Hechos Estilizados (cont) y Fuentes de Divergencia

Catedra II

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Sachs & Warner 1997

Modelo de Solow augmentado para incluir capital humano,

$$Q = K^a (AL)^{1-\alpha-\sigma} H^\sigma$$

$$q = k^a + h^\sigma + \varepsilon$$

log linearizando alrededor del steady state (aux.)

$$\dot{q} = \beta(q^* - q) - \rho(h^* - h) + \sigma\dot{h}$$

Notacion:

- $x = X/L$
- $\dot{x} = dx/dt$
- h^*valor de estado estacionario
- q producto por trabajador, y producto per cápita: $\dot{y} = \dot{q} + n - \pi$
- n, π tasa crecimiento empleo y población

1. q^* es una función lineal de variables: ϕZ
2. h^* es constante a través de países.
3. $\dot{h} = \varpi h - \omega h^2 / h^*$ acumulo h en función no linead de h.

Reemplazando

$$\begin{aligned} \dot{y} &= -\beta y + \beta\phi Z + \rho h + \sigma\left(\varpi h - \omega h^2 / h\right) \\ \dot{y}_i &= -\beta y_i + \lambda Z_i + \kappa h - \varphi h^2 \end{aligned}$$

Vector Z_i :

- geografía: tropical, acceso a mar
- recursos naturales
- políticas económicas (apertura, ahorro fiscal, calidad instituciones)

TABLE 2—CROSS-COUNTRY GROWTH REGRESSION
(DEPENDENT VARIABLE = GROWTH PER CAPITA,
1965–1990; 83-COUNTRY MEAN = 0.33 PERCENT)

Independent variable	Estimated regression coefficient
lnGDP per economically active person in 1965	−1.5 (−6.5)
Share of years open, 1965–1990	10.9 (3.7)
GDP in 1965 times share of years open	−1.1 (−3.0)
Growth of economically active population − population growth	0.7 (1.9)
Central government budget balance, 1970–1990	0.11 (5.2)
Institutional quality index (1980)	0.32 (3.8)
Tropics	−0.8 (−3.0)
Landlocked	−0.6 (−2.3)
Share of natural-resource exports in GDP, 1970	−3.9 (−4.0)
Life expectancy	0.3 (2.8)
Life expectancy squared	−0.0026 (−2.3)
Adjusted R^2:	0.84
Number of countries:	83
Standard error:	0.77

Supuestos modelo:

- h^*constante
- A?

Problemas empíricos?

- Causalidad
- Variables omitidas

Mankiw, Romer and Weil (1992)

$$
\begin{aligned}
Y &= K^a H^\beta (AL)^{1-\alpha-\beta} \\
k &= \frac{K}{AL} \dots
\end{aligned}
$$

$$
\begin{aligned}
\dot{h} &= s_h - (n+\delta+g)h \\
\dot{k} &= s_k - (n+\delta+g)k
\end{aligned}
$$

El steady state de este modelo (ejercicio)

$$
\begin{aligned}
k^* &= \left(\frac{s_k^{1-\beta} s_h^\beta}{n+\delta+g} \right)^{\frac{1}{1-\alpha-\beta}} \\
h^* &= \left(\frac{s_k^\alpha s_h^{1-\alpha}}{n+\delta+g} \right)^{\frac{1}{1-\alpha-\beta}}
\end{aligned}
$$

$$y^* = k^{*\alpha} + h^{*\beta}$$

$$\frac{Y}{L} = Ay$$

$$\ln A(t) = \ln A_0 + gt$$

luego sustituyendo los valores de EE para k^*

$$\begin{aligned} \ln\left(Y/L/(t)\right) &= \ln A_0 + gt + \frac{\alpha+\beta}{1-\alpha-\beta}\ln\left(n+\delta+g\right) && (1) \\ &+ \frac{\alpha}{1-\alpha-\beta}\left(\ln s_k\right) + \frac{\beta}{1-\alpha-\beta}\left(\ln_{sh}\right) && (2) \end{aligned}$$

Estima un modelo de Solow sin K humano (tabla 1)

$$\begin{aligned}\ln\left(Y/L/(t)\right) &= \ln A_0 + gt + \frac{\alpha}{1-\alpha}\ln\left(s_k\right) \\ &\quad - \frac{\alpha}{1-\alpha}\ln\left(n+\delta+g\right)\end{aligned}$$

en vez de

$$\begin{aligned}\ln\left(Y/L/(t)\right) &= \ln A_0 + gt + \frac{\alpha}{1-\alpha}\ln\left(s_k\right) - \frac{\alpha}{1-\alpha}\ln\left(n+\delta+g\right) \\ &\quad + \frac{\beta}{1-\alpha}\ln\left(h^*\right)\end{aligned}$$

sesgos?. Luego estima (tabla 2)

$$\begin{aligned}\ln\left(Y/L/(t)\right) &= \ln A_0 + gt + \frac{\alpha+\beta}{1-\alpha-\beta}\ln\left(n+\delta+g\right) \\ &\quad + \frac{\alpha}{1-\alpha-\beta}\left(\ln s_k\right) + \frac{\beta}{1-\alpha-\beta}\left(\ln_{sh}\right)\end{aligned}$$

TABLE I

ESTIMATION OF THE TEXTBOOK SOLOW MODEL

Dependent variable: log GDP per working-age person in 1985			
Sample:	Non-oil	Intermediate	OECD
Observations:	98	75	22
CONSTANT	5.48	5.36	7.97
	(1.59)	(1.55)	(2.48)
ln(I/GDP)	1.42	1.31	0.50
	(0.14)	(0.17)	(0.43)
$\ln(n + g + \delta)$	−1.97	−2.01	−0.76
	(0.56)	(0.53)	(0.84)
$\overline{R}^2$	0.59	0.59	0.01
s.e.e.	0.69	0.61	0.38
Restricted regression:			
CONSTANT	6.87	7.10	8.62
	(0.12)	(0.15)	(0.53)
$\ln(I/GDP) - \ln(n + g + \delta)$	1.48	1.43	0.56
	(0.12)	(0.14)	(0.36)
$\overline{R}^2$	0.59	0.59	0.06
s.e.e.	0.69	0.61	0.37
Test of restriction:			
p-value	0.38	0.26	0.79
Implied α	0.60	0.59	0.36
	(0.02)	(0.02)	(0.15)

Note. Standard errors are in parentheses. The investment and population growth rates are averages for the period 1960–1985. $(g + \delta)$ is assumed to be 0.05.

TABLE II

ESTIMATION OF THE AUGMENTED SOLOW MODEL

Dependent variable: log GDP per working-age person in 1985			
Sample:	Non-oil	Intermediate	OECD
Observations:	98	75	22
CONSTANT	6.89	7.81	8.63
	(1.17)	(1.19)	(2.19)
ln(I/GDP)	0.69	0.70	0.28
	(0.13)	(0.15)	(0.39)
$\ln(n + g + \delta)$	−1.73	−1.50	−1.07
	(0.41)	(0.40)	(0.75)
ln(SCHOOL)	0.66	0.73	0.76
	(0.07)	(0.10)	(0.29)
$\overline{R}^2$	0.78	0.77	0.24
s.e.e.	0.51	0.45	0.33
Restricted regression:			
CONSTANT	7.86	7.97	8.71
	(0.14)	(0.15)	(0.47)
$\ln(I/GDP) - \ln(n + g + \delta)$	0.73	0.71	0.29
	(0.12)	(0.14)	(0.33)
$\ln(SCHOOL) - \ln(n + g + \delta)$	0.67	0.74	0.76
	(0.07)	(0.09)	(0.28)
$\overline{R}^2$	0.78	0.77	0.28
s.e.e.	0.51	0.45	0.32
Test of restriction:			
p-value	0.41	0.89	0.97
Implied α	0.31	0.29	0.14
	(0.04)	(0.05)	(0.15)
Implied β	0.28	0.30	0.37
	(0.03)	(0.04)	(0.12)

Note. Standard errors are in parentheses. The investment and population growth rates are averages for the period 1960–1985. $(g + \delta)$ is assumed to be 0.05. SCHOOL is the average percentage of the working-age population in secondary school for the period 1960–1985.

Hall and Jones (1999)

$$Y = K^{\alpha}(AH)^{1-\alpha}$$

$$\begin{aligned} H &= e^{\phi(E)}L \\ h &= \frac{H}{L} = e^{\phi(E)} \end{aligned}$$

luego

$$\frac{Y}{L} = k^{\alpha}\left(Ae^{\phi(E)}\right)^{1-\alpha}L^{-\alpha}$$

y reordenando

$$\frac{Y}{L} = \left(\frac{K}{Y}\right)^{\frac{a}{1-\alpha}} hA$$

lo que permite descomponer las diferencias en $\frac{Y}{L}$ entre diferencias en productividad y diferencias en acumulación de factores (fisico y humano) (tabla + figura)

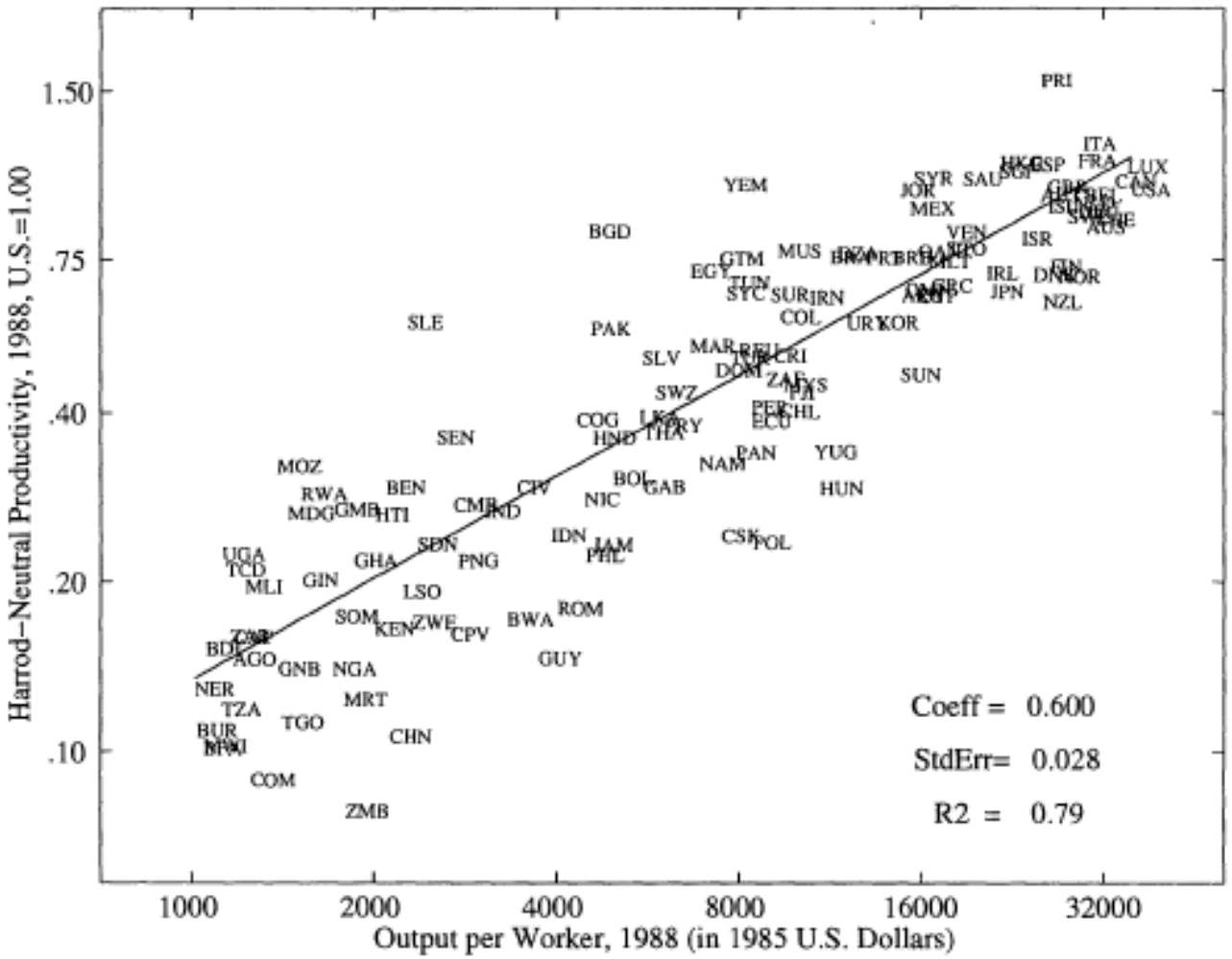

FIGURE I
Productivity and Output per Worker

TABLE I

PRODUCTIVITY CALCULATIONS: RATIOS TO U. S. VALUES

Country	Y/L	Contribution from $(K/Y)^{\alpha/(1-\alpha)}$	Contribution from H/L	Contribution from A
United States	1.000	1.000	1.000	1.000
Canada	0.941	1.002	0.908	1.034
Italy	0.834	1.063	0.650	1.207
West Germany	0.818	1.118	0.802	0.912
France	0.818	1.091	0.666	1.126
United Kingdom	0.727	0.891	0.808	1.011
Hong Kong	0.608	0.741	0.735	1.115
Singapore	0.606	1.031	0.545	1.078
Japan	0.587	1.119	0.797	0.658
Mexico	0.433	0.868	0.538	0.926
Argentina	0.418	0.953	0.676	0.648
U.S.S.R.	0.417	1.231	0.724	0.468
India	0.086	0.709	0.454	0.267
China	0.060	0.891	0.632	0.106
Kenya	0.056	0.747	0.457	0.165
Zaire	0.033	0.499	0.408	0.160
Average, 127 countries:	0.296	0.853	0.565	0.516
Standard deviation:	0.268	0.234	0.168	0.325
Correlation with Y/L (logs)	1.000	0.624	0.798	0.889
Correlation with A (logs)	0.889	0.248	0.522	1.000

The elements of this table are the empirical counterparts to the components of equation (3), all measured as ratios to the U. S. values. That is, the first column of data is the product of the other three columns.

$$\begin{aligned} \ln(Y/L) &= \alpha + \beta S + \varepsilon \\ S &= \lambda + \delta \ln(Y/L) + X\phi + \nu \end{aligned}$$

S: infraestructura social:

- S: no "hurto": estatal + privado
- Se supone que afecta tanto a A como la acumulación de factores
- H&J lo miden combinando: apertura comercial (Sachs + Warner) + Government Anti Diversion Policies del ICRG (una medida de riesgo pais)
- Tema de endogeneidad...busca instrumentos para S :
  - Comercio de un modelo de gravdedad
  - distancia del ecuador
  - % de población que habla idiomas Europeos

TABLE II

BASIC RESULTS FOR OUTPUT PER WORKER

$\log Y/L = \alpha + \beta \tilde{S} + \tilde{\epsilon}$

Specification	Social infrastructure	OverID test p-value test result	Coeff test p-value test result	$\hat{\sigma}_{\tilde{\epsilon}}$
1. Main specification	5.1432	.256	.812	.840
	(.508)	Accept	Accept	
Alternative specifications to check robustness				
2. Instruments:	4.998	.208	.155	.821
Distance, Frankel-Romer	(.567)	Accept	Accept	
3. No imputed data	5.323	.243	.905	.889
79 countries	(.607)	Accept	Accept	
4. OLS	3.289	—	.002	.700
	(.212)		Reject	

The coefficient on Social infrastructure reflects the change in log output per worker associated with a one-unit increase in measured social infrastructure. For example, the coefficient of 5.14 means than a difference of .01 in our measure of social infrastructure is associated with a 5.14 percent difference in output per worker. Standard errors are computed using a bootstrap method, as described in the text. The main specification uses distance from the equator, the Frankel-Romer instrument, the fraction of the population speaking English at birth, and the fraction of the population speaking a Western European language at birth as instruments. The OverID test column reports the result of testing the overidentifying restrictions, and the Coeff test reports the result of testing for the equality of the coefficients on the *GADP* policy index variable and the openness variable. The standard deviation of $\log Y/L$ is 1.078.