

# Price Saliency and Social Comparisons as Policy Instruments to Encourage Energy Conservation: Evidence from a Field Experiment

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  - Energy consumption (Kahn & Wolak, 2013)
  - Social Security (Liebman & Luttmer, 2011)
  - EITC (Chetty & Saez, 2013)

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- Social comparisons → behavior
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- **In a common setting, we evaluate the relative strength of two types of information interventions.**

# Motivation 2. Subsidized Energy in Developing Countries

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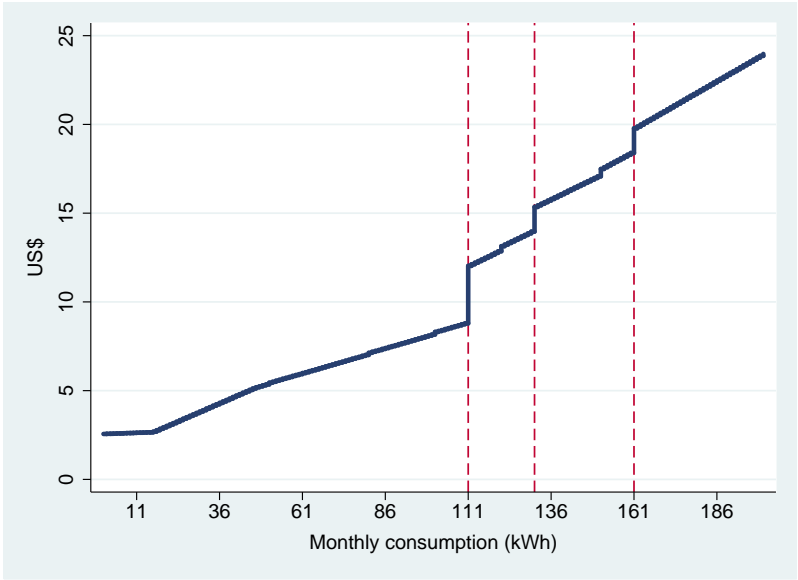
- Electricity (and other fuels) are highly subsidized
  - In Ecuador, cost of all energy subsidies is \$438 million; cost to electricity consumers would increase 27% if subsidies removed
- Politics makes increasing prices difficult
- Can consumption be reduced by non-price means?
  - Reduces emissions
  - Reduces funds allocated to subsidies



# Residential Electricity in Quito

- We partner with the Electric Utility in Quito, Ecuador (EEQ)
- EEQ's tariff has Notches

# Example of Total Tariff Function in Quito



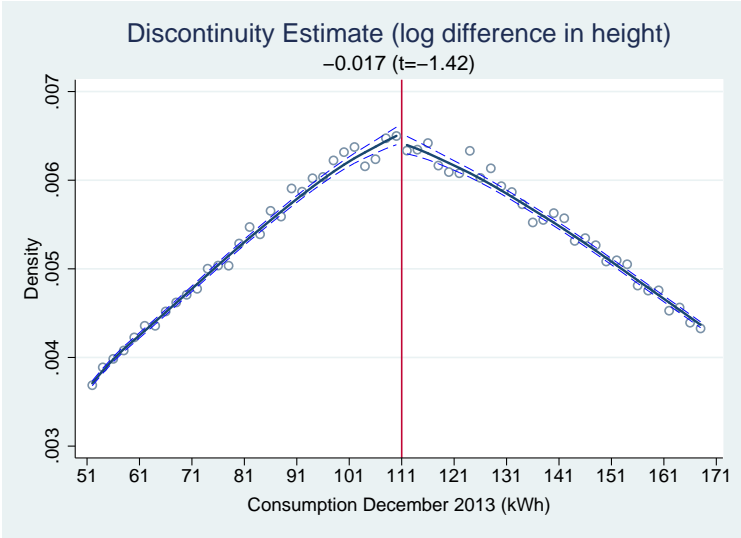
# Residential Electricity in Quito

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- Conditions for Notch to cause “Bunching”
  - 1 Notch is salient to households
  - 2 Households are price responsive
  - 3 Households do not face strong optimization frictions (e.g. adjustment costs, inattention)

# Residential Electricity in Quito

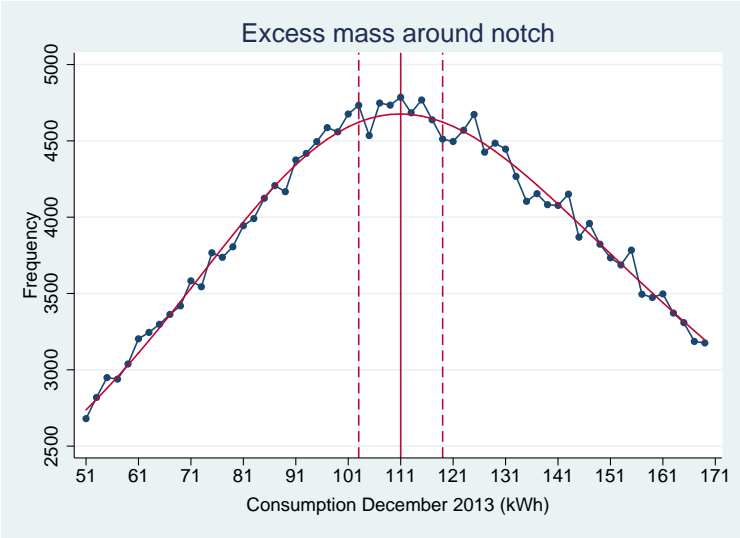
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- Biggest notch (at 111 kwh) does not appear to induce consumption reduction around the notch

# Pre-treatment evidence #1: effect of notch



Approach: "McCrary Test"

# Pre-treatment evidence #2: effect of notch



Approach: "Excess bunching?"

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- Biggest notch (at 111 kwh) does not appear to induce consumption reduction around the notch
- Bill design suggests that salience is a cause

# Electricity Bill



EMPRESA  
ELÉCTRICA  
QUITO S.A. E.E.Q.

Las Casas E1-24 y Av. 10 de Agosto R.U.C.: 179003881001 / CONTRIBUYENTE ESPECIAL / RESOLUCIÓN N° 5368

Factura No. **001-007-003108291**  
 Autorización SRI: 1110588751  
 Fecha de autorización: 01/02/2012  
 Válida hasta: 13/01/2013



No. de Control: **149805609-83**  
 Valor a pagar: **23.24**

Fecha de emisión: 18/12/2012

Fecha de vencimiento: 04/01/2013

## INFORMACION DEL CONSUMIDOR:

SUMINISTRO: **1498056 - 3** PROAÑO DURAN MARCO ANTONIO  
 CODIGO ÚNICO ELÉCTRICO NACIONAL: **1401498056** Cédula / R.U.C.: 170667497-3  
 Dirección servicio: NEW CASTLE 10 VIA GUANGOPOLLO C.H. NEW CASTLE  
 Dirección notificación: Domicilio  
 Plan/Geocódigo: 74 01-07-005-2390  
 Parroquia - Cantón: CONOCOTO DISTRITO METROPOLITANO QUITO  
 Tarifa: Residencial (Baja Tensión) 18/12/2012

## SUMINISTRO DEL SERVICIO ELÉCTRICO:

Medidor: 607818-SAX-AB Factor de multiplicación: 1.00 Constante: 1.00  
 Recargo Pérdidas en Transformación: 0 %  
 Desde: 15/11/2012 Hasta: 14/12/2012 Días: 29 Tipo consumo: Leído

LECTURAS				Valores	VALOR FACTURABLE:
Descripción	Actual	Anterior	Consumo	Unid.	
Energía	6362.00	6160.00	202	kWh	14.77
07000-22000				kWh	0
22000-07000				kWh	0
Reactiva				kvarh	0
Demanda Cliente				kW	0
Máxima				kW	0
Máxima en pico				kW	0

TOTAL SERVICIO ELÉCTRICO (1): **19.26**

Su ahorro por la Tarifa de la Dignidad es de **0.00**



## VALORES PENDIENTES DE PAGO POR SERVICIO ELÉCTRICO:

CONCEPTO VALOR

TOTAL VALORES PENDIENTES:



SIN EL SELLO DE CANCELADO, NO TIENE VALOR



EMPRESA  
ELÉCTRICA  
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## OTROS VALORES A PAGAR:

CONCEPTO	SUSTENTO LEGAL	VALOR
IMPUESTO BOMBEROS	Ley de Defensa Contra Incendios	1.46
TASA RECOLECCION BAS	Ordenanza Municipal	2.52

## VALORES PENDIENTES DE PAGO POR SERVICIO ELÉCTRICO:

TOTAL OTROS VALORES A PAGAR (2): **3.98**

TOTAL A PAGAR	
Valor servicio eléctrico (1):	19.26
Otros valores a pagar (2):	3.98
<b>TOTAL (1) + (2):</b>	<b>23.24</b>

(\*) BASE PARA RETENCION 1%: 0.00

Pagar hasta: 04/01/2013

CAR LIMCORNIO 001 0104203 13 42 53 LECORNB\_eB6  
 PROAÑO DURAN MARCO ANTONIO 1001498056037 23.24  
 \*\*\*\* FACTURA PAGADA \*\*\*\*

SIN EL SELLO DE CANCELADO, NO TIENE VALOR

ORIGINAL - USUARIO





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  - 3 Households do not face strong optimization frictions (e.g. adjustment costs, inattention)
- Biggest notch (at 111 kwh) does not appear to induce consumption reduction around the notch
- Bill design suggests that salience is a cause
- **One of our information interventions seeks to make notch salient & measure effect**
  - (We don't attempt to affect [3] or to separate [2] and [3])

# Social Comparisons

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- Non-price incentives are used to influence behavior
  - Alcohol and drug use, eating disorders, gambling, voting, tax compliance, recycling, energy consumption, among others
- Social comparisons are used to encourage conservation
  - Information on private optimum level of consumption
    - Becker (1965)
  - Social norms / moral payoffs.
    - Levitt & List (2007)

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    - Becker (1965)
  - Social norms / moral payoffs.
    - Levitt & List (2007)
- **We make salient the average consumption level for our target population**

# Experimental Design

# Experimental Design

- Information intervention to HHs with historical average consumption between 100 and 125 kWh
- Letters attached to the monthly electric bills in March 2014

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- Information intervention to HHs with historical average consumption between 100 and 125 kWh
- Letters attached to the monthly electric bills in March 2014
- **Random assignment of 3 treatments (16k each)**
  1. Make the 111 kWh price notch salient
  2. Make a social comparison (same level as in the notch)
  3. Do both
- Control (16k)

SUMINISTRO: XXXXXXXX - X

Plan/Geocódigo:



EMPRESA  
ELÉCTRICA  
QUITO

## INFORMACIÓN IMPORTANTE

### Ahorre Electricidad y Ahorre Dinero

Estimado Cliente:

La siguiente información con respecto a su consumo mensual de electricidad durante el año pasado puede ser de su interés.

**Su consumo promedio mensual fue aproximadamente: 115 kWh**

**Un hogar similar al suyo consume en promedio: 110 kWh**

Esto significa que durante el año pasado usted consumió aproximadamente **4.5 % más** que otros hogares similares. Le exhortamos que haga un uso eficiente de la energía para ahorrar dinero.

Por favor lea con atención los consejos para ahorrar energía que le damos a continuación para que empiece a ahorrar dinero ya! Comparta esta información con los demás miembros del hogar.

- No deje la puerta del refrigerador abierta por mucho tiempo y asegúrese que la puerta cierre herméticamente.
- No deje el televisor encendido si nadie lo mira.
- No olvide apagar las luces al salir de una habitación.

**¡AHORRE ELECTRICIDAD, AHORRE DINERO!**





# Price Salience Letter

## IMPORTANT INFORMATION

### Save Electricity and Save Money

Dear Customer:

Electricity in Quito is billed using a progressive pricing system. What this means for you is that there is a large increase in your monthly bill should you consume more than 110 kWh.

We thought that you might be interested in the following information regarding your monthly electricity use over the past year.

# Price Salience Letter

## IMPORTANT INFORMATION

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Dear Customer:

Electricity in Quito is billed using a progressive pricing system. What this means for you is that there is a large increase in your monthly bill should you consume more than 110 kWh.

We thought that you might be interested in the following information regarding your monthly electricity use over the past year.

Your average consumption was:

**115 kWh**

## Price Salience Letter Cont...

This means that you have paid around **\$12** a month for the electricity you use (**\$144** per year). If you were to reduce your electricity use by **5 kWh** per month (around **4%** of your average consumption), your bill would be reduced by nearly **47%** and would save approximately **\$64** per year. We encourage you to use energy wisely to save money.

## Price Salience Letter Cont...

This means that you have paid around **\$12** a month for the electricity you use (**\$144** per year). If you were to reduce your electricity use by **5 kWh** per month (around **4%** of your average consumption), your bill would be reduced by nearly **47%** and would save approximately **\$64** per year. We encourage you to use energy wisely to save money.

Please read carefully the following savings tips so you can start saving electricity now. Share this information with all the other members of the household.

- Don't leave the refrigerator door open for too long and make sure it closes tightly
- Turn off the television if nobody is watching it
- Don't forget to turn off the lights when leaving a room

# Electricity End Uses for Households around Notch

<b>End Use</b>	<b>Average Usage</b>
Refrigerator	39.8
Appliances	12.8
Television	12.7
Lighting	9.4
Washing Machine	8.0
Water Heater	8.0
Iron	6.6
Cooking	4.0
Music Electronics	2.8
Heating	0.7

Source: ENERINTER Asesoría Energética Internacional, 2012.

Data for EEQ Households with Monthly Avg Usage between 99 and 110kWh

# Social Comparison Letter

*Same Intro...*

# Social Comparison Letter

*Same Intro...*

We thought that you might be interested in the following information regarding your monthly electricity use over the past year.

Your average consumption was: **115 kWh**

The average household like you consumes: **110 kWh**

This means that you have consumed approximately 5% more electricity per month than others like you. We encourage you to use energy wisely to save money.

# Social Comparison Letter

*Same Intro...*

We thought that you might be interested in the following information regarding your monthly electricity use over the past year.

Your average consumption was: **115 kWh**

The average household like you consumes: **110 kWh**

This means that you have consumed approximately 5% more electricity per month than others like you. We encourage you to use energy wisely to save money.

*Same Ending...*



# Treatments to Compare

- Sample for today's talk: households historically **above** 110
  - Comparing
    - “You can save money by reducing to 110”  
to
    - “You can be like lower usage households by reducing to 110”  
to
  - Both
- (Preliminary look at households historically **below** 110 finds no evidence of a boomerang effect)

# Sample balanced across treatments

Pre-treatment: Average monthly consumption in 2013 (kWh)

Group	Count	Average	Median	Standard Deviation
Control	9,114	117.7	117.7	4.183
Social Norm (T1)	9,051	117.6	117.7	4.219
Price Saliency (T2)	9,101	117.7	117.7	4.195
Both (T3)	9,047	117.6	117.6	4.211
Total	36,313	117.7	117.7	4.202

Source: Authors calculations and EEQ.  
Statistics correspond to the Quito Metropolitan District.

# ATE Estimates - April (3 weeks)

Outcome: Avg. daily consumption (kWh)	(1)	(2)	(3)
Constant (Control)	3.963 (0.016)	— —	— —
Social Comparison (T1)	-0.039* (0.023)	-0.037** (0.015)	<b>-0.037**</b> (0.015)
Price Salienc (T2)	-0.013 (0.023)	-0.013 (0.014)	<b>-0.014</b> (0.014)
Both (T3)	-0.042* -0.023	-0.041*** (0.014)	<b>-0.039***</b> (0.014)
Pre-treatment consumption	No	Yes	Yes
Route FE	No	No	Yes
N	36,198	36,198	36,198

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$  (Model 3: F-test of  $T1=T2$   $p$ -value=0.13)

# ATE Estimates - May (full month)

Outcome: Avg. daily consumption (kWh)	(1)	(2)	(3)
Constante (Control)	3.977*** (0.017)	— —	— —
Social Comparison (T1)	-0.053** (0.023)	-0.050*** (0.018)	<b>-0.051***</b> (0.018)
Price Salienc (T2)	-0.011 (0.024)	-0.011 (0.017)	<b>-0.014</b> (0.017)
Both (T3)	-0.046* (0.023)	-0.046*** (0.017)	<b>-0.046***</b> (0.017)
Pre-treatment consumption	No	Yes	Yes
Route FE	No	No	Yes
N	36,198	36,198	36,198

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$  (Model 3: F-test of T1=T2 p-value=0.036)

# Preliminary Results

- Social comparison treatment reduces consumption:
  - April 2014: 1.1 kWh (around 1%) around 3 weeks after delivery.
  - May 2014 1.6kWh (1.3%)
- Price saliency estimate statistically not different from zero
- Quantile regression evidence suggest heterogeneous effects
  - Effect of price saliency concentrated around median
  - Effect of social comparison more spread across the distribution
- Combined information not different than social comparison alone

# Interpretation

- Price Salience does not induce conservation
  - Specification test of “did customers read the letters?” - Yes, see effects of social comparison treatment
- Social comparison treatments reduce energy consumption by around 1.3 %
  - Compare to 2% effects of (longer-term) OPOWER Home Energy Reports (Allcott, 2011)
- External validity caveats
  - Only very short-run response
  - Energy saving tips focused on usage rather than investment in different durable good stock

# Future Work

- EEQ is willing to conduct a second set of mailings
- Technology adaption (efficient refrigerators)
- Suggestions welcome

# THANKS!

Comments and suggestions are very welcome

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# Electricity Distribution in Ecuador

