Leakage in Fuel Subsidies

Evidence from Direct Benefit Transfer for LPG policy in India

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Policy context

- Fuel subsidy and subsidy leakage - significant burden on the exchequer
- Government of India has almost deregulated diesel
- LPG and kerosene - direct impact on household budget and politically sensitive
- Existence of underground market for LPG refills and Kerosene: role of the middle-men
- Rationing the supply- introduction of annual cap for LPG refills in September 2012
- Better targeting and monitoring
- Removal of the role of distributer and delivery-men in subsidy disbursement
- Purging out duplicate and ghost customers

Motivation

- High fuel subsidy burden in developing countries
- Subsidy diversion (leakage) consitutes a major part
- Significant fiscal and welfare implications of fuel subsidy reforms in developing countries
- Political economy of fuel subsidies
- Dependence between point of provision (incidence) of subsidies (taxes) and the fiscal loss or gain
- Targeting and monitoring

"Losing sleep over subsidy leakage, not subsidy itself"
Pronab Mukherjee, Ex- Finance Minister and current President of India (Feb 2012)

Research Question

- Evaluation of **Direct Benefit Transfer for LPG** (DBTL) policy - how effective was DBTL is controlling the subsidy leakage?
- Broader question: Does leakage in subsidy respond to how subsidy is disbursed?
- Particularly, is moving down the point of subsidy provision from the distributor to the household level effective in containing the leakage?
- If so, how much subsidy leakage can be avoided by providing it directly to the beneficiary households ?
- And, what happened when government rolled-back DBTL policy?

Summary of results

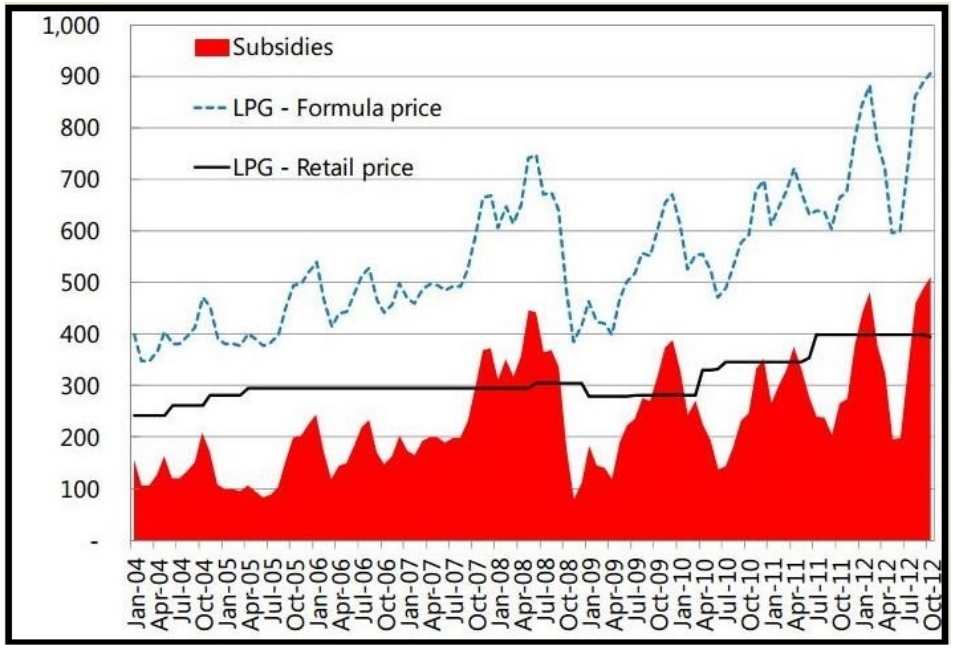
- DBTL policy had a significant causal impact on LPG consumption and so, on the LPG subsidy.
- The immediate high impact on LPG consumption gradually normalizes with time, but overall it indicates lesser subsidy leakage.
- Prices in LPG black-market respond to DBTL policy.
- LPG black-market equally responds to the removal of DBTL policy.

Selected literature

- Irrelevance between statutory and economic incidence of taxes (Rosen (2002))
  - Slemrod (2008): Irrelevance does not hold in the presence of avoidance and evasion
- Evasion:
  - Kopczuk, Marion, Muehlegger & Slemrod (2013): Going down the supply chain may provide greater opportunity to evade taxes
- Fossil fuel taxes:
  - Bento, Goulder, Jacobsen & Haefen (2009): Distributional and effciency impacts of tax increase on gasoline in terms of reduction in consumption and revenue recycling respectively
- Granado, Coady & Gillingham (2012):
  - Top income quintile captures 7 times more in subsidies than bottom most quantile.

Fuel subsidy in India

- About 2% of GDP spent on energy subsidies
- LPG subsidies : $ 7 billion in year 2012-2013



Source: Anand et al., The Fiscal and Welfare Impacts of Reforming Fuel Subsidies in India (May 2013). IMF Working Paper No. 13/128

LPG distribution in India

- Three Oil Marketing Companies (OMCs)- Indian Oil, Bharat Petroleum and Hindustan Petroleum.
- About 14000 LPG distributors- at least one distributorship alloted for any town with population > 20,000.
- Households are eligible for domestic LPG refills (14kg cylinder) at subsidized prices till they are within the annual cap.
- Annual average consuption is about 7 LPG refills per household per year.
- Introduction of cap:
  - Cap of 6 LPG refills per year introduced in September 2012
  - Cap increased to 9 in January 2012
  - Cap increased to 12 in February 2013
- Distributors also supply to non-domestic customers: in a bigger 19kg container
- Seperation of domestic and non-domestic LPG refills in size and price : regulation issues

Leakage in LPG subsidy in India

- Why do we care?
  - high fiscal cost
  - inefficiency
- No authentic estimate available for LPG subsidy diversion, however :
  - Leakage in PDS for grain is estimated to be ~ 40 to 60% (Dutta, Howes and Murgai 2012)
  - For Kerosene, upto 50% leakage is reported (Gangopadhyay, Ramaswami and Wadhwa 2005)
- Reporting number of subsidized and non-subsidized sales to the government- mis-reporting and collusion.
- Back market for subsidized LPG cylinders (i.e. 14kg containers): a high margin business.

DBTL Policy 2013-14

- Direct Benefit Transfer on LPG refills (DBTL)
  - Directly transfers the subsidy amount to the bank account of customer
  - Extra checks to avoid duplicacy using UID and centralized payment gateway
- Non-subsidized price of one standard size domestic refill (14kg LPG container): about Rs 1000 (July 2014)
- subsidy given per refill: about $10 (up to 12 refills per year per HH)
- Phase wise roll-out starting from June 2014
- Political announcement made to roll it back on January 30, 2014.
- Actual roll-back implemented from March 10, 2014 only.

Data

Administrative data on LPG refill transactions:

- Three Oil Marketing Companies- IOCL, BPCL and HPCL
- About 150 million households in 640 districts, being served by about 14,000 LPG distributors.
- Approx. 1 billion transactions every year
- For this study 10% sample from HPCL customer base (i.e. about 4 million customers) is used for 2013-14
- A monthly panel is created at the household level covering about 500 districts in total.
- Distrbutor level sales data is also used with about 3500 HPCL distributors

Field work

- Total 89 districts covered during Dec 2013 and March 2014 in three rounds of surveys.
- About 7 delivery-men and 15 small-busineses in each districts
- **Delivery-man audit survey**
  - asked about price for an LPG refill without LPG card
- **Small business survey**
  - Collected extensive details on price of LPG refills from snack-counters and restaurants.
  - Asked for refill history- dates and prices
  - Asked for ongoing black-market LPG price in the end of the survey
  - Same shops visited multiple times in 4 months period

Identification

- Identification rests on Phasewise rollout of the DBTL policy using difference-in-difference method
  - Phase I started on 1 June 2013 in 18 districts
  - Phase II started on 1 Sep 2013 and so on
  - DBTL introduced in about 300 districts till Jan 2014
  - However, it's made mandatory in about 40 districts only (i.e. Phase I and II)
- Criterion for selection into phases
  - penetration of Universal Identification at the district level
- There are UID related issues with DBTL implementation but by the end of 2013-14, more than 80% customers had UID/Bank Account linked to their LPG card.
- Government of India announced to suspend the scheme from February 2014, actual notification sent out in March 2014.

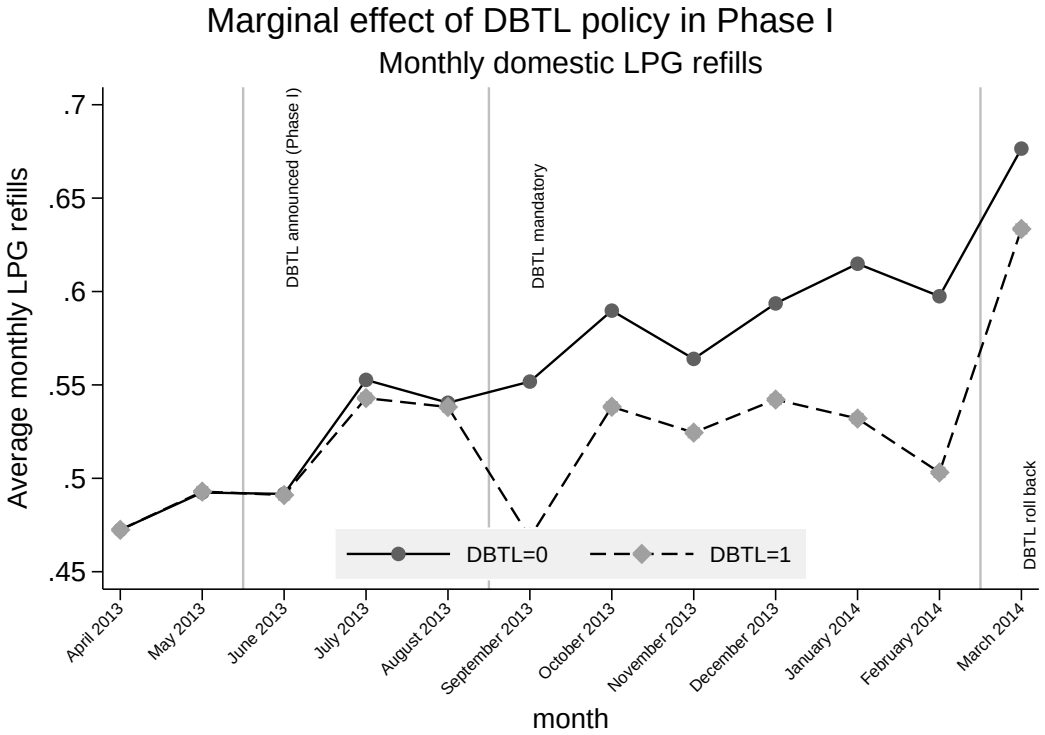
Empirical model

$$y_{idt} = \alpha_d + \lambda_t + \beta_0 DBTL_c + \beta_1 (DBTL_c * post_t) + \beta_2 post_t + \varepsilon_{idct}$$

i: household, d :district, t: time period
DBTL- DBTL status of the district: 1 if DBTL is mandatory , 0 otherwise
post- takes value 0 before DBTL is implemented in a district, 1 post-implementation
Fixed effects: month and district/ HH

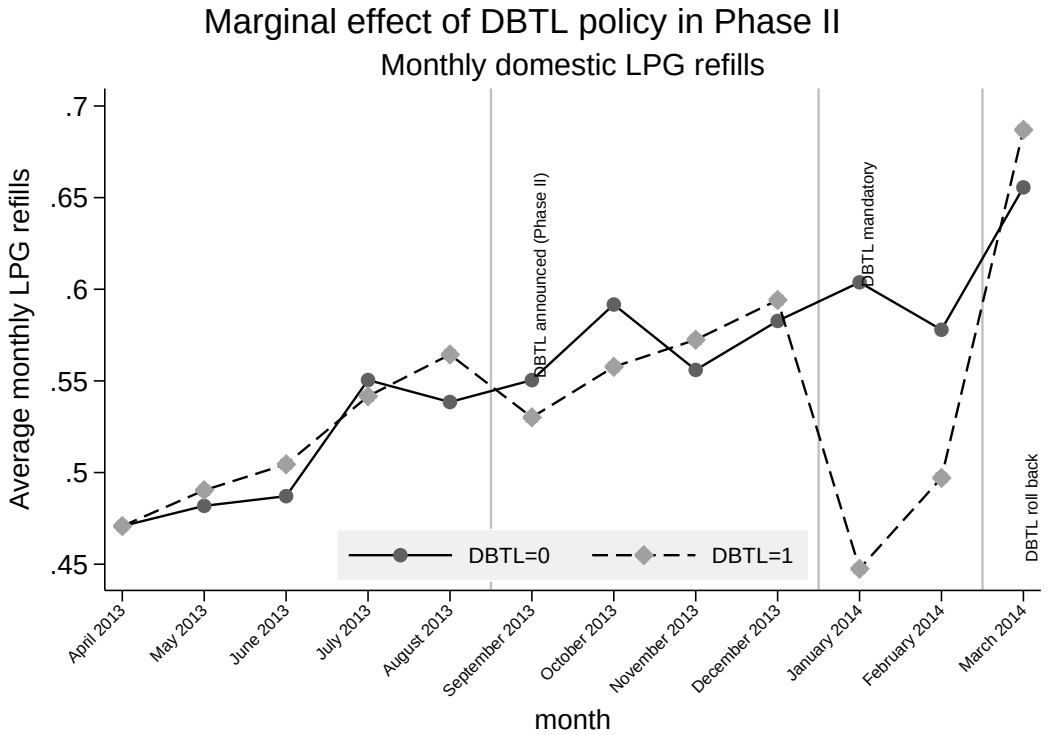
- Outcome variable Y: Number of refills per month, LPG black-market price

Results



Above graph shows regression coefficients for Phase 1 districts when compared to districts in subsequent Phases as control. Household fixed effects are used to control for time-invariant household fixed factors. Regression analysis shows a huge drop in LPG refills following the DBTL deadline but it gradually improves. After DBTL roll-back, Phase 1 districts catch up with control districts. The average estimate of effect of DBTL in reducing LPG consumption is about 12% (prelim).
While UID related transition issues are likely to be a factor in first month, LPG being an important commodity, household may still have to continue buying it. So, what we see here includes subsidized as well as non-subsidized domestic LPG refills.

Results



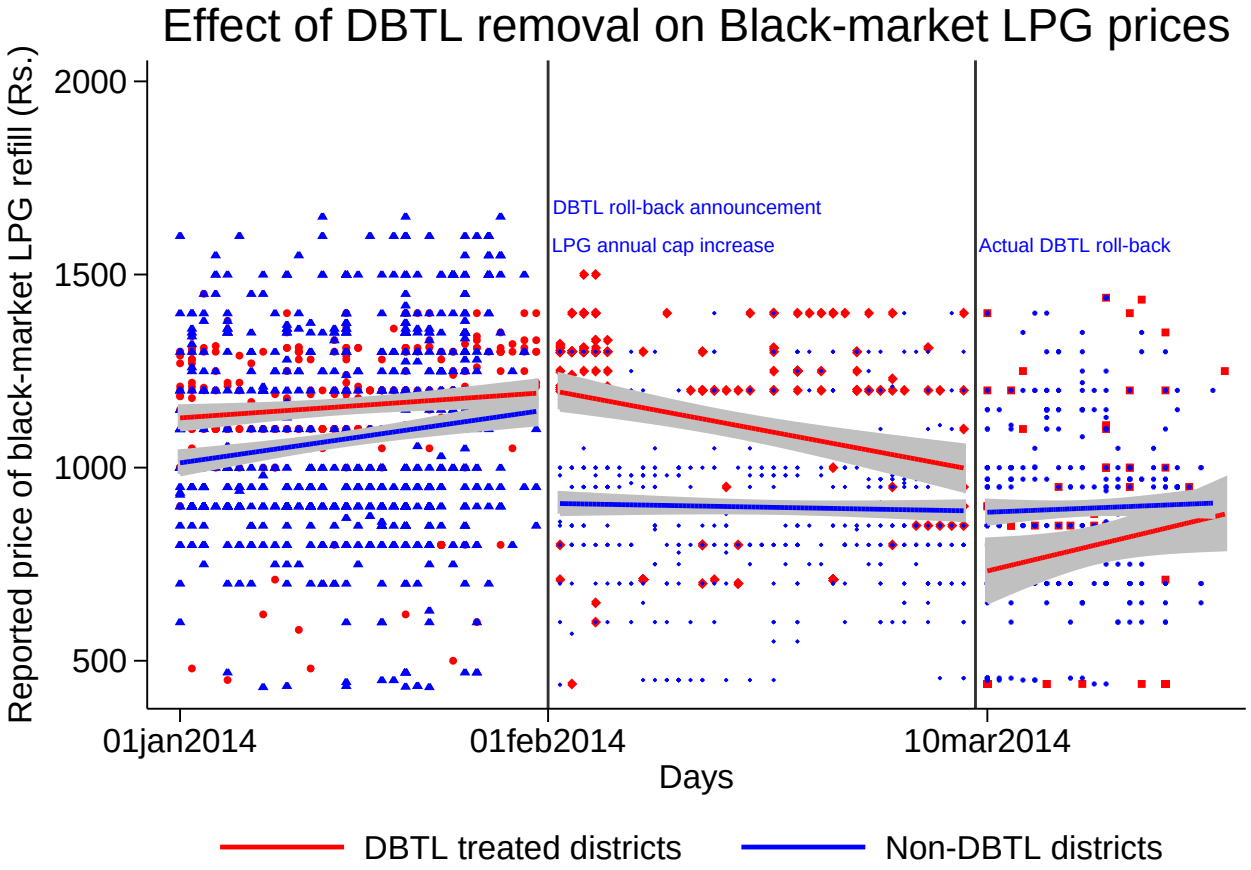
Similarly, for Phase 2 districts, above graph shows marginal effect on LPG consumption in each month when compared to districts in subsequent Phases as control. Household fixed effects are used to control for time-invariant household fixed factors. Regression analysis shows a heavydrop in LPG refills following the DBTL deadline. After DBTL roll-back, Phase 2 districts quickly catch up with control districts. The average estimate of effect of DBTL in reducing LPG consumption is about 18% (prelim).

Black- market price survey results- DBTL roll back

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					refill price					
post	-0.0300**	-0.0249**	-0.0256**	-0.0476***	-0.0215	-0.0218*	-0.0351**	0.00728	0.0192	0.0182
	(0.0119)	(0.0122)	(0.0122)	(0.0150)	(0.0180)	(0.0117)	(0.0161)	(0.0134)	(0.0153)	(0.0153)
treatment X post	-0.0443**	-0.0962***	-0.0912***	-0.0582**	-0.0509**	-0.0461**	-0.0305	-0.0936***	-0.145***	-0.140***
	(0.0206)	(0.0217)	(0.0218)	(0.0224)	(0.0217)	(0.0187)	(0.0194)	(0.0234)	(0.0257)	(0.0258)
Constant	6.994***	6.997***	6.998***	7.042***	7.039***	7.030***	7.076***	6.918***	6.937***	6.941***
	(0.00958)	(0.00908)	(0.00887)	(0.00847)	(0.0119)	(0.00532)	(0.00634)	(0.0186)	(0.0160)	(0.0150)
Observations	4,679	4,996	5,128	3,352	1,878	1,518	909	1,908	2,225	2,357
R-squared	0.822	0.811	0.809	0.821	0.773	0.786	0.656	0.774	0.758	0.759
Month FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Treatment group	Ph 1	Ph 2	Ph 1 & 2	Ph 1 & 2	Ph 1 & 2	Ph 1 & 2	Ph 1 & 2	Ph 1	Ph 2	Ph 1 & 2
Control group	Ph 3-6 & Non-DBTL	Ph 3-6 & Non-DBTL	Ph 3-6 & Non-DBTL	Ph 3-6	Ph 3-5	Ph 3-4	Ph 3	Non-DBTL	Non-DBTL	Non-DBTL
No. of Districts	81	85	88	60	35	27	16	31	35	38
No. of Firms	972	1028	1059	692	393	302	175	398	454	485

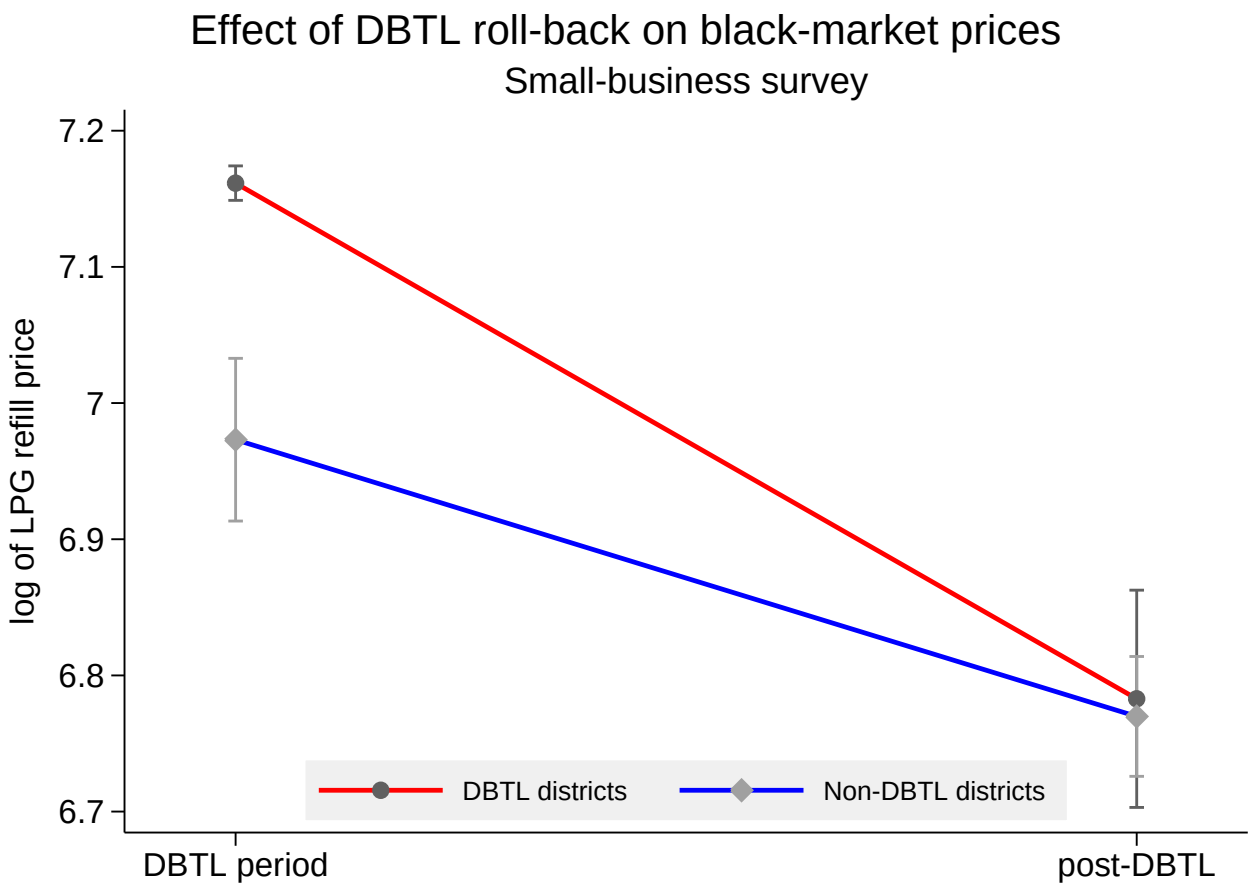
- Above Table show regression of log (LPG prices) with interaction of treatment and post suggetsing 10 to 15% drop in black market LPG prices when DBTL is "effectively" rolled back.

Black- market price survey results- Refill history



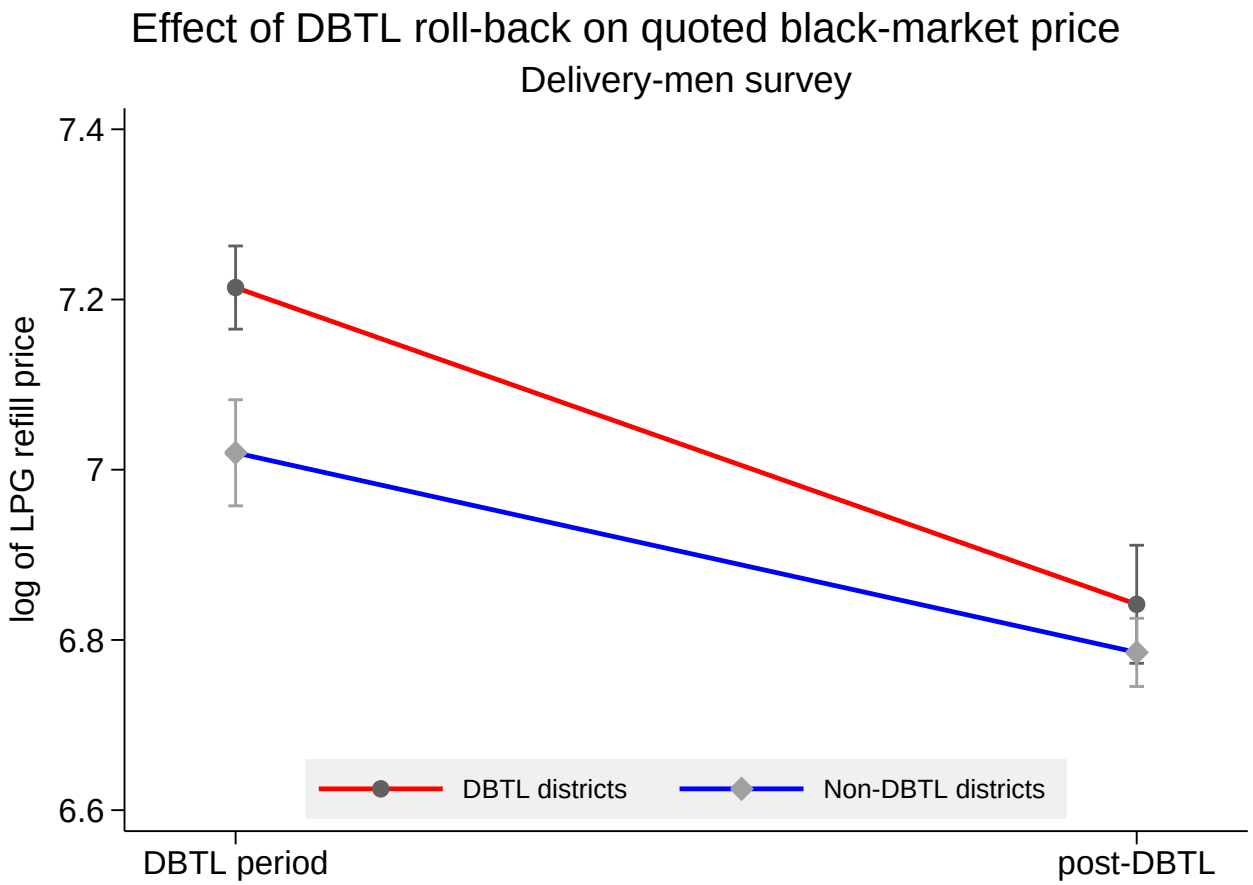
Above scatter plot shows distribution of LPG refills price in DBTL and non-DBTL districts. Focussing on March 10, we see a huge drop in Refill prices right after DBTL was "effectively" rolled-back.

Black- market price survey results: Small-business survey



Above coefficient plot show panel regression results of log(price) as the outcome variable. Firm and time fixed effects are included. The difference in difference estimates suggests about 17.5% drop in black-market LPG prices when DBTL is rolled-back.

Black- market price survey results: Delivery-men survey



Analysis of LPG price quoted by delivery-men suggests about 14% drop in the black-market LPG price. Distributor fixed effects are included.

Summary

- **Using household transaction data:**
  - Introduction of DBTL policy is effective in reducing LPG consumption (and subsidy burden) by about 12 to 18% (prelim).
- **Using survey data:**
- Impact of leakage is reflected in LPG black market.
- DBTL roll back decreases down black-market prices by about 15% in the DBTL districts.
- Black-market in DBTL mandatory districts responded more to the actual DBTL roll-out (there was about 40 days delay in political announcement and actual roll-back)

Conclusion

- Introduction of DBTL policy is effective in reducing subsidy burden by about 12 to 18%.
- Significant reduction in subsidized LPG consumption suggests direct transfer of subsidy is effective in avoiding leakage.
- Survey data provides complete view on subsidy diversion with LPG black-market prices responding to the removal of DBTL policy.
- Rising black-market prices in DBTL districts may provide new incentives to have duplicate cards or household level diversion.
- Following policies may help in curbing such leakage, in addition to Direct Benefit Transfer-
    - Reducing the cap or making it conditional to household size, poverty level, or with a non-linear subsidy.
    - More survelience in urban areas to control black-marketing channels.