"Is your commute really making you fat?"
The causal effect of commuting distance on height-adjusted weight

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Background

- Overweight and obesity are rapidly growing health problems and risk factors for a number of major illnesses including cardiovascular diseases or cancer.[1]
- Recent research suggest that societal and environmental factors (e.g. cultural practices or commuting to work) favour the development of overweight and obesity.
- However, only limited research is available on the effect of commuting on height-adjusted body weight (BMI) since these (U.S.) studies are based on small samples and cross-sectional data.[2]

Purpose

- To examine the causal effect of individual-level commuting distance on BMI using panel data to control for unobserved time-invariant heterogeneity.

Data & Methods

Data & Sample

- SOEP waves 2004 – 2012.
- Only 18- to 65- year old individuals in paid employment.
- Pregnant women were excluded.

Variables

- Dependent variable: logarithm of BMI (*log(bmi)*)
- Independent variable: one way commuting distance in kilometres
  - as continuous measure: *CD, CD²*
  - and categorical measure: *SDC: 10 - 24 km, MDC: 25 - 49 km, LDC: 50 km and over*
- Covariates: sociodemographic, spatial, health and job related variables

Empirical Strategy

(1) Pooled OLS (Table 1: Model I + Model II)
(2) OLS with fixed-effects (Table 1: Model III + Model IV)
(3) OLS with fixed-effects and …
  a. lagged values of commuting distance variables (Table 2: Model I + Model II),
  b. exogenous changes of commuting distance by exploiting variation in commuting distance within an individual, when there are no changes in residence and employer (Table 2: Model III + Model IV).

Results

- No relationship between commuting distance and BMI.
- Non-relationship consistently found across various sub-samples and prevails regardless of included controls.

***Table 1*: Estimation results.**

	Model I Pooled OLS	Model II Pooled OLS	Model III FE OLS	Model IV FE OLS
CD	-0.00000610		-0.0000172	
	(-0.18)		(-0.57)	
CD^2	-2.43e-08		1.47e-08	
	(-0.44)		(0.35)	
SDC		-0.00217		-0.000383
		(-1.11)		(-0.19)
MDC		0.00317		-0.00148
		(1.31)		(-0.52)
LDC		0.00180		-0.000807
		(0.57)		(-0.25)
F-stat.	0.95	1.65	0.23	0.10
(p-value)	0.3852	0.1758	0.7908	0.9617
N	33,034	33,034	33,034	33,034

Notes: Only coeff. for the commuting variables are reported. Non-commuters are treated as the reference category in Models II and IV. Following controls included: current health status, worries about health, invalidity level, sport, physical problems, physical pain, being well-balanced, energy, healthy nutrition, smoking, women (exc. FE OLS), age, age squared, # of children, partner, education, income, regional information, working hours mismatch, leisure time, migration (exc. FE OLS), civil service, employment status, white-collar, industry, federal state dummies, year dummies. All models are estimated using robust standard errors. *t* statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

***Table 2*: Results of strategies for causal inference.**

	Strategy 3a: using lagged commuting distance		Strategy 3b: using exogenous changes of CD	
	Model I FE OLS	Model II FE OLS	Model III FE OLS	Model IV FE OLS
CD	-0.0000116		-0.0000172	
	(-0.36)		(-0.57)	
CD^2	3.83e-08		1.47e-08	
	(0.83)		(0.35)	
SDC		-0.000818		-0.00231
		(0.43)		(-0.72)
MDC		0.00130		-0.0000773
		(0.45)		(-0.02)
LDC		0.00208		-0.0110*
		(0.65)		(-1.81)
F-stat.	0.85	1.65	1.59	1.42
(p-value)	0.4261	0.1758	0.2041	0.2335
N	29,448	29,448	21,455	21,455

Notes: See *Notes* of Table 1.

Possible Explanation

- We find evidence for compensating health behaviour:
  - Commuting induces changes in levels of physical activity that are likely to reduce weight.
  - These effect could explain why no significant relationship is found between commuting and BMI.

***Table 3*: Explanations for findings.**

	Dep. var.: Health conscious nutrition (not at all, a little, strong, very strong)	**Dep. var.**: Frequency of sport or exercise (never, several times a year, at least once a month, at least once a week)
Log(CD)	0.0232	0.0236*
	(1.38)	(1.69)
N	32,576	32,576
SDC	0.0504	0.0538
	(1.13)	(1.41)
MDC	-0.0215	-0.0024
	(-0.37)	(-0.05)
LDC	0.0522	0.0463
	(0.50)	(0.72)
F-stat.	2.43	2.73
(p-val.)	0.4883	0.4355
N	33,034	33,034

Notes: Random-effects ordered logistic regression with robust standard errors. Following controls included: age, age squared, # of children, married, education, current health status, worries about health, smoking, working hours, working hours mismatch, employment status, public sector, industry, white-collar job, ln(income), hours of leisure, spatial information, region and year dummies. *z* statistics in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

Conclusion

- No evidence that commuting distance is associated with a higher BMI (contrary to results of U.S.-study).
- *Intuition:*
  - Overweight and obesity are much more common in the United States.
  - Individuals who commute are aware of the potential adverse effect of commuting. We find evidence for compensating health behaviour, such as more physical activity, among those who commute.

References

1. World Health Organization, (2014): Global status report on noncommunicable diseases 2014. World Health Organization, Geneva.
2. Hoehner, C.M., Barlow, C.E., Allen, P., Schootman, M., (2012): Commuting distance, cardiorespiratory fitness, and metabolic risk. American Journal of Preventive Medicine 42 (6), 571 – 578.