Depression for Economists

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  - Understand depression through the lens of economics
  - Simple economic model that generates the core symptoms of depression through changes in economic primitives, e.g. beliefs

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- Ambiguous effects on sleeping and eating: sleep and eat more or less than usual
- Increase in temptation good consumption (e.g. tobacco), decrease in investment good expenditure (e.g. education)
- Can generate a poverty trap when beliefs are so pessimistic that agents fall back on the low-return "safe" activity and stop learning about returns to effort

Short History of Depression: Aaron T. Beck

Short History of Depression in Psychology/Psychiatry

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- Psychoanalysis (Freud) $\Longrightarrow$ Behaviorism (Skinner) $\Longrightarrow$ Cognitive revolution (Beck)
- Focus on "distorted thoughts" as the source of depression
- Standard treatment: Cognitive-Behavioral Therapy (CBT)
  - Main aim: correct distorted thoughts

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Our interpretation: pessimistic beliefs about returns to effort, and their consequences

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Our interpretation: consequences of pessimistic beliefs about the returns to effort (with suicidal wishes being an extreme form of escapism)

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Our interpretation:

- 1., 4., 6.: Consequences of pessimistic beliefs
- 2., 3., 5.: Low marginal utility of consumption of experiences $\Longrightarrow$ **difficult to interpret as pessimistic beliefs about returns to effort**

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- 1., 2., 5., 6.: Consequences of pessimistic beliefs
- 3., 4.: Difficult to accommodate

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3. Psychomotor agitation or retardation

Stylized facts

Indonesia Family Life Survey 2014–2015, N = 50,148 (16,204 households)

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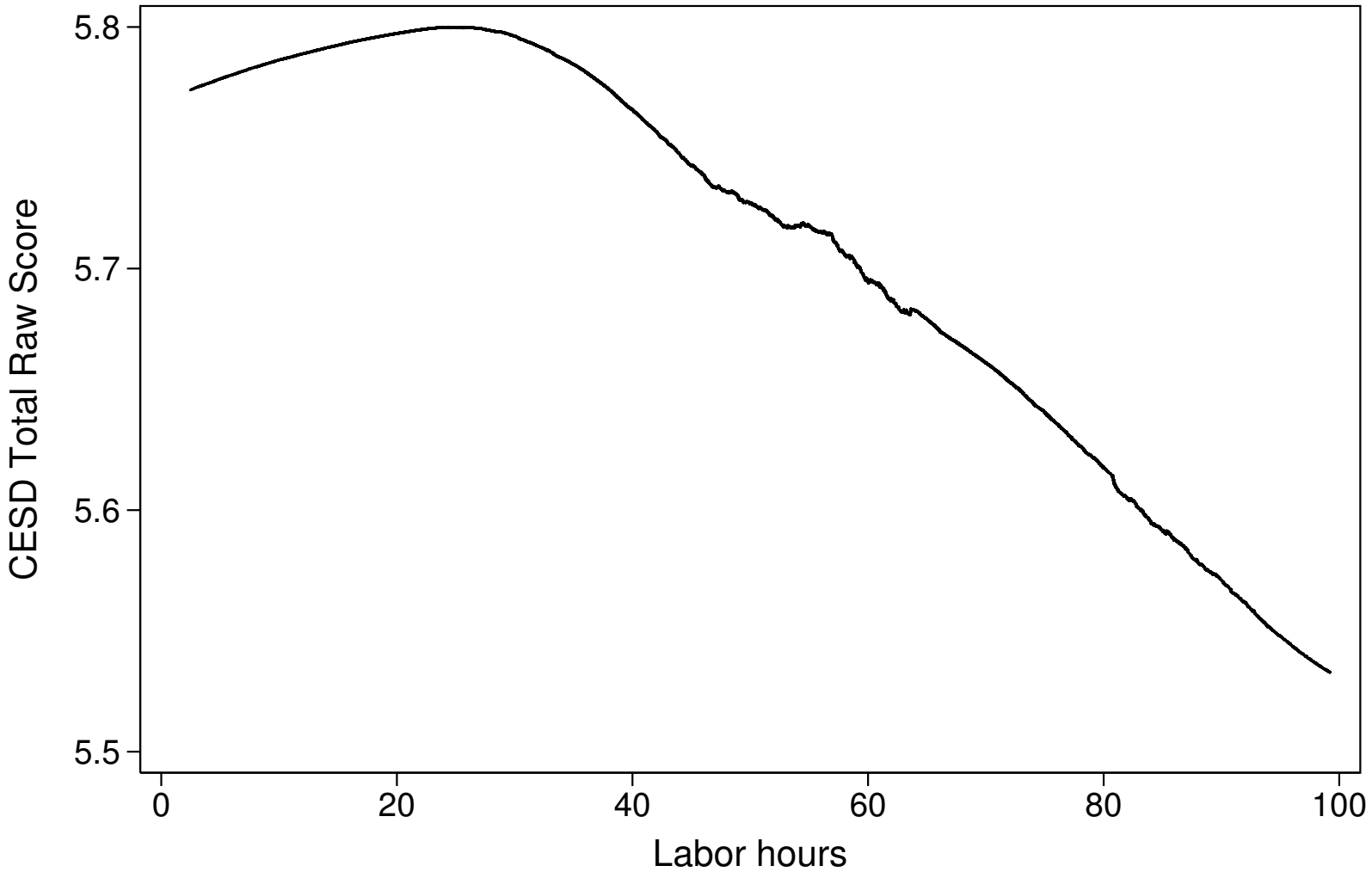
1. Depression and economic shocks
2. Depression and labor supply
3. Depression and total consumption
4. Depression and weight: BMI
5. Depression and sleep
6. Depression and investment goods: education
7. Depression and temptation goods: tobcacco

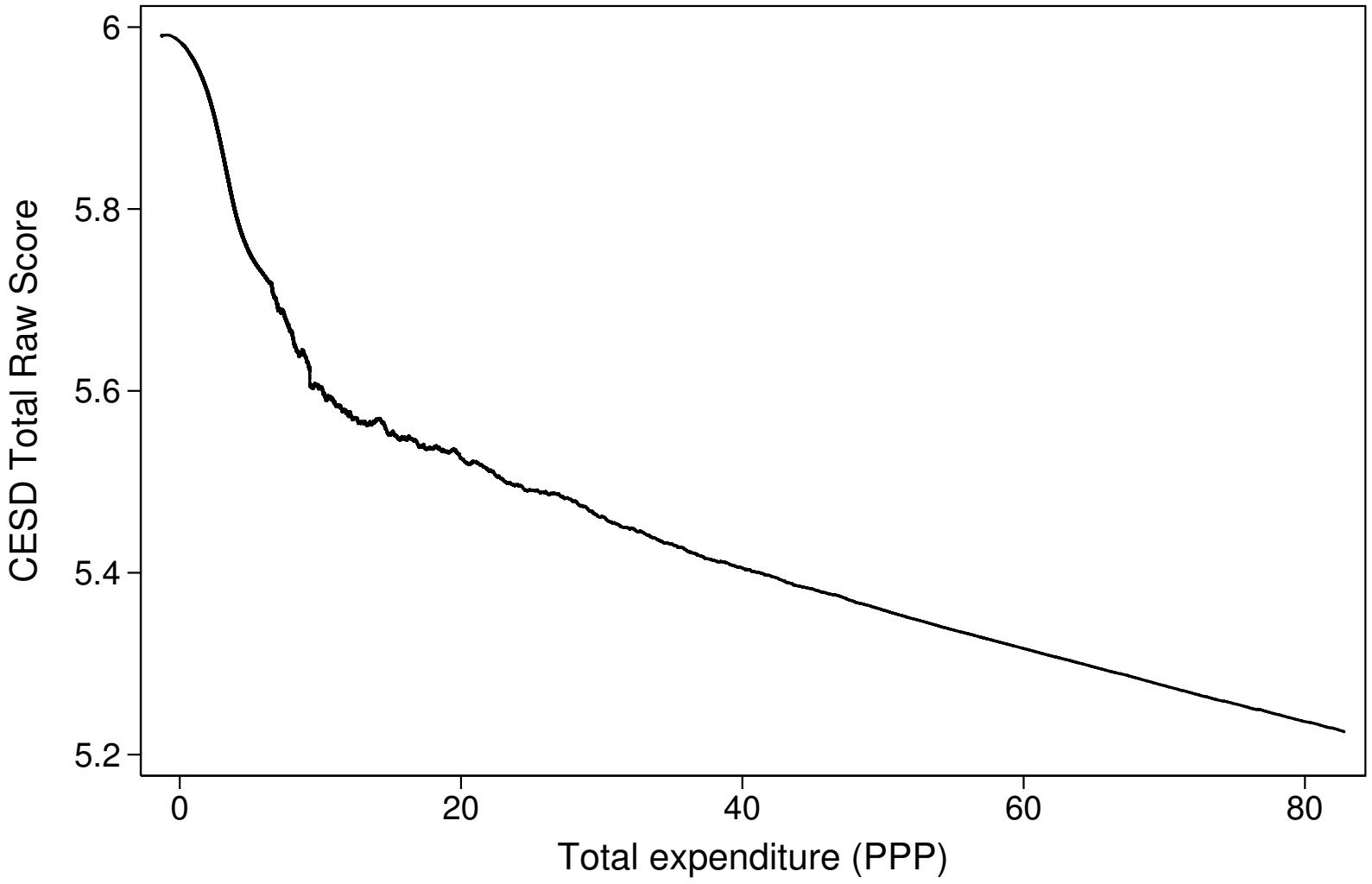
Depression and economic shocks

	(1) CESD Total Raw Score	(2) CESD Total Z-Score	(3) N
HH Business shut down in last 18 months	0.8077***	0.1902***	13095
	(0.2367)	(0.0557)	
Experienced natural disaster or civil strife	0.3967***	0.0934***	31401
	(0.0695)	(0.0164)	
Experienced economic disruption	0.5800***	0.1366***	31401
	(0.0703)	(0.0166)	

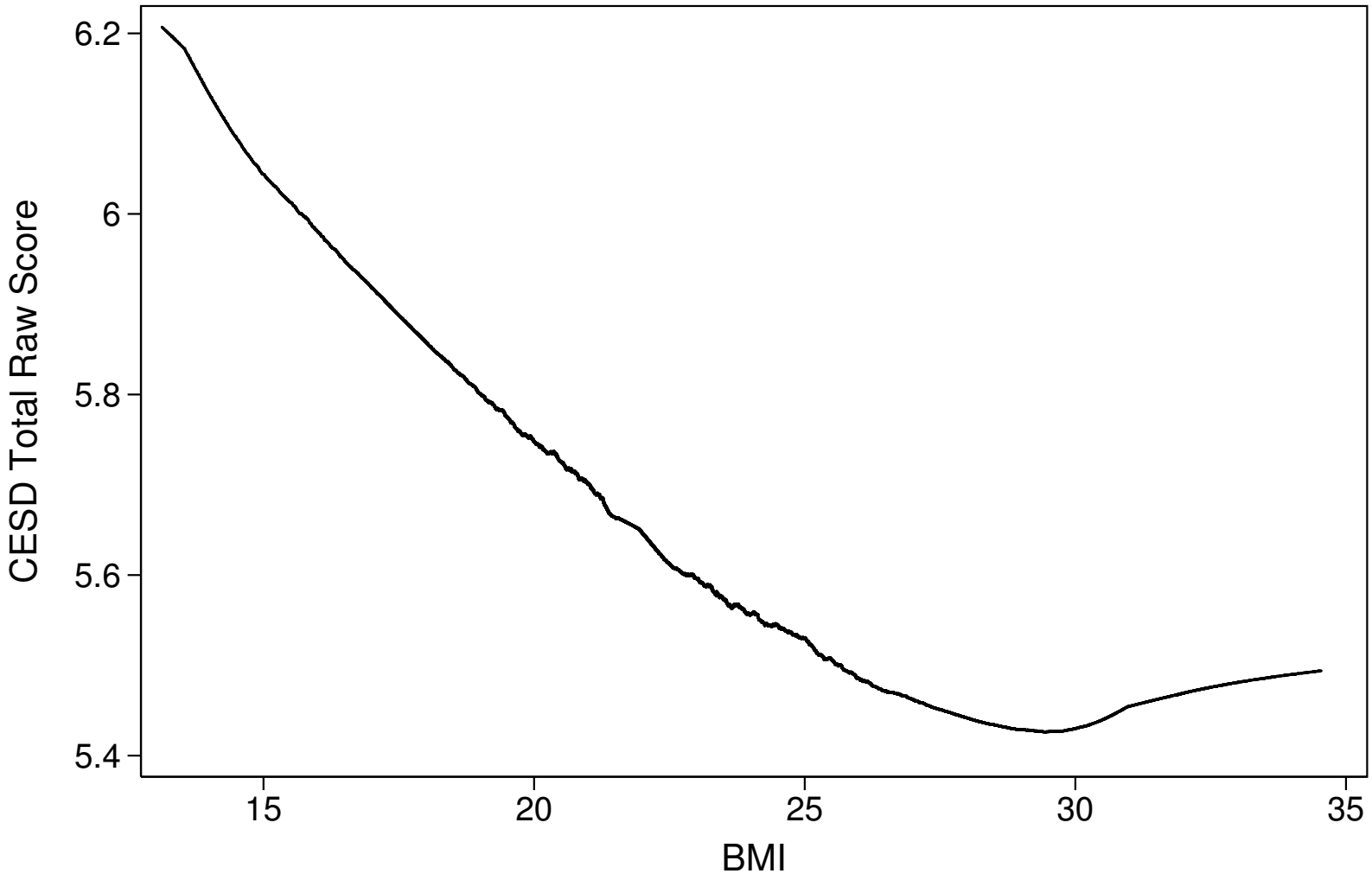
Depression and labor supply



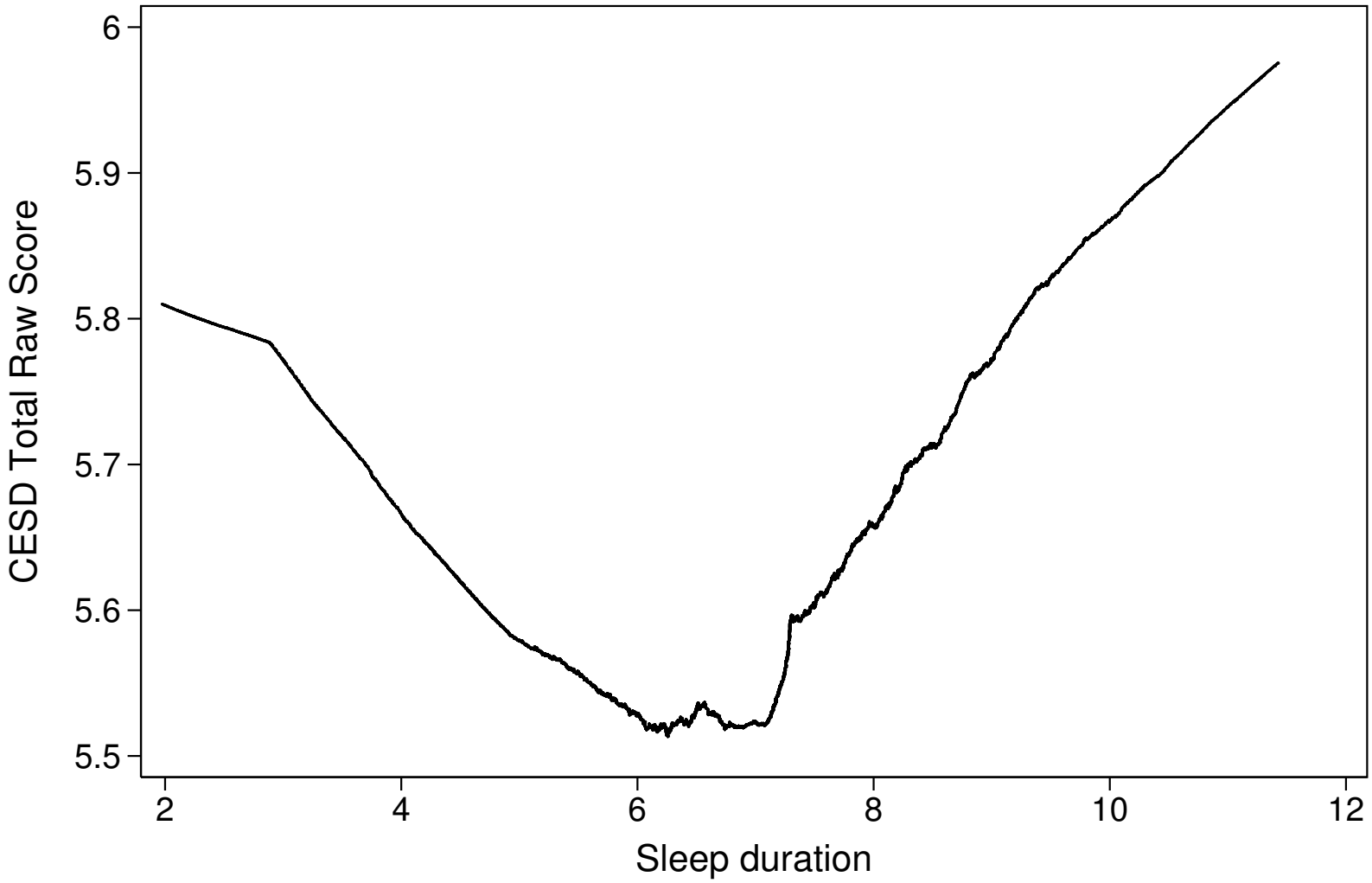
Depression and Total Consumption



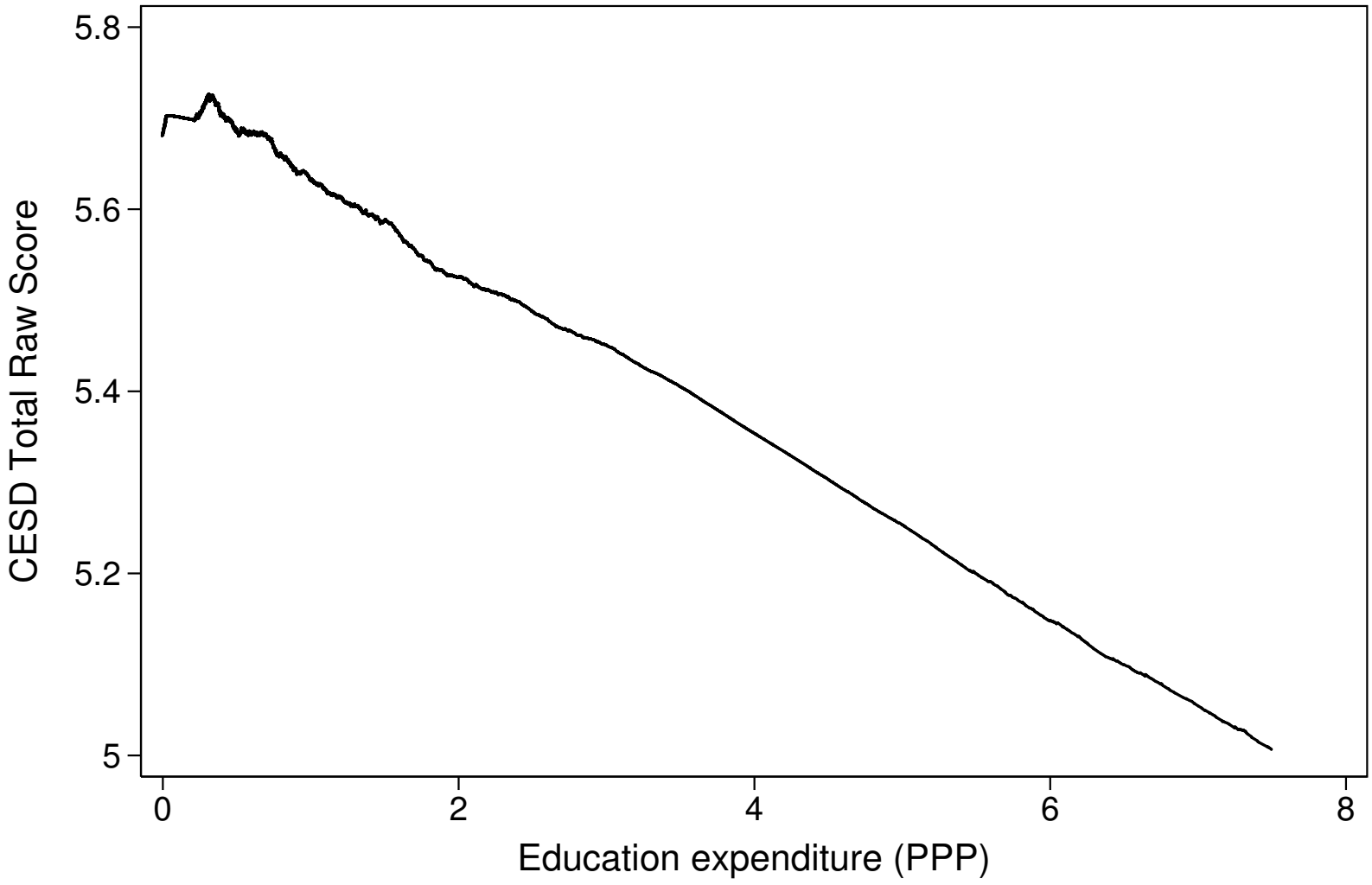
Depression and BMI



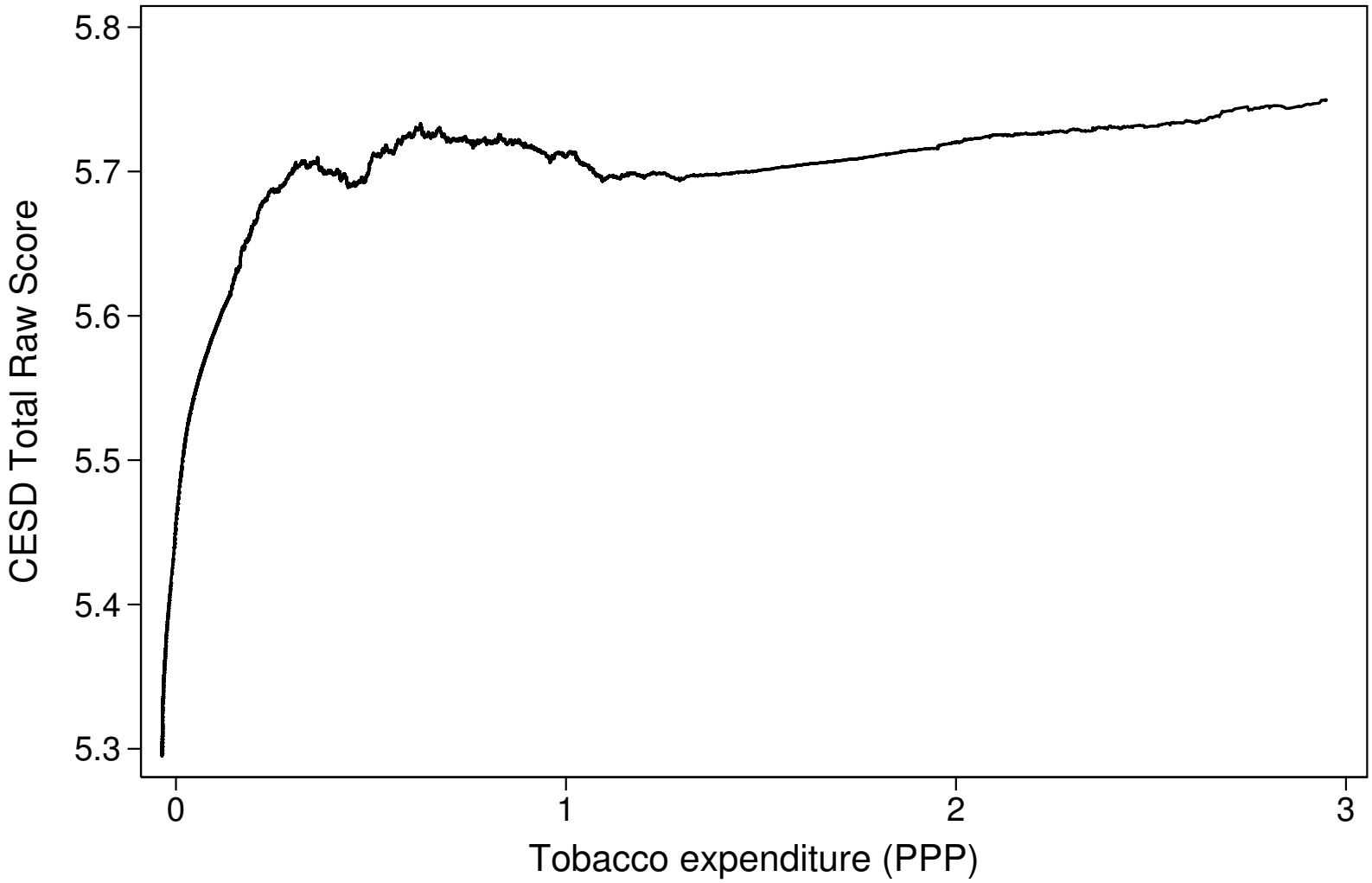
Depression and Sleep



Depression and Education Expenditure



Depression and Tobacco Expenditure



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- Exogenous shock to beliefs about returns to labor effort
- Adjustment in behaviors complementary to beliefs about returns to effort
- Goal: make only one simple assumption to account for as many of the stylized facts as possible

Utility

$$U(c, f, s) = c + \phi(f) + \psi(s) \tag{1}$$

- c : Non-food consumption
- f: Food consumption
- s: Sleep
- Unique utility-maximizing levels f^C and f^S of food and sleep consumption: $\phi'(f^C) = \psi'(s^C) = 0$

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Production

$$y(f,s) = \left((1-l)\bar{A} + lA\right)\left[\Phi(f) + \Psi(s)\right] + \varepsilon \tag{2}$$

- f: Food consumption
- s: Sleep
- l: Labor supply, $l \in \{0,1\}$
- $\bar{A}$, A: Returns to low and high labor effort, respectively
- ε: Random shock
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  - Φ and Ψ are decreasing for sufficiently high levels of food and sleep consumption
  - E.g. obesity harms productivity
  - E.g. too much sleep reduces labor supply

Budget constraint with subjective beliefs

Agent observes y, but doesn't observe A; instead forms beliefs μ over A

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Production:

$$y(f,s) = \left((1-l)\bar{A} + \mu l\right)\left[\Phi(f) + \Psi(s)\right] + \varepsilon$$

Budget constraint:

$$c + f = \left((1-l)\bar{A} + \mu l\right)\left[\Phi(f) + \Psi(s)\right] + \varepsilon \qquad (3)$$

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- Implications for observed behavior are the same

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- When $\mu < \bar{A} < A$, i.e. agent has depressed beliefs about A, she inefficiently chooses low effort, leading to lower income and consumption

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Food – extreme cases:

- Only consumption motives matter (e.g. because $\mu = \bar{A} = 0$, or $\Phi', \Psi' = 0$): $f^* = f^{C*}$

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In general, optimum lies between the extremes (i.e. consumption and production optima)

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- **Proposition 1:** For each of food and sleep, a decision-maker who is initially consuming more than her production optimum will increase consumption when she becomes depressed (i.e. when μ decreases), while if she is initially consuming less than her production optimum she will decrease consumption when she becomes depressed.

$$\begin{aligned}
\frac{df^*}{d\mu} &= -\frac{\Phi'(f^*)}{\phi''(f^*)+\mu\Phi''(f^*)} \lessgtr 0 \Leftrightarrow f^* \gtrless f^P \\
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- Intuitively: depressed people drift towards their natural tendencies

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- Mirrored in the model: downward shock to μ unambiguously decreases total consumption and utility. Two sources:
  1. When $\mu < \bar{A} < A$, agents choose low effort, reducing income
  2. When $\bar{A} < \mu < A$, choose food and sleep suboptimally, reducing income

Extension I: Temptation and Investment Goods

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- Negative shocks to μ decrease in the importance of production motives:
  - $\Longrightarrow$ Decrease optimal level of investment goods
  - $\Longrightarrow$ Increase optimal level of temptation goods

Extension II: Poverty traps

- Shock to μ leads to inefficient levels of food consumption and sleep, but high effort provision ($l = 1$): learn true A over time

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- Shock to μ leads to inefficient levels of food consumption and sleep, but high effort provision ($I = 1$): learn true A over time
- Shock to μ leads to low effort provision ($I = 0$): stop learning about A; **depression poverty trap** with low income and consumption and persistently depressed beliefs about return to effort

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- Agents observe y_{t-1} and form the posterior:

$$\mu_t = \mu_{t-1} + \frac{\sigma^2_{A,t-1}}{\sigma^2_{A,t-1} + \frac{\sigma^2_{\varepsilon}}{(\Phi(f_{t-1})+\Psi(s_{t-1}))^2}} \left(A - \mu_{t-1} + \frac{\varepsilon_{t-1}}{\Phi(f_{t-1})+\Psi(s_{t-1})} \right)$$

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- Crucial result: when σ^2_{ε} small relative to σ^2_A, beliefs highly susceptible to pessimism following shock

Extension III: Bayesian Foundation for Pessimistic Beliefs

- Dynamic version of the model in which the static decisions are made repeatedly over time
- Priors:

$$A \sim N\left(\mu_{t-1}, \sigma^2_{A,t-1}\right)$$
$$\varepsilon \sim N\left(0, \sigma^2_{\varepsilon}\right)$$

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- Crucial result: when σ^2_{ε} small relative to σ^2_A, beliefs highly susceptible to pessimism following shock
- This mirrors the fact that empirically, depression is especially likely to arise from stressors over which individuals believe they have control (Kendler et al., 1999)

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- Can generate a poverty trap when agents exert such low effort that they stop learning about their returns to effort

EXTRA SLIDES

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9. Recurrent thoughts of death, suicidal ideation