

4.4 Panel Data

Monday, October 18, 2021 10:29 AM

$i = 1, 2, \dots, N$ cross section
 $t = 1, 2, \dots, T$ time series
 $N \times T \rightarrow N = nT$
Usually:
small T
large N

S_1, S_2 $AVS(S_2 | T=1) - AVS(S_2 | T=0)$ $T \rightarrow S_2$
 $AVS(S_2 - S_1 | T=1) - AVS(S_2 - S_1 | T=0)$

Time
 $\begin{matrix} 1 & 0 \\ 2 & 1 \end{matrix}$ $\begin{matrix} y_1^1 & y_1^0 \\ y_2^1 & y_2^0 \end{matrix} \rightarrow (\hat{y}_2^1 - \hat{y}_1^1) - (\hat{y}_2^0 - \hat{y}_1^0)$

ind. t

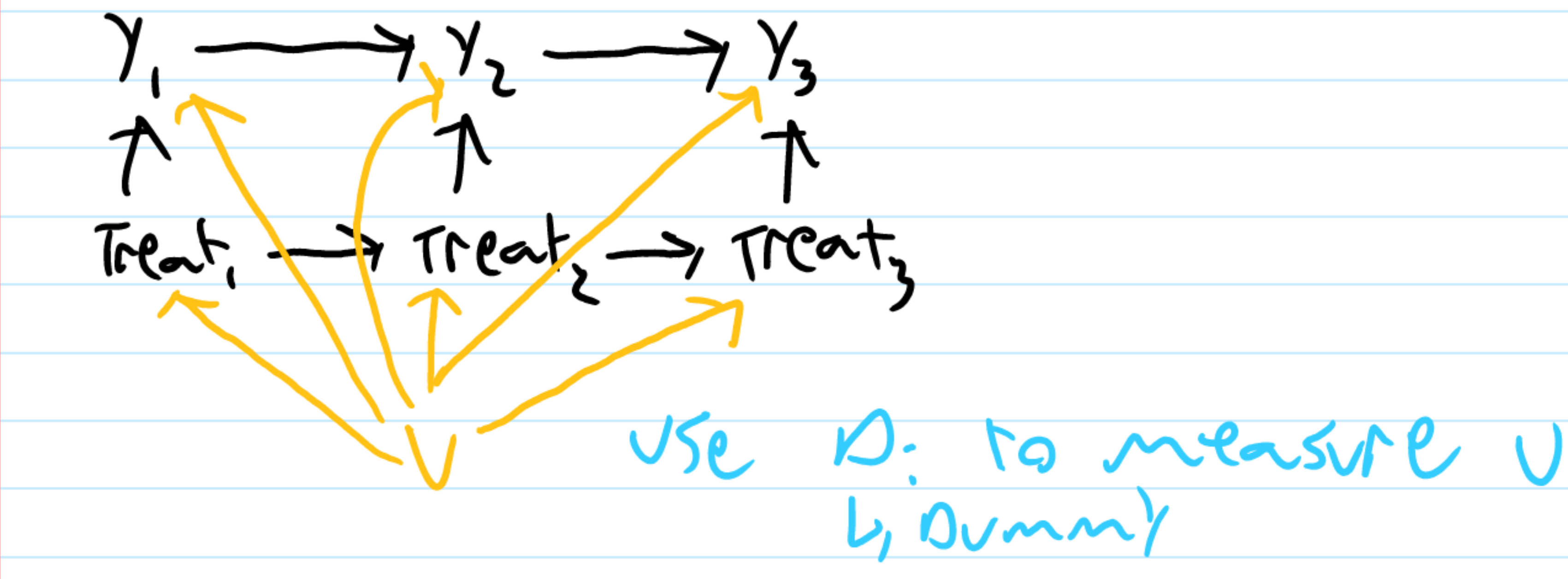
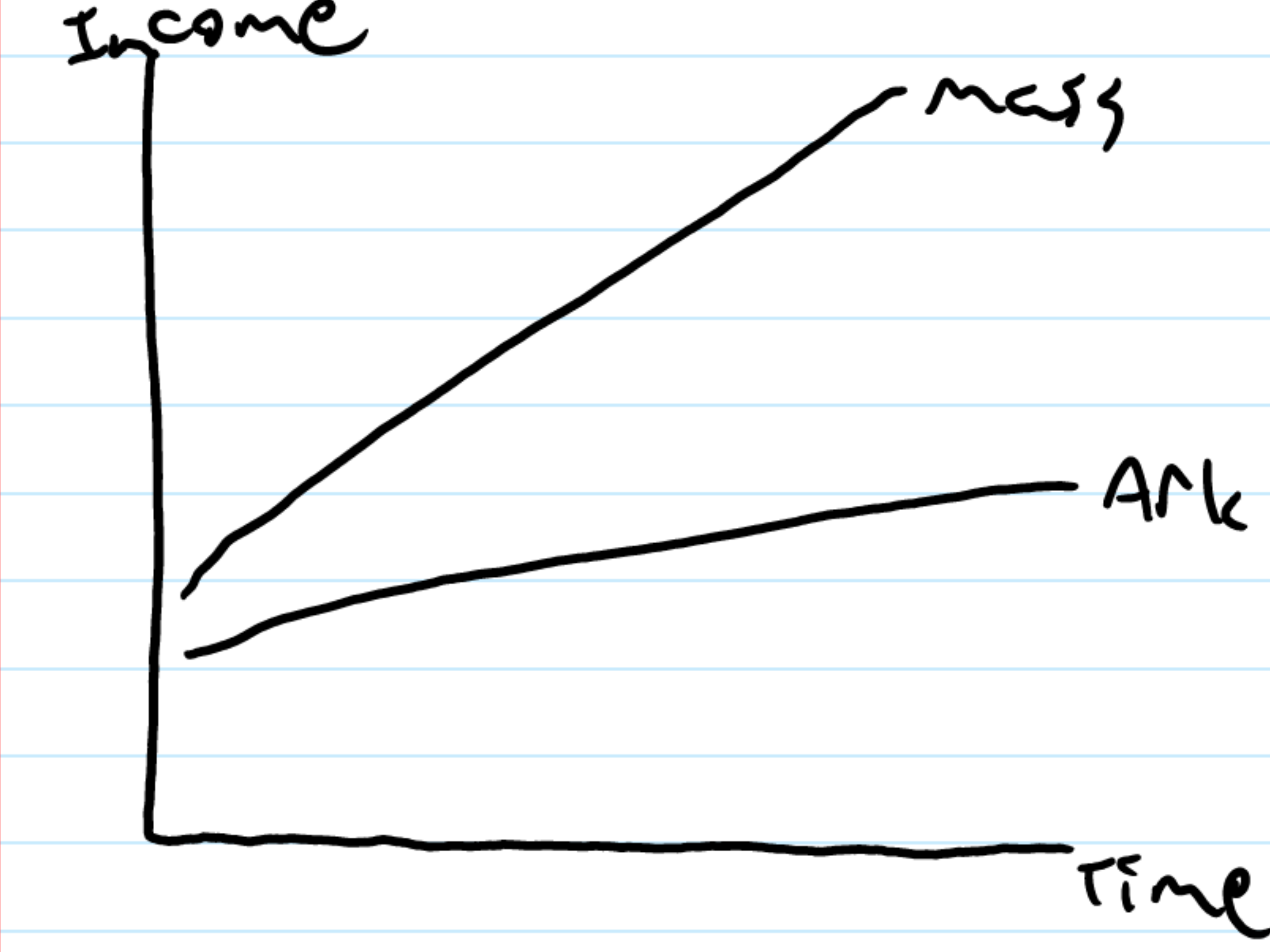
Ind	Exam	Score	Coffee	Study
1	1	80	0	4
2	1	70	0	7
3	1		0	6
4	1		0	
1	2		1	
2	2		0	
3	2		1	
4	2		0	

$y_{it} = \beta_0 + \beta_1 Treat_{it} + \beta_2 x_{it} + v_{it}$ OLS
 $y_{it} = \beta_0 + \beta_1 Treat_{it} + \beta_2 x_{it} + v_{it} + \gamma_t + \epsilon_{it}$
 $\hookrightarrow v_{it} = v_i + \gamma_t + \epsilon_{it}$
 \hookrightarrow seasonal effect

$y_{it} = \beta_0 + \beta_1 Treat_{it} + \beta_2 x_{it} + \underbrace{\alpha_i + \gamma_t + \epsilon_{it}}_{\text{fixed effects}}$

$y_{it} = \beta_0 + \beta_1 Treat_{it} + \beta_2 x_{it} + \sum_{i=2}^N \alpha_i D_{it} + \sum_{t=2}^T \gamma_t Z_{it}$

Int for Nicole @ $t=2$ $\beta_0 + \alpha_{Nicole} + \gamma_2$



Difference in Difference

"Parallel Trends"

	After	Before	delta
Treat	80	70	10
Non-treat	82	80	2
		delta delta	8

Confidence Interval: 8 ± 15
Control for X to decrease standard errors

2. Variable treatment timing

Simple 2x2

$y_{it} = \alpha_0 + \sum_{t \in 0,1} \beta_t D_t + \sum_t \gamma_t D_t + \delta Treat_{it} + \epsilon_{it}$
 $t \in 0,1$ $(+ \beta x_{it})$ Not simple 2x2
if trends diverge pre-treatment
 $+ \theta D_{it}$ $t = \text{linear time}$

