The Effect of Depression on Obesity: an instrumental variable approach

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BMI

$$\text{BMI} = \frac{\text{weight}}{\text{height}^2}$$

- BMI $< 18.5 \rightarrow$ underweight
- BMI $> 25 \rightarrow$ overweight
- BMI $> 30 \rightarrow$ obese
- BMI $> 40 \rightarrow$ morbidly obese
- Used as a standard way of estimating body fat percentage which would be a way better metric since it corrects for muscle mass but is long and expensive to measure

Depression score

- CESD score: Center for Epidemiologic Studies Depression Scale
- Ask 6 negative and 2 positive questions
- 1 point for every "depressed" answer
  - Do you feel depressed? (Yes $\rightarrow$ 1 , No $\rightarrow$ 0)
  - Are you happy? (Yes $\rightarrow$ 0 , No $\rightarrow$ 1)
- The sum of those points yields a score going from 0 (not depressed) to 8 (severely depressed).

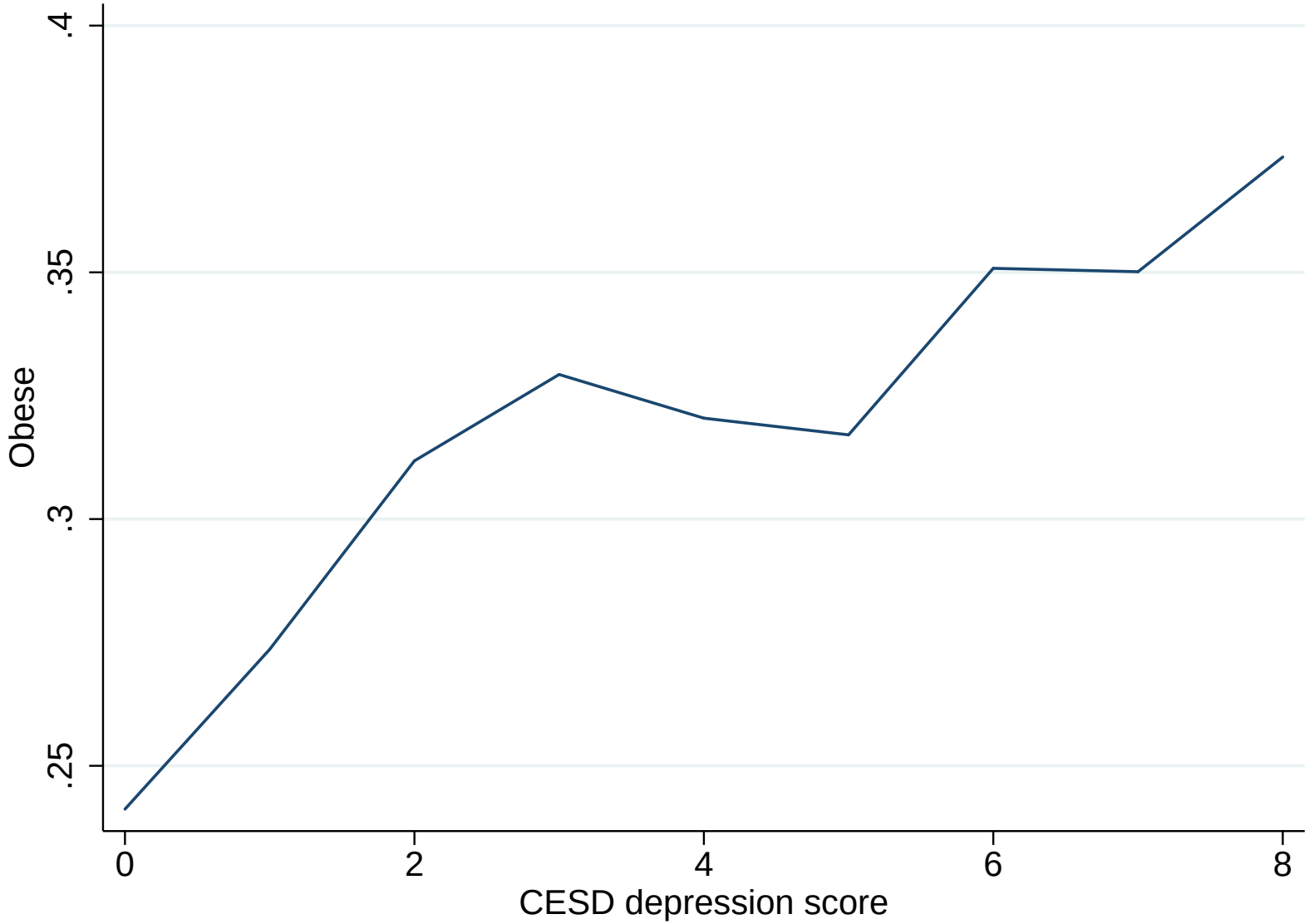
State of the Literature

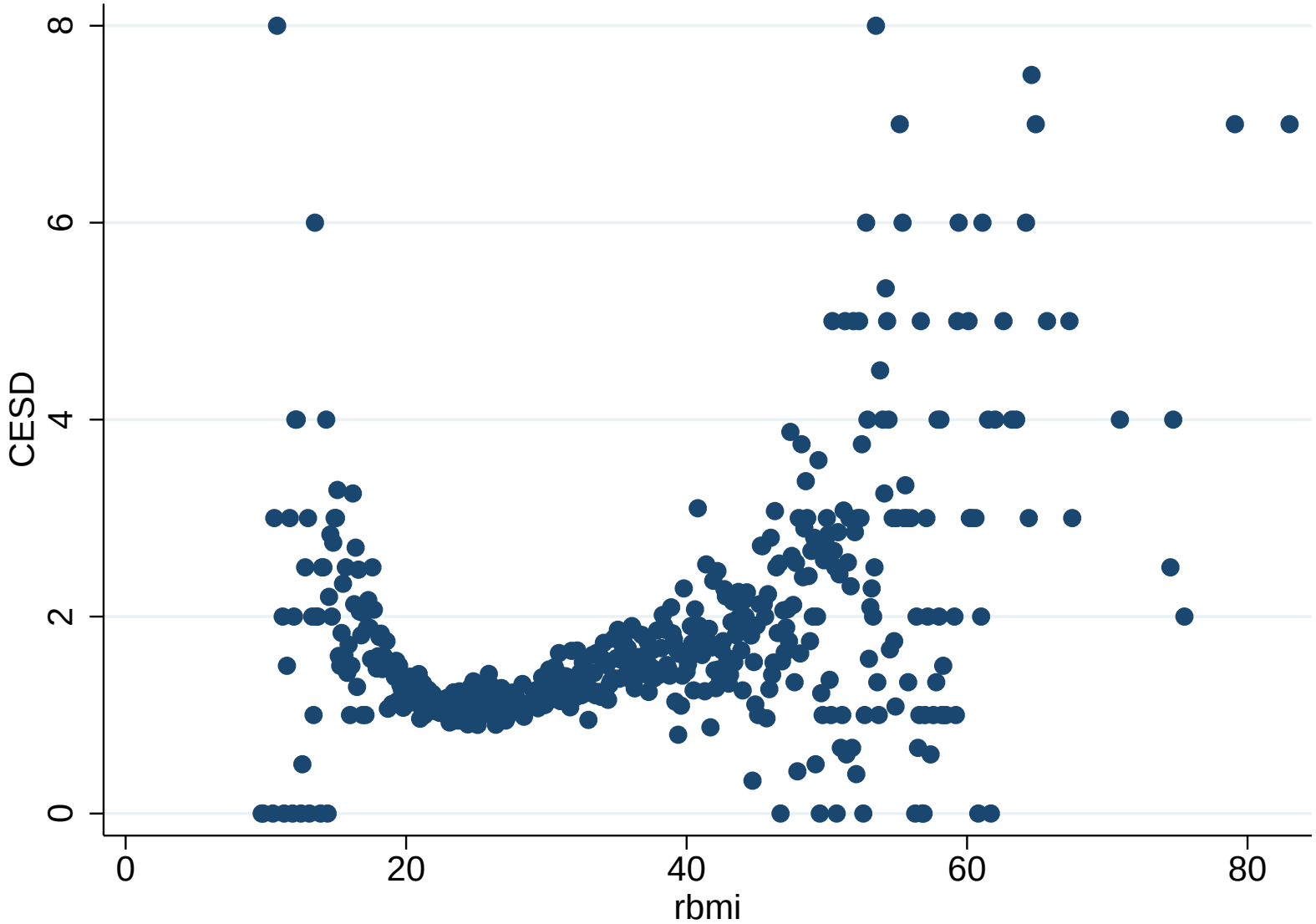
Dhaval M. Dave, Jennifer Tennant, and Gregory J. Colman. Isolating the effect of major depression on obesity: Role of selection bias.
NBER Working Paper, 2011

- Seven percentage points increase in the probability of being overweight or obese in women with current or past depression diagnosis (no significant effect in men)
- This causality is linked to an increase of the economic burden of depression by about 10% (9.7 billion $)

Brett Silverstein. Gender differences in the prevalence of somatic versus pure depression: A replication.
The American Journa of Psychiatry, 2002

- Somatic symptoms of depression were much higher among women


.4
.35
.3
.25
Obese
0
2
4
6
8
CESD depression score


CESD
0
2
4
6
8
0
20
40
60
80
rbmi

Data

	CESD	Male	Age	Smoken
mean	1.210755	.5000994	64.44591	.142326

Gender	CESD	BMI	Obese
Female	1.361464	27.53602	.2754623
Male	1.060107	27.90135	.2673226
Total	1.210755	27.71872	.2713917

Model

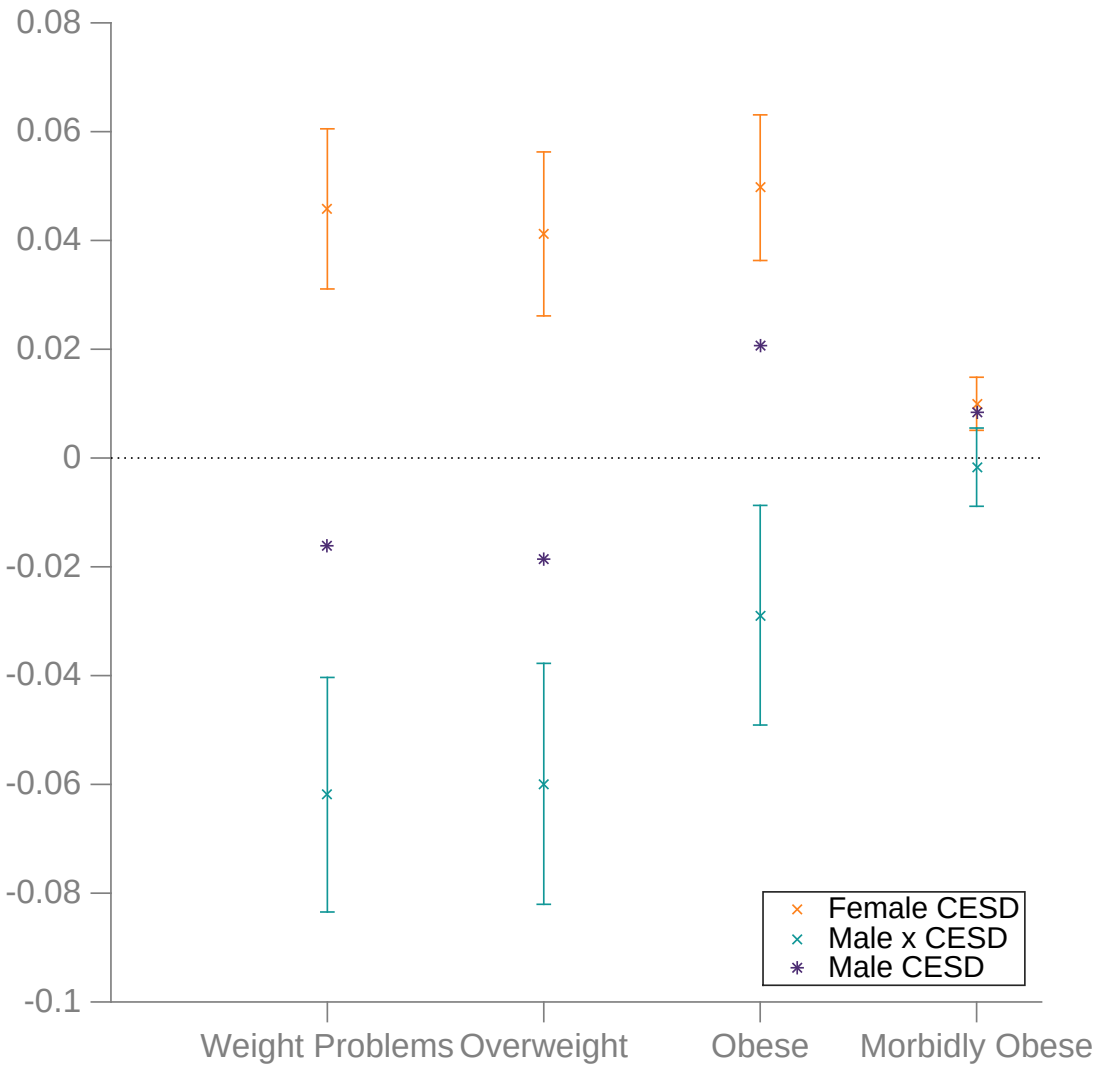
$$\text{Obese} = \beta_0 + \beta_1 \cdot \text{CESD} + \beta_2 \cdot \text{Male} + \beta_3 \cdot \text{Male} \cdot \text{CESD} + \beta_4 \cdot \text{Smoked}$$
$$+\beta_5 \cdot \text{Male} \cdot \text{Smoked} + \delta \cdot \text{wave} + \xi \cdot \chi + \epsilon$$

- wave is a vector of dummies telling in which wave the observation is
- ξ is composed of the controls education level, age and smoking situation of the spouse.

- OLS, ivreg, ivprobit (marginal effects at mean)
- Depression of the spouse as instrument for own depression
- Construction of a second instrument for the endogenous interaction Male x CESD

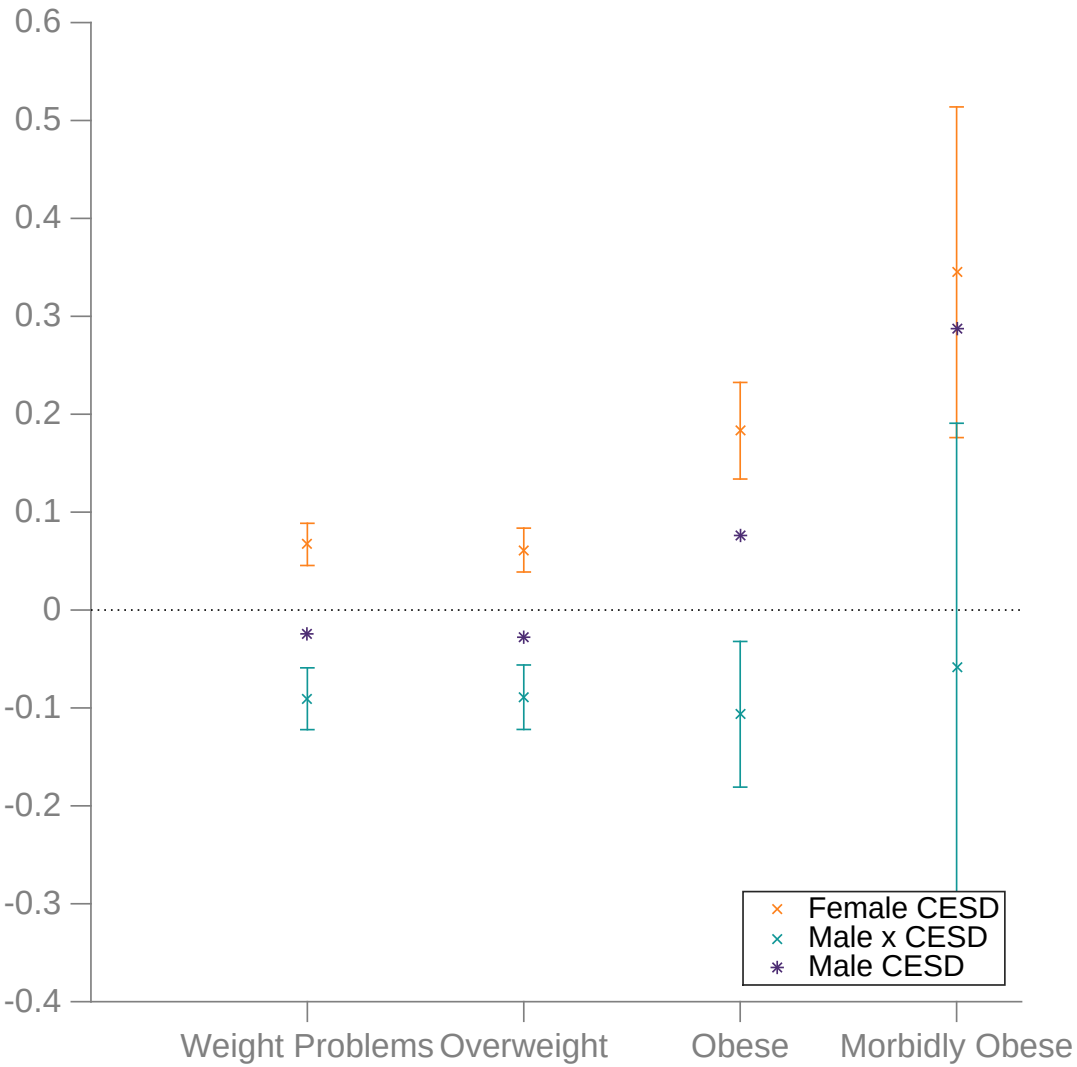
$$\textit{Male} \cdot \text{Spouse's CESD}$$

Results


0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
Weight Problems
Overweight
Obese
Morbidly Obese
Female CESD
Male x CESD
Male CESD

Results

scaled



Conclusion

- Confirmed intuitive result that being depressed increases your BMI
- Effect only weakly significant for males
- Smoking has a very strong effect on being thinner (-16% probability of being obese)
- Effect increases the cost of depression (Dave et al. [2011])

Thank you!

Questions ?

Bibliography

Dhaval M. Dave, Jennifer Tennant, and Gregory J. Colman. Isolating the effect of major depression on obesity: Role of selection bias. *NBER Working Paper*, 2011.

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Elaine Setiawan, Alan A. Wilson, Romina Mizrahi, Pablo M. Rusjan, Laura Miler, Grazyna Rajkowska, Ivonne Suridjan, James L. Kennedy, P. Vivien Rekkas, Sylvain Houle, and Jeffrey H. Meyer. Role of translocator protein density, a marker of neuroinflammation, in the brain during major depressive episodes. *JAMA Psychiatry*, 2015.

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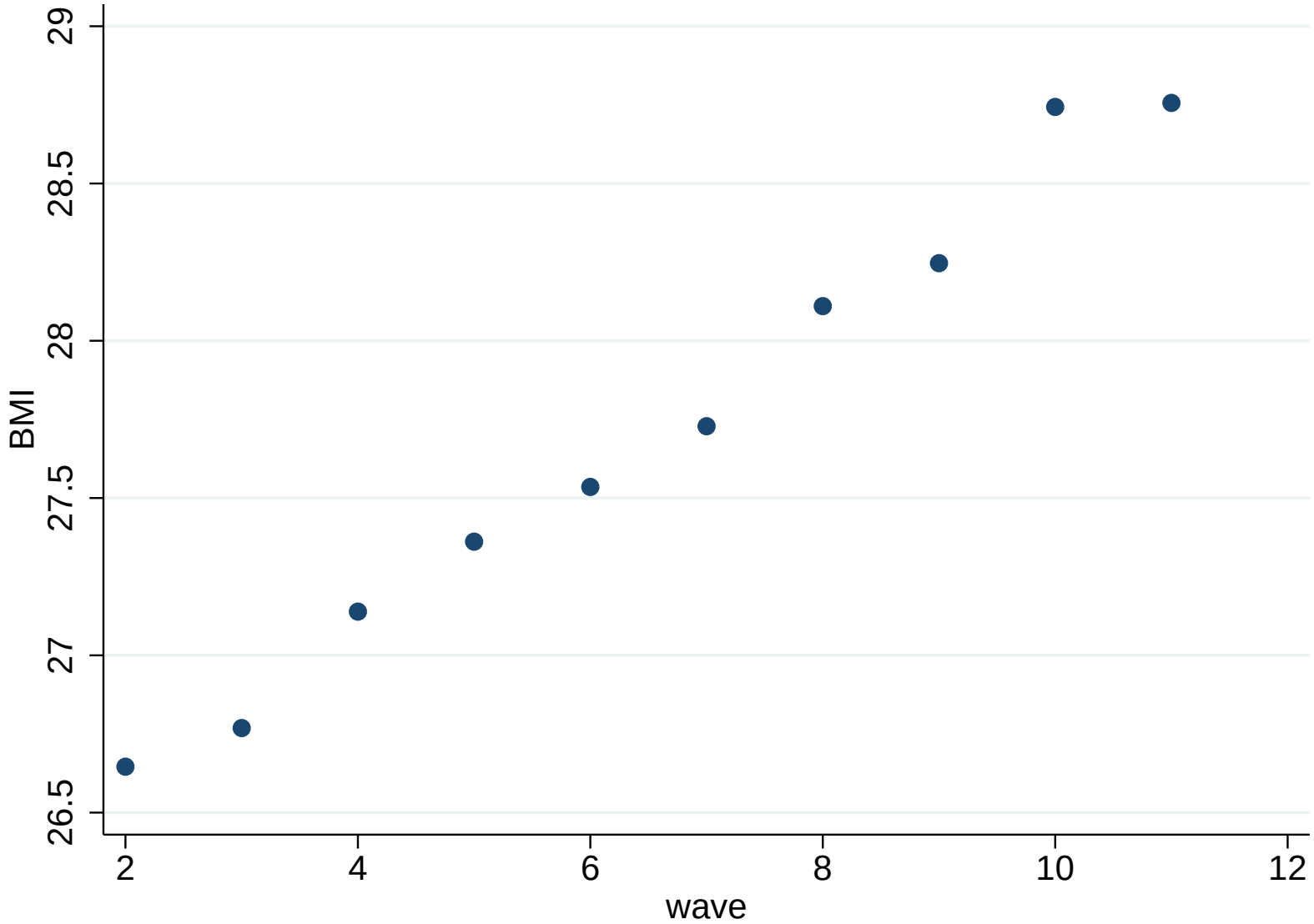
Appendix



	(1) obese reg	(2) obese ivreg	(3) obese ivprobit marginal
CESD depression score	0.0185***	0.0555***	0.0497***
	(0.00168)	(0.00794)	(0.00683)
Male x CESD	-0.00653*	-0.0317**	-0.0289**
	(0.00259)	(0.0111)	(0.0103)
Male	0.0336***	0.0688***	0.0636***
	(0.00781)	(0.0145)	(0.0137)
has smoked	-0.150***	-0.166***	-0.167***
	(0.00995)	(0.0106)	(0.0113)
Spouse has smoked	0.0124	0.00629	0.00580
	(0.00790)	(0.00799)	(0.00763)
Male x has smoked	0.0123	0.0286*	0.0301
	(0.0134)	(0.0145)	(0.0157)
Age	-0.00720***	-0.00706***	-0.00687***
	(0.000497)	(0.000498)	(0.000479)
Spouse's Age	-0.000264	-0.000291	-0.000445
	(0.000493)	(0.000495)	(0.000473)
Observations	100600	100600	100600
Education Control	Yes	Yes	Yes
Wave Control	Yes	Yes	Yes

Standard errors clustered by id in parentheses

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

Table 1: Regression results over the weight problems dependent variable