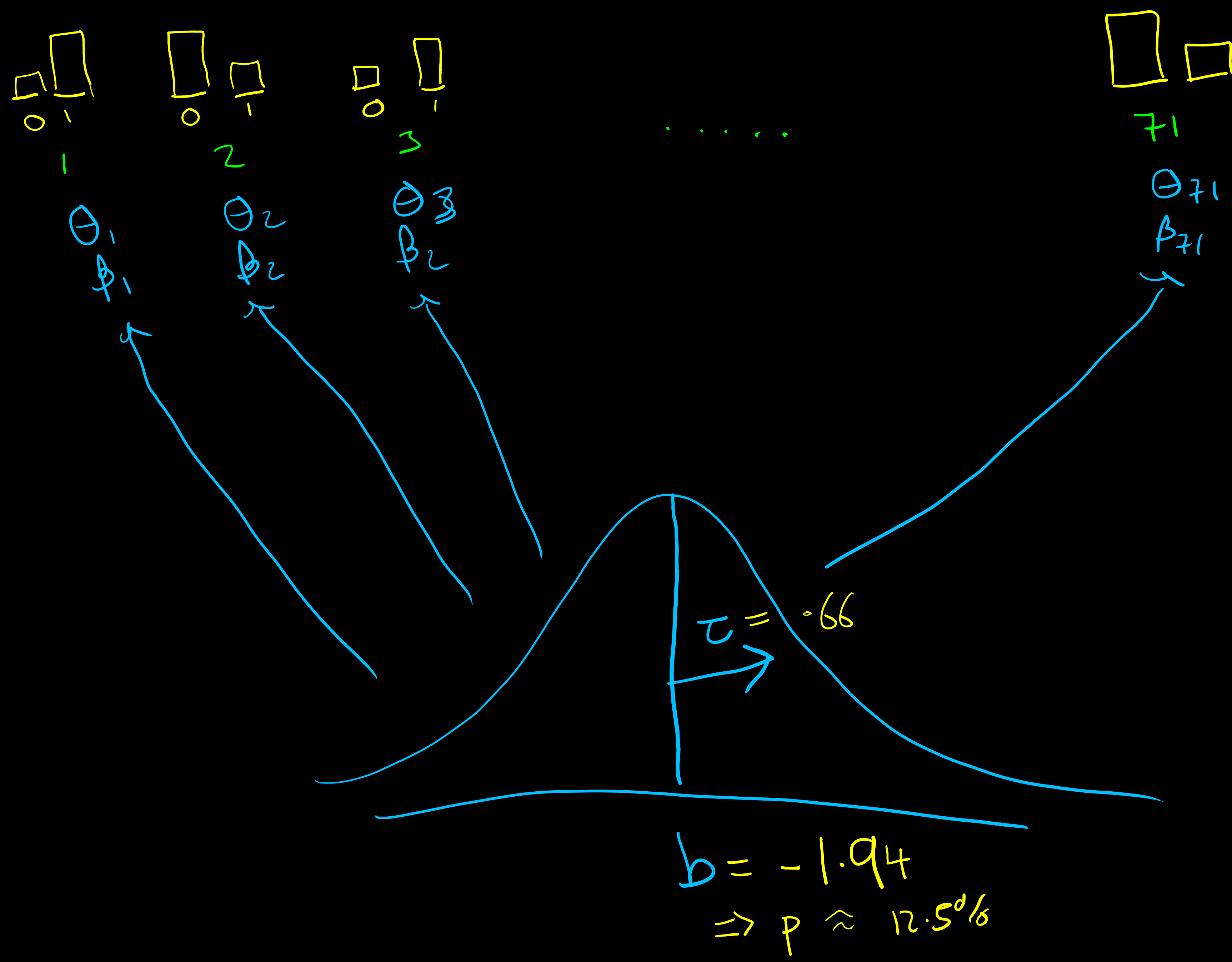
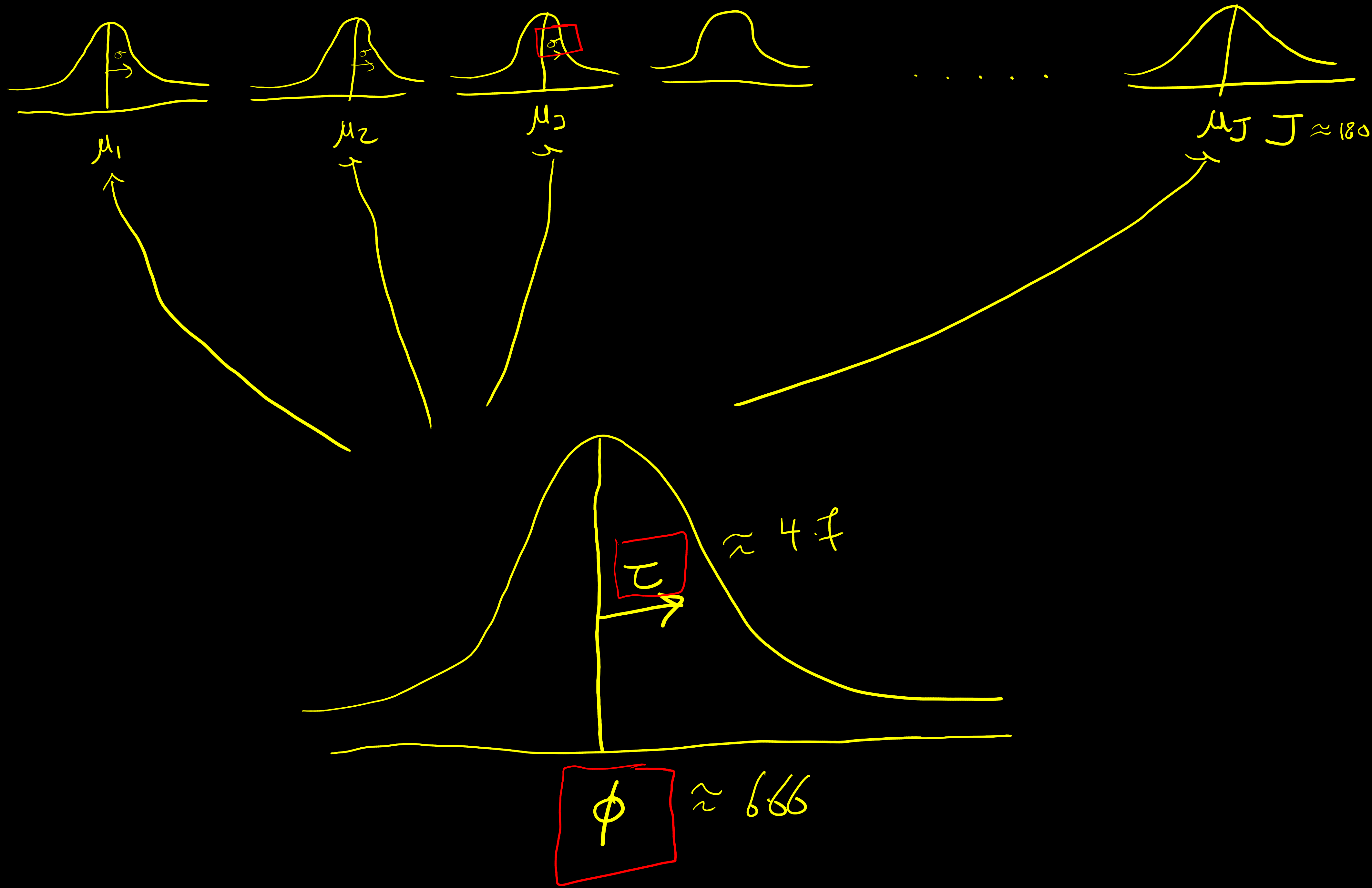


0 1
0 1
0 1
1
2
3
71
θ1
β1
θ2
β2
θ3
β2
θ71
β71
τ = .66
b = -1.94
⇒ p ≈ 12.5%



σ
μ_1
μ_2
μ_3
μ_J
$J \approx 180$
τ
≈ 4.7
ϕ
≈ 666

for d in $0 \ldots 9$

$$y_d \sim N(\mu_d, \sigma^2)$$

$$\mu_d = \beta_0 + \beta_1 x_d$$

$$y_d = \beta_0 + \beta_1 x_d + \varepsilon_d$$

$$\varepsilon_d \sim N(0, \sigma^2)$$

$$\vec{\beta} = \begin{bmatrix} \beta_0 \\ \beta_1 \end{bmatrix}$$

$$x \sim N(\mu, \sigma^2)$$

$$x = \mu + \varepsilon, \quad \varepsilon \sim N(0, \sigma^2)$$

for j in $1 \ldots J$

for d in $0 \ldots 9$

$$y_{jd} \sim N(\mu_{jd}, \sigma^2)$$

$$\mu_{jd} = \beta_0^j + \beta_1^j x_{jd}$$

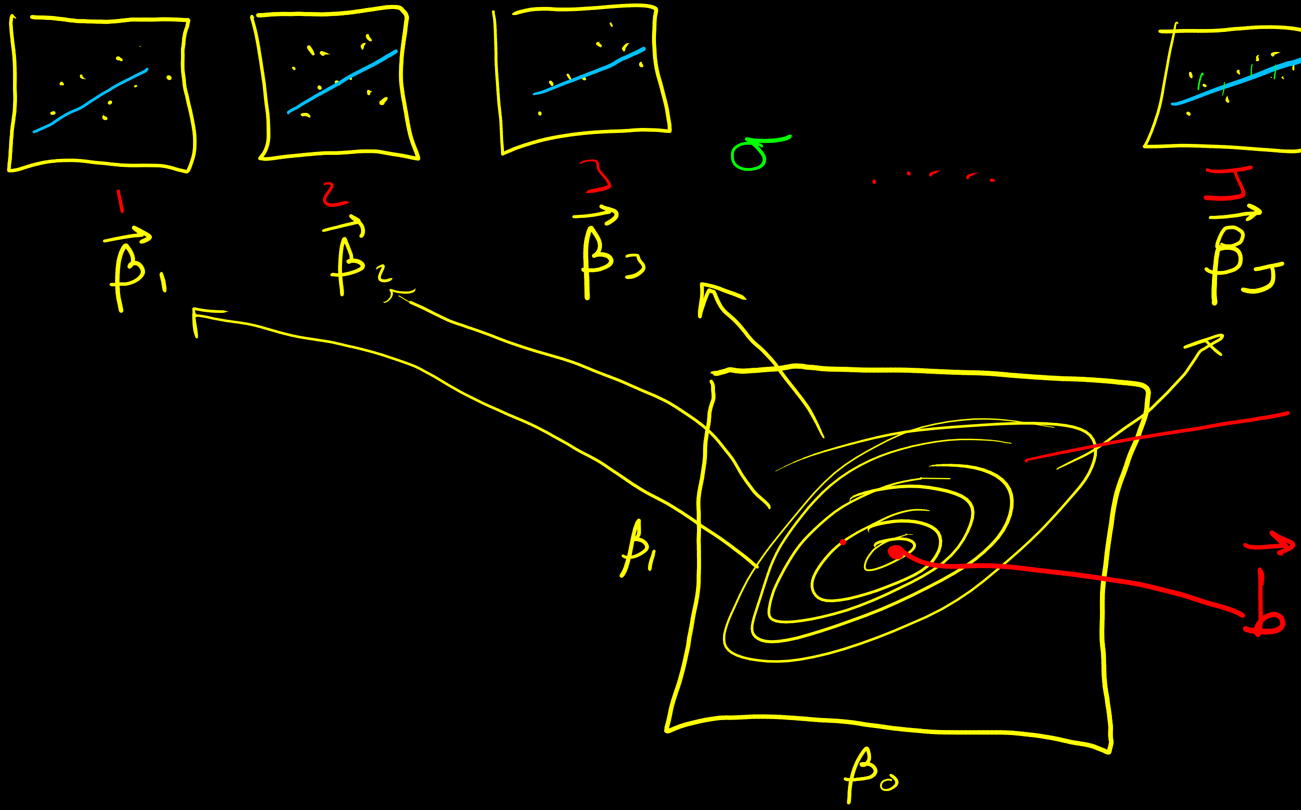
$$\beta_0^j + \beta_1^j x_{jd}$$

$$[b_0 + Z_0^j] + [b_1 + Z_1^j] x_{jd}$$

$$\underbrace{b_0 + b_1 x_{jd}}_{\text{fixed}} + \underbrace{Z_0^j + Z_1^j x_{jd}}_{\text{random effects}}$$

$$\vec{\beta}_j \triangleq \begin{bmatrix} \beta_0^j \\ \beta_1^j \end{bmatrix} \qquad \vec{\beta}_j \sim N(\vec{b}, \Sigma)$$

$$\vec{\beta}_j = [\vec{b} + \vec{Z}_j] \qquad \vec{Z} \sim N(0, \Sigma)$$



$$\beta_0^j \sim N(b_0, \tau_0^2)$$
$$\beta_1^j \sim N(b_1, \tau_1^2)$$

$$\Sigma = \begin{bmatrix} \tau_0^2 & \tau_0\tau_1\rho \\ \tau_0\tau_1\rho & \tau_1^2 \end{bmatrix}$$

$$p(\beta_0, \beta_1) = p(\beta_0)\,p(\beta_1)$$

$P($outcome variable values | estimates, predictor var values$)$

Conditional probability

log likelihood

$$\log\left(\frac{L_1}{L_0}\right) = \underbrace{\log L_1} - \underbrace{\log L_0}$$

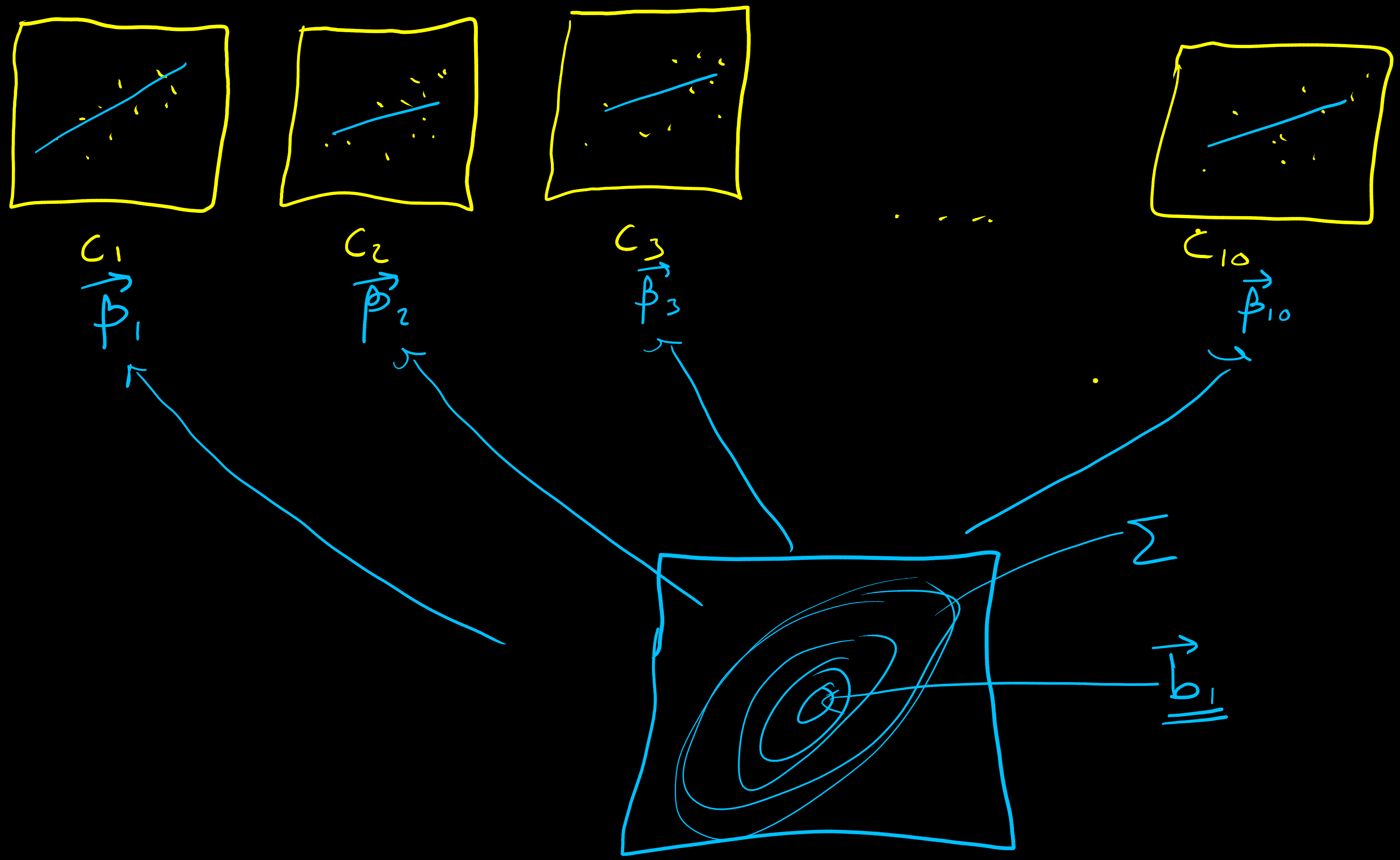
0.0000001

$$-2(\log L_1 - \log L_0)$$

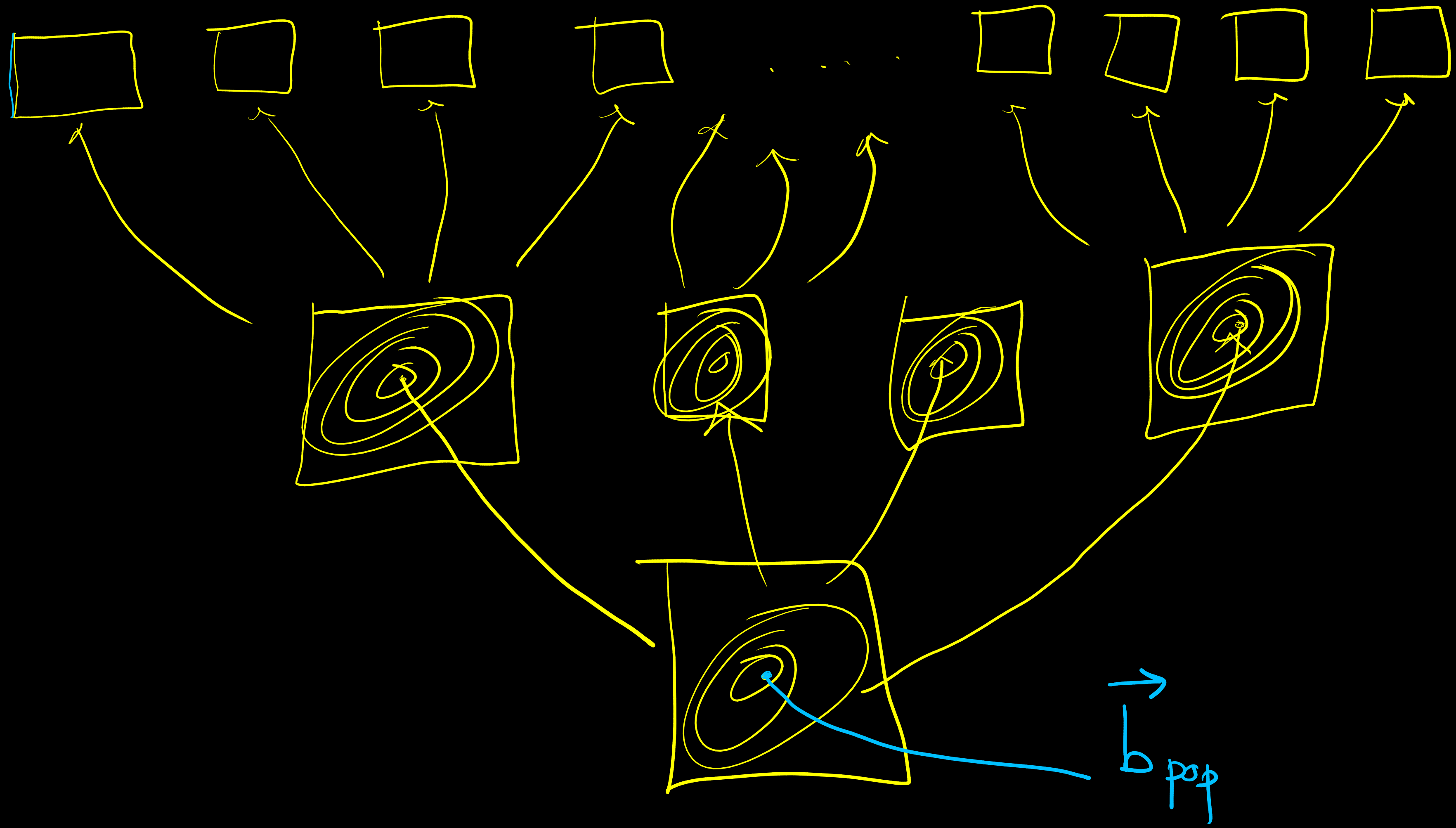
-6

-100

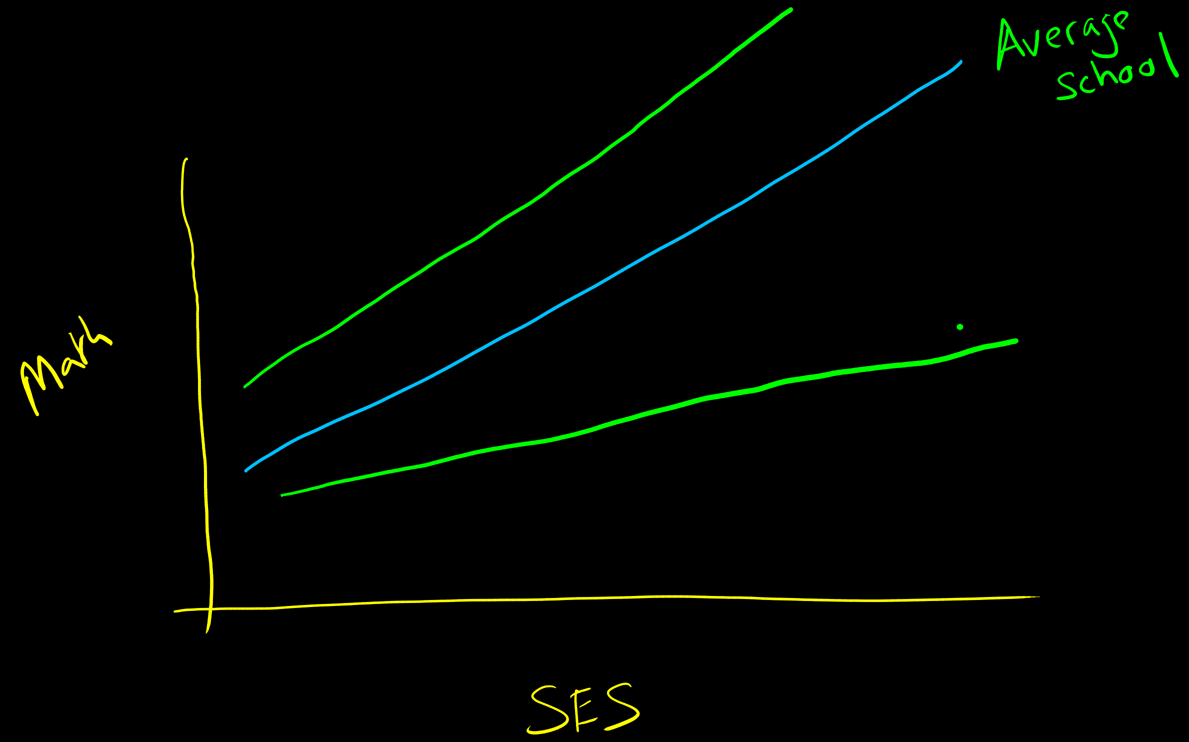
$$= \underbrace{-2\log L_1}_{D_1} - \underbrace{-2\log L_0}_{D_0}$$

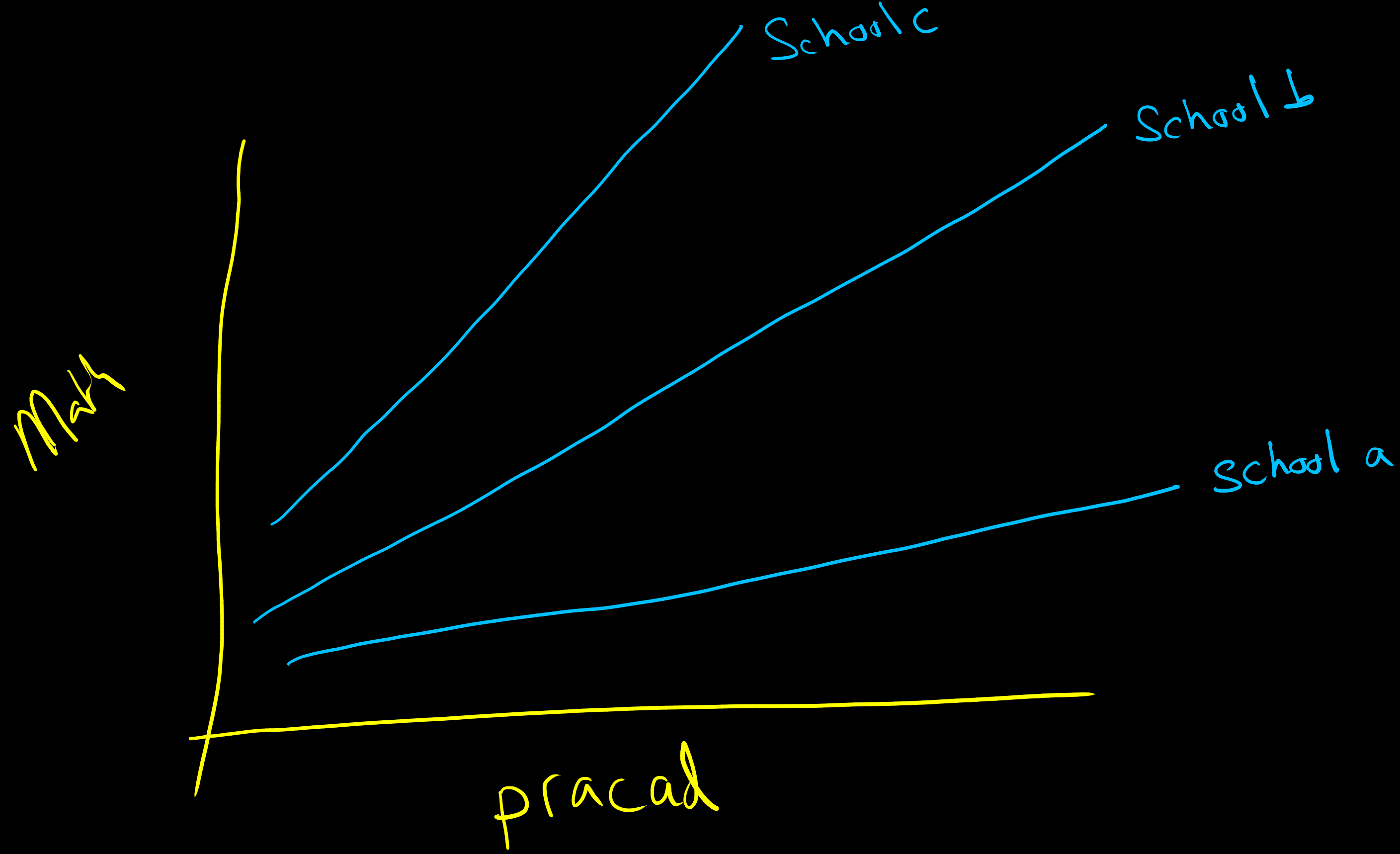


c_1
c_2
c_3
c_{10}
$\vec{\beta}_1$
$\vec{\beta}_2$
$\vec{\beta}_3$
$\vec{\beta}_{10}$
Σ
$\vec{b}_1$



$\vec{b}_{pop}$


Average School
Math
SES


School c
School b
school a
Math
pracad