Welfare analysis of soda and junk food taxes using

QUAIDS

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Quaids

- El comando **quaids** de Poi (2012) permite la estimación de sistemas de demanda lineales como el modelo AIDS de Deaton and Melbauer (1980) así como versiones cuadráticas como el modelo de Banks, Blundell y Lewbell (1997). **quaids** también permite incluir variables demográficas. Hasta ahora el commando estima elasticidades precio Hicksianas y Marshallianas.

- Sería conveniente la extensión del comando para graficar curvas de Engle (lineales y no lineales) y análisis de bienestar de reformas fiscales directas e indirectas.

- Exploramos aquí algunas extensiones útiles para el análisis de bienestar que pueden verse como parte de los comandos de post-estimación.

- Extendemos los resultados para el cálculo de elasticidades nutricionales--útiles para examinar el impacto en la salud. Esto lo ilustramos con el impuesto a las bebidas y la comida chatarra en México en efecto desde enero de 2014.

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Quaids vs Aids

- El supuesto de proporciones de gasto lineales puede ser muy restrictivo para algunos tipos de bienes en el modelaje de la curva de Engle.
- Análisis no paramétrico sugiere que las curvas de Engle requieren términos cuadráticos en el gasto--Banks, et al (1997), Attanasio (2013).
- El término cuadrático permite distinguir bienes necesarios y de lujo a distintos niveles de ingreso.

Quaids: $\ln V(\mathbf{p},m)$

$$\ln V(\mathbf{p},m) = \left\{ \frac{\ln m - \ln a(\mathbf{p})}{b(\mathbf{p})} \right\}^{-1} + \lambda(\mathbf{p})$$

$$\ln a(\mathbf{p}) = \alpha_0 + \sum_{i=1}^{k} \alpha_i \ln p_i + \frac{1}{2} \sum_{i=1}^{k} \sum_{j}^{k} \gamma_{ij} \ln p_i \ln p_k$$

$$b(\mathbf{p}) = \prod_{i=1}^{k} p_i^{\beta_i}$$

y

$$\lambda(\mathbf{p}) = \sum_{i=1}^{k} \lambda_i \ln p_i$$

$$\sum_{i=1}^{k} \alpha_i = 1, \quad \sum_{i=1}^{k} \beta_i = 0, \quad \sum_{j=1}^{k} \gamma_{ij} = 0, \quad \sum_{i=1}^{k} \lambda_i = 0 \text{ and } \gamma_{ij} = \gamma_{ji}$$

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Quaids: ln*C*(**p**,u)

$$\ln C(u,\mathbf{p}) = \ln a(\mathbf{p}) + \frac{ub(\mathbf{p})}{1-ug(\mathbf{p})}$$

$$\frac{\partial \ln C}{\partial \ln p_i} = w_i = \alpha_i + \sum_{j=1}^{k} \gamma_{ij} \ln p_j + \beta_i \ln\left\{\frac{m}{a(\mathbf{p})}\right\} + \frac{\lambda_i}{b(\mathbf{p})}\left[\ln\left\{\frac{m}{a(\mathbf{p})}\right\}\right]^2, \quad i = 1,\ldots,k$$

$$H_0 : \lambda_i = 0$$

$$AIDS:$$

$$w_i = \alpha_i + \sum_{j=1}^{k} \gamma_{ij} \ln p_j + \beta_i \ln\left\{\frac{m}{a(\mathbf{p})}\right\}$$

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Quaids: ln*C(***p**,u*) con z*

$$w_i = \alpha_i + \sum_{j=1}^{k} \gamma_{ij} \ln p_j + \left(\beta_i + \boldsymbol{\eta}_i' \mathbf{z}\right) \ln\left\{\frac{m}{(1+\rho' \mathbf{z}) a(\mathbf{p})}\right\} + \frac{\lambda_i}{b(\mathbf{p}) c(\mathbf{p},\mathbf{z})}\left[\ln\left\{\frac{m}{(1+\rho' \mathbf{z}) a(\mathbf{p})}\right\}\right]^2$$

donde

$$c(\mathbf{p},\mathbf{z}) = \prod_{j=1}^{k} p_j^{\eta_i' \mathbf{z}}$$

$$\sum_{j=1}^{k} \eta_{rj} = 0 \qquad r = 1,\ldots,s.$$

El comando . quaids

quaids $varlist_{expshares}$ [*if*] [*in*], anot(#)
{prices($varlist_{prices}$) | lnprices($varlist_{lnprices}$)}
{expenditure($varname_{exp}$) | lnexpenditure($varname_{lnexp}$)}
[demographics($varlist_{demo}$) noquadratic nolog vce(*vcetype*) level(#)]

predict [*type*] {*stub** | $newvar_1$, ..., $newvar_k$} [*if*] [*in*]

estat expenditure [*type*] {*stub** | $newvar_1$, ..., $newvar_k$} [*if*] [*in*]

estat uncompensated [*type*] {*stub** | $newvar_1$, ..., $newvar_{k^2}$} [*if*] [*in*]

estat compensated [*type*] {*stub** | $newvar_1$, ..., $newvar_{k^2}$} [*if*] [*in*]

Sistema Demanda de Alimentos

- ENIGH: 2002, 2004, 2005, 2006, 2008, 2010, 2012.
  - Pseudo panel con cohortes de área (rural/urbana); nivel de ingreso y región.
  - Consumo de adultos equivalentes.
  - Variables sociodemográficas.
- Grupos de alimentos:
  - 1) jugos, 2) comida chatarra, 3) comida rápida, 4) refrescos, 5) frutas y verduras, 6) cereales, 7) carnes, 8) aceites, 9) azúcares y dulces, 10) agua, 11) leches y 12) lácteos
- Se estima el modelo QUAIDS estándar y se obtienen elasticidades ingreso, compensadas y no compensadas por cohorte.

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Engle Curves

Lineales y No lineales

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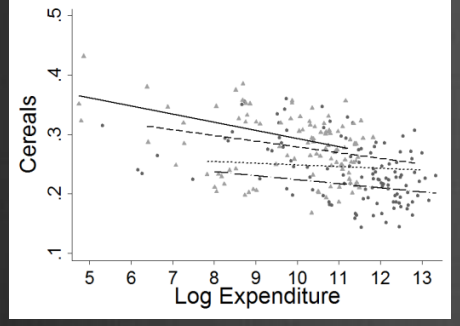
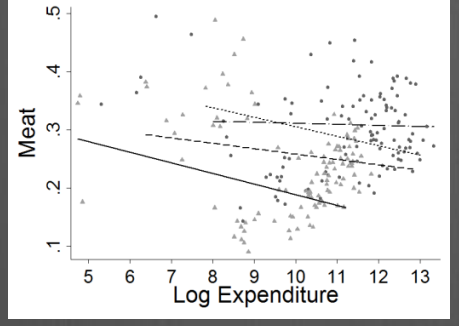
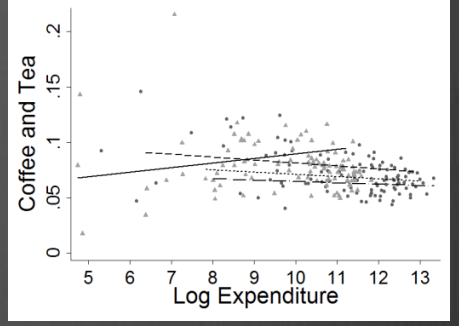
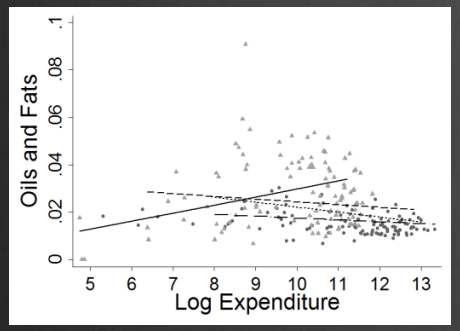

Cereals
.1
.2
.3
.4
.5
5 6 7 8 9 10 11 12 13
Log Expenditure


Meat
.1
.2
.3
.4
.5
5 6 7 8 9 10 11 12 13
Log Expenditure


Coffee and Tea
0
.05
.1
.15
.2
5 6 7 8 9 10 11 12 13
Log Expenditure


Oils and Fats
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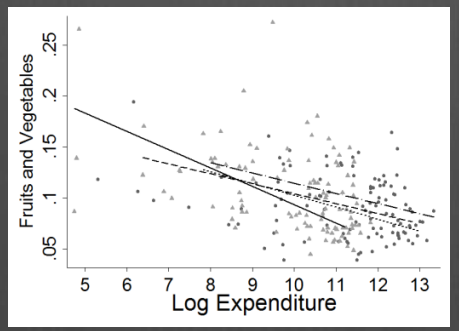
.02
.04
.06
.08
.1
5 6 7 8 9 10 11 12 13
Log Expenditure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.2
.25
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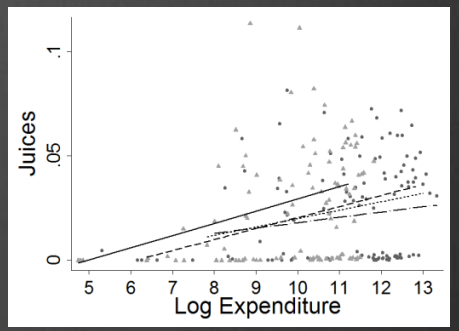
Log Expenditure


Juices
0
.05
.1
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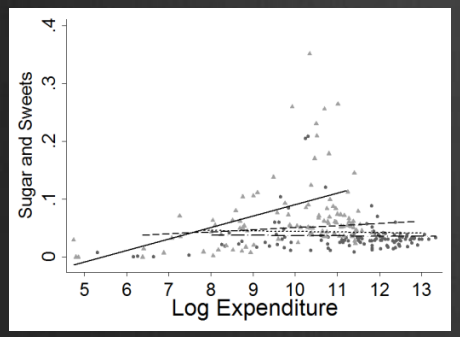
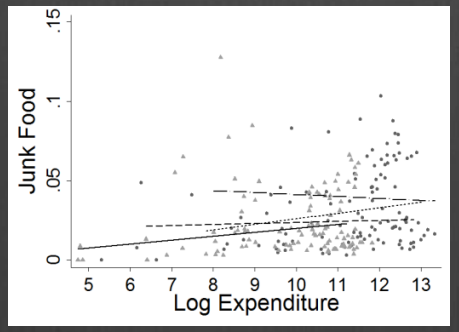
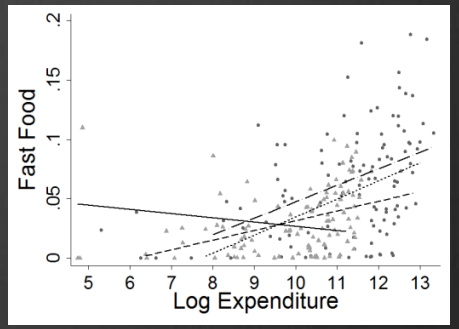
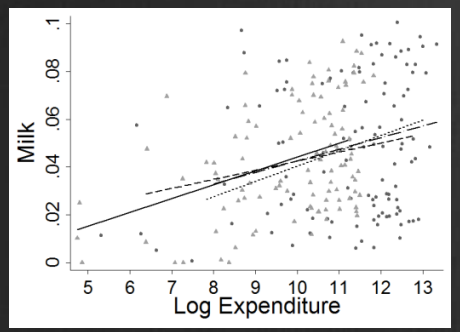
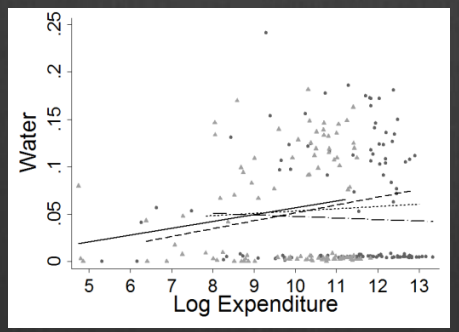
Log Expenditure


Sugar and Sweets
0
.1
.2
.3
.4
5 6 7 8 9 10 11 12 13
Log Expenditure


Junk Food
0
.05
.1
.15
5 6 7 8 9 10 11 12 13
Log Expenditure


Fast Food
0
.05
.1
.15
.2
5 6 7 8 9 10 11 12 13
Log Expenditure


Milk
0
.02
.04
.06
.08
.1
5 6 7 8 9 10 11 12 13
Log Expenditure


Water
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.05
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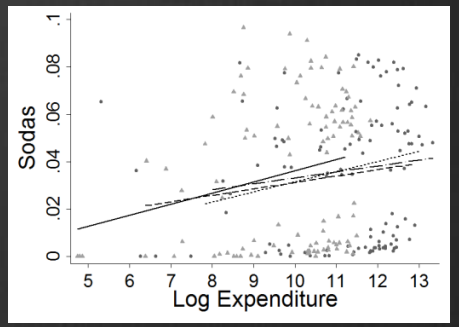
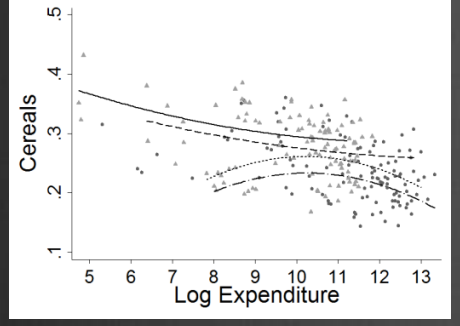
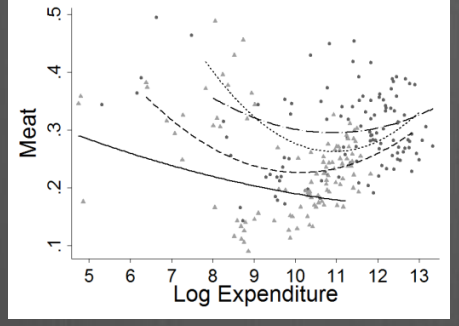
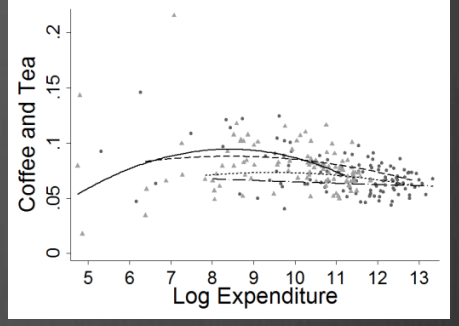
.15
.2
.25
5 6 7 8 9 10 11 12 13
Log Expenditure

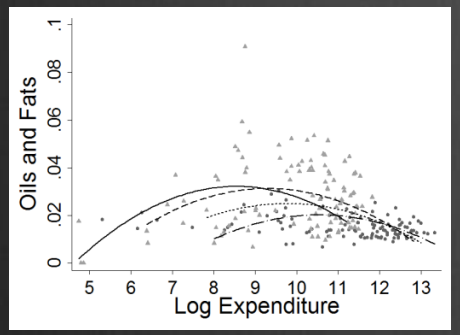

Sodas
0
.02
.04
.06
.08
.1
5 6 7 8 9 10 11 12 13
Log Expenditure

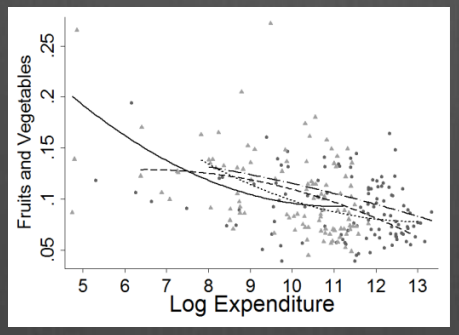
Rural
Urban
Food Poverty
First Tertile
Second Tertile
Third Tertile

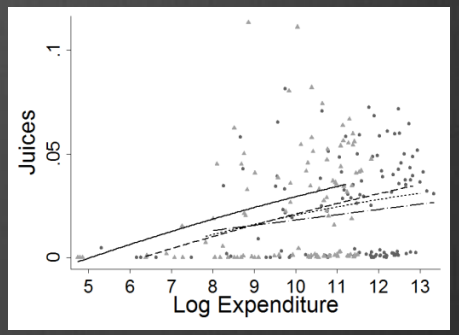

Cereals
.1 .2 .3 .4 .5
5 6 7 8 9 10 11 12 13
Log Expenditure

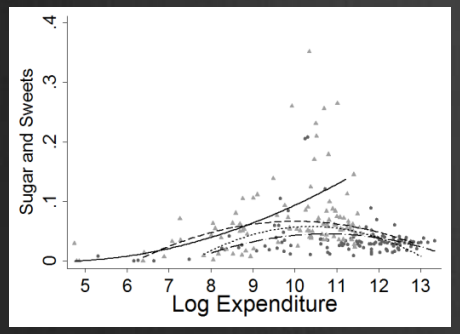

Meat
.1 .2 .3 .4 .5
5 6 7 8 9 10 11 12 13
Log Expenditure

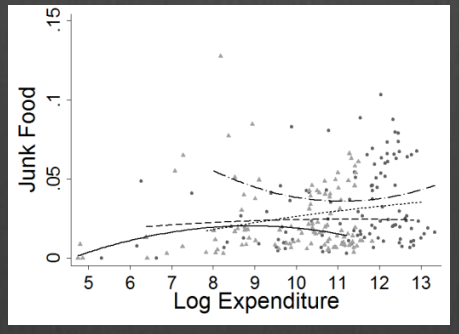

Coffee and Tea
0 .05 .1 .15 .2
5 6 7 8 9 10 11 12 13
Log Expenditure

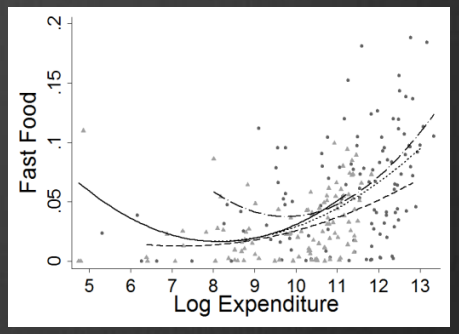

Oils and Fats
0 .02 .04 .06 .08 .1
5 6 7 8 9 10 11 12 13
Log Expenditure

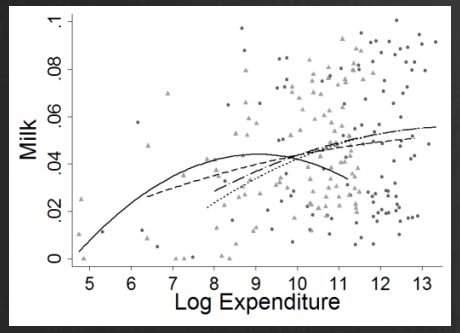

Fruits and Vegetables
.05 .1 .15 .2 .25
5 6 7 8 9 10 11 12 13
Log Expenditure

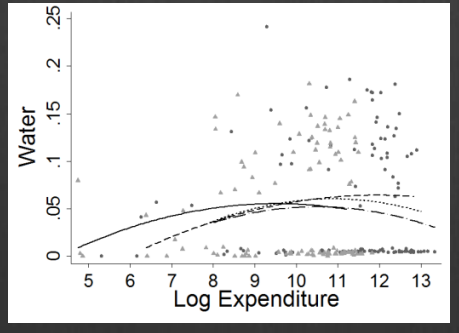

Juices
0 .05 .1
5 6 7 8 9 10 11 12 13
Log Expenditure

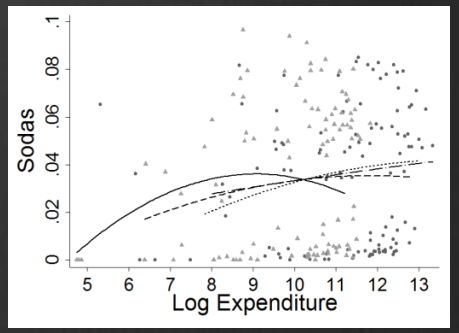

Sugar and Sweets
0 .1 .2 .3 .4
5 6 7 8 9 10 11 12 13
Log Expenditure

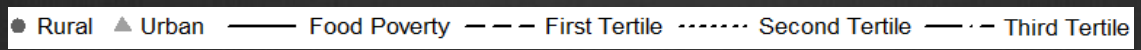

Junk Food
0 .05 .1 .15
5 6 7 8 9 10 11 12 13
Log Expenditure


Fast Food
0 .05 .1 .15 .2
5 6 7 8 9 10 11 12 13
Log Expenditure


Milk
0 .02 .04 .06 .08 .1
5 6 7 8 9 10 11 12 13
Log Expenditure


Water
0 .05 .1 .15 .2 .25
5 6 7 8 9 10 11 12 13
Log Expenditure

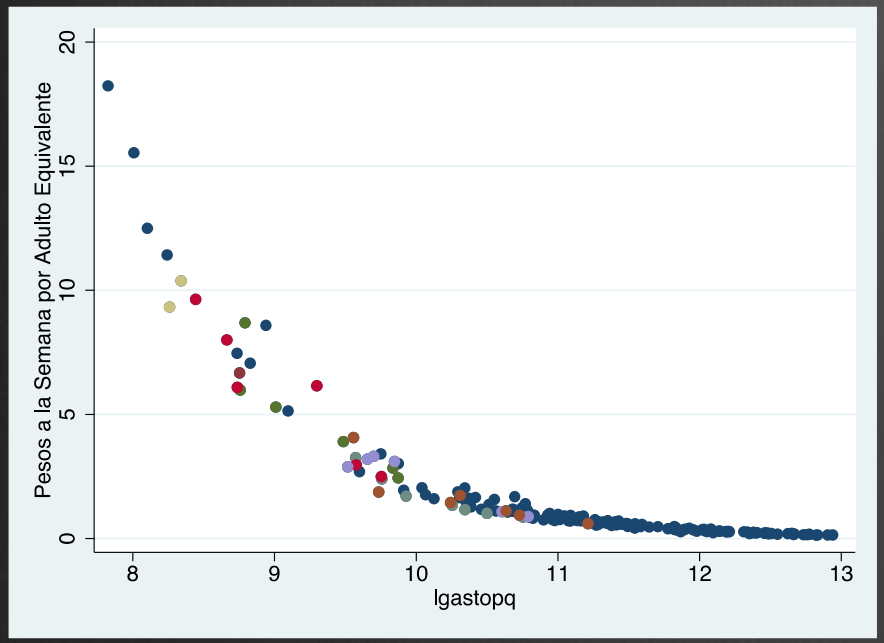

Sodas
0 .02 .04 .06 .08 .1
5 6 7 8 9 10 11 12 13
Log Expenditure

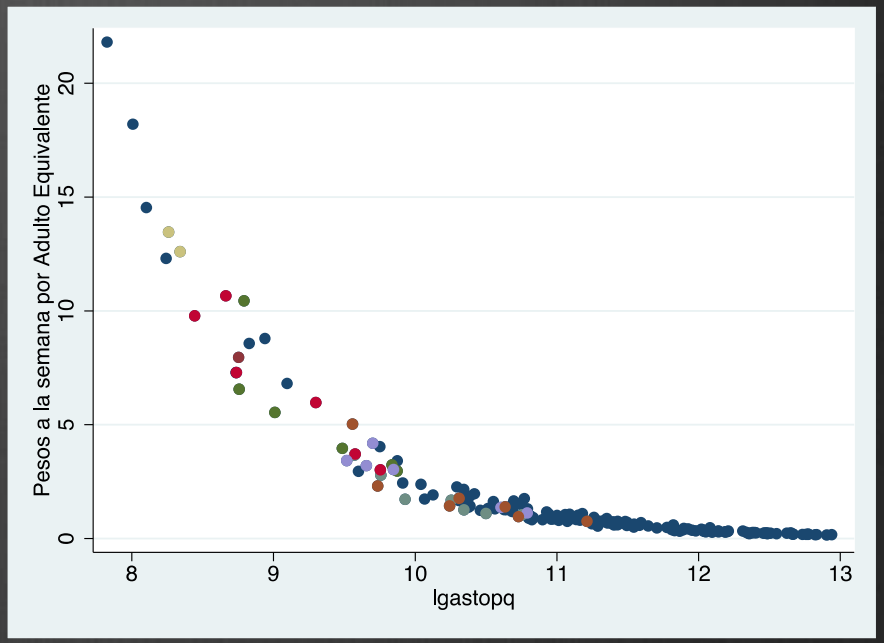

Rural
Urban
Food Poverty
First Tertile
Second Tertile
Third Tertile

Impuestos a refrescos y comida chatarra

- Impuesto de un peso por litro a bebidas azucaradas (refrescos y jugos)
- Impuesto de 8% a la comida chatarra: alimentos que contienen más de 275 calorías por 100 gramos.
- Representa MXN$3.5 billones de pesos al año.
- El ingreso haría posible la disponibilidad de agua purificada en las escuelas públicas del país

Welfare Losses





DASP: Coeficientes de Gini

```
i w1 w2 w3 w4 w5 w6 w7 w8 w9 w10 w11 w12

dex             :  Gini index
```

Variable	Estimate	STE	LB	UB
I_w1	0.118353	0.006214	0.106106	0.130
I_w2	0.134876	0.006812	0.121450	0.148
I_w3	0.149575	0.008021	0.133768	0.165
I_w4	0.306142	0.013032	0.280454	0.331
I_w5	0.216358	0.009809	0.197027	0.235
I_w6	0.473166	0.022896	0.428012	0.518
I_w7	0.326116	0.016722	0.293152	0.359
I_w8	0.484120	0.013394	0.457716	0.510
I_w9	0.438483	0.019865	0.399323	0.477
NI_w10	0.338041	0.011936	0.314512	0.361
NI_w11	0.591163	0.024376	0.543106	0.639
NI_w12	0.433578	0.022990	0.388246	0.478

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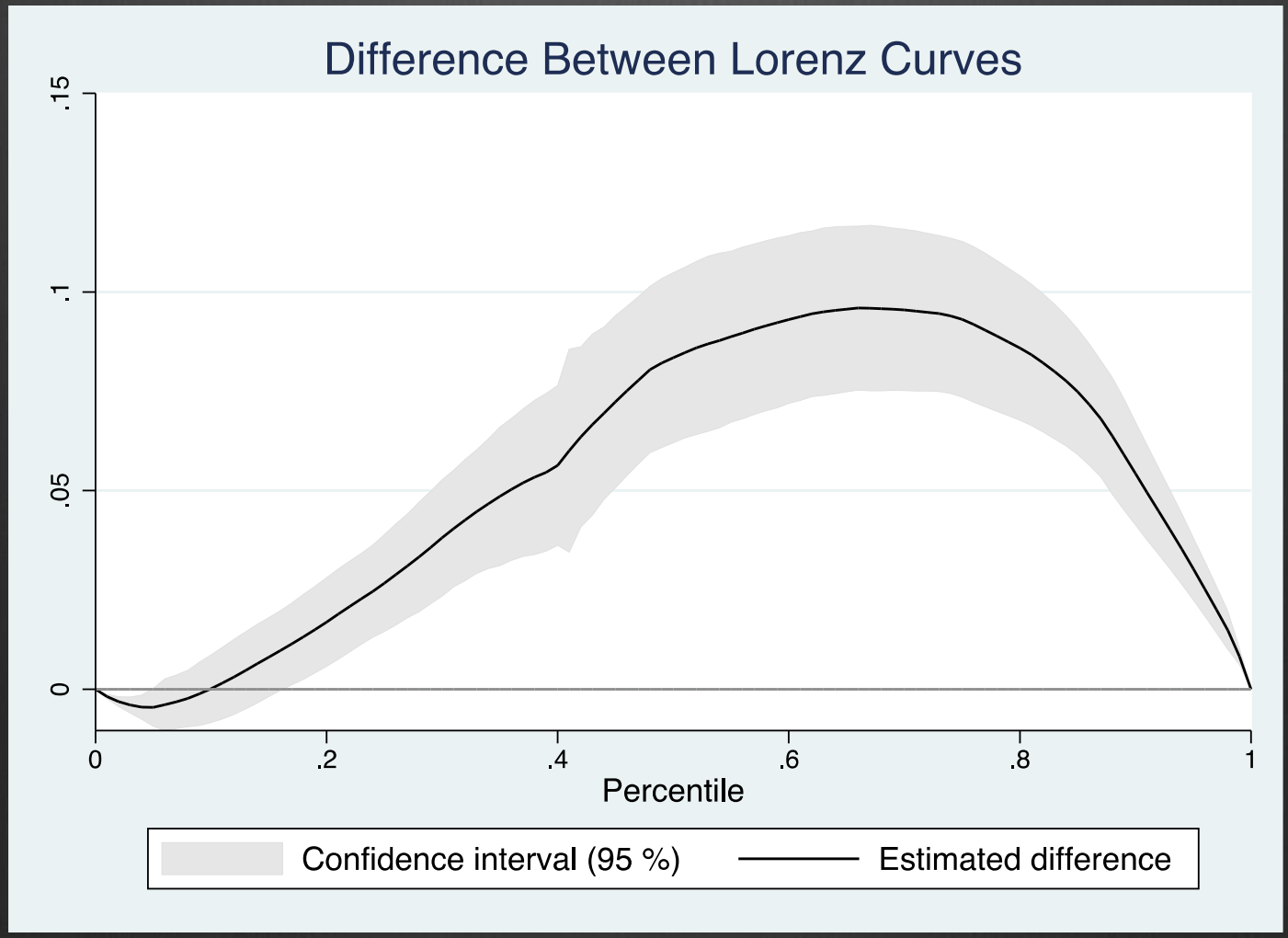
DASP: Por año, cohorte, etc.

```
. igini w1 w2 w3 w4 w5 w6 w7 w8 w9 w10 w11 w12, hgroup(year)

    Index              :  Gini index
    Group variable     :  year
```

Group	Estimate	STE	LB	UB
1: 2002	0.107331	0.016647	0.074521	0.140140
2: 2004	0.119229	0.015498	0.088684	0.149773
3: 2005	0.103548	0.010779	0.082304	0.124791
4: 2006	0.107803	0.011401	0.085333	0.130273
5: 2008	0.086429	0.009317	0.068067	0.104792
6: 2010	0.138936	0.017321	0.104799	0.173074
7: 2012	0.100422	0.010436	0.079853	0.120990
Population	0.118353	0.006214	0.106106	0.130600

Diferencial de Concentración antes y después de impuesto



Elasticidades Nutricionales

$$(1) \quad dq_i = \sum_j (\partial q_i/\partial p_j)dp_j + (\partial q_i/\partial m)dm.$$

$$(2) \quad dq_i/q_i = \sum_j e_{ij}(dp_j/p_j) + \eta_i(dm/m)$$

$$(3) \quad \phi_k = \sum_i a_{ki} q_i.$$

$$(4) \quad d\phi_k = \sum_i a_{ki}[\sum_j (\partial q_i/\partial p_j)dp_j + (\partial q_i/\partial m)dm].$$

$$(5) \quad \begin{aligned} d\phi_k/\phi_k &= \sum_j (\sum_i e_{ij} a_{ki} q_i/\phi_k)dp_j/p_j \\ &+ (\sum_i \eta_i a_{ki} q_i/\phi_k)dm/m \\ &= \sum_j \pi_{kj} dp_j/p_j + \rho_k dm/m \end{aligned}$$

$$(6) \quad \mathbf{N} = \mathbf{S} * \mathbf{D}$$

where **N** is the $\ell \times (n + 1)$ matrix of nutrient

Elasticidades Nutricionales

Nec[15,13]

	ec1	ec2	ec3	ec4	ec5	ec6	ec7	ec8	
scn1	.02721648	-.00526807	.02445016	.00760047	-.04409076	.01192625	-.10645585	-.01603068	.09
scn2	-.01596785	.03169908	.04654568	.02056509	.01638471	.06289389	-.10819707	.0812654	-.12
scn3	.11555628	-.01187192	.03830136	.00186173	-.08377656	.09282167	-.20957435	-.0118861	.13
scn4	-.10765914	.010169	.00295106	.02369822	-.00157171	-.13276952	-.02012555	-.0461674	.14
scn5	.06017897	.04190532	.04498628	.01779761	-.00835173	.08639173	-.17933457	.10968502	-.10
scn6	.00849253	.09621672	.04986715	.01710693	.02277897	-.24438015	-.03757585	.0237009	.11
scn7	-.00560267	.07059794	.05401418	.01959747	.01501864	-.10643573	-.08908344	.03151459	.04
scn8	-.0766531	-.01291957	.0189888	.01326703	-.00590386	.02413831	-.11445728	.02069992	.04
scn9	.02889538	.08329401	.08640777	.04020568	.02919808	-.30839686	-.0704081	.03027925	.10
scn10	-.01461256	.05075845	.03982057	.02734993	-.02620192	.05819099	-.19983821	-.00818715	.0
scn11	.06700489	.0955602	.12274691	.0732638	.02837179	-.50386411	-.09207887	.06379298	.17
scn12	-.11848706	.05704584	.05958112	.06639894	-.03918553	.08279873	-.27422363	.04388461	.11
scn13	.04692582	.09198292	.10901201	.06198633	.02992127	-.42890835	-.08086816	.05902108	.
scn14	.05802348	.09046737	.12125524	.07220111	.02877283	-.43536172	-.10506917	.06733621	.12
scn15	.0686695	.10148514	.1299262	.07910354	.03430183	-.54615848	-.08466286	.06571282	.17

1	2	3	4	5	6	7	8
Calories(kcal/100g)	Protein(g)	Fat(g)	Carbo(g)	Cholestrol(mg)	Calcium(mg)	Phosphorous(mg)	Iron(mg)

9	10	11	12	13	14	15
Potassium(mg)	Sodium(mg)	Vitamin A(microg)	Thiamine(mg)	Riboflavin(mg)	Niacin(mg)	Vitamin C(mg)

Extensiones potenciales en curso

- Kernels no paramétricos
- Impacto distributivo de subsidios y adaptaciones de DASP
- Efectos sobre el bienestar provenientes de políticas directas e indirectas.
- Cálculo de variaciones compensatorias
- Impacto sobre malnutrición (sobrepeso/obesidad y desnutrición).
  - Simulación de diversos procesos
  - Pruebas de sensibilidad
  - Etc.

Muchas Gracias!!!

Datos de Contacto

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