

The Economic Psychology of Body Weight

Evidence from Country-Level Obesity Rates in the OECD

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Theories of Obesity

Most economic analysis of obesity has emphasized partial equilibrium effects, variation in **material constraints**.

- income
- relative prices: calories, fat, time. . .
- e.g., Cutler *et al.* 2003, Chou *et al.* 2004, Drewnowski 2004, Loureiro & Nayga 2005, Bleich *et al.* 2007, Huffman *et al.* 2007, Schroeter *et al.* 2008, Alston *et al.* 2008, others



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But obesity is among the most “psychological” of subjects, suggesting need for broader behavioral perspective.

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- Endogenous Dietary Preferences
 - biology and **dietary quality** (Ludwig 2002, Taubes 2007)
 - advertising, information, habits (Smith 2004, Chou *et al.* 2008, Smith & Tasnadi 2007, Smith *et al.* 2009a)



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Introduction
Ad Sample
Regrettable
Conclusion

Defining Deception
in Television Advertisements for Food
Aimed at Children
Perspectives from Economics and Behavioral Biology

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Trent Smith Food Advertisements



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 - biology and dietary quality (Ludwig 2002, Taubes 2007)
 - advertising, information, habits (Smith 2004, Chou *et al.* 2008, Smith & Tasnadi 2007, Smith *et al.* 2009a)
- Stress, “Comfort Foods,” & **Economic Insecurity**
 - food insecurity and obesity (Dietz 1995, Gibson 2003, others)
 - income insecurity and weight gain (Smith 2006, Smith *et al.* 2009b)



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Because data constraints, limited within-population variation often preclude simultaneous evaluation of these various hypotheses, **country-level analysis** is needed.



Obesity Data

- The usual drawbacks to country-level analysis apply: aggregation, coverage, unobservables, consistency of measurement



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- In particular, obesity rates reported in *OECD Health 2009* database are **problematic**:
 - Actual vs. reported BMI (*adjust with NHANES III-generated correction factors*)
 - Demographic coverage (*ditto*)
 - Values reported for U.S. evidently adjusted for demographic changes, but not sampling weights (*replace with correct values from NHANES*)
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 - Values reported for U.S. evidently adjusted for demographic changes, but not sampling weights (*replace with correct values from NHANES*)
 - Temporal coverage limited for many countries (*trim sample, interpolate, then use multiple imputation*)
- Nevertheless, variation across countries (2% ↔ 33%) and over time (+0.5% ↔ +14.5%, 1990-2007) is **large**.



Obesity Data

Table 1: Unadjusted *OECD Health 2009* Obesity Rates

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008		
Australia			8.3			9.2						10.8						19.8				21.7		17.9			18.7	18.7					
Austria													8.5									9.1							12.4				
Belgium																	12.1	11.4		11.1		13.6		11.7		12.7							
Canada																							13.9		14.3		14.9			15.4			
Czech Republic																						14.2		9.5		17.0							
Denmark										5.5						7.6									14.8		11.4						
England													14.0	14.0	15.0	16.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	23.0	23.0	23.0	24.0	24.0				
Finland	6.6	7.4	7.4	7.3	7.2	7.6	7.7	6.7	7.5	8.3	7.8	8.3	8.4	8.8	8.6	8.9	9.5	10.4	10.2	9.9	9.5	10.1	11.2	11.4	11.8	12.8	14.0	14.1	14.3	14.9			
France													5.8	5.7	6.5	6.6	6.9	7.0	8.3	7.4	8.2		9.0		9.4		9.4		10.5				
Germany																							11.5			12.9		13.6					
Greece																												16.4		18.1			
Hungary																								18.2		18.8							
Iceland													7.5												12.4					20.1			
Ireland																					11.0			15.0			9.9	10.2	9.9				
Italy																7.0						8.8	8.6	8.5	9.0		9.9	10.2	9.9				
Japan	2.1	1.8	2.0	1.9	2.1	1.9	1.9	1.8	1.8	2.2	1.8	1.9	2.3	2.2	2.5	2.3	2.2	2.6	2.5	2.7	3.1	2.8	2.9	3.2	3.6	3.2	3.0	3.9	3.4				
Korea																						2.2		3.2				3.5					
Mexico																								24.2			30.2	30.0					
Netherlands				5.1	4.7	4.8	5.2	5.0	4.8	5.3	4.8	6.3	6.1	5.8	6.4	6.1	7.0	6.9	6.9	8.1	8.4	8.7	9.4	9.3	9.7	10.7	10.9	10.7	11.3	11.2			
New Zealand													12.7												25.0				26.5				
Norway																	5.0										9.0						
Poland																										12.5							
Portugal																														15.4			
Spain									6.8							8.8		10.3			11.7			12.6		13.1			14.9				
Sweden												5.5									7.9	8.1	8.1	9.2	9.2	10.2	9.7	9.8	10.7	9.6	10.2		
Switzerland															5.4						6.8				7.7				8.1				
Turkey																										12.0							
United States	15.0													23.3										30.5	30.6		32.2		34.3				



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	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	
Australia			8.3	•	•	9.2	•	•	•	•	•	10.8	•	•	•	•	19.8	•	•	•	21.7	•	17.9	•	•	•	18.7	18.7				
Austria														8.5	•	•	•	•	•	•	9.1	•	•	•	•	•	•	•	•	•	12.4	
Belgium																					11.1	•	•	11.7	•	•	12.7					
Canada																	12.1	•	11.4	•	13.6	•	•	13.9	•	14.3	•	14.9	•	15.4		
Czech Republic																11.3	•	•	11.3	•	•	14.2	•	•	14.8	•	•	17.0				
Denmark									5.5	•	•	•	•	•	•	7.6	•	•	•	•	•	•	•	•	•	•	•	11.4				
England													14.0	14.0	15.0	16.0	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	23.0	23.0	23.0	24.0	24.0			
Finland	6.6	7.4	7.4	7.3	7.2	7.6	7.7	6.7	7.5	8.3	7.8	8.3	8.4	8.8	8.6	8.9	9.5	10.4	10.2	9.9	9.5	10.1	11.2	11.4	11.8	12.8	14.0	14.1	14.3	14.9		
France													5.8	5.7	6.5	6.6	6.9	7.0	8.3	7.4	8.2	•	9.0	•	9.4	•	9.4	•	10.5			
Germany																						11.5	•	•	•	12.9	•	13.6				
Greece																																
Hungary																							18.2	•	•	18.8			16.4	•	18.1	
Iceland													7.5	•	•	•	•	•	•	•	•	•	•	•	12.4	•	•	•	•	•	20.1	
Ireland																					11.0	•	•	15.0	•	•	•	•	•	15.0		
Italy																7.0	•	•	•	•	•	8.8	8.6	8.5	8.5	9.0	•	9.9	10.2	9.9		
Japan	2.1	1.8	2.0	1.9	2.1	1.9	1.9	1.8	1.8	2.2	1.8	1.9	2.3	2.2	2.5	2.3	2.2	2.6	2.5	2.7	3.1	2.8	2.9	3.2	3.6	3.2	3.0	3.9	3.4			
Korea																					2.2	•	•	3.2	•	•	•	3.5				
Mexico																							24.2	•	•	•	30.2	30.0				
Netherlands				5.1	4.7	4.8	5.2	5.0	4.8	5.3	4.8	6.3	6.1	5.8	6.4	6.1	7.0	6.9	6.9	8.1	8.4	8.7	9.4	9.3	9.7	10.7	10.9	10.7	11.3	11.2		
New Zealand													12.7	•	•	•	•	•	•	•	•	•	•	•	•	25.0	•	•	•	26.5		
Norway																	5.0	•	•	•	6.4	•	•	•	•	8.3	•	•	9.0			
Poland																											12.5					
Portugal																																
Spain									6.8	•	•	•	•	•	•	8.8	•	10.3	•	•	11.7	•	•	12.6	•	13.1	•	•	14.9			
Sweden																					7.9	8.1	8.1	9.2	9.2	10.2	9.7	9.8	10.7	9.6	10.2	
Switzerland																					6.8	•	•	•	•	7.7	•	•	8.1			
Turkey																																
United States	15.0	•	•	•	•	•	•	•	•	•	•	•	•	23.3	•	•	•	•	•	•	•	•	30.5	•	30.6	•	32.2	•	34.3			



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	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008		
Australia			8.3	•	•	9.2	•	•	•	•	•	•	10.8	•	•	•	•	19.8	•	•	•	21.7	•	17.9	•	•	•	18.7	18.7				
Austria														8.5	•	•	•	•	•	•	•	9.1	•	•	•	•	•	•	•	•	12.4		
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Denmark										5.5	•	•	•	•	•	•	7.6	•	•	•	•	•	•	9.5	•	•	•	•	•	•	•	11.4	
England																																	
Finland	6.6	7.4	7.4	7.3	7.2	7.6	7.7	6.7	7.5	8.3	7.8	8.3	8.4	8.8	8.6	8.9	9.5	10.4	10.2	9.9	9.5	10.1	11.2	11.4	11.8	12.8	14.0	14.1	14.3	14.9			
France													5.8	5.7	6.5	6.6	6.9	7.0	8.3	7.4	8.2	•	9.0	•	9.4	•	9.4	•	•	10.5			
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Netherlands				5.1	4.7	4.8	5.2	5.0	4.8	5.3	4.8	6.3	6.1	5.8	6.4	6.1	7.0	6.9	6.9	8.1	8.4	8.7	9.4	9.3	9.7	10.7	10.9	10.7	11.3	11.2			
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Spain									6.8	•	•	•	•	•	•	8.8	•	10.3	•	•	11.7	•	•	•	12.6	•	13.1	•	•	14.9			
Sweden												5.5	•	•	•	•	•	•	•	7.9	8.1	8.1	9.2	9.2	10.2	9.7	9.8	10.7	9.6	10.2			
Switzerland															5.4	•	•	•	•	•	6.8	•	•	•	7.7	•	•	•	•	8.1			
Turkey																																	
United States	15.0	•	•	•	•	•	•	•	•	•	•	•	•	23.3	•	•	•	•	•	•	•	•	•	30.5	•	30.6	•	32.2	•	34.3			



Obesity Data

Table 2: Adjusted OECD Obesity Rates (selected years; raw data in parentheses)

	1989	1990	1991	1992	1993	1994	2005	2006	2007
Australia	9.4 (10.8)						20.0 (18.7)		
Austria			10.0 (8.5)					15.5 (12.4)	
Canada						15.1 (12.1)	18.6 (14.9)		19.2 (15.4)
Czech Republic					14.1 (11.3)		16.2 (17.0)		
Denmark						9.5 (7.6)	14.2 (11.4)		
England			13.8 (14.0)	13.8 (14.0)	14.8 (15.0)	15.8 (16.0)	22.7 (23.0)	23.7 (24.0)	23.7 (24.0)
Finland	10.2 (8.3)	10.3 (8.4)	10.8 (8.8)	10.6 (8.6)	10.9 (8.9)	11.7 (9.5)	17.3 (14.1)	17.6 (14.3)	18.3 (14.9)
France		7.2 (5.8)	7.1 (5.7)	8.1 (6.5)	8.2 (6.6)	8.6 (6.9)		13.1 (10.5)	
Iceland		9.4 (7.5)							23.9 (20.1)
Italy						8.7 (7.0)	11.9 (9.9)	12.3 (10.2)	11.9 (9.9)
Japan	1.8 (1.9)	2.2 (2.3)	2.1 (2.2)	2.4 (2.5)	2.2 (2.3)	2.1 (2.2)	3.8 (3.9)	3.3 (3.4)	
Netherlands	7.3 (6.3)	7.1 (6.1)	6.8 (5.8)	7.5 (6.4)	7.2 (6.1)	8.3 (7.0)	12.7 (10.7)	13.4 (11.3)	13.3 (11.2)
New Zealand	12.7 (12.7)								26.5 (26.5)
Spain					11.0 (8.8)			18.6 (14.9)	
Sweden	6.8 (5.5)						13.2 (10.7)	11.8 (9.6)	12.6 (10.2)
Switzerland				6.7 (5.4)					10.1 (8.1)
United States			20.6 (23.3)				32.6	32.6 (34.3)	



Obesity Data

Table 3: Obesity Rankings, 1990-2007

	Obesity Rate (%)			Rank		
	1990	2007	Difference	1990	2007	Difference
Iceland	9.4	23.9	14.5	10	3	1
New Zealand	13.5	26.5	13.0	5	2	2
United States	20.0	32.6	12.6	1	1	3
England	13.8	23.7	9.9	4	4	4
Spain	9.7	19.3	9.6	9	6	5
Australia	10.9	20.0	9.1	6	5	6
Finland	10.3	18.3	8.0	7	8	7
Denmark	8.0	15.2	7.2	11	10	8
France	7.2	13.8	6.6	12	12	9
Austria	9.9	16.1	6.2	8	9	10
Netherlands	7.1	13.3	6.2	14	13	10
Sweden	7.2	12.6	5.4	12	14	12
Italy	6.9	11.9	5.0	15	15	13
Switzerland	6.0	10.1	4.1	16	16	14
Canada	16.8	19.2	2.4	2	7	15
Japan	2.2	2.8	0.6	17	17	16
Czech Republic	14.1	14.6	0.5	3	11	17



Covariates

- **Income:** real GDP per capita (PPP) from *OECD Health 2009*
- **Prices:** compensation per employee from *OECD Health 2009*, hours worked per employee from *OECD Employment Outlook 2009*, ratio of fpi to cpi from *OECD.Stat*
- **Diet Quality:** ratio of sugar to fruit & vegetable consumption per capita from *FAOStat*
- **Insecurity:** index of extent to which wages are set competitively from *2008 World Economic Forum, Executive Opinion Survey*, public fraction of healthcare spending from *OECD Health 2009*, indices of employment protection legislation from *OECD Employment Outlook 2004*



Results

Table 4: Country FE Results

	(1)	(2)	(3)	(4)	(5)	(6)
Real GDP per capita (PPP)	0.209** (0.0843)					
Compensation per employee		0.287*** (0.105)	0.275*** (0.121)	0.215** (0.108)	0.228*** (0.0981)	0.280*** (0.0985)
Hours worked per employee		0.245*** (0.00245)	0.238*** (0.00265)	0.268*** (0.00238)	0.308*** (0.00222)	0.321*** (0.00224)
Ratio of fpi to cpi			0.001 (1.781)	0.015 (1.867)	0.049** (2.052)	0.038* (2.231)
Sugar/vegetable ratio			-0.028 (2.864)	-0.054 (3.026)	-0.035 (2.557)	-0.061* (2.445)
Competitive wages				0.182*** (0.116)	0.032 (0.107)	0.066* (0.108)
Public fraction of healthcare spending				-0.087 (0.0320)	-0.187** (0.0315)	-0.101 (0.0296)
Employment protection legislation (EPL)					0.201*** (0.293)	
EPL (firing costs for permanent workers)						-0.114* (0.379)
EPL (restrictions on temporary employment)						0.160*** (0.145)
Observations	303	303	303	303	252	252

Standardized beta coefficients; Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ 

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Country Effects

Table 5: Fixed Effects

	Obesity Rate (U.S.= 0.0%)		
	1990	2007	Fixed Effects
United States	0.0	0.0	0.0
New Zealand	-6.5	-6.1	-1.6
England	-6.2	-8.9	-3.1
Australia	-9.1	-12.6	-3.7
Finland	-9.7	-14.3	-6.1
Spain	-10.3	-13.3	-6.1
Czech Republic	-5.9	-18.0	-6.4
Netherlands	-12.9	-19.3	-7.1
Canada	-3.2	-13.4	-7.3
Denmark	-12.0	-17.4	-7.4
Iceland	-10.6	-8.7	-7.4
Austria	-10.1	-16.5	-7.9
Sweden	-12.8	-20.0	-8.6
France	-12.8	-18.8	-9.3
Italy	-13.1	-20.7	-11.2
Switzerland	-14.0	-22.5	-16.0
Japan	-17.8	-29.8	-21.4



Fattening Explained?

Table 6: Changes in Key Variables, 1990-2007

	Obesity	Employee Compensation	Hours Worked	Competitive Wages	EPL (temp)
Iceland	14.5	11029	-32.0	1.7	-
New Zealand	13.0	5539	-38.6	3.4	-
United States	12.6	12543	-33.0	0.8	0.0
England	9.9	9838	-98.0	2.5	0.1
Spain	9.6	8417	-106.0	0.6	-0.5
Australia	9.1	9315	-78.5	1.2	0.0
Finland	8.0	6783	-59.2	-2.1	0.0
Denmark	7.2	9609	60.7	0.2	-2.7
France	6.6	7956	-151.9	1.8	0.9
Austria	6.2	7657	-42.4	-1.7	0.0
Netherlands	6.2	10126	38.0	-0.5	-1.8
Sweden	5.4	8638	54.1	-1.0	-3.8
Italy	5.0	4697	-49.9	-1.0	-4.1
Switzerland	4.1	8293	-70.8	2.2	0.0
Canada	2.4	9131	-41.1	0.5	0.0
Japan	0.6	7462	-246.0	0.2	-0.6
Czech Republic	0.5	6823	15.0	3.6	-



Conclusion

- In our model, changes in obesity national obesity rates captured best by
 - ① measures of opportunity cost of time
 - ② measures of employment security



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 - ① measures of opportunity cost of time
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- Caveat: could be driven by data limitations. . . should be viewed in context of findings from individual-level studies
- Next: explore variation in cross-section using FE estimates, out-of-sample countries

