

Taxes and Subsidies on Farm Commodities and Food Products: Useful Weapons in the War on Obesity?

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Department of Agricultural
and Resource Economics

Outline

1. Rationale for Policy Intervention
2. In-Principle Arguments
3. Model and Evidence
4. Conclusion

Motivation—Farm Bill Topics

- **U.S. Obesity is Expensive – a sufficient condition for policy?**
 - High Rates (~ 1/3 of adult Americans have BMI > 30)
 - Adds to health-care costs and other costs
 - \$150 b (9.1 % of direct medical costs) – Finkelstein et al. (2010)
 - \$260 b (or \$500 b including value of lost life) – Dor et al. (2010)
 - Pooling => market failure?

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 - Pooling => market failure?
- **Proposed Policies**
 - Restrict food stamps to “healthy foods”
 - Greater purchasing power of food stamps for “healthy foods”
 - Eliminate farm program subsidies
 - Revise balance of R&D spending
 - Taxes on foods (sodas), nutrients (fat), or ingredients (corn, sugar)

Market Failure Rationale for Intervention

John Freebairn. "Taxation and Obesity"
The Australian Economic Review, March 2010.

- Deficient information
 - Food consumption, other behaviour => obesity?
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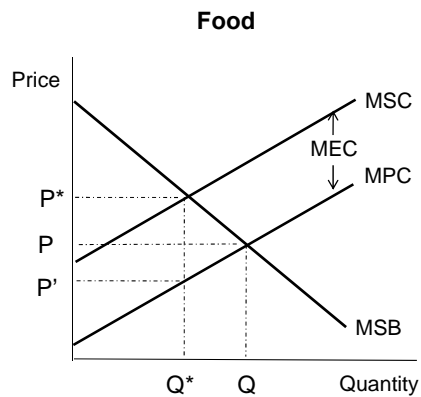
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- **Time inconsistency as market failure**
 - Paternalism

Market Failure Rationale for Intervention

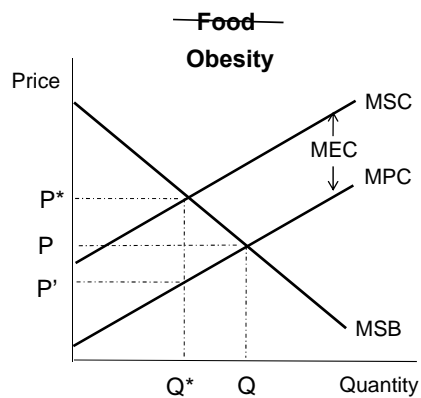
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 - Food consumption, other behaviour => obesity?
 - Obesity => health?
- **Time inconsistency as market failure**
 - Paternalism
- **External costs of obesity ($MSC = MPC + MEC > MSB$)**
 - Pooling of health-care costs through insurance or public provision
 - Deadweight costs of taxation to pay for public programs
 - Tax share of foregone earnings
 - Spillover costs to other family members

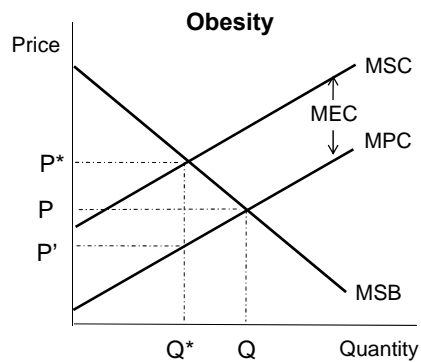
Model of Obesity Externality



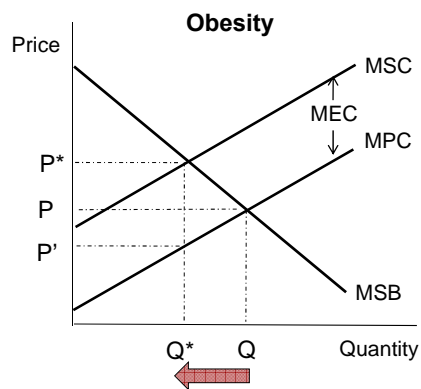
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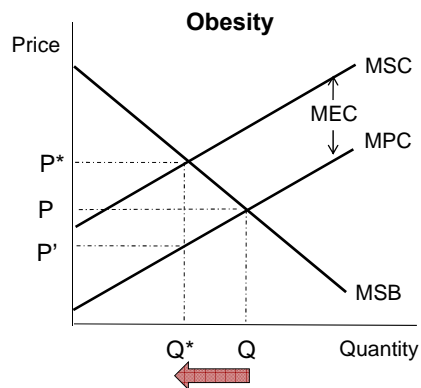
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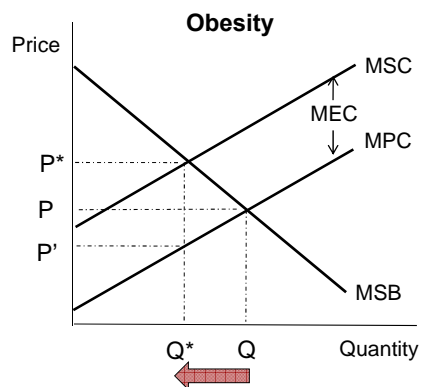
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OPTIMAL POLICY?

PIGOVIAN TAX ON OBESITY?

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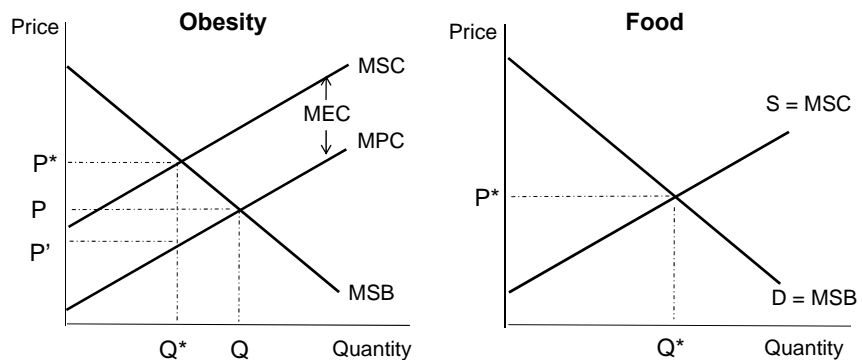


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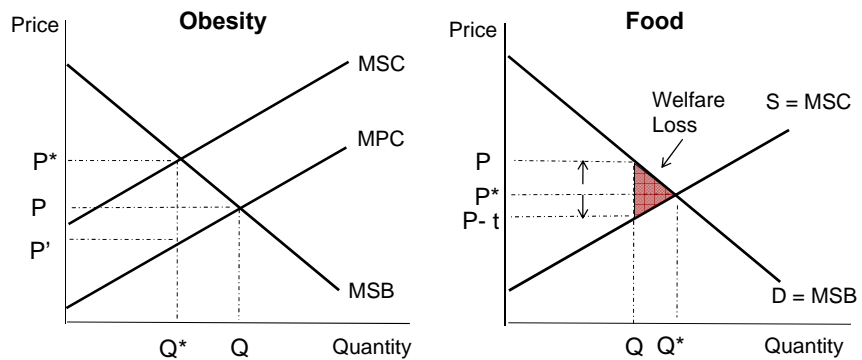
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CAP AND TRADE?

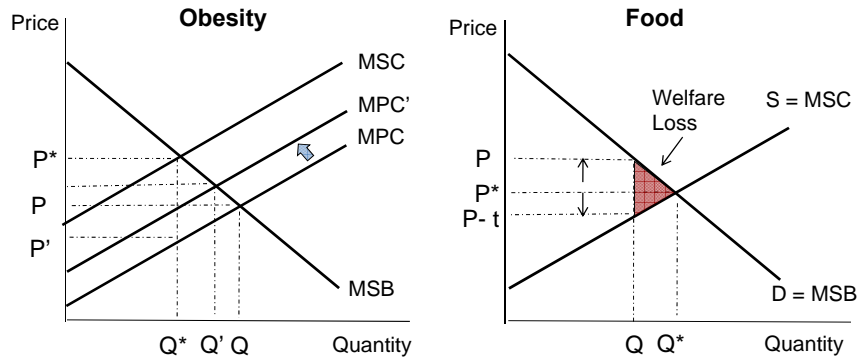
Model of Obesity Externality and Food Tax



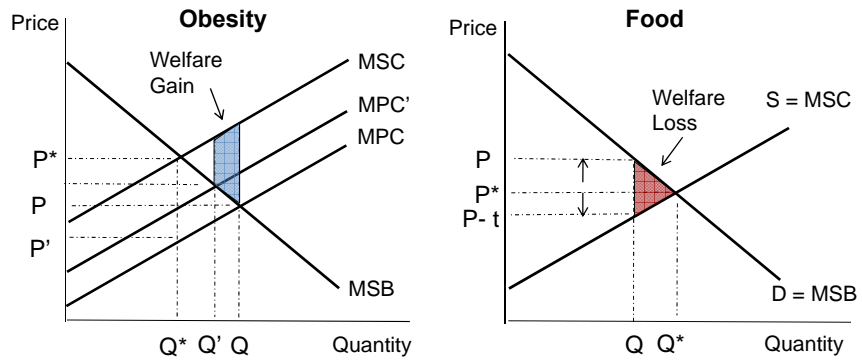
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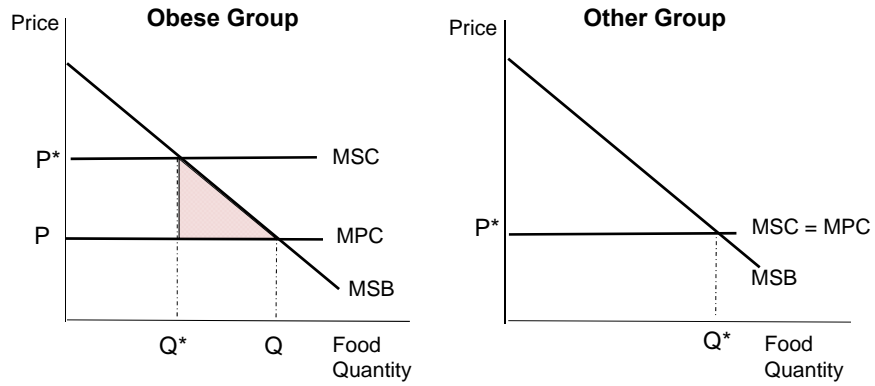
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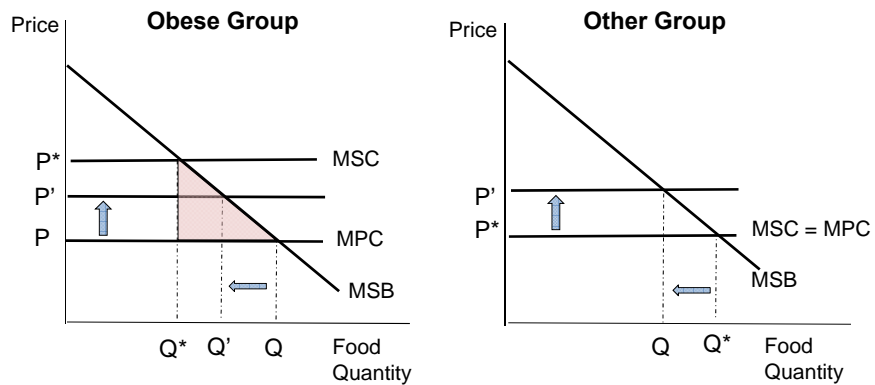
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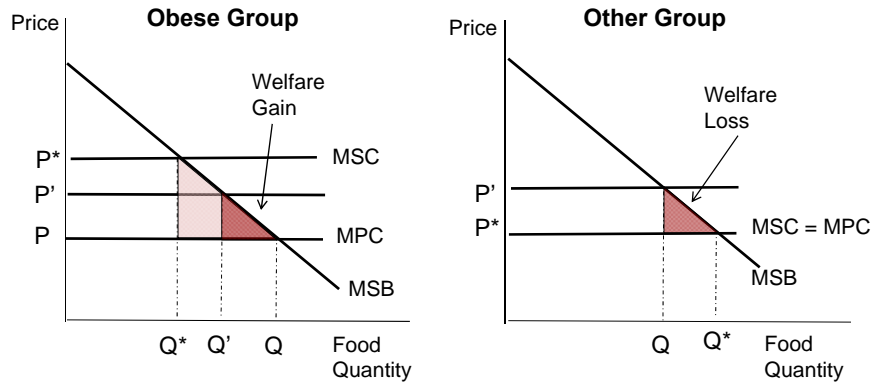
A Food Tax with Heterogeneous Consumers



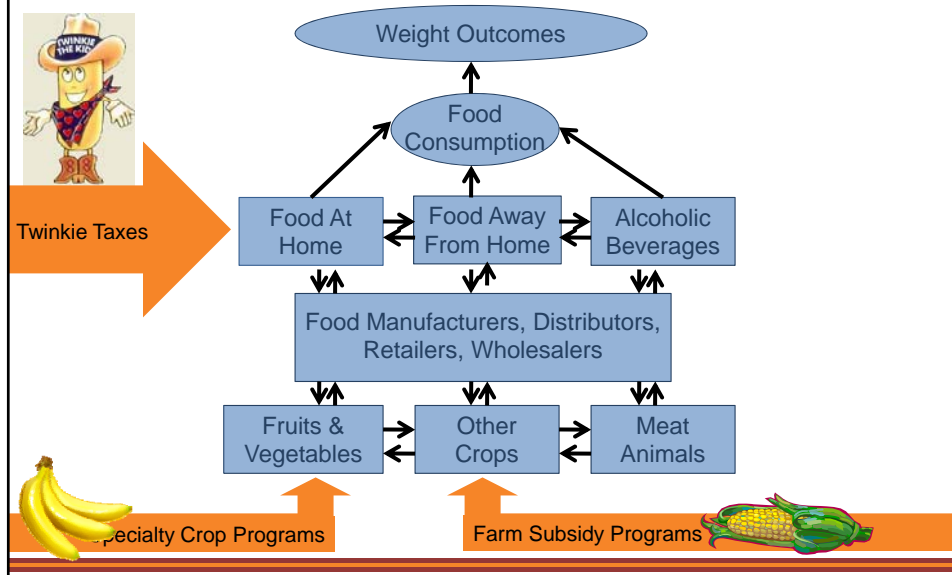
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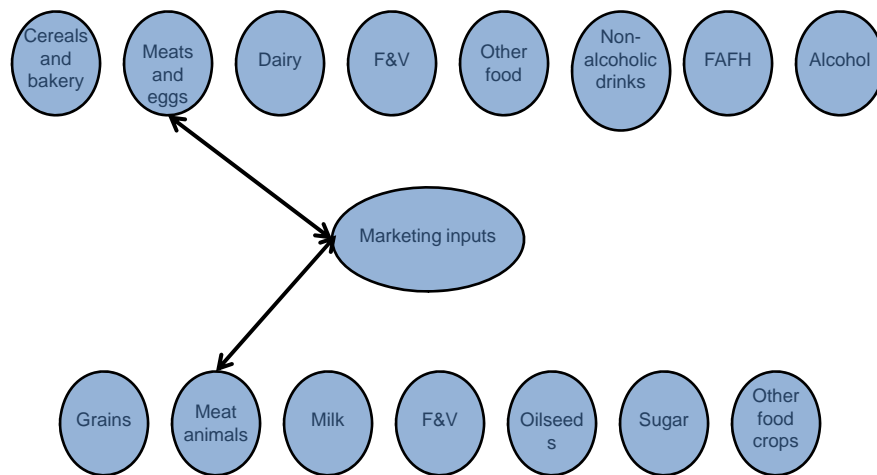
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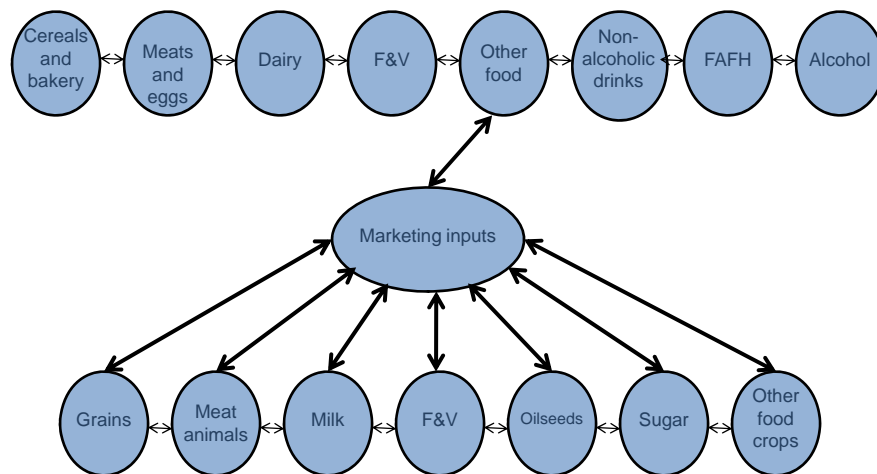
U.S. Food Sector – Proposed Obesity Policies



Linkages Between the Farm and Retail



Linkages Between the Farm and Retail



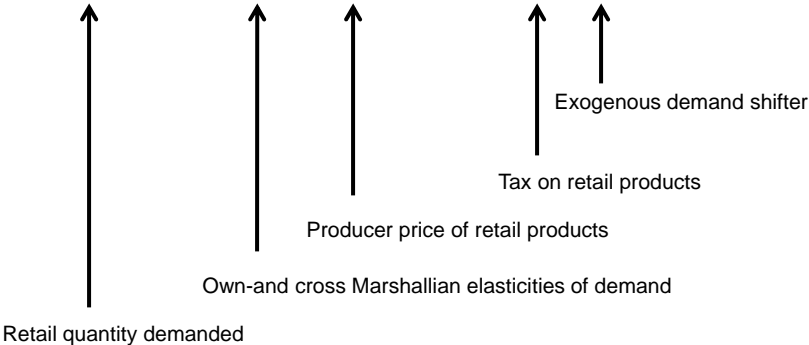
A Model of the Linkage Between Markets for Farm Commodities and Retail Food Products

Okrent (2010), Okrent and Alston (2011)



10 Consumer Demand Equations for Retail Products

$$d \ln Q^n = \sum_{k=1}^{10} \eta^{n,k} d \ln P^{Sk} + \sum_{k=1}^{10} \eta^{n,k} t^k + \alpha^n$$



12 Commodity Supply Equations

$$d \ln X_m = \sum_{j=1}^L \varepsilon_{m,j} d \ln W_{D,j} + \sum_{j=1}^L \varepsilon_{m,j} s_j + \beta_m$$

Quantity of commodity supplied

Elasticity of supply of commodities

Buyer price of commodities

Commodity subsidy rate

Exogenous commodity supply shifter



10 Zero Profit Equations, i.e., P=MC

$$d \ln P^{S,n} = \sum_{l=1}^{12} SR_l^n d \ln W_{D,l}$$

Producer price of retail F&V

Cost share of retail product attributable to a commodity

Buyer price of a commodity

12 Commodity Demand Equations

$$d \ln X_{FRUIT} = \sum_{m=1}^{12} \eta_{FRUIT,m}^* d \ln W_{D,m} + \sum_{n=1}^{10} SC_{FRUIT}^n d \ln Q^n$$

Quantity of fruit commodity demanded

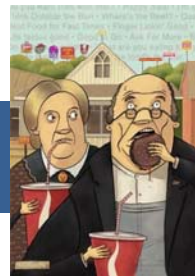
Own- and cross-price Hicksian elasticities of demand for commodities

Buyer prices of commodities

Cost share of fruit commodity attributable to a retail product

Quantity of retail product

Data for Simulations



Data for Model

- **Marshallian elasticities of demand for food products**
Okrent and Alston (2011)
- **Farm-retail product shares**
2002 Benchmark I-O Use Table, Bureau of Economic Analysis
- **Farm-commodity shares**
2002 Benchmark I-O Use Table, Bureau of Economic Analysis



Elasticities of supply of commodities

(a) $\varepsilon_{ll} = \infty$, for all $l = 1, \dots, L$; (b) $\varepsilon_{ll} < \infty$ from Chavas and Cox (1995)

Hicksian elasticities of demand for commodities

$\eta_{ll}^* = 0$, for all $l = 1, \dots, L$

Other Data

- **% $\Delta Q \rightarrow \Delta kcal$**
Average pounds and calories of foods consumed
(2005-2006 NHANES, CDC)
- **% ΔQ , % ΔP , % ΔX , % $\Delta W \rightarrow \Delta$ compensating variation,
 Δ profit, Δ government revenue**

**Total value of retail products and commodities (2002
Benchmark I-O Use Table, BEA)**

Simulations and Results



Taxes Simulated

	\$5.00 per kilogram fat	\$0.17 per 1000 calories	\$6.50 per kilogram sugar	5% on all food products
	<i>percentage tax rate</i>			
Cereals and bakery	4.66	6.18	7.93	5.00
Red meats	2.84	1.58	0.09	5.00
Poultry and eggs	3.91	2.30	0.32	5.00
Fish and seafood	2.09	1.91	0.09	5.00
Dairy	9.63	6.89	17.25	5.00
Fruit and vegetables	1.52	2.94	10.05	5.00
Other food	7.85	5.23	5.63	5.00
Nonalcoholic beverages	0.91	3.92	22.18	5.00
FAFH	4.63	3.69	4.40	5.00
Alcoholic beverages	0.02	1.26	0.35	5.00

Welfare Effects of Taxes (excl. changes in public health care costs)				
	Change in Body Weight Per U.S. Adult	Change in Social Welfare	Cost of Reduction in Individual Body Weight	Cost of Reduction in National Body Weight
	<i>Pounds per Adult per Year</i>	<i>\$ Millions per Year</i>	<i>Dollars per Pound</i>	<i>\$ Millions per Pound per Adult</i>
<i>Exogenous Prices of Commodities ($\epsilon = \infty$)</i>				
\$0.17 tax per 1,000 calories	-5.79	- 511	0.40	88
\$5.00 tax per kilogram fat	-5.81	- 661	0.52	114
\$6.50 tax per kilogram sugar	-6.08	- 831	0.63	137
5% tax on food products	-6.04	- 1,129	0.86	187
<i>Upward-sloping Supply of Commodities ($\epsilon < \infty$)</i>				
\$0.17 tax per 1,000 calories	-5.48	- 480	0.40	88
\$5.00 tax per kilogram fat	-5.52	- 598	0.50	108
\$6.50 tax per kilogram sugar	-5.81	- 753	0.59	129
5% tax on food products	-5.83	- 1,041	0.82	179
<i>Source: Okrent (2010), Okrent and Alston (2011)</i>				

Additional Health Care Costs

- One unit increase in BMI => \$11 increase in billed charges for health care services over 18 months for Minnesotans 40 years of age and older (Pronk et al. 1999)
- Actual cost is greater than billed cost according to a cost-to-charge ratio = 0.597 for Minnesotans in 1994 (Haddix and Schaffer 1996)
- In our policy experiments the implied savings in external health care costs savings ranged from \$606 to \$ 672 million per year
- This translates to external cost savings of about \$0.51 per pound reduction in body weight


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\$5.00 tax per kilogram fat	-5.81	- 18	0.01	3
\$6.50 tax per kilogram sugar	-6.08	- 159	0.12	26
5% tax on food products	-6.04	- 462	0.35	77
Upward-sloping Supply of Commodities ($\epsilon < \infty$)				
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\$5.00 tax per kilogram fat	-5.52	13	-0.01	- 2
\$6.50 tax per kilogram sugar	-5.81	- 110	0.09	19
5% tax on food products	-5.83	- 397	0.31	68

Source: Okrent (2010), Okrent and Alston (2011)

Live-weight loss?

↕

Dead-weight gain!



Caveats

- **Our specific findings depend on our particular parameterization of the demand system and other elements**
- **We do not consider all potential external costs associated with obesity and the estimates we use are fairly crude**
- **We do not consider all potential external costs associated with particular foods or ingredients (e.g., fat or sugar)**
- **We do not consider distributional implications (regressive taxes) or other unintended consequences of taxes (e.g., for nutrition outcomes and health of the poor)**
- **But our central results are consistent with theory—more targeted policies are more efficient—and generally plausible**

The End

- **Thank You!**