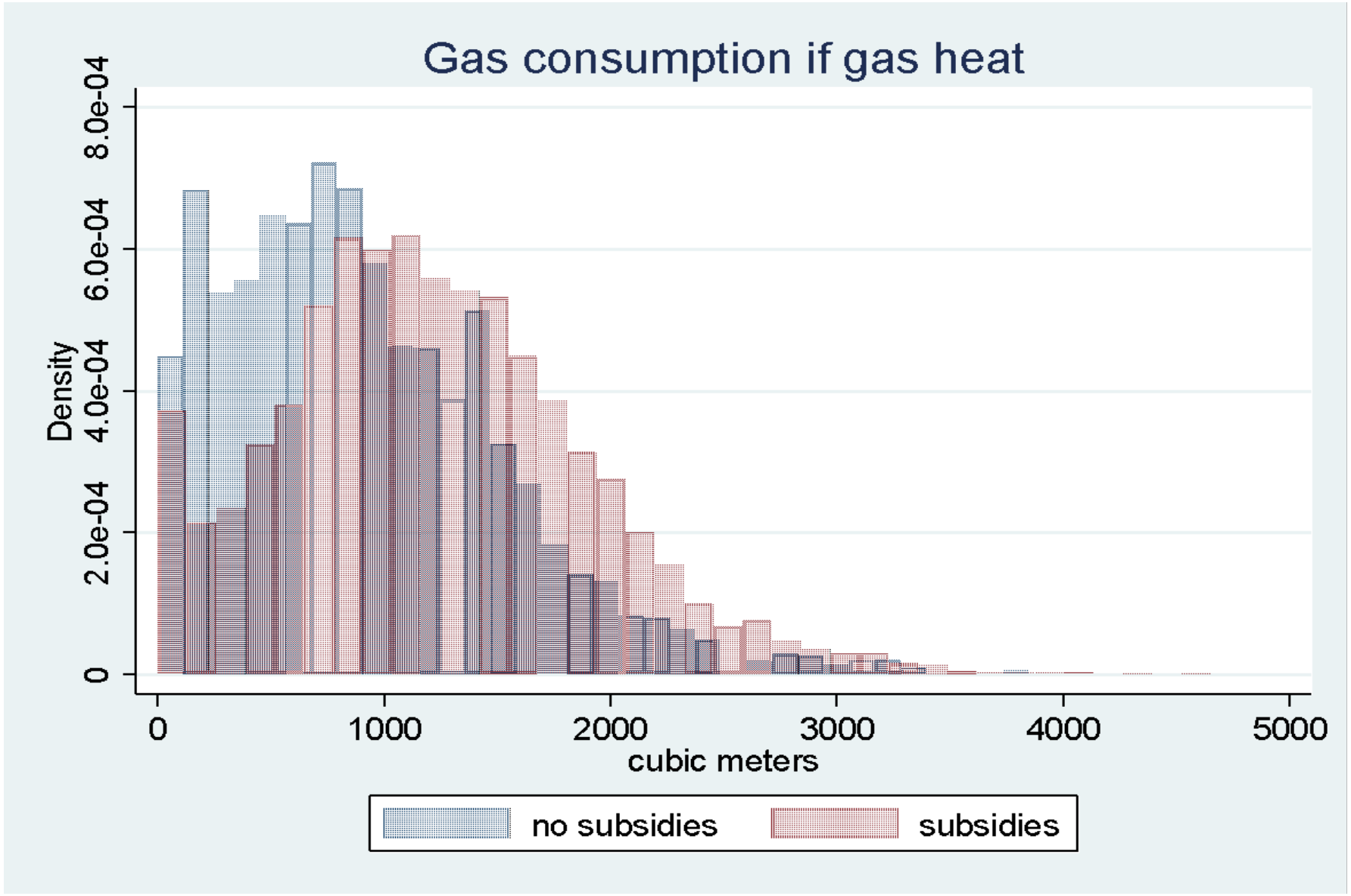
	Consumption Quartile				
Income quartile	1	2	3	4	Row total
1	27.81%	27.35%	25.96%	18.88%	100.00%
2	25.15%	25.04%	26.68%	23.13%	100.00%
3	24.26%	24.26%	24.79%	26.69%	100.00%
4	22.73%	23.31%	22.48%	31.48%	100.00%

HUS and Household Income

- 2/3 of the households in the first income quintile receive the HUS; and 1/3 of the households in the top income quintile
- Distribution of the HUS payments to income groups

Year	1st quintile (bottom)	2nd quintile	3rd quintile	4th quintile	5th quintile (top)
2014	48.35%	26.26%	17.86%	4.49%	3.04%
2016	21.39%	21.34%	20.89%	19.06%	17.33%
2017	23.21%	22.00%	19.90%	18.88%	16.02%
2018	28.19%	23.77%	19.81%	16.29%	11.94%
2019	30.67%	24.75%	18.23%	13.53%	12.45%

Key Findings: Performance of the HUS (1)



Key Findings: Performance of the HUS (2)

Electricity, gas and fuels as share of net income		
	No HUS households	HUS recipients
2014	5.67%	5.91%
2016	11.39%	6.15%
2017	11.18%	6.70%
2018	11.11%	8.08%

- Share very similar before the tariff reforms
- But 5% apart thereafter

And even among the non-HUS recipients, the average household is "fuel poor"

Key Findings: Performance of the HUS (3)

	Rate of fuel poverty if households had to pay the full electricity and gas bills (no HUS)	Actual rate of fuel poverty (with HUS)
2014	29.19%	13.67%
2016	73.76%	32.81%
2017	67.81%	31.25%
2018	62.27%	34.24%

- A household is fuel poor if it spends more than 10% if income on electricity and fuels
- Fuel poverty rate cut in half by the HUS
- But still very high!

Key Findings: Performance of the HUS (4)

* Results from fitting a demand function for 2017-2018 where the HUS changes the effective price of gas
* Estimated price elasticity -0.17

* Within each consumption quartile, CS gain relatively constant wrt to income

	Consumer Surplus Gain from the HUS (2014 UAH): Average per Household per Year			
	Consumption quartile			
Income quartile	1	2	3	4
1	1,445.19 (9.37% of inc.)	1,498.69	1,723.25	2,187.29 (14.11% of inc.)
2	1,657.86	1,732.40	1,714.52	2,152.53
3	1,995.67	1,702.14	1,730.79	2,004.77
4	1,946.20 (2.76% of inc.)	1,900.17	1,732.74	1,957.32 (2.65% of inc.)

Average CS gain per HUS household per year: 1722 UAH (2014 UAH) or 6.5% of net income

Remove the HUS or Change it? Some Options

- Drop the HUS entirely
  - Loss of CS equal to 6.5-7.2% of income
  - Gas consumption reduced by 8%
  - Big savings for the government (2.5% of GDP)
- Cut the HUS in half
  - Very modest loss of CS (1% of income)
  - Gas consumption reduced by 4%
  - Still considerable savings for the government
- Replace the HUS with payments to households below the poverty line (decoupled from gas consumption)
  - Large loss of CS
  - Considerable savings for the government only under the least generous scenario
- Partially cut the HUS + social tariffs
  - If the lowest income quantile pays 80% of the full tariff and the highest 115%, the revenue from the latter covers the discount offered to the poor
- Convert the HUS into a subsidy to energy efficiency upgrades

Energy Efficiency Programs

"Warm Loans" program

- Since 2014, 850,000 households served
- Much smaller budget than the HUS
  - some 400 million UAH/year until 2020 v. HUS 52,600 million UAH in 2016
  - 2021 budget is only 130 million UAH
- Reimburses 20-35% of principal of loans for EE upgrades (insulation, windows, new boilers), which households must take out from selected banks
- Average cost of project for individual household 18,000 UAH
- Based on SAEE (2016, 2017) and Alberini et al. (2019), projects reduce consumption by 20% on average

Simple math

- Project cost 18,000 UAH
- Assume up to 50% of cost of the project borrowed
  - project "pays itself back" over lifetime of equipment and materials
  - Govt disbursement still less than HUS payment
- …and reduces consumption by 20% permanently at no loss of welfare for the household.
- Negligible rebound effect given the low price elasticity of gas demand

Conclusions

- Abrupt energy tariff hikes can cause significant distress and create (or worsen) fuel poverty
- Energy assistance programs may be necessary…
- …but are expensive and tend to be short-lived
- Ukraine HUS
  - Big program (½ of the households in UA)
  - Pays in proportion to "normative consumption," but reduces payment in proportion to income
- The Ukraine HUS appears to have assisted both low- and high-income households
  - It did provide relief to the most vulnerable segments of the population
  - It also helped heavy consumers, but heavy consumers are not necessarily the wealthy
  - It helped ameliorate fuel poverty
  - But fuel poverty remains very widespread in Ukraine
- Various redesigns of the HUS, including converting it into a (one-time) subsidy to EE upgrades.

Thank you!
Questions and comments?
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Key Findings: Performance of the HUS (5)

* Results from fitting a demand function where the HUS is treated as a demand shifter and the price elasticity is set at -0.16
* HUS elasticity of gas demand: 0.079.

* Larger numbers than before, more variation within and across quartiles.

	Consumer Surplus Gain from the HUS (2014 UAH): Average per Household per Year			
	Consumption quartile			
Income quartile	1	2	3	4
1	895.42 (5.77% of inc.)	1,347.37	1,685.75	2,111.98 (13.46% of inc.)
2	1,129.69	1,627.02	1,931.51	2.408.13
3	1,247.10	1,802.13	2,158.18	2,679.31
4	1,256.42 (1.82% of inc.)	2,703.45	2,427.17	3,076.27 (4.12% of inc.)

Average CS gain per HUS household per year: 2163 UAH (2014 UAH) or 7.2% of net income