

The World Income Distribution

Acemoglu and Ventura(QJE 2002)

Main Questions

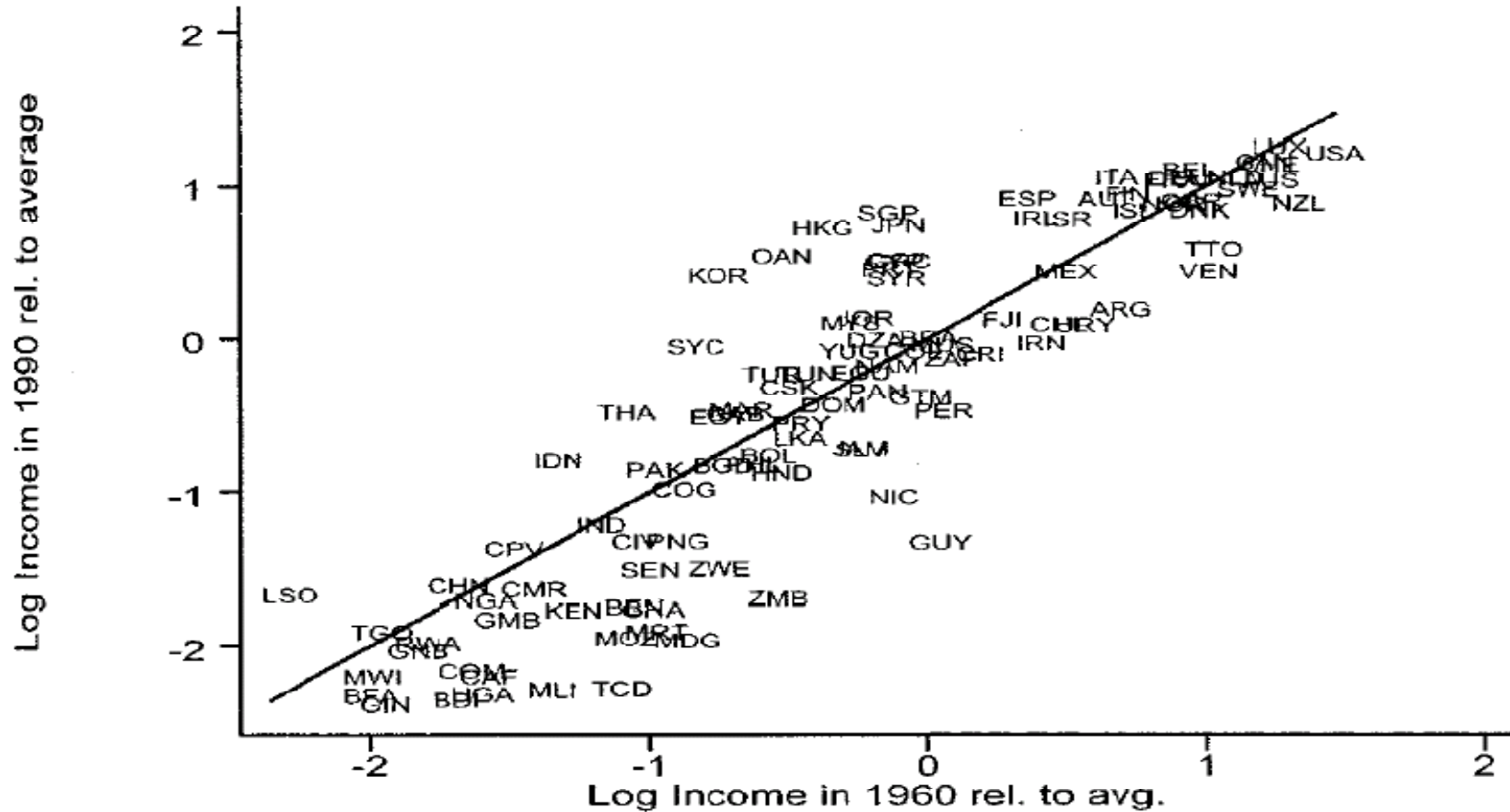


FIGURE I

Log of Income per Worker in 1990 and 1960 Relative to World Average from the Summers and Heston [1991] Data Set

The thick line is the 45 degree line.

- Why is there a large difference in income across countries?
- Why has the world income distribution been relatively stable since 1960?

Why world income dist. is stable?

- Existing framework (Solow-Ramsey model) to explain this stable income distribution
 - Exogenous technology spill-over
(share the same level of world tech.)
 - Diminishing returns in production
- Alternative framework
 - Even without these two assumptions, International trade (based on specialization) leads to a stable income distribution.

The role of international trade

(the effect of int. trade on the incentive to accumulate capital)

- Different technology and economic policy across countries
- Terms of trade effect works as de factor diminishing returns at country level
 - Countries that accumulate capital faster experience declining export prices, reducing value of the marginal product of capital and discouraging accumulation at home.
 - Those countries also increase the demand for products and the value of the marginal product of capital in the rest of world increases
- Specialization in production is essential for the terms of trade effects

Model (1)

- Assumptions
 - Capital is only factor of production
 - Continuum of intermediate products indexed by $z \in [0, M]$
 - Free trade in intermediate goods and no trade in final products or assets
 - Different technology (μ), time preference (ρ), and economic policies (Φ) across countries
 - μ be the measure of ability to produce a larger variety of intermediates, so μ as an indicator of how advanced the technology of the country is.
 $\int \mu \cdot dG = M$
 - Armington assumption that products are differentiated by origin

Model (2)

- Consumer problem

$$\int_0^{\infty} \ln c(t) \cdot e^{-\rho \cdot t} \cdot dt,$$
$$p_I \cdot \dot{k} + p_C \cdot c = y \equiv r \cdot k,$$

- Unit cost functions for firms

$$B_C(r, p(z)) = r^{1-\tau} \cdot \left(\int_0^M p(z)^{1-\epsilon} \cdot dz \right)^{\tau/(1-\epsilon)},$$

$$B_I(r, p(z)) = \phi^{-1} \cdot r^{1-\tau} \cdot \left(\int_0^M p(z)^{1-\epsilon} \cdot dz \right)^{\tau/(1-\epsilon)},$$

- τ is the share of intermediates in production, and it will also turn out to be the ratio of exports to income
- ϕ is the incentive to invest

Model (3)

- Consumer's maximization

$$\frac{r + \dot{p}_I}{p_I} - \frac{\dot{p}_C}{p_C} = \rho + \frac{\dot{c}}{c},$$

- Firm's maximization $p = r,$

$$\int_0^M p(z)^{1-\epsilon} \cdot dz = \int \mu \cdot p^{1-\epsilon} \cdot dG = 1.$$

$$p_C = r^{1-\tau}.$$

$$p_I = \phi^{-1} \cdot r^{1-\tau}.$$

- Market clear for capital $k = k_n + \mu \cdot k_i,$

$$y = \mu \cdot p^{1-\epsilon} \cdot Y, \quad \text{where } Y \equiv \int y \cdot dG$$

Model (4)

- Model dynamics

$$\dot{k}/k = \phi \cdot r^\tau - \rho,$$

$$r \cdot k = \mu \cdot r^{1-\epsilon} \cdot \int r \cdot k \cdot dG.$$

- Steady-state equilibrium $\dot{k}/k = \dot{y}/y = x \equiv \dot{Y}/Y$

$$r^* = \left(\frac{\rho + x^*}{\phi} \right)^{1/\tau},$$

$$y_R^* = \mu \cdot \left(\frac{\phi}{\rho + x^*} \right)^{(\epsilon-1)/\tau}, \quad y_R \equiv y/Y$$

Model (5)

- Steady-state equilibrium

$$\text{terms of trade} = p = \left(\frac{\mu}{y_R} \right)^{1/(\epsilon-1)},$$

$$\text{rate of return} = \frac{r + \dot{p}_I}{p_I} - \frac{\dot{p}_C}{p_C} = \phi \cdot p^\tau.$$

- (1) For a given measure of country technology μ , the terms of trade of the country are decreasing in its relative income
- (2) For a given economic policy Φ , the rate of return to capital is increasing in the terms of trade.

Empirical evidence

- Relationship between terms of trade and growth rate

$$\pi_t = (g_t - x_t)/(\epsilon - 1) + \Delta \ln \mu_t,$$

$$\pi_t = \delta \cdot g_t + Z_t' \cdot \omega + v_t,$$

IV REGRESSIONS OF GROWTH RATE OF TERMS OF TRADE

	Main regression (1)	Detailing schooling (2)	Adding political indicat (3)	Adding change in Sch (4)	Adding change in Sch (5)	Nonoil sample (6)
<i>Panel A: Two-stage least squares</i>						
GDP Growth 1965–1985	-0.595 (0.265)	-0.578 (0.261)	-0.458 (0.221)	-0.561 (0.248)	-0.455 (0.187)	-0.620 (0.354)
Years of schooling 1965	-0.001 (0.002)		-0.002 (0.002)	-0.000 (0.002)		-0.001 (0.002)
Years of primary schooling 1965		-0.002 (0.003)				
Years of secondary schooling 1965		-0.002 (0.006)				
Years of higher schooling 1965		0.019 (0.034)				
Log of life expectancy 1965	0.043 (0.024)	0.045 (0.024)	0.034 (0.021)	0.020 (0.027)		0.046 (0.030)
OPEC dummy	0.091 (0.009)	0.090 (0.009)	0.092 (0.009)	0.086 (0.010)	0.087 (0.009)	
War dummy			-0.013 (0.005)			
Political instability			0.007 (0.023)			
Log black market premium			-0.005 (0.012)			
Change in years of schooling 1965–1985				0.008 (0.004)	0.009 (0.003)	
Change in log of life expectancy 1965–1985				-0.000 (0.078)	-0.042 (0.045)	

Extension

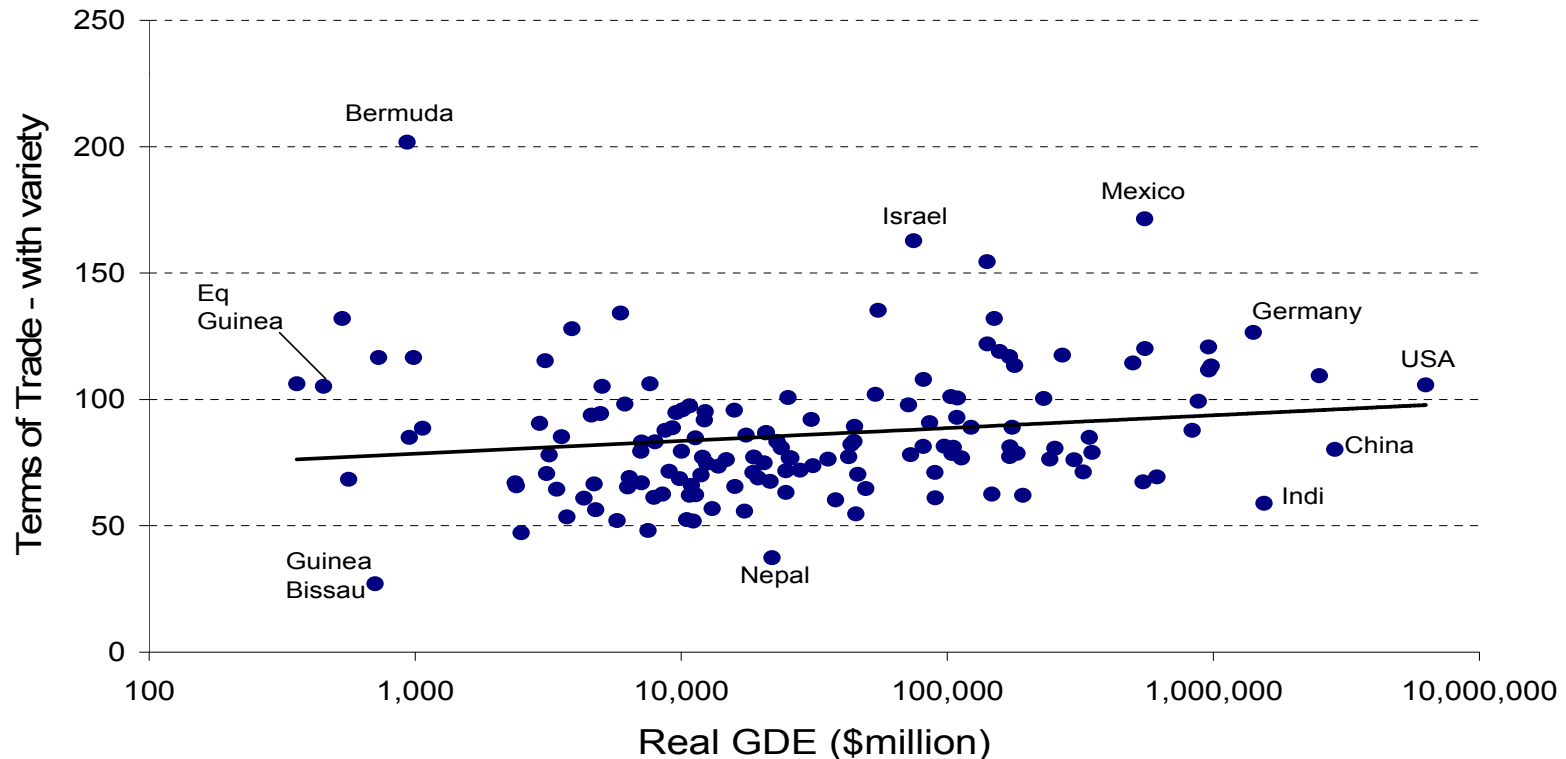
- Including labor
- Changing the assumptions on international trade(specialization)
 - Monopolistic firms
 - Fixed cost of production

Conclusion

- Presents the model of world income distribution in which all countries share the same long-run growth because of terms of trade effects
- Why capital accumulation leads to a lower value of marginal product of capital?
 - In general, it is assumed that there is technically diminishing returns of capital
 - However, in world equilibrium, terms of trade effects generate diminishing returns

Discussion

- The same growth rate across countries?
- Terms of trade is negatively related to relative income?
 - intra industry trade



Feenstra(2009), Figure 5.5: Terms of Trade with Variety and real GDE, 1996

Panel B: First-stage for GDP growth

Log of GDP 1965	-0.019 (0.004)	-0.020 (0.004)	-0.024 (0.004)	-0.020 (0.004)	-0.020 (0.004)	-0.016 (0.004)
R^2	0.35	0.36	0.54	0.47	0.47	0.34

Panel C: Ordinary least squares

GDP Growth 1965–1985	0.037 (0.106)	0.037 (0.107)	0.038 (0.107)	0.041 (0.112)	-0.005 (0.103)	0.116 (0.114)
N. of obs	79	79	70	79	79	74

“Growth Rate of Terms of Trade” is measured as the annual growth rate of export prices minus the growth rate of import prices. The OPEC dummy takes value 1 for five countries in our sample (Algeria, Indonesia, Iran, Iraq, and Venezuela). The political instability variable is the average of the number of assassinations per million inhabitants per year and the number of revolutions per year, the war variable is a dummy for countries that fought at least one war over the period 1965–1985, and the log black market premium is the average of the logarithm of the black market premium over the period 1965–1985. All the data are from the Barro-Lee data set.

Excluded instrument is log of output in 1965 in columns (1), (2), (3), and (4) and (6), while in column (5) excluded instruments are log of output in 1965, years of schooling in 1965, and the log of life expectancy in 1965.