Global savings glut and some welfare analytics

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TWO CONSIDERATIONS

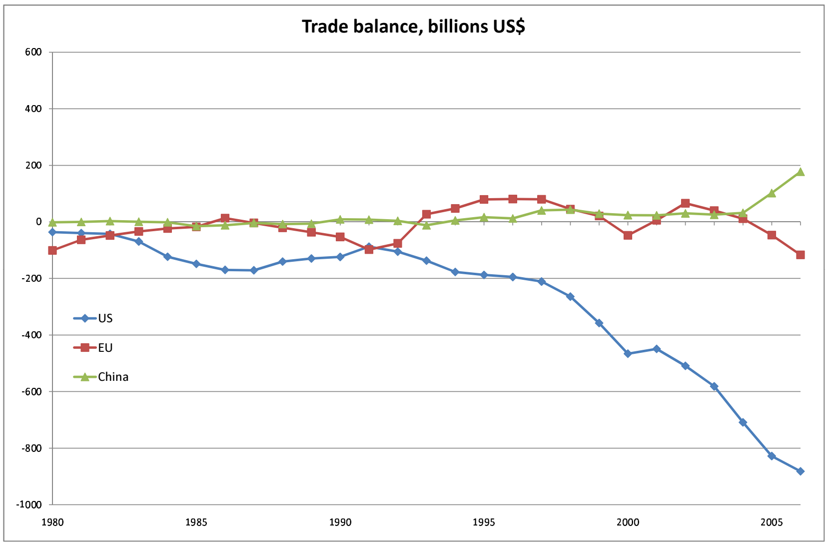
1. Global imbalance; global savings glut
   - US consumption versus Asian savings
   - Importance of oil exporters
2. Welfare analytics
   - Overwhelming importance of growth for poverty alleviation
   - Nuances in welfare: Risk and mobility

1. Global imbalance

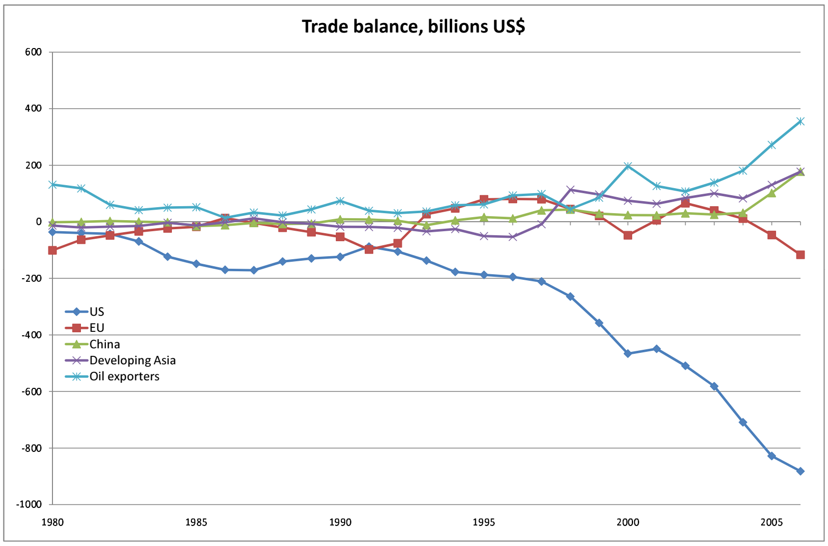
Contributions to the global economy:

	2005 Fraction of World GNI	2006 growth, billions US$
US	28.6%	533.1
China	5.0%	371.8
India	1.8%	102.5
China+India	6.8%	474.3
High-income OECD	75.6%	1763.4
Low and mid-income	21.1%	1462.8

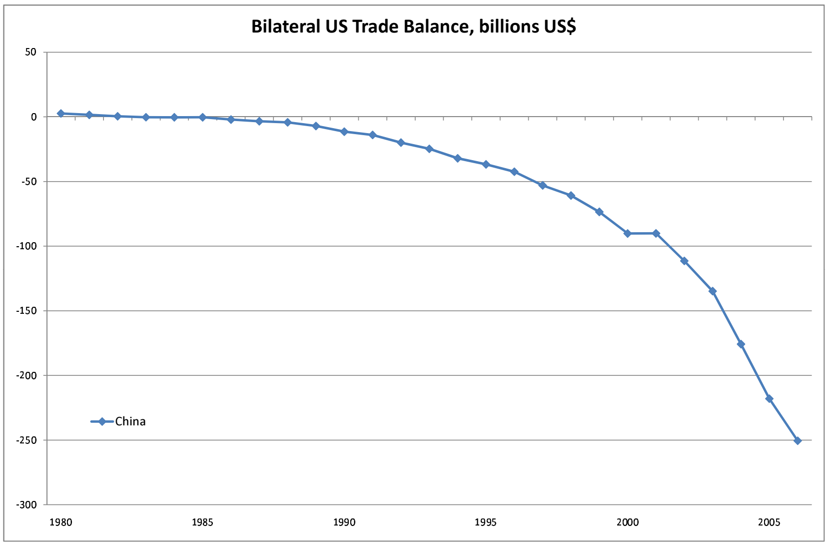
Overall balance of trade



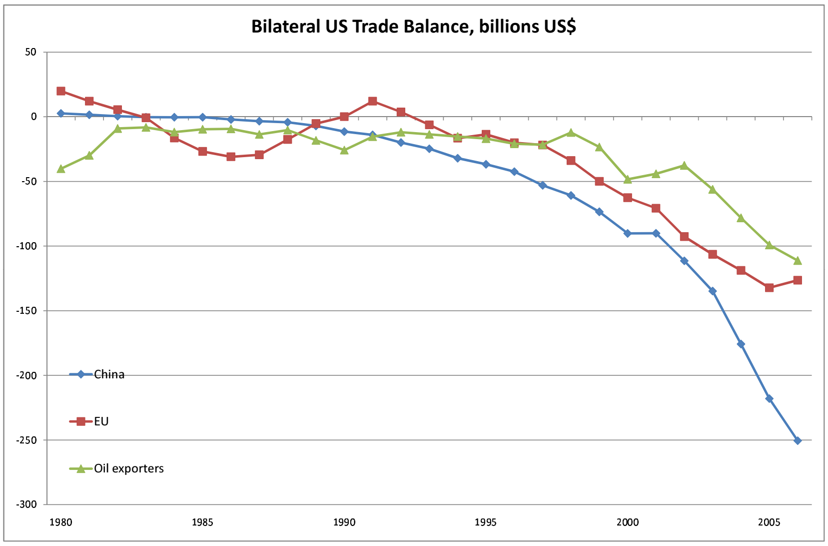
Overall balance of trade



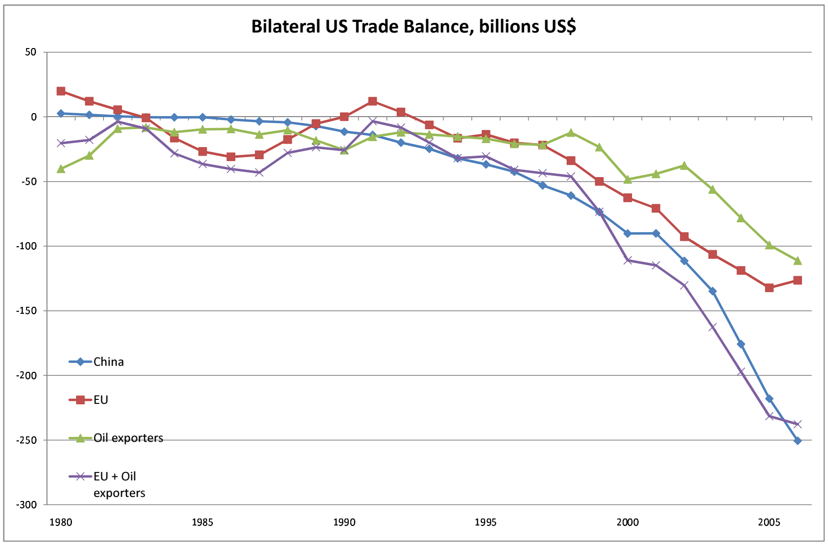
Bilateral balance of trade



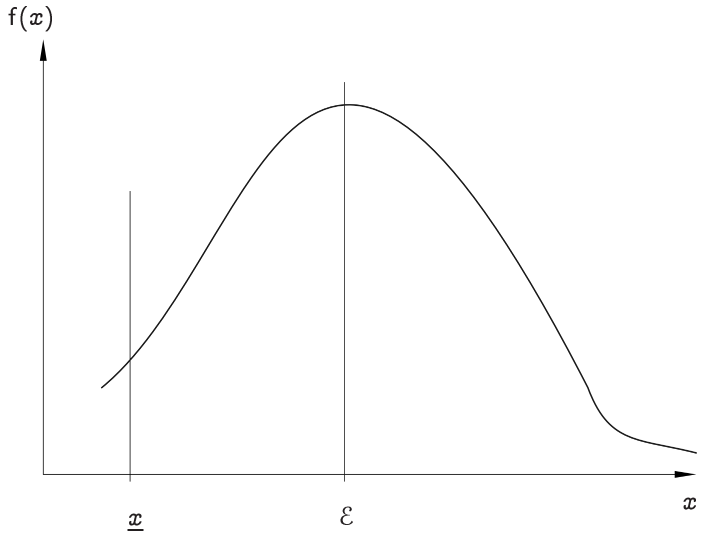
Bilateral balance of trade



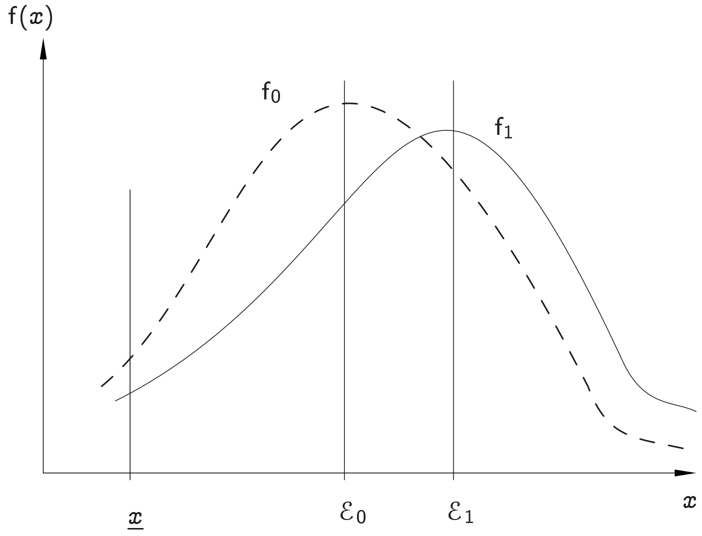
Bilateral balance of trade



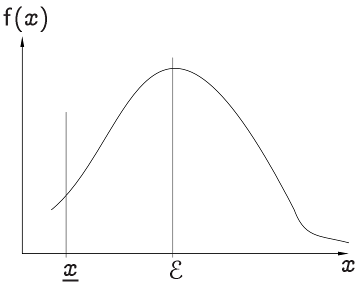
2. Distribution and growth



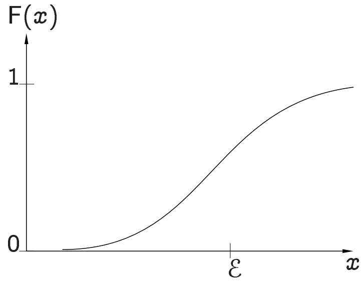
Distribution and growth



Distribution and inequality



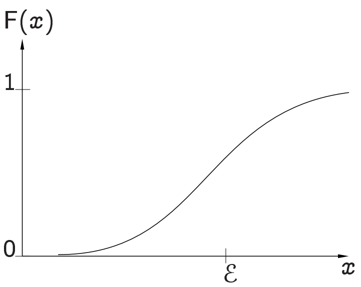
$\Longleftrightarrow$



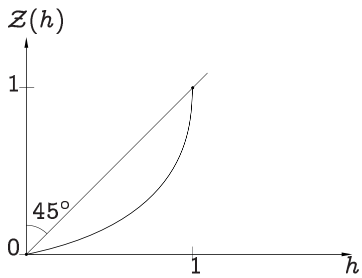
$$\mathsf{f}(x) = \mathsf{F}'(x)$$

Global dynamics and welfare

Distribution and inequality



$\Longleftrightarrow$



$$\mathcal{Z}(h) = \mathcal{E}^{-1} \int_{\mathsf{F}(x)=0}^{\mathsf{F}(x)=h} x \, d\mathsf{F}(x)$$

Lorenz curve and Gini coefficient

- When the entire population has equal income then $\mathcal{Z} \equiv 45^\circ$ line
- Gini coefficient or Gini index

$$\begin{aligned} \mathcal{I}_G &\stackrel{\text{def}}{=} 1 - 2 \times \int_0^1 \mathcal{Z}(h)\, dh \\ &= 2 \times \int_0^1 [\, h - \mathcal{Z}(h)\,]\, dh \\ \Longrightarrow\ \mathcal{I}_G &\in [0, 1] \end{aligned}$$

Income and population in China and India, 1981–2004

	GDP per capita (PPP 2000 Intl\$)			Population (10^6)	
	1981	2004	Annual growth	1981	2004
China	792.8	5418.5	8.36%	993.9	1296.2
India	1228.8	2907.1	3.74%	702.8	1079.7

Inequality in China and India, 1981–2004

	Gini coefficient (%)	
	1981	2004
China – Urban	15.0/16.1/16.7/18.5	32.9/34.0
China – Rural	23.9/23.9/25.1/25.0	33.4/34.0
China – All	29.1/	44.9/
India – Urban	34.1/33.3	34.7/37.6
India – Rural	30.1/30.1	26.3/30.5
India – All	31.4/	36.0/

$1-Poverty in China and India, 1981–2004

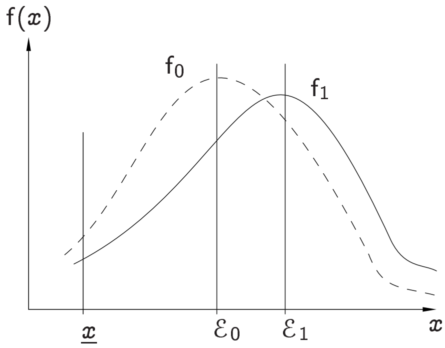
	$\underline{x} = 1;\ HC_{\underline{x}}\ (N_{\underline{x}}, 10^6)$	
	1981	2004
China	63.8 (633.7)	9.9 (128.4)
India	51.8 (363.7)	34.3 (370.7)

\$2-Poverty in China and India, 1981–2004

	$\underline{x} = 2;\ HC_{\underline{x}}\ (N_{\underline{x}}, 10^6)$	
	1981	2004
China	88.1 (875.8)	34.9 (452.2)
India	88.9 (624.9)	80.4 (867.6)

Empirical models

$$\{X(t) : t \geq 0\} \quad \Longleftrightarrow$$



For reducing poverty, growth overwhelms inequality (Bourguignon 2003; Dollar and Kraay 2002; Quah 2003; Ravallion 2001).

Analytical framework

$$U(\,[1+\Psi]\,C_A, \mathcal{Z}_A\,) = U(\,C_B, \mathcal{Z}_B\,).$$

- Welfare, not just inequality
- Dynamics
  - permanent, transitory
  - depth, duration
  - not just current inequality

Continuous time growth and inequality, 1

$$C_j(t) = e^{Z_j(t)} e^{\xi t}$$

$$W_j(t) = E_t \left[\int_t^\infty e^{-(s-t)\rho} U(C_j(s))\, ds \right], \qquad \rho > 0,$$

$$U(c) = \frac{c^{1-R} - 1}{1 - R}, \qquad R > 0.$$

Continuous time growth and inequality, 2

1. Z Brownian motion
2. Z (discrete) Markov chain
3. Z ...

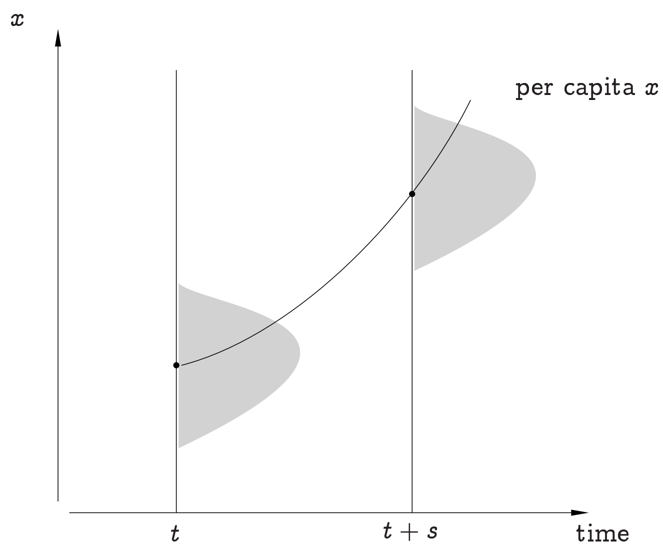


Figure 1: **Growth and inequality** Z fluctuations around a ξ growth path

Theorem 2.1 Suppose Z Markov, time-homogeneous ... then

$$W(0) = (\mathbf{R}_{\tilde{\rho}}\widetilde{U})(\log C(0)) + \text{constants}$$

Theorem 2.2 If further Z Brownian motion (σ^2) then

$$(\mathbf{R}_{\tilde{\rho}}\widetilde{U})(z) = \begin{cases} r(R, \rho, \xi, \sigma)^{-1} \times e^{(1-R)z} & \text{for } R \neq 1; \\ \rho^{-1} z & \text{otherwise.} \end{cases}$$

Theorem 2.3 Suppose Z Markov chain, with time-homogeneous transition probability matrices

$$P = \{ P_t : t \geq 0 \} .$$

so that the infinitesimal generator of the semigroup P,

$$\mathbf{G} = \lim_{t \downarrow 0} \frac{P_t - I}{t}.$$

Then

$$(\mathbf{R}_{\tilde{\rho}}\widetilde{U})(\overline{z}_m) = \left[(\tilde{\rho} - \mathbf{G})^{-1} \overline{U} \right] (m), \quad m = 0, 1, \ldots, M-1.$$

Discrete time growth and inequality, 1

$$W_j(t) = E_t\left[\sum_{s=0}^{\infty} \delta^s U(C_j(s))\right], \qquad \delta \in (0,1),$$

$$C_j(t) = Z_j(t)\xi^t, \qquad \xi \geq 1,$$

$$Z_j(t) = \overline{z}_j \epsilon_j(t),$$

Discrete time growth and inequality, 2

$$\log \epsilon_j(t) = -\frac{1}{2}(1+\alpha)^{-1}\sigma_j^2 + \alpha \log \epsilon_j(t-1) + \nu_j(t),$$

with

$$|\alpha| < 1 \quad \text{and} \quad \nu_j(t) \sim \text{iid N}(0, \sigma_j^2).$$

implying

Discrete time growth and inequality, 3

$$E\epsilon_j(t) = \exp\left[E\log\epsilon_j(t) + \frac{1}{2}\operatorname{Var}\log\epsilon_j(t)\right]$$
$$= \exp\left[-\frac{1}{2}(1-\alpha^2)^{-1}\sigma_j^2 + \frac{1}{2}(1-\alpha^2)^{-1}\sigma_j^2\right] = 1$$

and

$$\operatorname{Var}\epsilon_j(t) = \exp\left[(1-\alpha^2)^{-1}\sigma_j^2\right] - 1,$$

increasing in σ_j^2.

Theorem 2.4: .... Otherwise

$$W_j(0;\epsilon_j(0),\xi,\overline{z}_j,\sigma_j^2,\alpha) = \ldots$$
$$\ldots\sum_{t=1}^{\infty}\delta^t\xi^{-(R-1)t}e^{D_1\alpha^t}e^{-D_2\alpha^{2t}}$$

[Completely messy — outside of log case with $R = 1$ (Lucas, 1987), or using unconditional expectation (Còrdoba and Verdier, 2005).]

Results

- Numerical
  1. Growth ξ
  2. Inequality

$$\mathcal{I}_G(t) = 2 \times \mathsf{F}_{\mathsf{N}(0,1)} \left(\left[\frac{1-\alpha^t}{1-\alpha^2}\, \sigma_j^2 \right]^{1/2} / \sqrt{2} \right) - 1$$

  3. Mobility α

$\bar{\xi} = 1.02$		Compensating Ψ (%)			
ξ	R	1	2	5	10
1.005		107	58	26	14
1.01		62	32	14	7
1.03		−38	−19	−8	−4
1.04		−61	−32	−14	−8
1.05		−76	−42	−19	−10
1.06		−85	−49	−22	−12
1.07		−90	−54	−25	−14

Table 1: **Growth matters.** $\mathcal{I}_G = 0.32$, $\alpha = 0$, $\delta = 0.98$: For small rises in underlying growth rates ...

R	$\mathcal{I}_G$	Compensating Ψ (%) 0.28	0.30	0.34	0.36	0.38	0.40
1		-4	-2	2	5	8	11
2		-8	-4	5	10	16	23
5		-19	-10	12	27	46	69
10		-34	-20	26	63	113	185

Table 2: **Distribution matters but, when R is low, not as much.** Base $\mathrm{Var}\,\epsilon$ sets inequality $\mathcal{I}_G = 0.32$; growth $\xi = 1.02$; persistence $\alpha = 0$; and discount $\delta = 0.98$. To compensate for rises in inequality, permanent consumption levels have to increase some.

- For $R = 1$, growth multiplier 50×; Gini multiplier 1×. Changes in different directions as $R \nearrow$.
- Inequality more than business cycles (Krueger and Perri 2004 [6%]; Lucas 1987, 2003 [0.1%])

$$\Delta \log \overline{z} \doteq (R/2) \times \Delta \left(\sigma^2\right).$$

  US business cycles, $\sigma = 0.013$
  Inequality, $\sigma = 0.58$ (45×)

- China: $R = 2$ (adding: +31; combining: roughly the same)? Or $R = 5$ (adding: -44, combining: roughly the same)

		Compensating Ψ (%)				
R	α	0.25	0.50	0.75	0.95	0.98
1		1	2	5	28	57
2		1	4	10	42	66
5		3	7	14	27	28
10		5	7	7	−8	−26

Table 3: **Mobility matters.** Initial $\epsilon(0)$ at 5th percentile of stationary distribution; base $\alpha = 0$; Var ϵ sets $\mathcal{I}_G = 0.32$. At a low initial level of consumption, to compensate for declines in mobility, permanent consumption levels have to rise (mostly). The relation is not monotone everywhere.

Global dynamics and welfare

		Compensating Ψ (%)				
R	α	0.25	0.50	0.75	0.95	0.98
1		0	0	−1	−4	−8
2		0	−1	−2	−10	−17
5		−1	−3	−7	−28	−42
10		−2	−5	−11	−42	−63

Table 4: **Mobility matters.** Initial $\epsilon(0)$ at 50th percentile of stationary distribution; base $\alpha = 0$; Var ϵ sets $\mathcal{I}_G = 0.32$. At an average initial level of consumption, to compensate for declines in mobility, permanent consumption levels have to fall, although not by as much as in Table 5, where initial consumption is yet higher.

R	α	Compensating Ψ (%)				
		0.25	0.50	0.75	0.95	0.98
1		0	-1	-4	-17	-28
2		-1	-2	-7	-26	-39
5		-2	-5	-12	-41	-59
10		-3	-6	-15	-50	-72

Table 5: **Mobility matters.** Initial $\epsilon(0)$ at 95th percentile of stationary distribution; base $\alpha = 0$; Var ϵ sets $\mathcal{I}_G = 0.32$. At a high initial level of consumption, to compensate for declines in mobility, permanent consumption levels have to fall a lot.

Mobility

1. $\epsilon(0)$ — 50%, 95%: Mobility soundly disliked.
2. $\epsilon(0)$ — 5%: Mobility favored, except at very high (R, α). Mobility has implications for uncertainty.
3. Mobility effects large: $\alpha = 0 \to 0.95$ at $R = 5$ comparable to $\mathcal{I}_G = 0.32 \to 0.36$ or $\xi = 1.02 \to 1.07$.

CONCLUSIONS

1. Global imbalance; global savings glut
   - US consumption versus Asian savings
   - Importance of oil exporters
2. Welfare analytics
   - Overwhelming importance of growth for poverty alleviation
   - Nuances in welfare: Risk and mobility

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