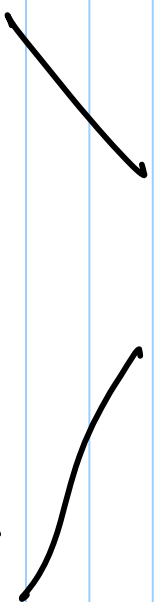


CLASSES - MICROECONOMIA - LEZIONE 9 &

MODELLI PANEL STATICI CON EFFETTI INDIVIDUALI

FISSI
(WITHIN)

CASUALI
(BETWEEN)



EFFICIENT

$$\text{NBI: } y_{it} = \alpha_i + \sum_2 \beta_2 x_{2it} + u_{it}$$

$$\text{Within: } y_{it} - \bar{y}_{i\cdot} = \alpha_i + \sum_2 \beta_2 x_{2it} + u_{it} - \bar{y}_{i\cdot}$$

$$\text{Dove } \bar{y}_{i\cdot} = \frac{1}{T} \sum_t y_{it} = \frac{1}{T} \sum_t (\alpha_i + \sum_2 \beta_2 x_{2it} + u_{it}) \\ = \alpha_i + \sum_2 \beta_2 \bar{x}_{2i\cdot} + \bar{u}_{i\cdot}$$

$$y_{it} - y_{i0} = \sum_2 \beta_2 (x_{2it} - x_{2i0}) + (v_{it} - v_{i0})$$

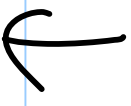
→ OLS (within) : $\hat{\beta}_2$, $2=2 \dots k$

$$\hat{\alpha}_i = y_{i0} - \sum_2 \hat{\beta}_2 x_{2i0}$$

STATA: LATNASKOMPIJIANE WITHIN VOIIZIETA
DA STATA E :

$$y_{it} - y_{i0} + y_{00} = \alpha_i + \sum_2 \beta_2 x_{2it} + u_{it} - \alpha_i - \sum_2 \beta_2 x_{2i0} - u_{i0} + \alpha_0 + \sum_2 \beta_2 x_{200} + u_{00} \longrightarrow$$

$$\text{Dove } y_{00} = \frac{1}{N} \sum_i y_{i0} = \frac{1}{N} \sum_i (\alpha_i + \sum_2 \beta_2 x_{2i0} + u_{i0}) = \alpha_0 + \sum_2 \beta_2 x_{200} + u_{00}$$



$$(y_{it} - y_{i0} + y_{i0}) = \alpha_0 + \sum_2 \beta_2 (x_{2it} - x_{2i0} + x_{2i0}) + (u_{it} - u_{i0} + u_{i0})$$

→ OLS (within): $\hat{\beta}_2, 2=2 \dots k; \hat{\alpha}_0$

$$\hat{\mu}_i = y_{i0} - \sum_2 \hat{\beta}_2 x_{2i0} - \hat{\alpha}_0$$

$$e_{it} = y_{it} - \hat{\mu}_i$$

XINEL COST ATPV, FE
PREDICT M1, $\textcircled{U} \rightarrow \mu_u$

MODEL DAN PANEL STATIS DAN EFEK:

INDIVIDUAL E TENDAL (TWO-WAY
MODEL)

FISI
(WITHIN)

CASUAL
(BETW)

EFFETTI NON LINEARI E TEMPORALI FISSI

$$y_{it} = \alpha_i + \lambda_t + \sum_{z=2}^k \beta_z x_{zit} + u_{it}$$

↑ EFFETTI NON LINEARI
↑ EFFETTI TEMPORALI

ES. $N=2$; $T=3$

Dviejšisiodaki
 Dviejš
 TERAALI

i	t	D1	D2	T1	T2	T3
1	1	1	0	1	0	0
1	2	1	0	0	1	0
1	3	1	0	0	0	1
2	1	0	1	1	0	0
2	2	0	1	0	1	0
2	3	0	1	0	0	1

TRANSFORMAZIONE VARIABILI IN PRESENZA DI EFFETTI

INDIVIDUALI E TEMPORALI FISSI :

$$Z_{it}^w \equiv (z_{it} - z_{i0} - z_{0t} + z_{00})$$

$$(y_{it} - y_{i0} - y_{0t} + y_{00}) = \alpha_i + \lambda_t + \sum_2 \beta_2 X_{kit} + u_{it} - y_{i0} - y_{0t} + y_{00} \quad \checkmark$$

$$\text{DVE } y_{i,t} = \frac{1}{T} \sum_t (a_i + x_t + \sum_2 \beta_2 x_{2it} + u_{it}) =$$

$$= \underbrace{a_i + x_0 + \sum_2 \beta_2 x_{2i0} + u_{i0}}$$

$$y_{0,t} = \frac{1}{N} \sum_i (a_i + x_t + \sum_2 \beta_2 x_{2it} + u_{it}) =$$

$$= \underbrace{a_0 + x_t + \sum_2 \beta_2 x_{20t} + u_{0t}}$$

$$y_{00} = \frac{1}{T} \sum_t y_{0t} = \frac{1}{T} \sum_t (\alpha_0 + \lambda t + \sum_2 \beta_2 x_{20t} + u_{0t}) =$$

$$= \alpha_0 + \lambda_0 + \sum_2 \beta_2 x_{200} + u_{00}$$

$$y_{it} - y_{i0} - y_{0t} + y_{00} = \cancel{\alpha_i} + \cancel{\lambda t} + \sum_2 \beta_2 x_{2it} + u_{it} - \cancel{\alpha_i} - \cancel{\lambda_0} - \sum_2 \beta_2 x_{2i0} - u_{i0} - \cancel{\alpha_0} - \cancel{\lambda t} - \sum_2 \beta_2 x_{20t} - u_{0t} + \cancel{\alpha_0} + \cancel{\lambda_0} + \sum_2 \beta_2 x_{200} + u_{00}$$

$$(y_{it} - y_{i0} - y_{0t} + y_{00}) = \sum_2 \beta_2 (x_{2it} - x_{2i0} - x_{20t} + x_{200}) +$$

$$+ (u_{it} - u_{i0} - u_{0t} + u_{00})$$

WITHIN
 CAN EFFERON FISSI
 INDIV. \equiv TEMP.

\rightarrow OLS: $\hat{\beta}_2, n = 2 \dots k$

$$\widehat{\alpha}_i = (y_i - y_0) - \sum_{t=2} \widehat{\beta}_2 (x_{2it} - x_{2i0})$$

$$\widehat{\alpha}_t = (y_{0t} - y_{00}) - \sum_{i=2} \widehat{\beta}_2 (x_{20t} - x_{200})$$

EFFEKT INDIVIDUAL VS TERAKSI CASUAL

$$Y_{it} = \alpha + \beta_2 \rho_2 X_{2it} + (\mu_i + \lambda_t + U_{it})$$

$$\begin{aligned} E(\mu_i) &= 0, \text{ Var}(\mu_i) = \sigma_\mu^2 && \text{N}_{it} \\ E(\lambda_t) &= 0, \text{ Var}(\lambda_t) = \sigma_\lambda^2 && \text{No autocor} \\ E(U_{it}) &= 0, \text{ Var}(U_{it}) = \sigma_u^2 && \text{No correl} \end{aligned}$$

$$y_i = \alpha_i \delta + \nu_i \quad | \quad \text{have } \nu_i = \mu_i \mathbb{1} + \lambda + \epsilon_i$$

$$(T \times 1) \quad (T \times K) (K \times 1) \quad (T \times 1) \quad (T \times 1) \quad (1 \times 1) (T \times 1) \quad (T \times 1)$$

$$V \equiv E(\nu_i \nu_i') = E \left[\left(\mu_i \mathbb{1} + \lambda + \nu_i \right) \left(\mu_i \mathbb{1} + \lambda + \nu_i \right)' \right] + U_i$$

$$(T \times T) \quad (T \times T) \quad (T \times T) \quad (T \times T) \quad (T \times T) \quad (T \times T) \quad (T \times T)$$

$$= E(\mu_i \mu_i') \mathbb{1} \mathbb{1}' + E(\lambda \lambda') + E(\nu_i \nu_i')$$

$$= \sigma_{\mu}^2 J J' + \sigma_{\lambda}^2 I_T + \sigma_w^2 I_T$$

$$= \sigma_{\mu}^2 J J' + (\sigma_{\lambda}^2 + \sigma_w^2) I_T$$

$$\Downarrow$$

$$V(T;T) = \begin{pmatrix} \sigma_{\lambda}^2 + \sigma_w^2 + \sigma_{\mu}^2 & & & \\ & \sigma_{\lambda}^2 + \sigma_w^2 + \sigma_{\mu}^2 & & \\ & & \ddots & \\ & & & \sigma_{\lambda}^2 + \sigma_w^2 + \sigma_{\mu}^2 \end{pmatrix} \Rightarrow \underline{\underline{GLT}}$$

ATTENZIALE

: SE LA CANGIAMENTO TRA UN ENTRA
BIANCO DELLA PALEL EFFERNO CASUALI (EFFERNO' MODIVUAS)
E/O TERNOVAI
CASUALI

E I RECONERAN Xelit, $n=2k$, E PRESERVOE

Alena GLS INCORRISISTENTE

⇒ STINARONE A VANERBILI STINARONE

Modelle AN EFFETTO CASUALI E VARIABILI SIMBOLICI

(INDIVIDUALI)

$\epsilon \rightarrow \epsilon_{n \cdot i}$

$$y = Xp + z\gamma + (M + U)$$

$$(N \cdot 1) \quad (N \cdot k) \quad (k \cdot 1) \quad (N \cdot c) \quad (c \cdot 1) \quad \underbrace{\hspace{10em}}_{N \cdot 1}$$

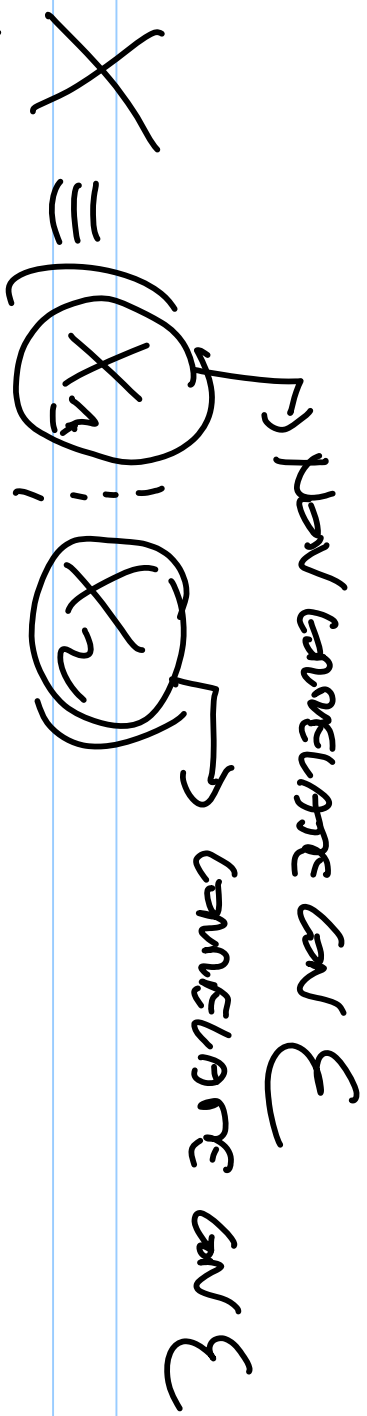
DOVE $X \rightarrow X_{nit}$, $n=1-k$ $M \equiv \mu \otimes J$
 $z \rightarrow z_{it}$, $n=1-c$ $(N \cdot 1) \quad T \cdot 1$

X continue Variabili e Variato Risorse

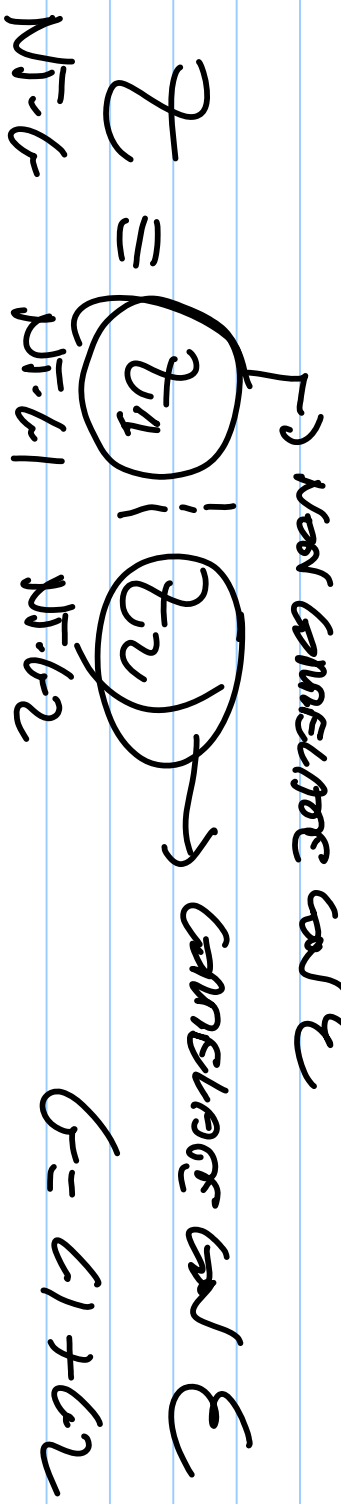
$$A \quad i = 1 \dots N \quad \underline{\underline{E}} \quad t = 1 \dots T$$

Z continue Variabili e Variato Jobs, Risorse

$$A \quad i = 1 \dots N,$$



$N_{I \cdot K} \quad N_{I \cdot K_1} \quad N_{I \cdot K_2} \quad K = K_1 + K_2$



$$y = X\beta + \varepsilon \gamma + \zeta = X_1\beta_1 + X_2\beta_2 + \varepsilon_1\gamma_1 + \varepsilon_2\gamma_2 + (M+U)$$

CONSISTENTE
PER μ_i

CONSISTENTE
PER μ_i

CONSISTENTE
PER μ_i

OBIETTIVO: stima di $\beta \in \gamma$

Approccio 1: stima consistente di $\beta \in \gamma$

Approccio 2: stima efficiente di $\beta \in \gamma$

VARIABILI
STRUMENTALI

Appiccio 1 : sistema consistente di P e Y
(2 gradi)

Stadio 1 : Stima di P

Trasformazione
Wittich

$$y = X\beta + z\gamma + \varepsilon$$

$$Dy = DX\beta + DZ\gamma + D\varepsilon$$

$$Dz = 0$$

Trasformazione Wittich
"Eliminazione" di γ
(che vanno solo a destra)

OLS su modelli trasformati secondo White

L'assenza di eteroscedasticità (consistenza) β , cioè
di ottenere $\hat{\beta}_w$

Stadio 2

$$y = X\beta + \varepsilon + \xi$$

$$y - X\hat{\beta}_w = X\beta + \varepsilon + \xi - X\hat{\beta}_w$$

MAXIMIZE
w.r.t. β

$$\begin{aligned} \sum_{i=1}^N C(y - X\hat{\beta}_w) &= CX\beta + C\sum \epsilon + C\sum \epsilon - CX\hat{\beta}_w \\ &= C\sum \epsilon + [CX\beta - CX\hat{\beta}_w] \\ &= C\sum \epsilon + C[\sum \epsilon + X(\beta - \hat{\beta}_w)] \end{aligned}$$

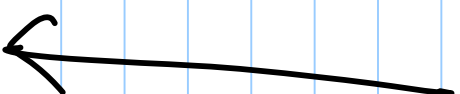
$$\begin{aligned}
 &= Z\gamma + c \left[\underbrace{\varepsilon + X(\beta - \hat{\beta}_X)}_{\substack{\text{ERRORE} \\ \text{Dovuto al} \\ \text{"SAMPLE BIAS"}}}} \right] \\
 &\quad \swarrow \text{ERRORE} \quad \searrow \text{"}\varepsilon\text{"} \\
 &Z\varepsilon = Z \\
 &(\text{Z non varia rispetto al tempo}) \quad \Downarrow
 \end{aligned}$$

$$\boxed{\tilde{y} = z_1 x + \tilde{\varepsilon}} = z_1 x_1 + z_2 x_2 + \tilde{\varepsilon}$$

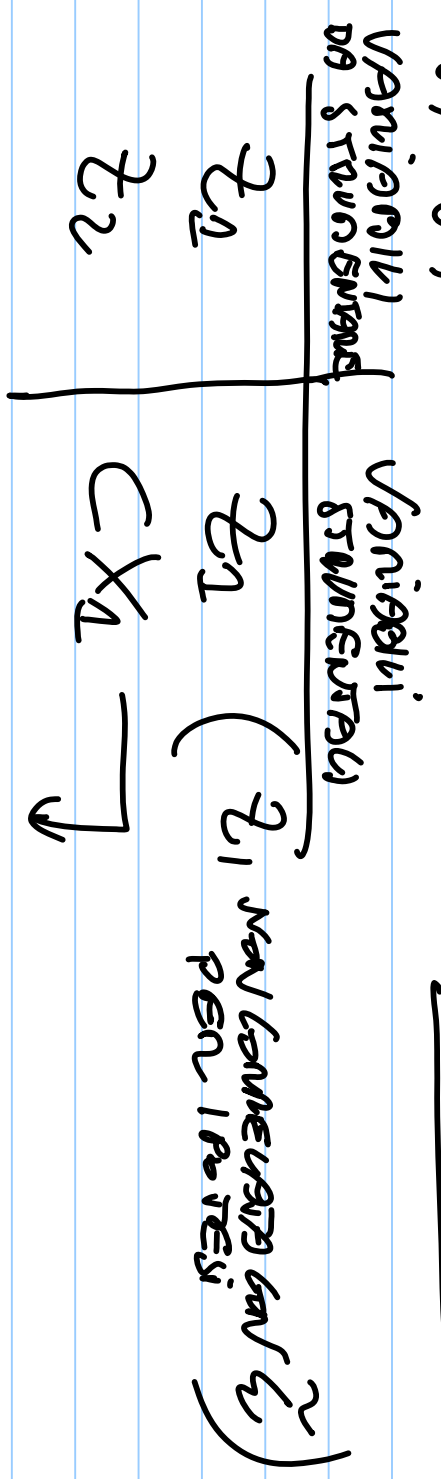
COEFFICIENTS
ATTACHED TO
 $\tilde{\varepsilon}$

DAVE $\tilde{y} \equiv C(y - X\hat{\beta}_{OLS})$

$$\tilde{\varepsilon} \equiv C[\varepsilon + X(\beta - \hat{\beta}_{OLS})]$$



DATA LA CONNESSIONE TRA Z_2 E \tilde{Z} , LA STIPULAZIONE
 CONSISTENTE PER $\gamma, \delta, \tilde{\epsilon}$ ERO STIPULAZIONE DI VARIABILI STRUMENTALI



CX_2 Trasformazione "BESTIKEN" di X_2 ,

CHE VARIA SOLO NELLE $\theta_i \quad i = 1 \dots K$

(CON Z_2)

X_2 NON È CORRELATA CON Z_2 PER IPOTESI

X_2 È UNA NATTICE DI DECISIONI (VISIONE θ_{K_2} ,
 $Z_1 \in Z_2$), QUINDI "NATIVAMENTE" CORRELATO
CON Z_2

↳ SIMILAR GIVE PER δ , δ_{GIVE} , AND
GAME STRATEGIES $Z_1 \in CK_1$