Farm Subsidies and Obesity in the United States: National Evidence and International Comparisons

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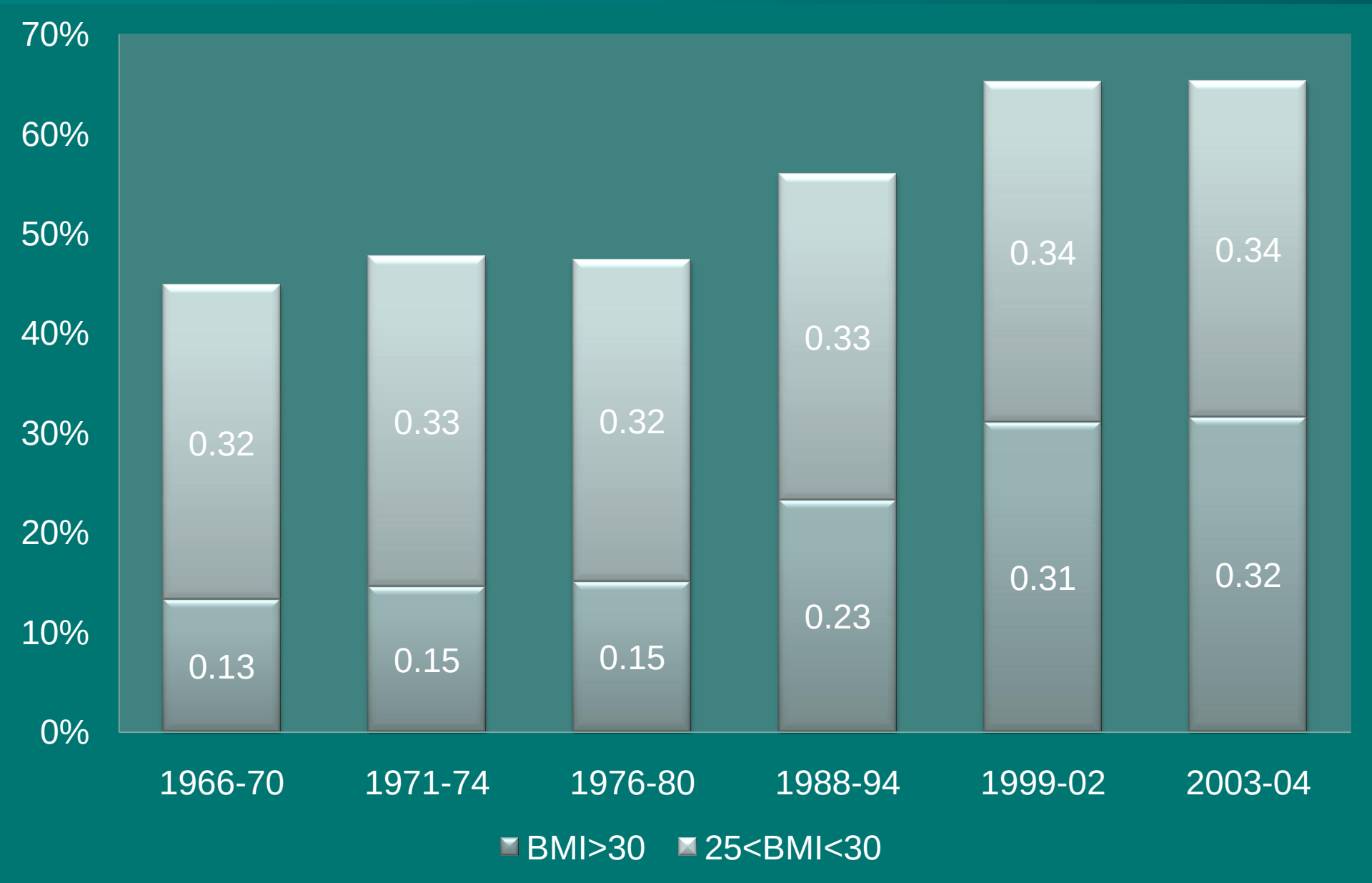
Based mainly on:

Alston, J.M., D.A. Sumner, and S.A. Vosti, “Farm Subsidies and Obesity in the United States: National Evidence and International Comparisons.” *Food Policy* 33(6) (December 2008): 470-479.

Obese and Overweight U.S. Adults, 1966-2004



Motivation

- One common idea is that farm subsidies contribute significantly to obesity and reducing these subsidies would go a long to solving the problem (e.g., *New York Times*, 2003, Michael Pollan):

  > [Our] cheap-food farm policy comes at a high price: … . [with costs including] the obesity epidemic at home – which most researchers date to the mid-70s, just when we switched to a farm policy consecrated to the overproduction of grain.

- In 2008 Barak Obama, citing Michael Pollan, told *Time* magazine:

  > [Farm subsidies are] contributing to type 2 diabetes, stroke and heart disease, obesity, all the things that are driving our huge explosion in health care costs.

- This view has become accepted as a fact, in spite of
  - No real evidence presented
  - Questions about the nature of effects
  - Grounds for skepticism about the size of effects

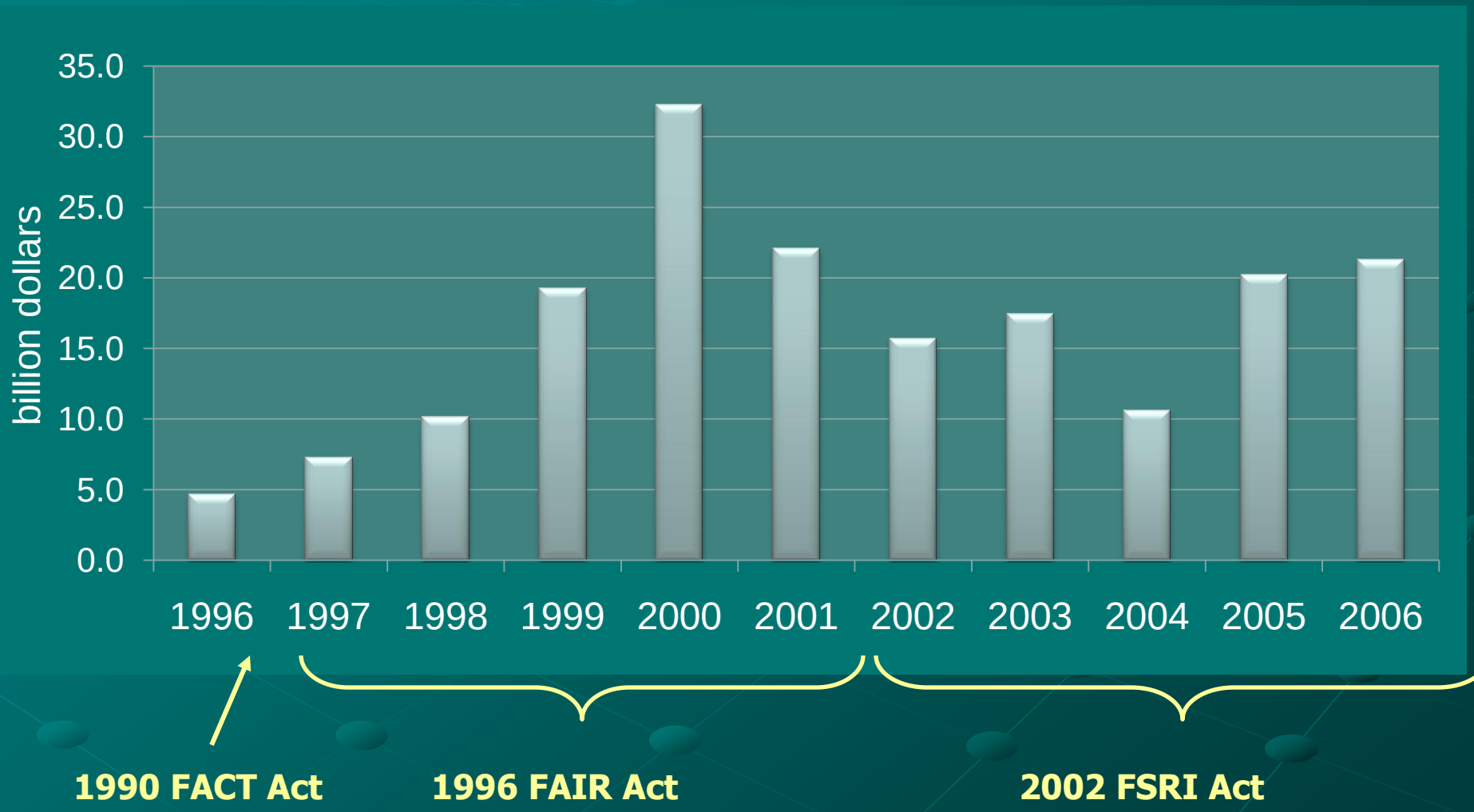
USDA Program	Expenditure in 2007	Percent of Total
	billions of dollars	*percent*
Food, Nutrition, & Consumer Services	54.4	43.3
Farm Service Agency	33.9	27.0
Rural Development	14.4	11.5
Natural Resources & Environment	7.7	6.1
Foreign Agricultural Service	5.2	4.1
Risk Management	4.2	3.3
Research, Education, & Economics	2.3	1.8
Marketing & Regulatory Programs	1.7	1.4
Other	1.8	1.4
TOTAL	125.6	100.0

Commodity Subsidy Overview

- ~ $20 billion for producers of “program crops”
  - averages 20% of revenue for grains, oilseeds, and cotton
    - 50% or more for rice or cotton in some years
  - most commodities get little subsidy
    - e.g., 70% of California agriculture
- Other subsidies
  - environmental programs
    - CRP idling 35 million acres, etc.
  - dairy price supports
  - crop insurance, widespread and growing
  - disaster payments
- Other (non farm bill) policies and programs (payments, regulations, or trade barriers) support some other commodities

Farm Program Expenditures

CCC Outlays by Fiscal Year



Budget for Commodity Subsidies

(FY 2005/06 – numbers vary with market conditions)

	$ billions
Feed grains	8.6
Soybeans	2.2
Wheat	2.2
Cotton	2.5
Rice	0.9
Dairy	0.3
Other commodities	0.6
Disaster	0.3
Other	1.0
TOTAL	18.6

Details of Policies Matter

- An array of policies for program crops
- Details differ by crop
  - direct payments (significantly “decoupled” from production)
  - marketing loans
  - counter-cyclical payments
  - crop insurance subsidies
  - export credit guarantees for buyers of US commodities
- Some farm prices are supported by barriers to imports at the expense of consumers
  - dairy
  - sugar
  - orange juice
  - beef (sometimes)

Implicit Model

- Simplistic model
  - Textbook subsidy => increase in producer price and production, a decrease in the consumer price, and an increase in consumption
- More detailed mechanism
  - Subsidies reduce market prices of farm commodities, especially those that are important ingredients of more fattening foods
  - Lower farm commodity prices lower costs of food manufacturing
  - Food industry passes these cost savings on to consumers yielding reductions in retail prices
  - Consumers respond by increasing their consumption of more-fattening foods
- Size of effect?
  - If effect at <u>any</u> step is small, total effect is small; if effect at <u>every</u> step is small combined effect is negligible

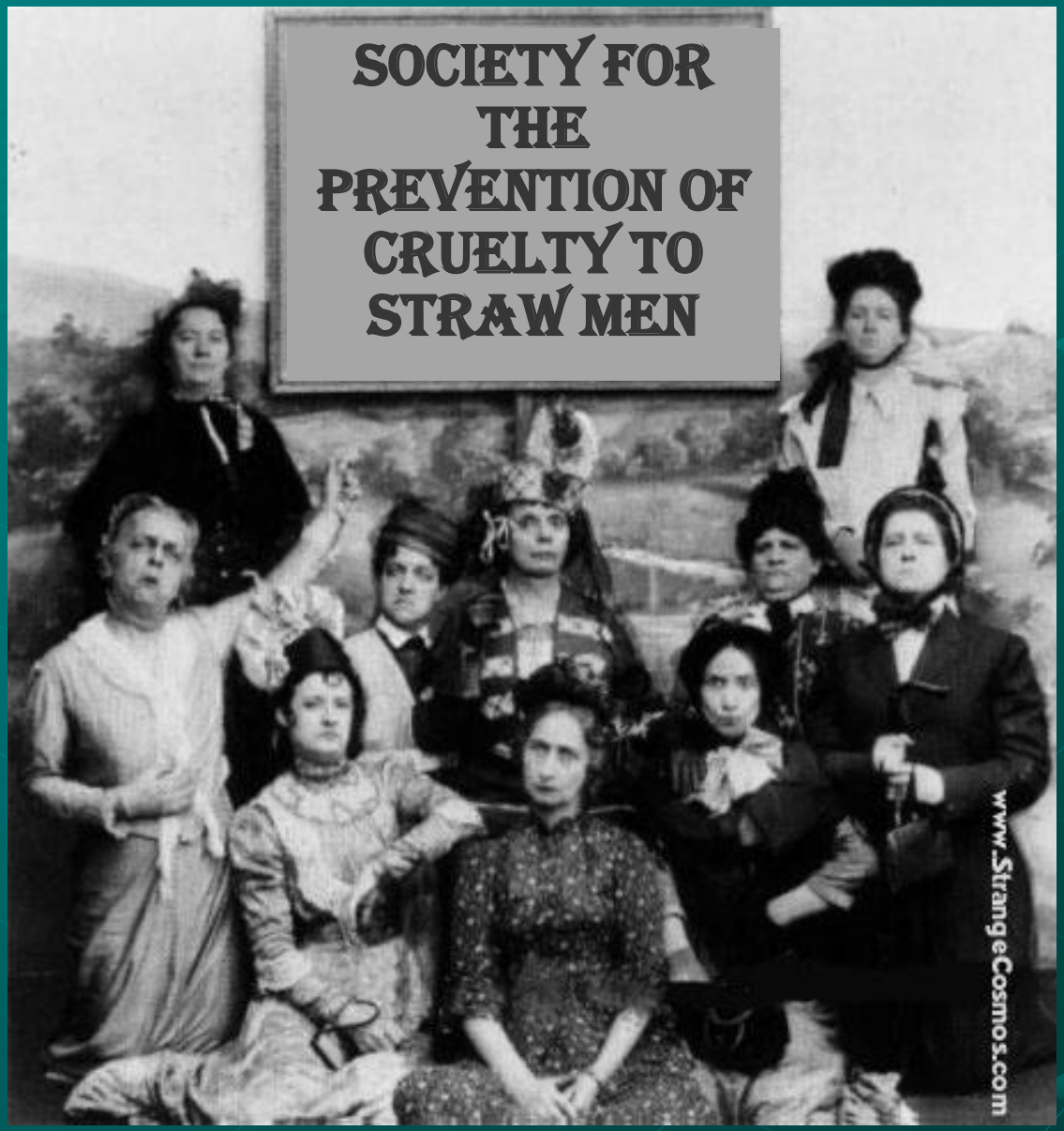
In reality . . . .

- Lower impact on production and prices than text-book model would indicate because
  - Other policies (e.g., acreage set-asides) have contained production response
  - Conservation Reserve Program removes 36 million acres (about 8 percent of cropland) from production
  - A significant share of subsidies (~50%) are based on historical yields and acreage
  - Policies make some commodities more expensive for the food industry – especially sugar, dairy

Consequently. . .

- Effects on commodity prices: modest and mixed
- Effects on food prices: even smaller
  - Commodity costs are a small share of food costs – say 20% or less
  - Even with complete pass through, percentage effects on food prices would be small
- Effects on consumption must be very small given limited consumer demand response to price

Isn’t it obvious?



Percentage Changes in Quantity and Price in 2016 after Phasing Out all U.S. Agricultural Subsidies and Protection over 2007-2016

Source: ABARE (2006) Report

Commodity	% Quantity Change	% Price Change
Soybeans	-2.86	-1.14
Wheat	-7.58	1.52
Corn	-3.79	0.26
Rice	-11.71	-3.87
Sugar	-33.31	-15.30
Fruit and Vegetables	4.42	-5.16
Beef Cattle	1.44	-3.31
Pigs and Poultry	0.41	-0.01
Milk	-0.45	-0.01

Alternative Estimates--Corn

- Sumner (2005) – elimination of policies just for corn, leaving all other farm subsidies in place
  - 9-10 % decrease in corn production
- Alston (2007) – elimination of subsidies for program crops
  - 7.3 % decrease in production of program crops if CRP stays
  - 5.0 % decrease in production of program crops if CRP stays
- ABARE (2006) – elimination of all farm subsidies including import protection
  - 3.79 % decrease in corn production

Corn Prices and Consumers

- Corn and other feedstuffs
  - < 40% of farm cost of meat
- Farm cost of livestock
  - ~ 20% of the retail cost of meat
- A 5% decrease in corn price
  - < 0.4 % decrease in retail price of meat
  - < 0.2 % increase in consumption of meat

Caloric Sweeteners

- What about High Fructose Corn Syrup (HFCS)?
- Growth in consumption of HFCS was caused mainly by restrictions on imports of sugar
  - Higher price of sugar
  - Switch from sugar to HFCS (reinforced by corn policy)
- Overall effect of sugar policy and corn policy
  - Higher price of caloric sweeteners
  - Less total consumption of caloric sweeteners
  - A change in the mix to consume more HFCS and less sugar

International Evidence

- Simple causation from farm subsidies to obesity is also inconsistent with patterns across countries

- Josef Schmidhuber (FAO, 2007)

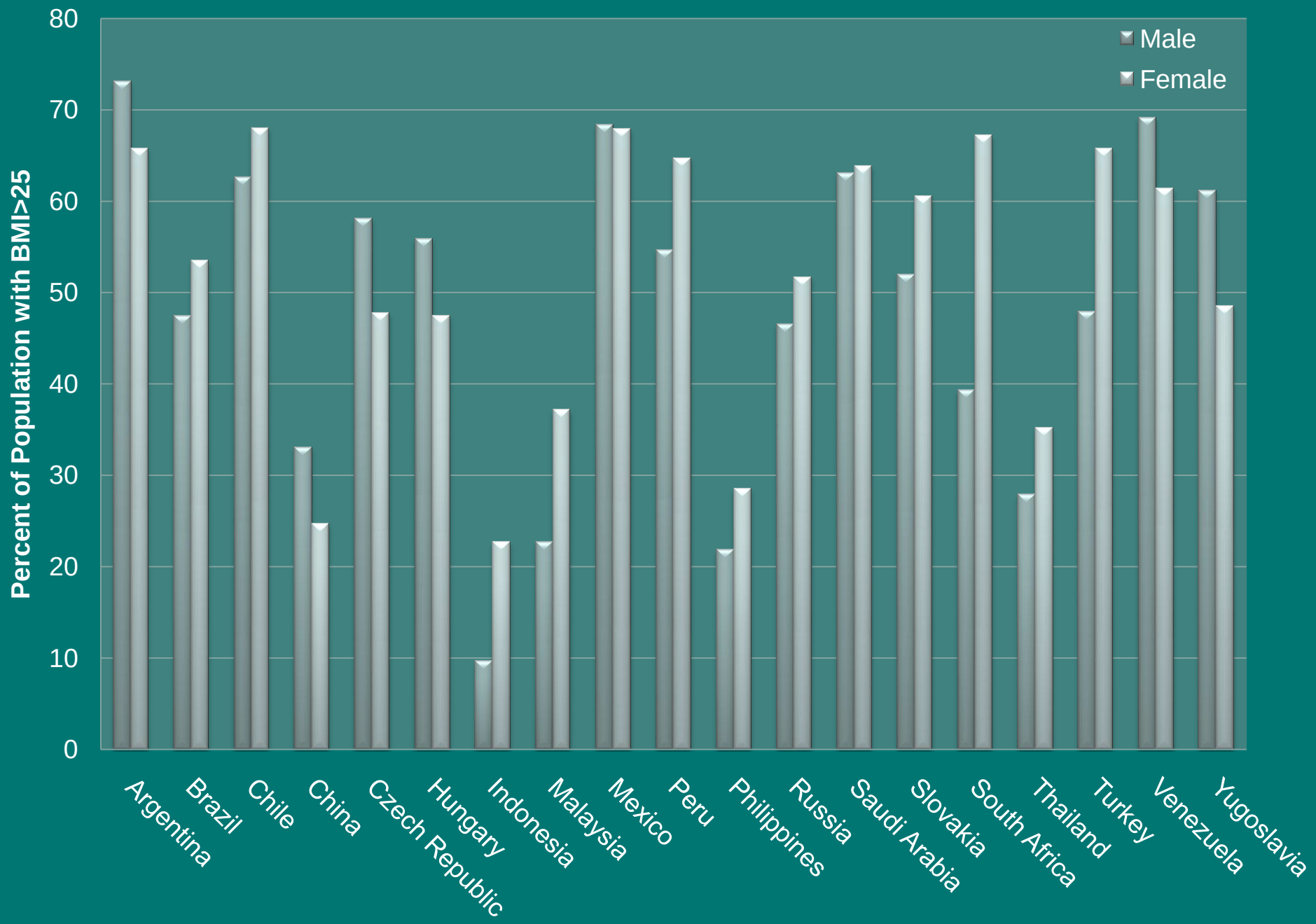
  "The EU Diet – Evolution, Evaluation and Impacts of the CAP"

  > [There] is no reason to suggest that the CAP has caused higher overall consumption levels nor that it has promoted the consumption of particularly unhealthy foods. On the contrary, if the CAP had any impact on EU food consumption patterns at all, it reduced overall consumption levels and particularly those of "unhealthy" foods (rich in sugar, saturated fats and cholesterol).

  http://www.fao.org/es/ESD/Montreal-JS.pdf

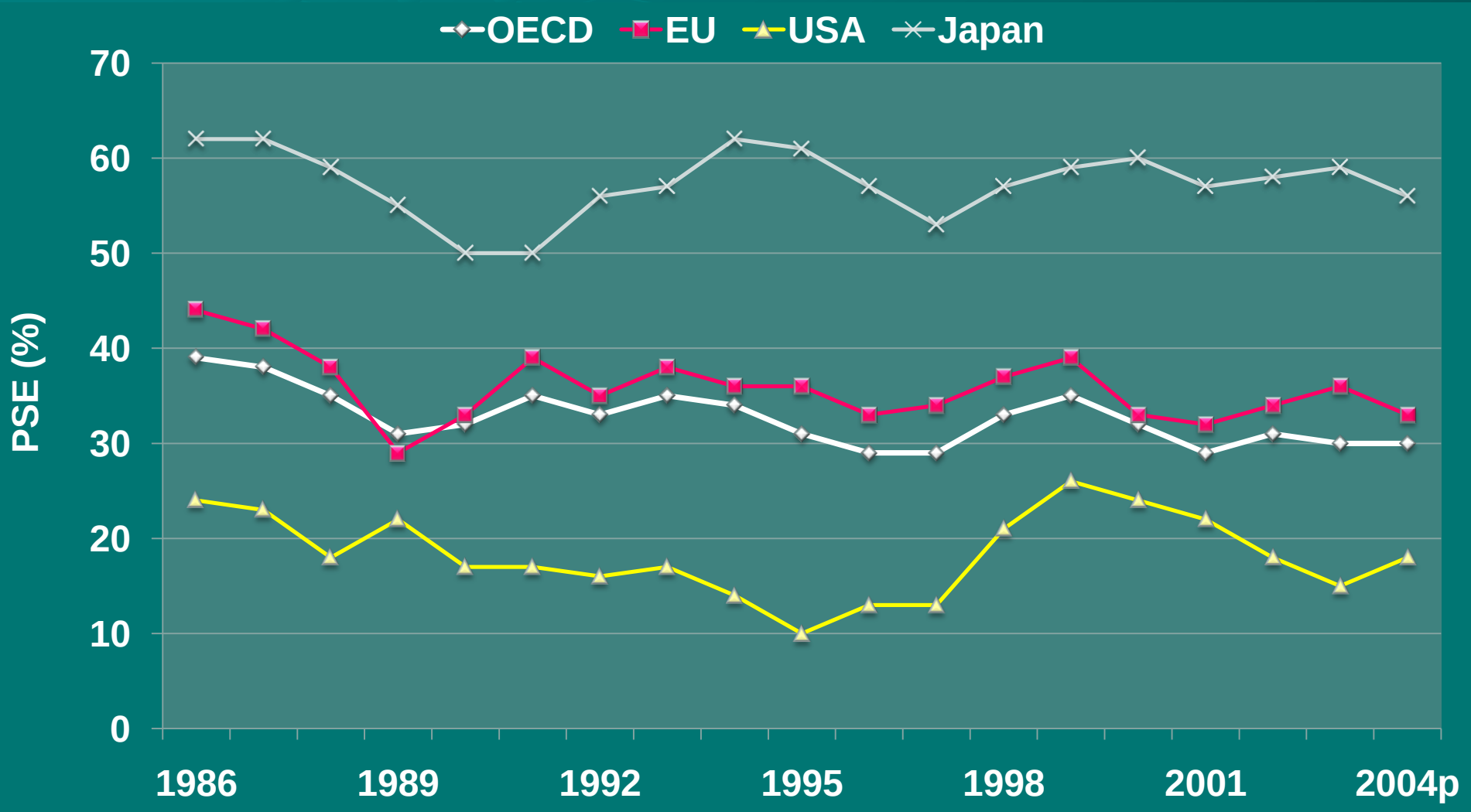
Overweight Prevalence in EU Countries

Overweight Prevalence in the Developing World



Farm Support in OECD Countries

[Total US$ 280 billion in 2004]



International Comparisons: PSE

Country	Percentage of, Males and Females, 15 years and older who were Overweight or Obese in 2005				PSE 1986-01 average
	Overweight (BMI > 25)		Obese (BMI > 30)		
	Male	Female	Male	Female	
	percent		*percent*		*percent*
United States	75.6	72.6	36.5	41.8	19.7
Mexico	68.4	67.9	24.0	34.3	13.2
Australia	72.1	62.7	23.8	24.9	7.9
Canada	65.1	57.1	23.7	23.2	24.4
New Zealand	68.7	68.2	23.0	31.5	3.6
United Kingdom	65.7	61.9	21.6	24.2	37.3
France	45.6	34.7	7.8	6.6	37.3
Korean Republic	40.2	43.8	4.1	10.1	69.3
Japan	27.0	18.1	1.8	1.5	58.8

Measuring Farm Policy Impact

- Consumer Support Estimates (CSEs)
  - Measure of impact of policies on prices paid by consumers
  - Available for OECD countries for 20 years
  - Relevant measure:
    - % CSE = % subsidy to consumers (or tax borne by consumers)

- $$P_i^k = F^k \cdot \left(1 - c_i^k\right)$$

  - P_i = domestic buyer price
  - F = world price
  - c_i = rate of CSE

International Comparisons: CSE

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	Overweight (BMI > 25)		Obese (BMI > 30)		
	Male	Female	Male	Female	
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United States	75.6	72.6	36.5	41.8	-1.1
Mexico	68.4	67.9	24.0	34.3	-4.1
Australia	72.1	62.7	23.8	24.9	-5.1
Canada	65.1	57.1	23.7	23.2	-17.4
New Zealand	68.7	68.2	23.0	31.5	-6.0
United Kingdom	65.7	61.9	21.6	24.2	-32.9
France	45.6	34.7	7.8	6.6	-32.9
Korean Republic	40.2	43.8	4.1	10.1	-66.0
Japan	27.0	18.1	1.8	1.5	-53.0

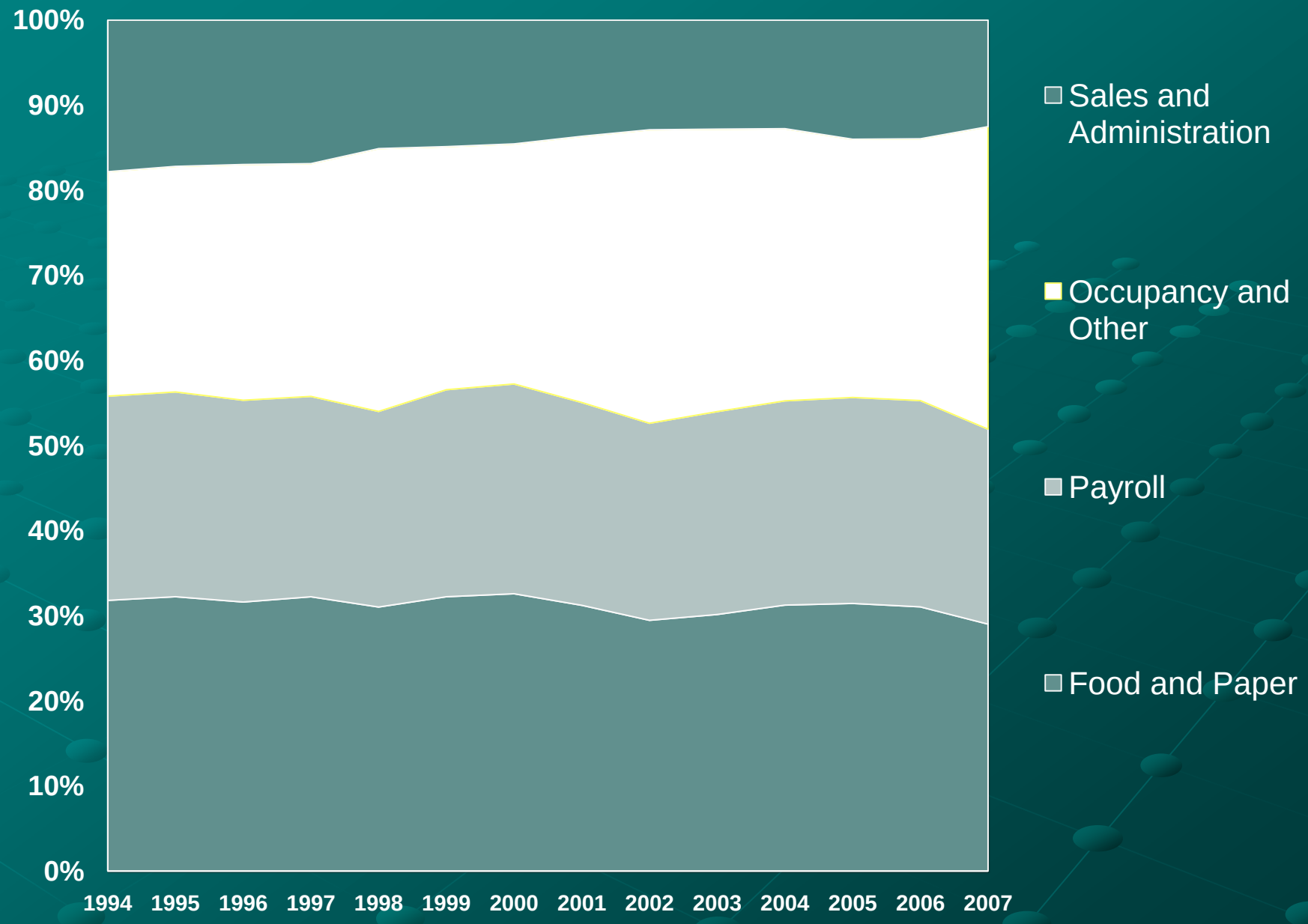
Burgernomics:

Farm Subsidies, McMarketing Margins and Obesity

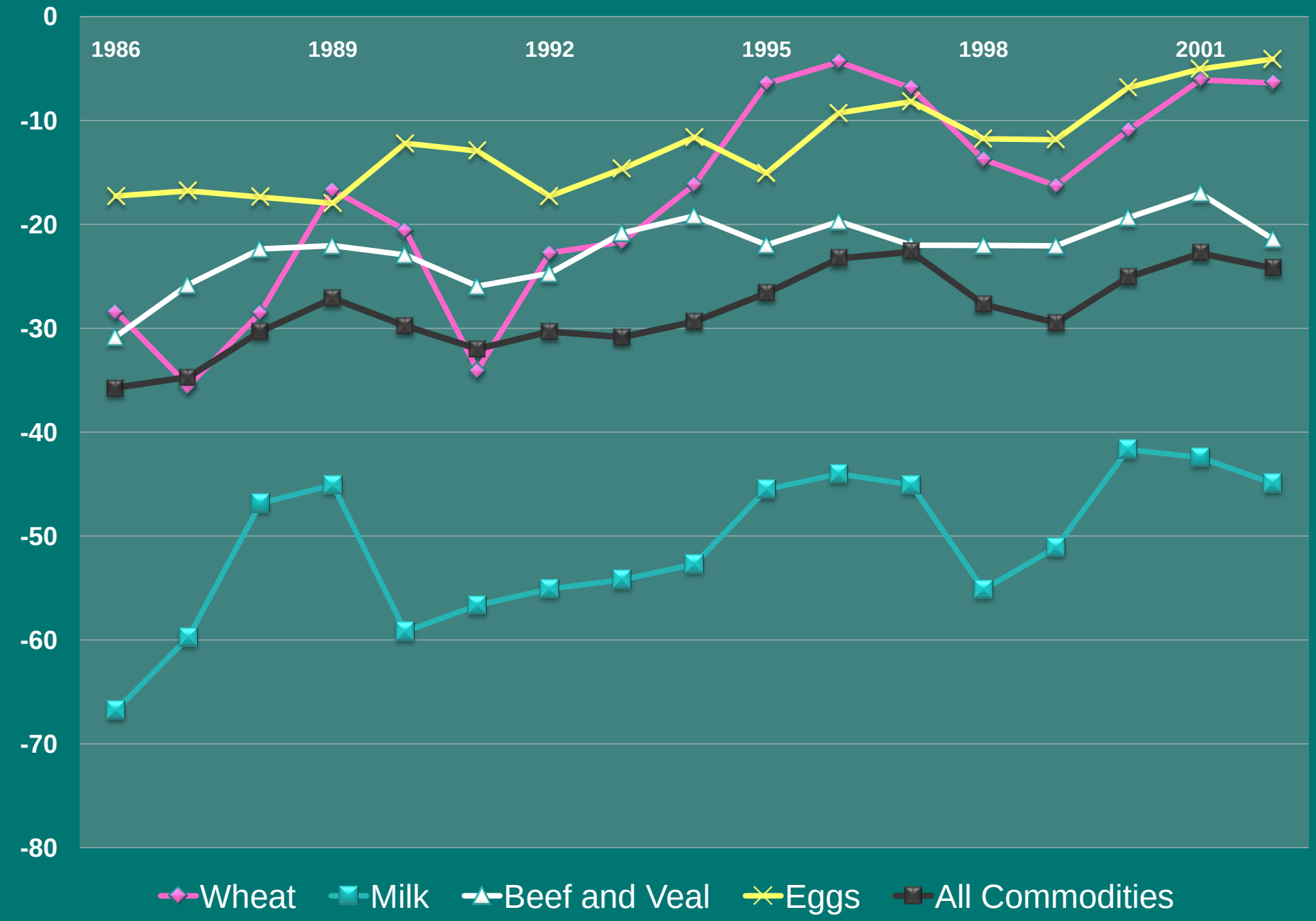
Big Mac Index

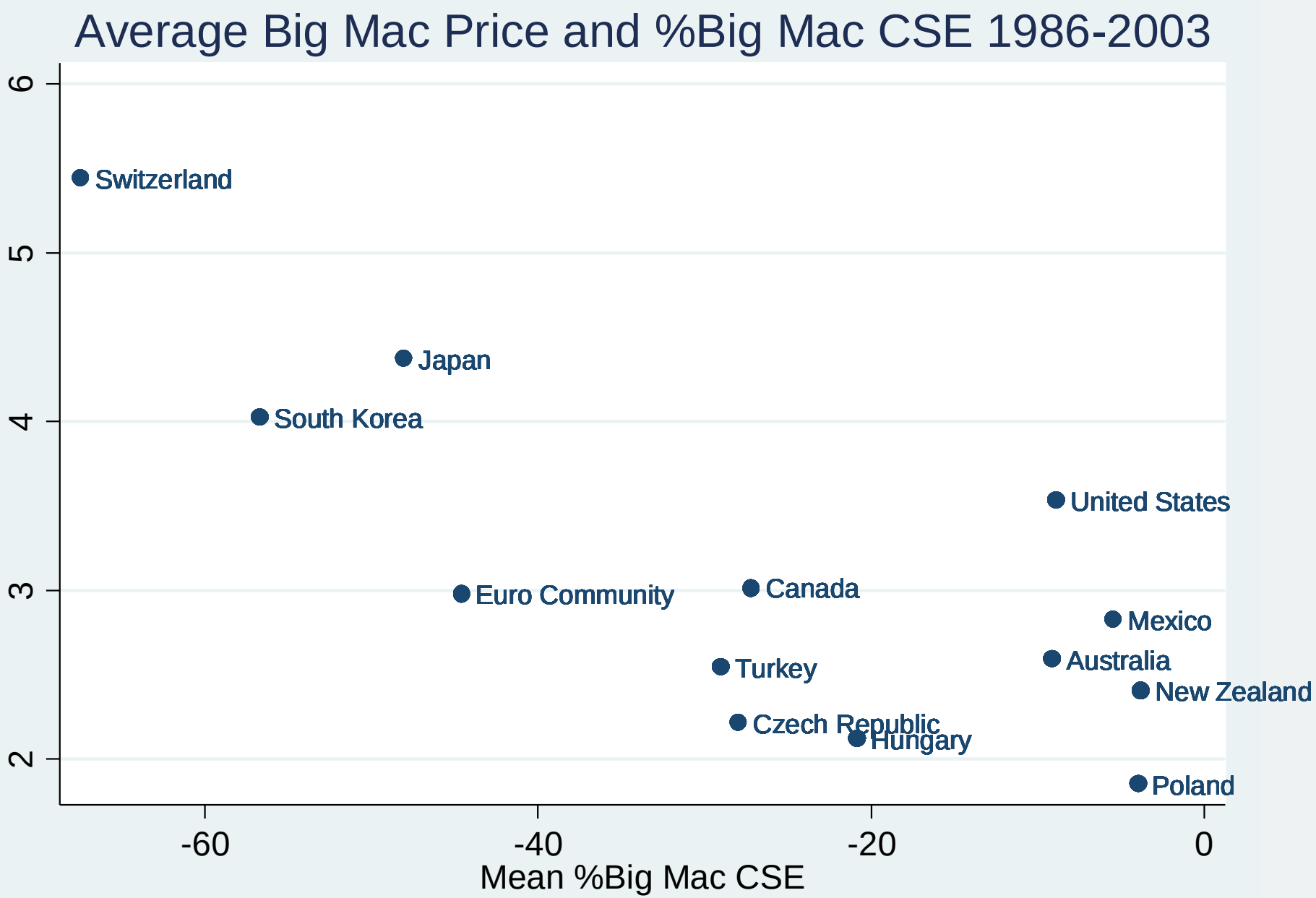
- Index of the price of a particular bundle of food
  - Fixed weight index with weights equal to quantities of ingredients and other inputs, assuming fixed proportions and competition
- Index of the price of a Big Mac!
- Model relationship between
  - Big Mac price and CSE
  - Obesity (BMI, % obese) and Big Mac price
  - Obesity and CSE

McDonald's Cost Shares 1994-2007



%CSE for Big Mac Commodities, OECD, 1986-2002




Average Big Mac Price and %Big Mac CSE 1986-2003
6
5
4
3
2
Switzerland
Japan
South Korea
United States
Euro Community
Canada
Mexico
Australia
Turkey
New Zealand
Czech Republic
Hungary
Poland
-60
-40
-20
0
Mean %Big Mac CSE

Regressions of Big Mac Prices vs. %BigMacCSE

	Pooled OLS Regression	Country Fixed Effects Model	Year and Country Fixed Effects Model
Big Mac %CSE	-0.039*	- 0.035*	-0.024*
	[0.004]	[0.01]	[0.008]
Elasticity	**-0.33**	**-0.30**	**-0.20**
Constant	2.158*	2.248*	1.990*
	[0.125]	[0.28]	[0.26]
Observations	159	159	159
Within R^2		0.08	0.63
Overall R^2	0.41	0.41	0.63
Number of countries		13	13

Standard errors in brackets, elasticities in braces

+ significant at 10%; ** significant at 5%; * significant at 1%

Regressions of Big Mac Price vs. %BigMacCSE

	Pooled Model	Country Fixed Effects Model
Big Mac %CSE	- 0.027**	-0.024*
	[0.004]	[0.01]
Elasticity	**-0.23**	**-0.20**
Minimum Wage	0.103*	-1.294**
	[0.04]	[0.206]
Energy Price Index	- 0.015**	-0.014*
	[0.006]	[0.006]
Constant	3.242**	8.016**
	[0.533]	[0.784]
Observations	131	131
R^2	0.29	0.363
Number of countries		12

Standard errors in square brackets and elasticities in braces.

+ significant at 10%; * significant at 5%; ** significant at 1%

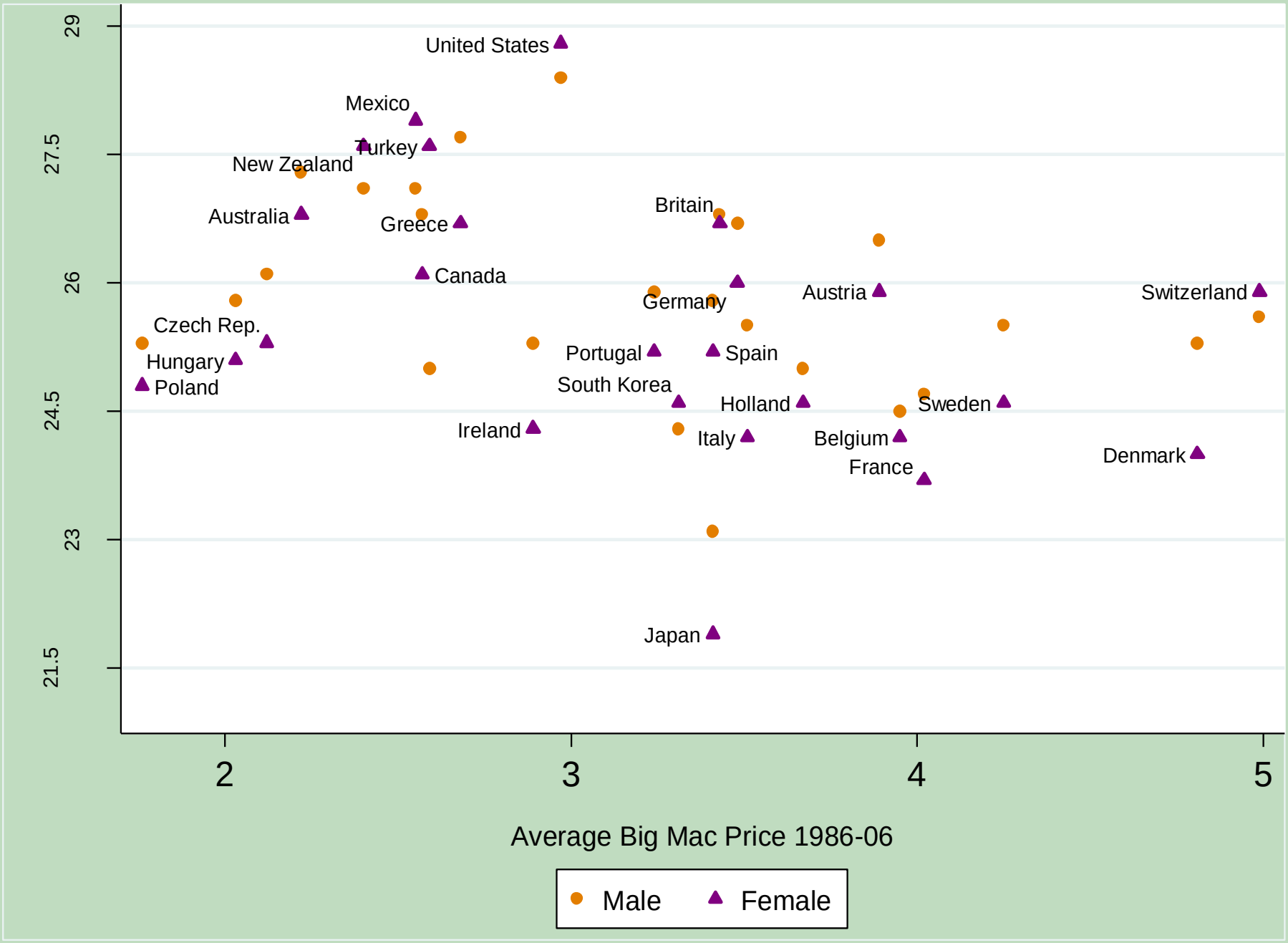
Minimum wages converted into US dollars using PPP.

Elasticities?

- Increase in Big Mac CSE =>
  - Decrease in buyer cost of ingredients
  - Decrease in the cost of a Big Mac
  - Decrease in price of Big Mac, depending on
    - cost share (food and paper ~30 %, food ~ 20%)
    - CSE as a share of ingredient costs
    - margin behavior (fixed proportions technology)
- Elasticities of Big Mac price with respect to the Big Mac CSE implied by competitive model
  - Fixed markup ~ 0.04”
  - Proportional markup ~0.20 percent

Big Mac Price and Obesity

- OECD versus non-OECD
- Male versus female
- Dependent variable
  - % obese
  - % overweight or obese
  - % overweight but not obese
  - average BMI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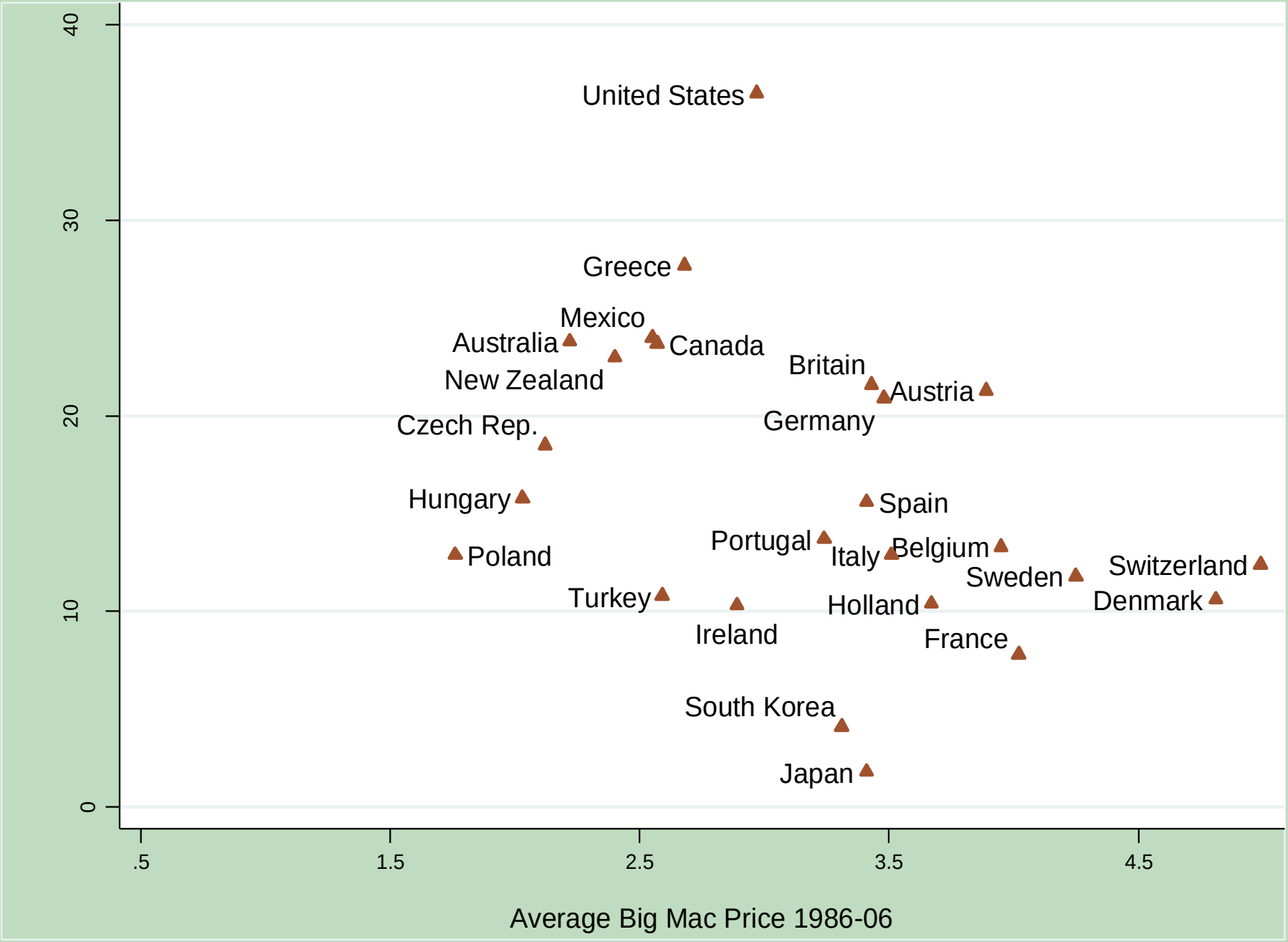
New Zealand
Australia
Greece
Britain
Canada
Germany
Austria
Switzerland
Czech Rep.
Hungary
Poland
Portugal
Spain
South Korea
Holland
Sweden
Ireland
Italy
Belgium
France
Denmark
Japan
2
3
4
5
Average Big Mac Price 1986-06
Male
Female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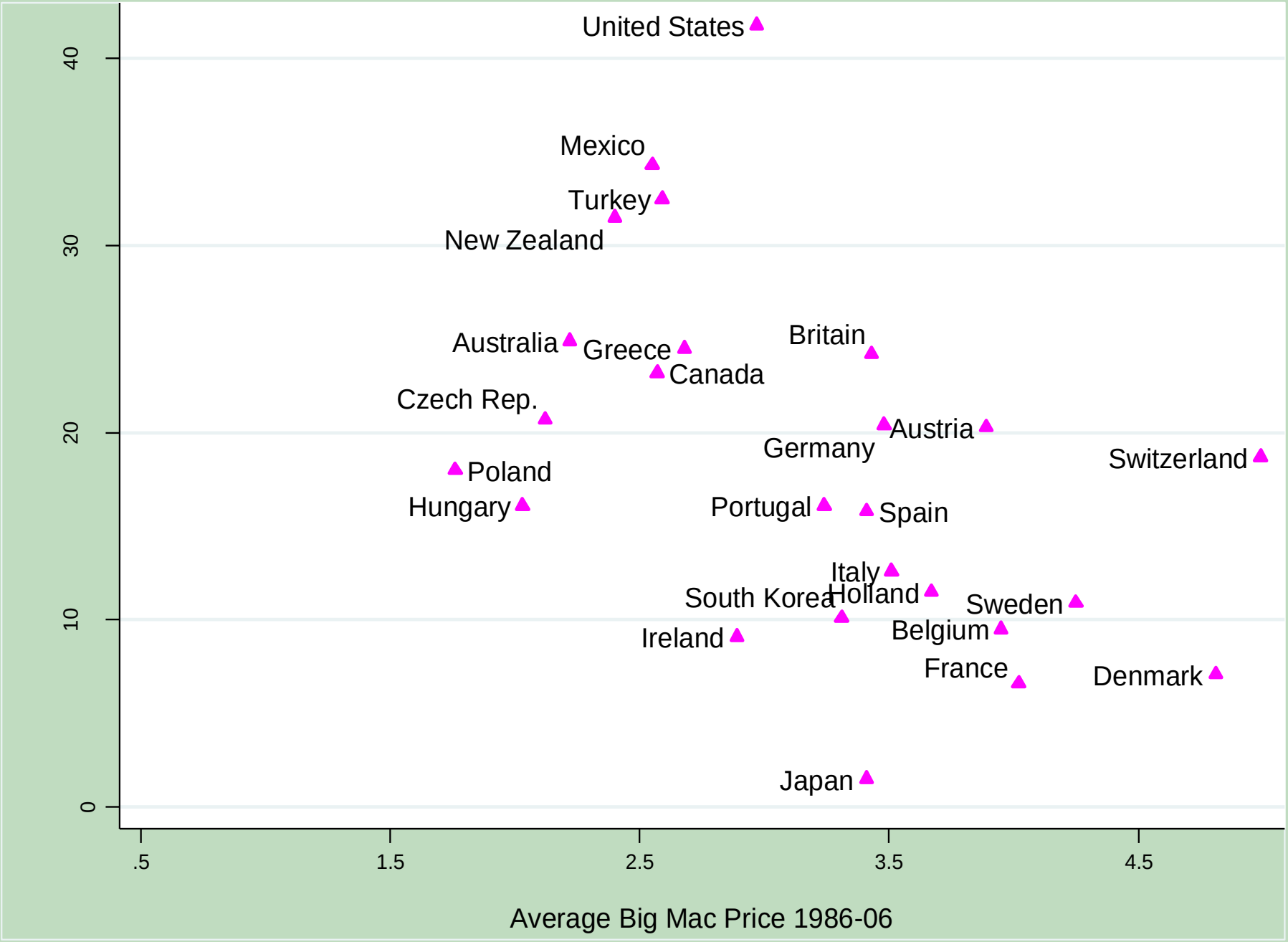
Average Big Mac Price 1986-06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Average Big Mac Price 1986-06

Simple Regressions of Obesity Prevalence Measures Against Average Relative Big Mac Prices: OECD Countries

Dependent Variable	Females	Males	Pooled w/ Female Indicator	Pooled w/o Female Indicator
Average Adult BMI	-2.046+	-1.438+	-1.742*	-1.742*
	[1.06]	[0.82]	[0.66]	[0.67]
	{-0.09}	{-0.06}	{-0.07}	{-0.07}
% Obese	-16.197*	-10.048+	-13.123**	-13.123**
	[6.30]	[5.37]	[4.12]	[4.12]
	{-0.97}	{-0.7}	{-0.84}	{-0.84}
% Overweight	1.045	-2.214	-0.585	-0.585
	[3.43]	[3.36]	[2.39]	[3.25]
	{0.03}	{-0.06}	{-0.02}	{-0.02}
% Overweight or Obese	-15.152+	-12.262	-13.707*	-13.707*
	[8.68]	[7.89]	[5.81]	[5.98]
	{-0.32}	{-0.24}	{-0.28}	{-0.28}
Standard errors in square brackets and elasticities in braces				
+ significant at 10%; * significant at 5%; ** significant at 1%				

Obesity Model Results

- OECD Countries:
  - Significant negative relationship between average adult BMI, obesity prevalence and relative Big Mac price
  - 6.6% lower obesity prevalence associated with having $0.50 higher relative Big Mac Price
- Non-OECD Countries:
  - Significant positive relationship between overweight only (25<BMI<30) prevalence and relative Big Mac price
  - Big Mac model makes less sense for these countries

McDonald's
Hits Africa

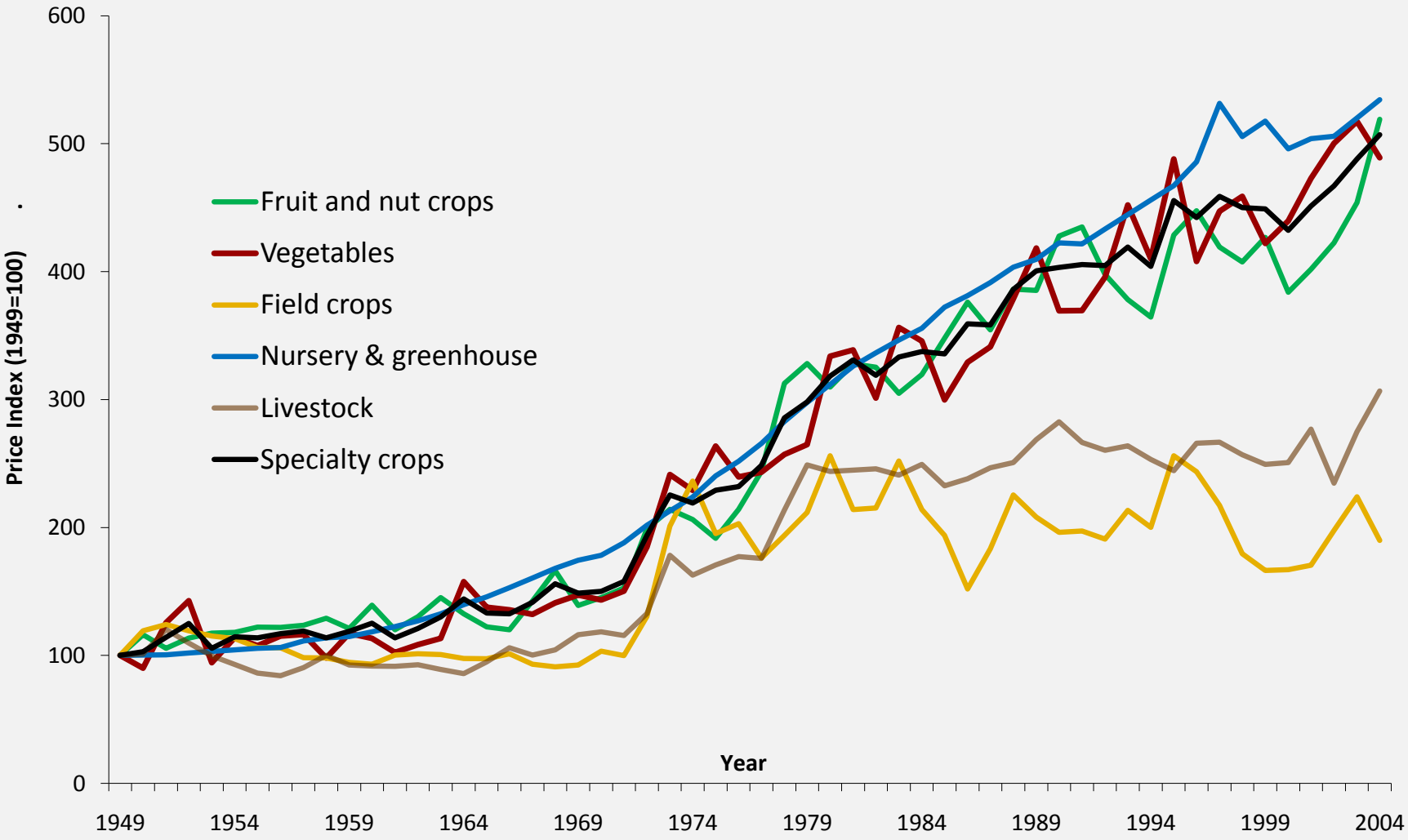
Conclusion

- Farm subsidy policies have had
  - small effects on commodity prices
  - much smaller effects on retail prices
  - even smaller effects on consumption
- Thus
  - the effect of U.S. farm commodity subsidy policies on obesity must be very small – compared with other factors, negligible
  - farm subsidies may be ineffective, wasteful, and unfair, but eliminating them would not make a dent in America's obesity problem

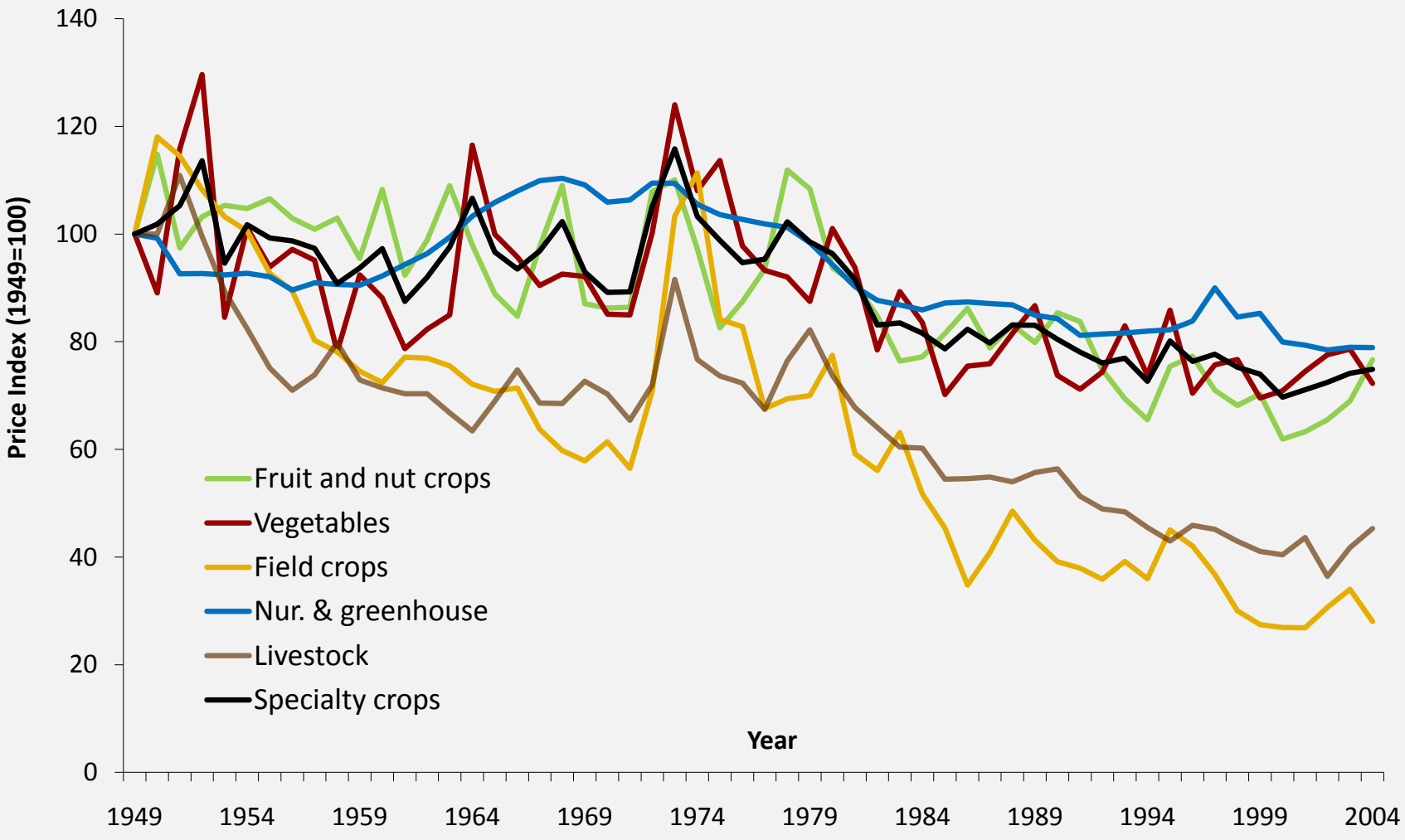
Conclusion continued

- Burgernomics results suggest
  - Policies that affect food commodity prices appreciably could influence food consumption and obesity in the ways our text book models predict
- Effects are mitigated by
  - factors that mute price transmission from farmers to consumers
  - generally low elasticities of demand
- Agricultural R&D has the potential to have meaningful effects on relative prices of food commodities – but it takes a long time

Nominal Prices of U.S. Farm Products, 1949-2004



Real Prices (I-GDP) of U.S. Farm Products, 1949-2004



Could it be something else?

Merci!