Spurts and lags as Brazil fell behind before 1913: a Puzzle in the Great Divergence

EPRG Seminar 11/05/2017 Steve De Castro

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After its final abolition of slavery in 1864-5, the US GDP per capita (*GDPpc*) began to grow at a steady high rate of about 1.7% per annum (*p.a.*).

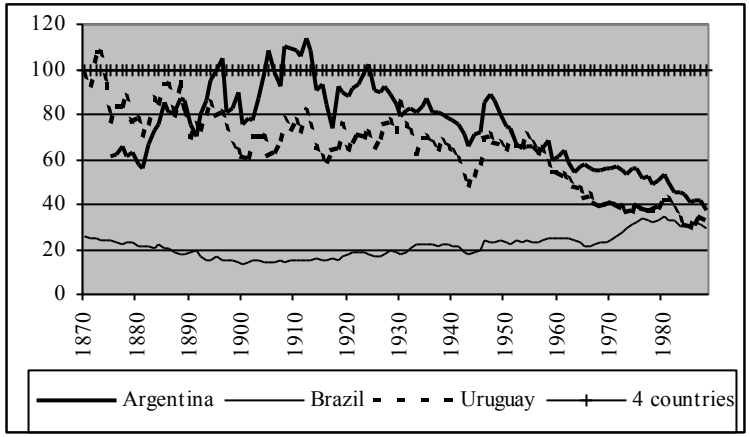
Celso Furtado's classic [1963, original 1959] found the Brazil *GDPpc* to have grown substantially from 1850 at 1.5% *p.a.* , both as slavery was phased out from 1850 to 1888, and beyond to 1950, the terminal year of his data.
Three subsequent primary sources found Brazil's late 19th century trajectory to be several decades of secular stagnation if not decline, at least to 1900.

By 2007, Furtado's monograph went through 34 editions with only minor revisions. Its view that the abolition of slavery and the substitution of sugar exports by mainly coffee, produced increasingly by free workers led to a growth surge after 1850, became the dominant paradigm in economic history courses in universities here.

The paper introduces new research on the Brazil-US data on GDP per capita for 1800-1950 and especially for before 1913, with direct, quantitative, single-year comparisons which avoid the index number problems which so plague the economic history of both economies.

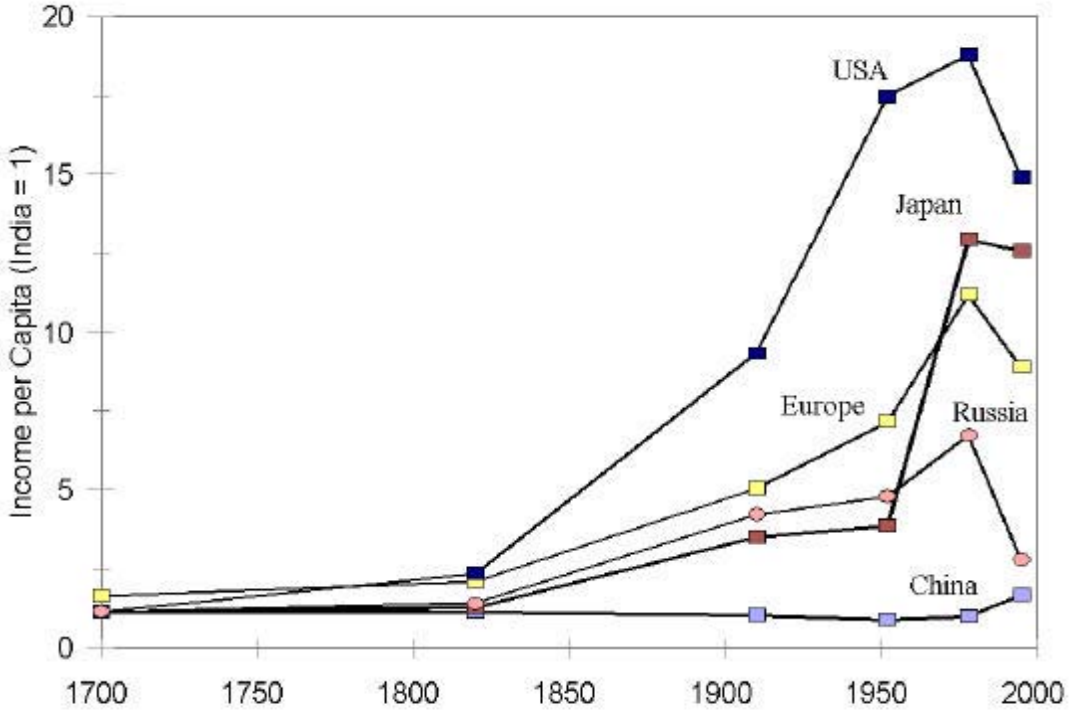
The technique should be done for all the third-world mega-economies which together contain most of the world's population and which are currently undergoing rapid structural change.

Graph 1. Argentina, Brazil and Uruguay, 1870-1988: per capita GDP relative to the average of France, Germany, the U.K. and the U.S.A. (100)



Source: Bértola, L. & Porcile, G [1998]

Incomes per Capita Relative to India



From: R. Feenstra & G.Clark [2001] Figure 1.

Table 1: Growth rates, 1800-2000

Period	Brazil GDP pc	USA GNP pc	
1822-2000	1.55%	1800-1989	1.67%
1822-1950	1.01%	1820-1950*	1.56%
1822-1900	0.16%	1800-1913	1.60%
1822-1850	0.44%	1800-1850	1.10%
1850-2000	1.76%	1869-1996	1.74%
1850-1950	1.18%	1869-1950	1.66%
1850-1900	0.01%	1869-1900	1.73%
1900-2000	2.64%	1900-1996	1.76%
1900-1950	2.34%	1900-1950	1.89%
1950-2000	2.93%	1950-1996	1.89%
1950-1975	4.48%	1950-1975	1.52%
1975-2000	1.39%	1975-1996	2.10%

Source: De Castro & Gonçalves [2005] Brazil; average, not point to point

Table 1: Brazil *GDPpc* as %US, 1800-1950

	Brazil				USA		
	1950 prices			%US	1840 prices		1950 prices
Year	(1)	(2)	(3)		(4)	(5)	(6)
1800	$50	$84	-	-	$58	$73	$202
1822[1]	-	-	$196	92%	$61	$77	$213
1850	$50	$84	$202	73%	$100	$100	$276
1900	$106	$177	$212	28%	-	-	$754
1913	-	$215	$215	20%	-	-	$1,054
1950	$224	$373	$196	11%	-	-	$1,874

- means not available from the source of the data in the column. $ are US dollars

Notes and Sources

Note 1.US data not 1822 but 1820

Col (1) Furtado [1963] p.118, 164, 270.

Col (2) Author modified Furtado by using Leff-Haddad benchmark for 1913, US$215, and interpolating from it with Furtado's 1.5% *p.a.* for 1850 through 1950. For 1800, Furtado's stagnation, 1800-50.

Col (3) Leff [1982] p.47, 214. For 1950, the $196 is for 1947 at the 1947 official exchange

Cols (4), (5) are for the USA from David [1967] and Weiss [1989] respectively, in 1840 prices

Col (6) For USA, 1800-1850 are converted to 1950 US$ from Weiss [1989]. For USA 1900, 1950from McGreevey & Tyrer[1968]; 1913 from Hanson II [1988]

GDP/head: Selected Countries, Americas, 19th century*

	Moohr	Eisner	Moohr	Eisner	Atack & Passell			Engerman & Sokoloff			Maddison		
	British Guiana	Jamaica	British Guiana	Jamaica	US South	US Midwest	USA Total	USA	Cuba	Brazil	Brazil	USA	UK
	£ const.		$ current					$ const. 1985			$ const. 1990		
	1912	1910											
1775							60						
1800								807	904	738			
1820							74				670	1287	1756
1830							92						
1832	23.9	15.6	100	65									
1840					74	65	109						
1850	19.4	12.2	77	45				1394	1087	901			
1860					103	89	128						
1870	20.7	11.9	95	55							740	2457	3263
1880					79		205						
1890	22.4	12.4	121	67									
1900					128						704	4096	4593
1910	24.0	13.7	117	67									
1913					200		399[2]	4854	1893	700	839	5307	5032
1920													
1930		15.7		93	466		847[3]						

*Table taken from De Castro [2004], "Wrong incentives for growth in the transition from modern slavery to firms and labor markets: Babylon before, Babylon after", *Social & Economic Studies 53(2):75-116.* Full text is available on-line at Proquest Periodicals.

Milton Friedman's "quantity theory" equation derives the per capita income growth rates from the currency stock growth:

$$g = g_{cs} + g_v - g_z$$

where g is the growth rate of real, monetized per capita income, and the other three symbols are the growth rates of respectively the currency stocks, the income velocity of circulation and the share of the currency stock in the total money supply.

Leff himself did not take the extra step to obtain the per capita income growth rates g in his [1972] paper but only interpreted verbally the currency stock growth as a proxy variable for them.

Although Leff [1972] had three estimates for g_v and one for g_z he chose the intermediate value for g_v to yield a constant value for $(g_v - g_z)$, minus 0.6. The following gives his g_{cs} data and the g we derived.

"Spurts and lags…" Table 2

Periodization of *GDPpc* in 19th century: Brazil & USA

Brazil	g_{cs}	g	USA	*GDPpc*
1822-1869	1.2%	+0.6%	1820-1870	+0.9%
1870-1894	0.3%	-0.3%	1870-1900	+2.7%
1895-1913	2.2%	+1.6%	1900-1913	+2.6%
1822-1913	--	+0.6%	1820-1913	1.7% C&O´R
1870-1913	--	+0.7%	1870-1913	1.8% ditto

Source: USA: Our Table 1 above, column 6; and C&O´R: Crafts & O´Rourke [2013]

"Spurts and lags…" Appendix Table 3

Brazil *GDPpc* as % of USA, 1800-1950

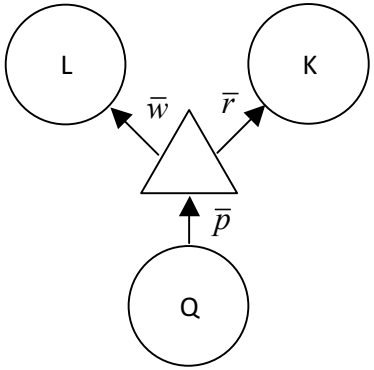
Year	USA	Brazil	%US	Prices	Sources
1800	$626	$437	70%	1980	Coatsworth [1993]
1800	$80	$29	36%	1800	Coatsworth [1998]
1820	$276	$97	35%	1965	Maddison [1983]
1820	$1278	$670	52%	1990	Maddison [1995]
1822	$213	$196	**92%**	1950	See Table 1 in text
1822	$253	$196	78%	1950	Leff [1982] p.47
1850	$276	$202	**73%**	1950	See Table 1 in text
1850	$1082	$533	49%	1980	Coatsworth [1993]
1860	$550	$55	10%	1966	Contador *e* Haddad p.413
1870	$567	$101	18%	1965	Maddison [1983]
1870	$2457	$740	30%	1990	Maddison [1995]
1870	$339	$206	**61%**	1950	See Table 1 in text
1900	$2911	$436	15%	1980	Coatsworth [1993] citing Maddison [1989]
1911-13	$981	$215	**22%**	1950	Brazil: Haddad to Leff [1982] p.47
1913	$1344	$169	13%	1965	Maddison [1983]
1913	$391	$80	20%	1913	Hanson II [1988]
1947	$1622	$196	12%	1947	Leff p.214 FGV + official exchange rate
1950	$10,350	$1656	**16%**	1996	Penn tables Mark 5

Years and %US in bold script are our most plausible estimates of the Brazil-US gaps.
Brazil 1822, for example, is put at 92%US from our Table 1 in the text, consistent with the view that the Great Divergence had not yet started so that, before 1850, all economies then had more or less the same *GDPpc*.

Additional notes on sources and methods:

1822 US: Leff (Kuznets) Chap 3, note 37; Brazil: Leff interpolated from 1911-13 at 0.1% p.a.
1860 Contador *e* Haddad p.413
1911-13 US: Extrapolated from McGreevey &Tyrer[1968] 1900 at 1.8% *p.a*. Brazil: Leff to US$ from Haddad's average of three years, 1911-13, in 1947 *mil-reis*
1947 Leff p.214 from FGV national accounts + official exchange rate
1950 Summers-Heston Penn tables Mark 5

Three Markets and one hierarchical Firm



Source: De Castro [2007] "The Great Divergence: History or path dependence? Results from the Americas".

All 4 institutions shown cannot co-exist. For example, if all 3 markets, *L, K, Q* are functioning, the hierarchical firm will have no economic role. All the incentives would be in the markets and not the firm.

Modern capitalism suppresses the goods market, *Q*. Slavery suppressed the labor market, *L*, but inserting it at abolition meant one of the other three had to go. If it must be the slave plantation, as a hierarchical proto-firm, then the family farm may emerge.

In modern capitalism, even the family farm disappears and agro-business as hierarchical firms become dominant, with bosses, orders and the right to hire and fire.

Relative GDP per head in 1820 (pre-World War I borders)

From: Leandro Prados de la Escosura [2000] in Explorations in Economic History 37 (1): 1-41.

Prados de laEscosura		Maddison (R)		Exchange Rate	
lAustralia	1.023	Netherlands	1.670	Australia	1.361
2 USA	1.000	2 UK	1.437	2 UK	1.228
3 UK	0.965	3 Australia	1.316	3 USA	1.000
4 Netherlands	0.800	4 Denmark	1.282	4 Netherlands	0.959
5 France	0.713	5 USA	1.000	5 France	0.690
6 Denmark	0.513	6 France	0.829	6 Denmark	0.548

Relative GOP per head in 1850 (pre-World War I borders)

Prados de laEscosura		Maddison (R)		Bairoch		Exchange Rate	
Australia	1.096	1 Australia	1.903	1 USA	1.000	Australia	1.540
2 UK	1.000	2 UK	1.392	2 UK	0.996	2 UK	1.299
3 USA	1.000	3 Netherlands	1.372	3 Netherlands	0.928	3 USA	1.000
4 Canada	0.827	4 Belgium	1.203	4 Belgium	0.894	4 Belgium	0.889
5 Netherlands	0.791	5 Austria	1.119	5 France	0.724	5 France	0.840
6 France	0.781	6 Denmark	1.097	6 Spain.	0.681	6 Netherlands	0.796
7 Belgium	0.742	7 USA	1.000	7 Germany	0.67(1	7 Canada	0.770
8 Denmark	0.661	8 France	0.865	8 Portugal	0.565	8 Spain	0.656
9 Spain	0.638	9 Germany	0.853	9 Denmark	0.557	9 Denmark	0.655
10 Germany	0.609	10 Canada	0.783	10 Sweden	0.459	10 Germany	0.473
11 Austria	0.541	11 Spain	0.700			1 Sweden	0.442
12 Sweden	0.520	12 Sweden	0.631			12 Austria	0.441
13 Portugal	0.456	13 Portugal	0.488			13 Portugal	0320

Relative GDP per head in 1913 (pre-World War I borders)

Prados de laEscosura		Maddison (R)		Bairoch		Exchange Rate	
IUSA	1.000	1 Australia	1.125	1 USA	1.000	1 Australia	1.063
2Australia	0.976	**2 Argentina**	1.086	2 Canada	0.835	2 USA	1.000
3 Canada	0.968	3 New Zealand	1.069	3 Australia	0.754	3 Canada	0.971
4 UK	0.847	4 USA	1.000	4 UK	0.707	4 New Zealand	0.966
5 New Zealand	0.838	5 Belgium	0.966	5 Switzerland	0.705	5 UK	0.715
6 Argentina	0.813	6 UK	0.961	6 Belgium	0.655	6 Switzerland	0.662
7 France	0.770	7 Canada	0.865	7 Denmark	0.632	7 France	0.645
S Belgium	0.743	8 Switzerland	1).859	8 New Zealand	0.586	**8 Argentina**	0.633
9 Germany	0.742	9 Netherlands	0.830	9 Germany	0.555	9 Belgium	0.588
10 Switzerland	0.726	10 Denmark	0.800,,	10 Netherlands	0.552	10 Denmark	0.583
I1 Norway	0.683	11 Germany	0.754	I1 Norway.	0.549	11 Norway	0.544
12 Denmark	0.677	12 Austria	0.704	12 France	0.509	12 Germany	0.529
13 Sweden	0.673	13 France	0.687	13 Austria-Hungary	0.499	13 Sweden	0.507
14 Netherlands	0.668	14 Sweden	0.632	14 Sweden	0.493	14 Netherlands	0.438
15 Austria	0.532	15 Greece	0.539	15 Ireland	0.448	15 Austria	0352
16 Italy	0.526	16 Italy	0.527	16 Finland	0.381	16 Italy	0.339
17 Spain	0.511	17 Norway	0.463	17 Italy	0.232	17 Spain	0.332
18 Finland	0.490	18 Spain	0.442	I8 Spain	0.269	18 Finland	0.267
19 Ilungary	0.461	19 Finland	0.424	19 Russia	0.239	19 Hungary	• 0.261
20 Russia	0.451	20 Hungary	0.424	20 Greece	0.236	20 Bulgaria	0.220
2I Portugal	0.396	21 Bulgaria	0.302	21 Portugal	0.214	21 Greece	0.202
22 Greece	0.391	22 Russia	0.300	22 Bulgaria	0.193	22 Portugal	0.200
23 Japan	0.375	23 Japan	0.269	23 Japan	0.185	23 Russia	• 0.173
24 Bulgaria	0.369	24 Portugal	0.239			24 Japan	0.131

Table 1-8. The Ten Largest Economies in 1820 and 1992

	GDP (million 1990S)	GOP as Per Cent of World Total %	Population (000s)	Population as Share of World Tota %l
		1820		
1. China	199 212	28.7	381 000	35.5
2. India	110 982	16.0	209 000	19.6
3. France	37 397	5.4	30 698	2.9
4. UK	36 164	5.2	21 240	2.0
5. Russia	33 779	4.9	45 005	4.2
6. Japan	21 831	3.1	31 000	2.9
7. Austria	13 460	1.9	14 268	1.3
8. Spain	12 975	1.9	12 203	1.1
9. USA	12 432	1.8	9 656	0.9
10. Prussia	11 864	1.7	11 214	1.1
Top Ten Total	490 096	70.5	765 284	71.7
World	694 772	100.0	1 067 894	100.0
		1992		
1. USA	5 675 617	20.3	255 610	4.7
2. China	3 615 603	12.9	1 167 000	20.9
3. Japan	2 417 603	8.6	124 336	2.3
4. Germany	1 359 696	4.9	80 576	1.5
5. India	1 188 096	4.2	881 200	16.2
6. France	1 030 356	3.7	57 372	1.1
7. Italy	939 685	3.4	57 900	1.1
8. UK	927 772	3.3	57 848	1.1
9. Russia	801 837	2.9	149 400	2.7
10. Brazil	756 014	2.7	156 012	2.9
Top Ten Total	18 712 219	66.8	2 987 254	54.9
World	28 000 037	100.0	5 440 983	100.0

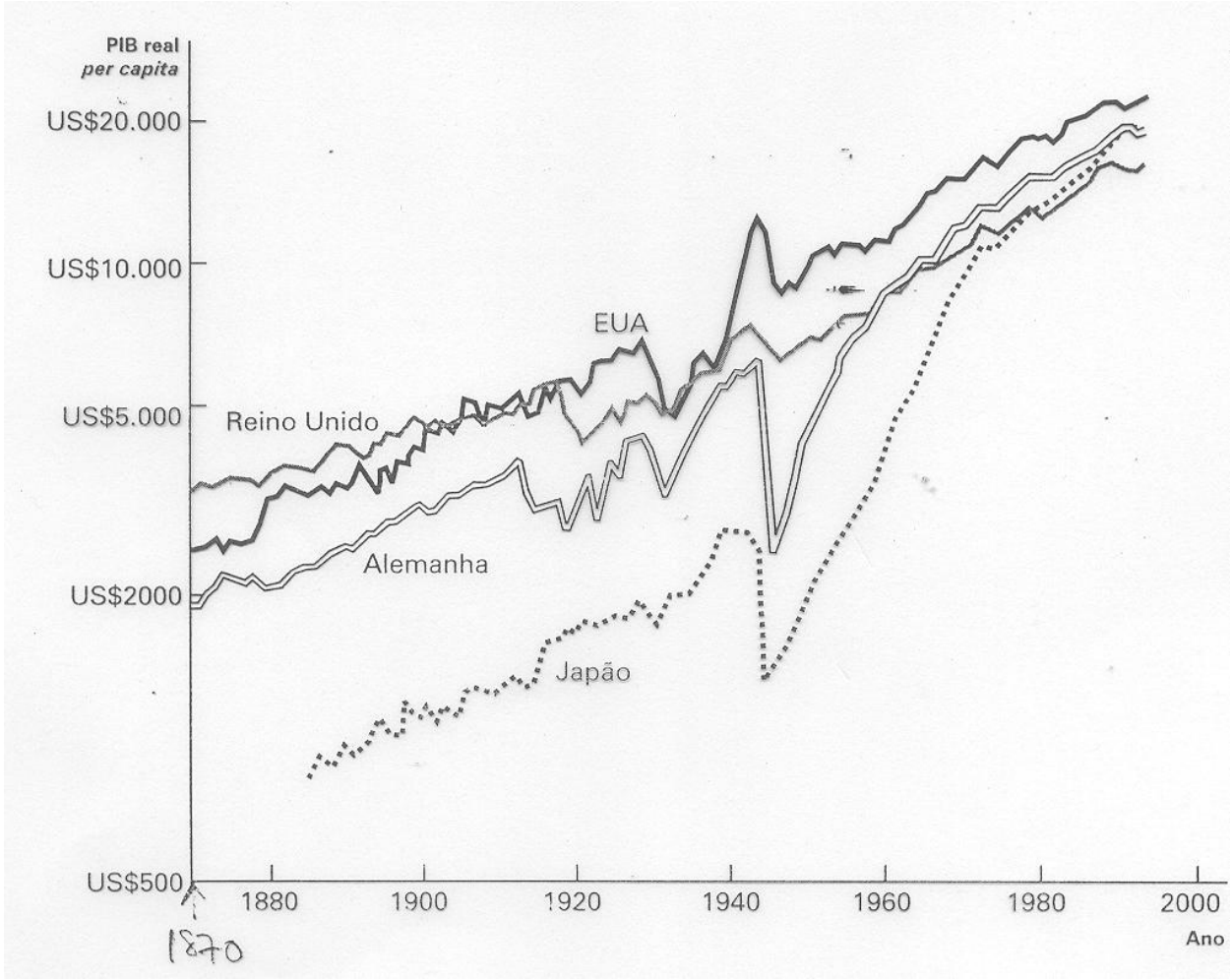
Source: Angus Maddison, Monitoring the world economy, OECD, 1995

Table 8.2 Levels of GNP in the Third World and the developed countries, 1750-1990 (in 1960 US dollars and prices)

	Total (billions of dollars)		Per capita (dollars)	
	Third World	Developed countries	Third World	Developed countries
1750	112	35	188	182
1800	137	47	188	198
1830	150	67	183	237
1860	159	118	174	324
1900	184	297	175	540
1913	217	430	192	662
1928	252	568	194	782
1938	293	678	202	856
1950	338	889	214	1,180
1970	810	2,450	340	2,540
1980	1,280	3,400	390	2,920
1990	1,730	4,350	430	3,490

Source: P. Baicoch, Economics and World history, U. Chicago Press 1993

PIB *PER CAPITA*, 1870-1994.



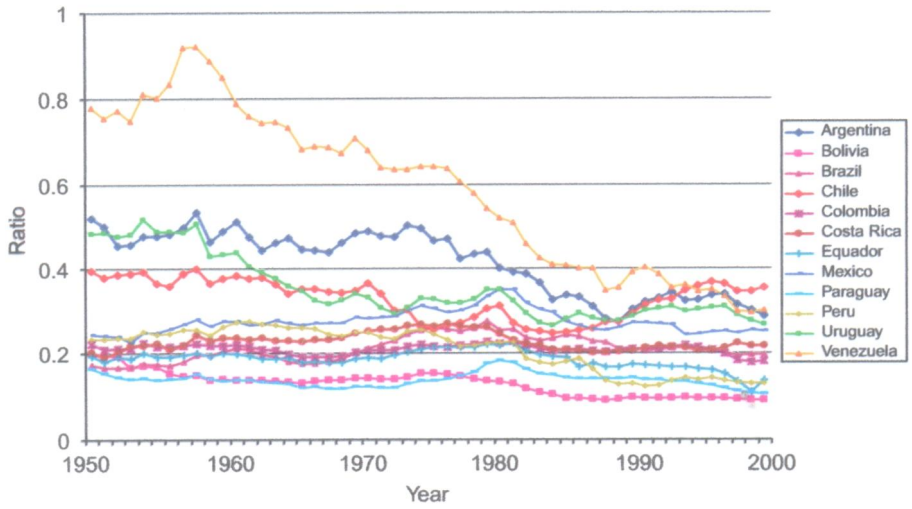


Fig. 5. Latin American GDP per capita relative to U.S.

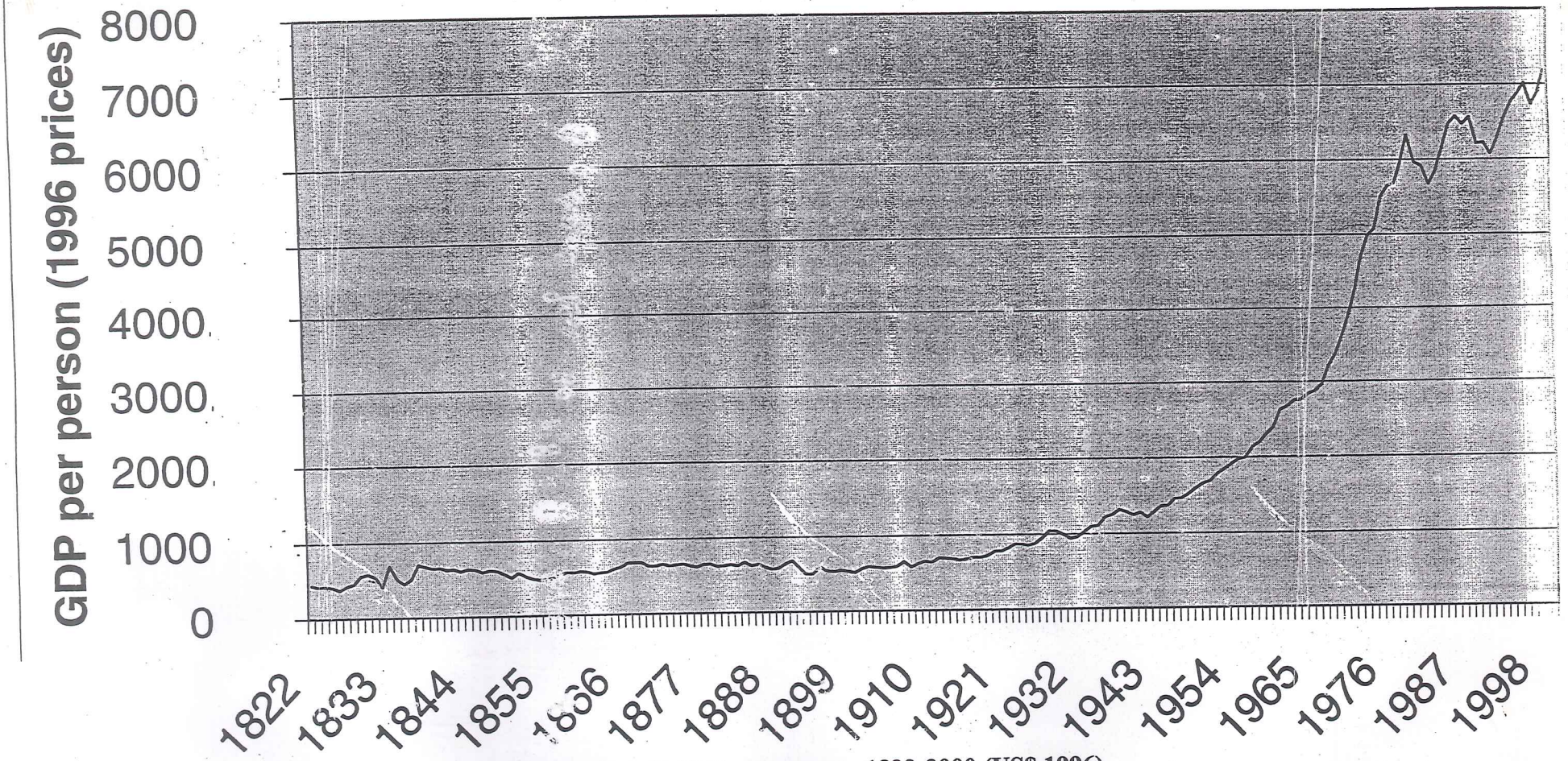
Latin American GDP per capita relative to the U.S.'

Year	1950	1980	2001
Argentina	0.67	0.52	0.44	0.29
Bolivia	-	0.20	0.14	0.09
Brazil	0.17	0.17	0.28	0.20
Chile	0.48	0.40	0.31	0.36
Colombia	0.24	0.23	0.23	0.18
Costa Rica	-	0.21	0.26	0.22
Equador	-	0.19	0.22	0.14
Mexico	0.33	0.25	0.34	0.25
Paraguay	0.25	0.18	0.18	0.11
Peru	0.20	0.24	0.23	0.13
Uruguay	0.54	0.49	0.35	0.27
Venezuela	0.20	0.78	0.55	0.30
Average	0.29	0.28	0.31	0.

'The average is computed using all of the available data in each year and is population 22

where it was in 2001.[7] For the 10 countries that we have data for over this earlier period, per-adult income in 5 of these countries has remained roughly unchanged relative to the United States. Argentina and Chile lost ground relative to the U.S.

'We have data back to 1900 for all of our Latin American countries except for Costa Rica, Boliva and Paraguay back to 1900, and these countries are small enough not to have substantially affected this average.



Brazil GDP per person, 1822-2000 (US$ 1996)

1822-1849: constructed using the monetary data and the method of N. Leff [1972].
1850-1949: constructed using the indices of growth rates from Goldsmith [1986].
1950-2000: reproduced from Summers-Heston Penn tables 5.1.
Complete series available from:

Gadelha, Sérgio Ricardo de Brito (2009), "Crescimento econômico, imigração e salários reais no Brasil, 1880-1937", *História Econômica & História de Empresas* XII (1): 71-100. Apêndice B Tabela B.1 pag. 93-4

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