Inequality in global production and trade: A proposal for measurement

by

Utz-Peter Reich

Groningen, July 18-19, 2013

Scheme of input-output table

Intermediate consumption	Final use Domestic Exports	Total use
Value added		
Imports		
Total supply		

Terminology (SNA)

Goods and Services Account	
Output	Intermediate con-sumption
Imports	Final use
(Taxes)	Exports
Total supply	Total use

Terminology (SNA)

- Supply is the sum of output and imports.
- Output equals intermediate consumption plus gross value added.
- Output is always domestic, by definition (establishments in the economic territory).
- Intermediate consumption excludes intermediate use of capital goods.

Scheme of input-output table with suggested PPP-supplement

Intermediate consumption	Final use Domestic Exports	Total use	1 PPP's 59
Value added			
Imports			
Total supply			

Content

- Illustration of the Geary-Khamis system by way of a two-country, two-product world,

- Approximate compilation for eight actual countries,

- Review of two theories of unequal exchange.

Two countries, two products (X, Y), no trade

Billion A$ Billion B$

IC1	X1
	Y1
VA1	

IC2	X2
	Y2
VA2	

PPP x
PPP y

VA1 = X1 + Y1 [bill. A$]   VA2 = X2 + Y2 [bill. B$]
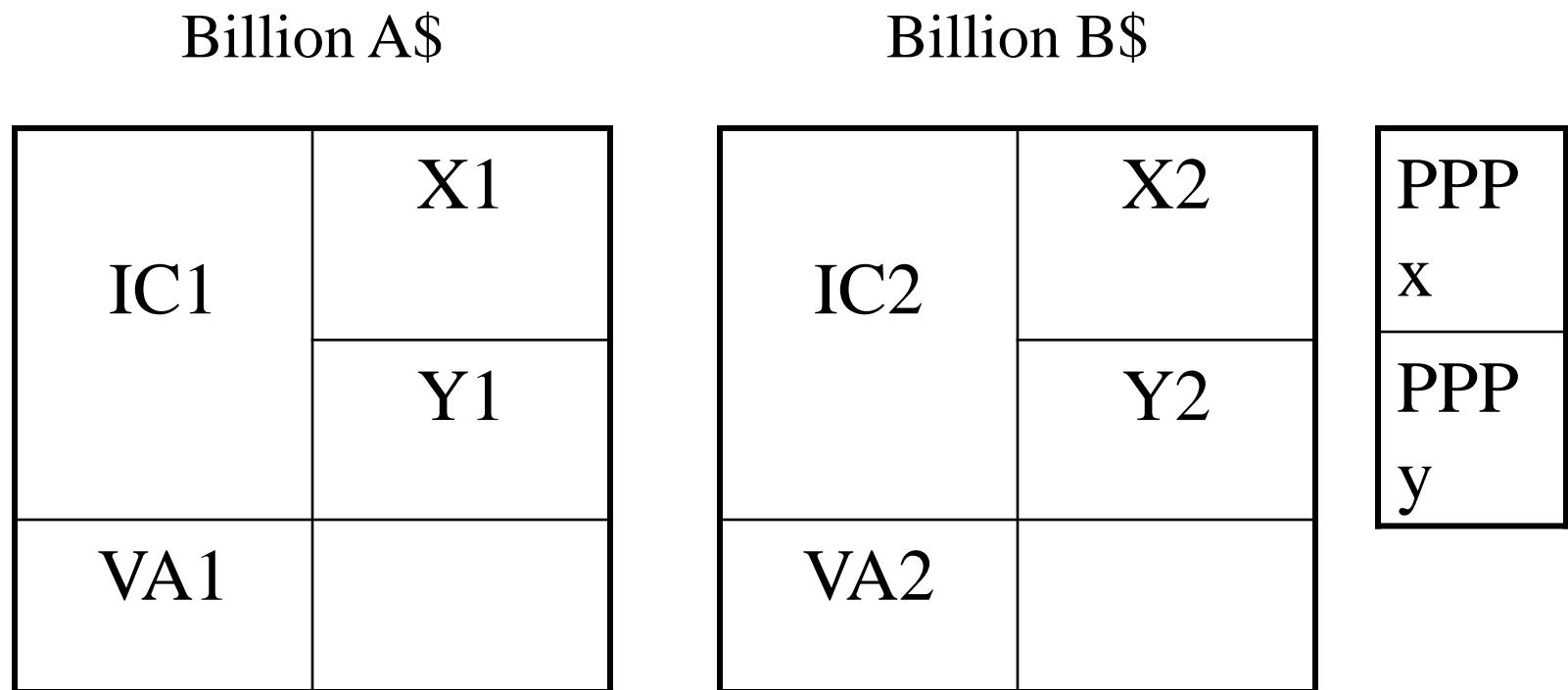
Purchasing power parities

PPP's measure the ratio between two national prices of a product.

Condition: Homogeneity of product across countries ("A potato is a potato")

$$PPPx = \text{price X2} / \text{price X1} = 1.50 \ [B\$/A\$]$$
$$PPPy = \text{price Y2} / \text{price Y1} = 0.70 \ [B\$/A\$]$$

World prices and world currency unit

world price $\times$ world volume = world expenditure, for every product:

$$\pi x \, (\, X1 + X2/1.5) = X1 + \varepsilon \, X2 \, [\text{A\$}]$$

$$\pi y \, (\, Y1 + Y2/0.7) = Y1 + \varepsilon \, Y2 \, [\text{A\$}]$$

National GDP in world currency = GDP in world prices, for every country:

$$\varepsilon \, (X2 + Y2) = \pi x \, X2 + \pi y \, Y2 \, [\text{A\$}]$$

If
X1=X2=Y1=Y2=1 then:

πx = 1.208 (world price of X)

πy = 0.829 (world price of Y)

ε = 1.014 [A\$ / B\$] (parity exchange rate)

VA1 = 2.000 [A\$]

VA2 = 2.028 [A\$]

Two countries, two products X, Y, with trade
at current exchange rate e [A$/B$]

Billion A$

	Dom. fin. use	Exports
IC1	1	1
	1	1
Value added	2	
Imports	1	1	

Billion A$

	Dom. fin. use	Exports
e IC2	1	1
	1	1
Value added	2	
Imports	1	1	

Geary-Khamis system

$$\pi^x \left(x_{11} + \frac{e}{ppp^x} x_{22} \right) = x_{11} + \varepsilon\, e x_{22}$$

$$\pi^y \left(y_{11} + \frac{e}{ppp^y} y_{22} \right) = y_{11} + \varepsilon\, e y_{22}$$

Real trade
balance

$$\pi^x \left(e\frac{x_{22} + x_{21}}{ppp^x} - x_{12} \right) + \pi^y \left(e\frac{y_{22} + y_{21}}{ppp^y} - y_{12} \right) = \varepsilon\, e\, (x_{22} + x_{21} + y_{22} + y_{21}) - x_{12} - y_{12}$$

Volume of GDP2   =   Parity value of GDP2

(at world prices)   (at national prices,

converted at parity rate)

If
$e = 1, ppp^x = 0.5, ppp^y = 0.8$ then :

(Billion A$)

	Dom. fin. use	Exports
(IC1)	.86	.86
	1.57	1.57
VA 1.18		
Im 1.71 | 1.97		

	Dom. fin. use	Exports
(IC2)	1.71	1.71
	1.97	1.97
4.93	Ex:	3.68
.86 | 1.57	Im:	2.43

RTB: 1.25

Country 1   Country 2

Trade between 8 countries 1995

(billion US$, at current exchange rates)

from: \ to:	DEU	FRA	JAP	USA	BRA	CHN	IND	RUS
DEU	--	55.6	14.8	42.4	7.5	7.0	4.4	8.3
FRA	52.0	--	8.1	23.6	2.2	3.6	1.5	2.2
JAP	27.4	10.6	--	**123.7**	3.2	31.4	2.5	1.6
USA	48.4	31.8	**84.2**	--	14.8	**17.1**	4.5	4.3
BRA	3.9	2.1	4.0	15.8	--	0.8	0.3	0.3
CHN	14.7	7.2	41.3	**64.5**	1.3	--	2.6	2.4
IND	2.9	1.2	3.0	6.4	0.1	0.6	--	0.8
RUS	9.9	3.8	5.0	4.8	0.7	2.1	1.2	--

Source:WIOD

Nominal trade balances 1995
(billion US$, at current exchange rates)

with: of:	DEU	FRA	JAP	USA	BRA	CHN	IND	RUS	Sum
DEU	--	3.6	-12.6	-6.4	3.7	-7.8	1.5	-1.5	-19.4
FRA	-3.6	--	-2.5	-19.6	0.1	-3.6	0.3	-1.6	-19.1
JAP	12.6	2.5	--	39.4	-0.8	-9.9	-0.4	-3.4	40.1
USA	6.4	19.6	**-39.4**	--	-1.0	**-47.4**	-1.9	-0.5	-75.7
BRA	-3.7	-0.1	0.8	1.0	--	-0.5	0.2	-0.4	-2.7
CHN	7.8	3.6	9.9	47.7	0.5	--	2.0	0.2	71.3
IND	-1.5	-0.3	0.4	1.9	-0.2	-2.0	--	-0.4	-2.0
RUS	1.5	1.6	3.4	0.5	0.4	-0.2	0.4	--	7.5

Source:WIOD and own calculations

Gross national income 1995
(billion US$)

	DEU	FRA	JAP	USA	BRA	CHN	IND	RUS
Current ex-change rates	2,332	1,495	5,187	7,480	628	644	361	392
Purchasing power parity	1,818	1,199	2,901	7,337	1,001	1,783	1,090	825
Real ex-change rate	0.780	0.802	0.559	0.981	1.594	2.769	3.019	2.105

Source: World Bank and own calculations

Trade between 8 countries 1995
(billion US$, at real exchange rates)

to: from:	DEU	FRA	JAP	USA	BRA	CHN	IND	RUS
DEU	--	43.4	11.6	33.1	5.9	5.4	3.5	33.1
FRA	41.7	--	6.5	19.0	1.8	2.9	1.2	1.8
JAP	15.3	6.0	--	**69.2**	1.8	17.6	1.4	0.9
USA	47.8	31.2	**82.6**	--	14.5	**16.6**	4.4	4.2
BRA	6.2	3.4	6.3	25.1	--	1.3	0.6	0.4
CHN	40.8	20.0	114.3	**178.6**	3.5	--	7.3	6.5
IND	8.7	3.7	9.0	19.4	0.4	1.9	--	19.3
RUS	20.8	8.0	10.5	10.1	1.4	4.4	2.5	--

Source:WIOD, World Bank and own calculations

Real trade balances 1995
(billion US$, at purchasing power parity)

with: of:	DEU	FRA	JAP	USA	BRA	CHN	IND	RUS	Sum
DEU	--	1.7	-3.8	-14.8	-0.3	-35.4	-5.3	-14.3	-72.1
FRA	-1.7	--	0.6	-12.2	-1.5	-17.1	-2.5	-6.2	-40.7
JAP	3.8	-0.6	--	-13.5	-4.6	-96.7	-7.6	-9.6	-128.7
USA	14.8	12.2	**13.5**	--	-10.6	**-161.8**	-14.9	-5.9	-152.7
BRA	0.3	1.5	4.6	10.6	--	-2.2	0.1	-1.0	14.0
CHN	35.4	17.1	96.7	161.8	2.2	--	5.3	2.1	320.6
IND	5.3	2.5	7.6	14.9	-0.1	-5.3	--	-0.1	24.6
RUS	14.3	6.2	9.6	5.9	1.0	-2.1	-0.1	--	35.0

Trade balances summarised 1995
(billion US$)

Valued at:	DEU	FRA	JAP	USA	BRA	CHN	IND	RUS
Current exchange rates	-19.4	-19.1	40.1	-75.7	-2.7	71.3	-2.0	7.5
Real exchange rates	-72.1	-40.7	-128.7	-152.7	14.0	320.6	24.2	35.0
Balance	-52.7	-21.6	-168.8	-77.0	16.7	249.3	26.2	27.5

Sources: WIOD, World Bank and own calculations

Prebish and Singer: Theory

Developing countries are disadvantaged in
world trade because their terms of trade
are falling in the long run. Reasons are

a) price elasticities of demand,

b) income elasticity of primary products,

c) monopolistic profit,

d) organised labour in developed countries.

Prebish and Singer: Facts

Terms of trade in years 1980 - 2009
2000 = 100
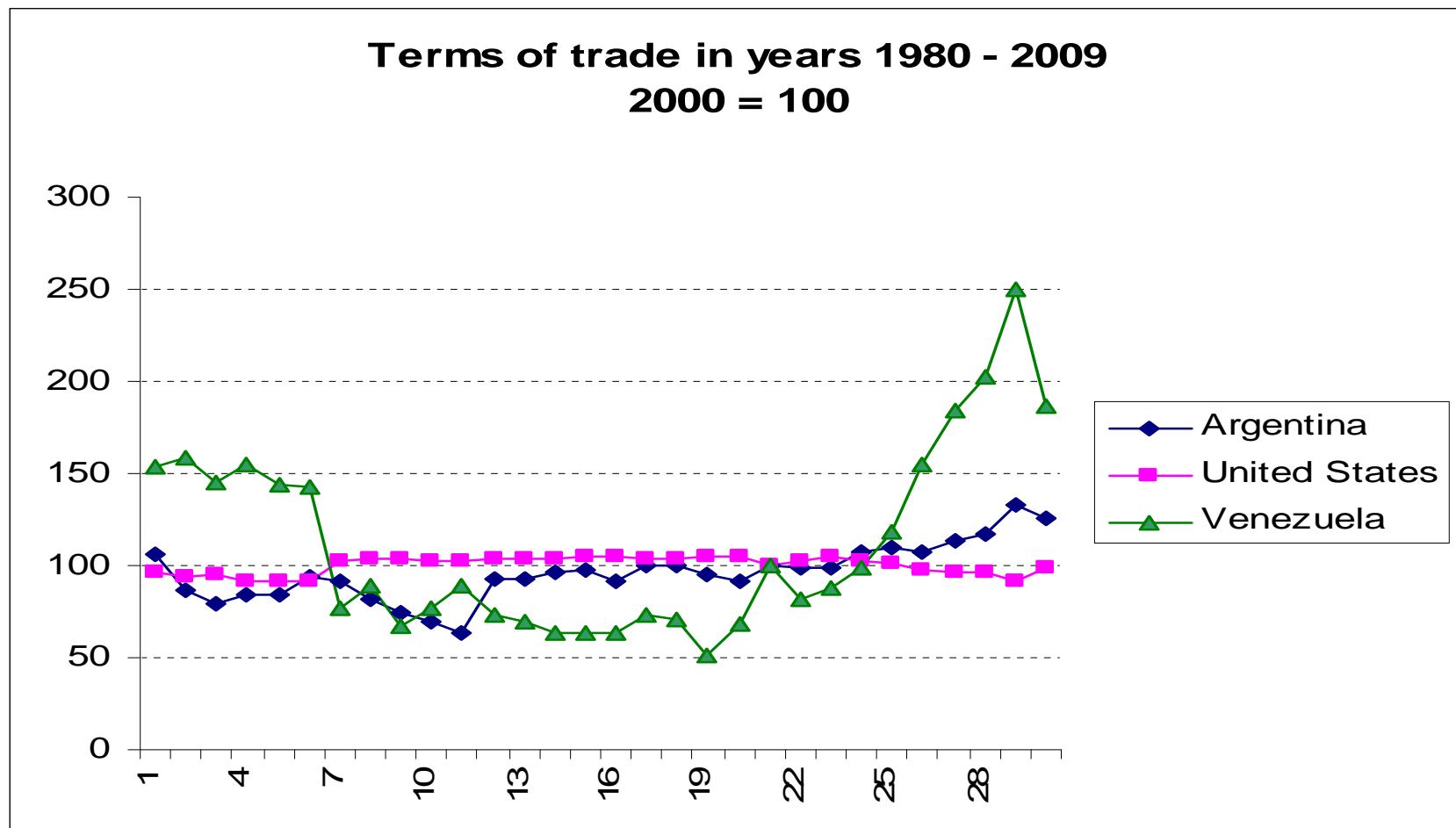
Prebish and Singer: PPP-adjusted

Value added terms of trade in years 1980 - 2009
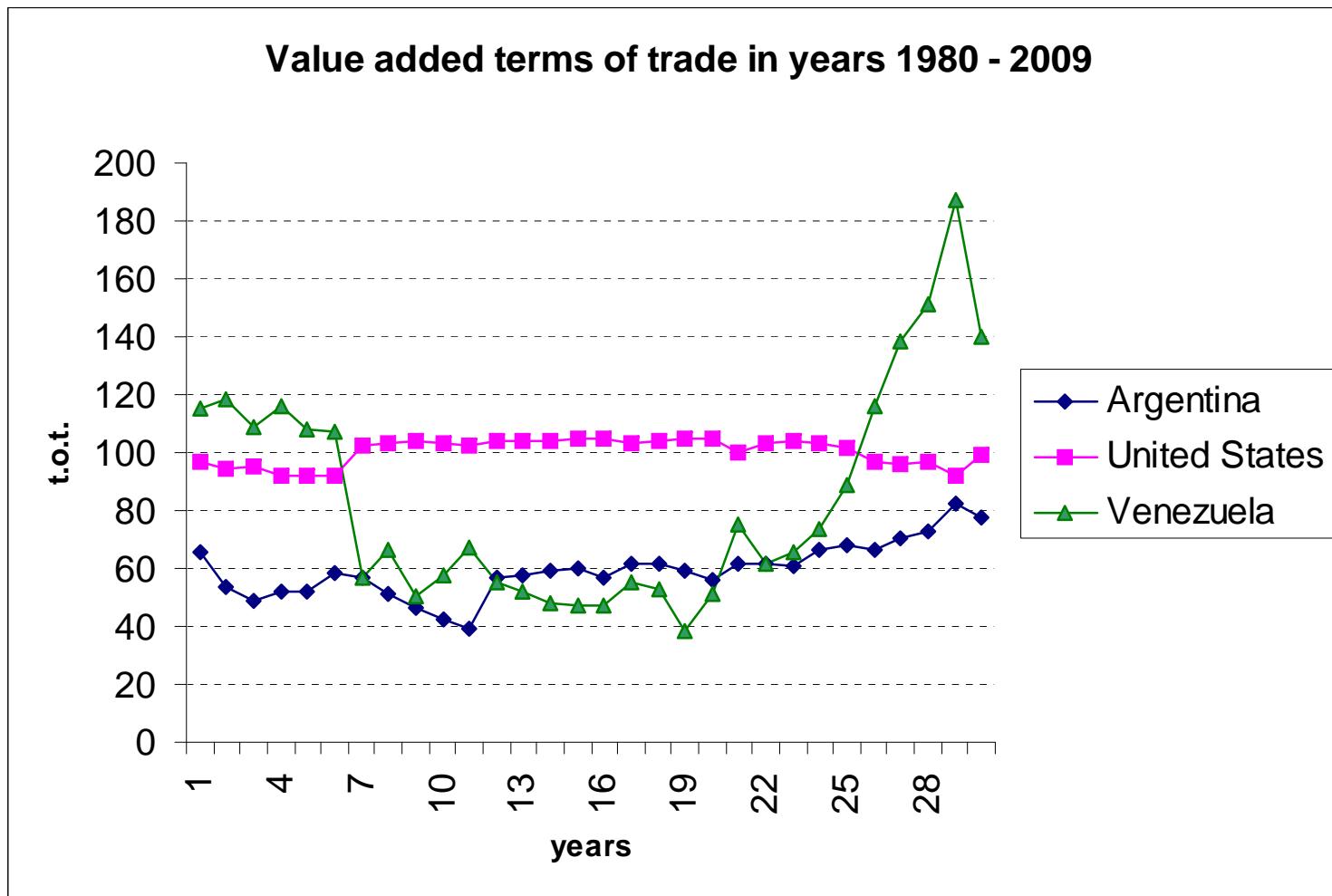
Arghiri Emmanuel: Uneven exploitation

Country	A	B
Output at national prices	170	170
Intermediate consumption	50	50
Compensation of employees	100	20
National operating surplus	20	100
Capital stock	240	240
World rate of profit	25%	
International operating surplus	60	60
Output at international prices	210	130

Conclusion

Supplement WIOD by a table of purchasing power parities at the elementary product group level

$$PPP_{ij,}$$
$$i = 1,...,59$$
$$j = 1,...,40$$

Allowing to compile value added of countries in real terms, and to estimate their inequality in trade.

Literature

Reich, U.-P., PPPs for SDRs? Some theoretical observations on how to normalise, capture the dynamics, and extend the application of, global purchasing power parities in: *Journal of Economic and Social Measurement (2013)*, in press.