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Branko Milanovic

For additional information please contact:

Branko Milanovic
1779 Carnegie Endowment for Internationla Peace
Washington DC 20036
Email: bmilanovic@ceip.org
Fax: 1-202-483-1840
Telephone: 1-202-939-2251

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INCOME CONVERGENCE DURING THE DISINTEGRATION OF THE WORLD ECONOMY 1919-39

Branko Milanovic[1]
Development Research Group
World Bank

ABSTRACT

We would expect that the process of disintegration of the world economy during the inter-war period must have led to income divergence between countries. This is implied by economic theory and recent evidence of income convergence among the highly-integrated economies of of Western Europe and North America. Contrary to this, we find a very strong evidence for income convergence among rich countries during the inter-war period, and very weak evidence for income convergence during the heyday of the First Globalization. This presents us with a puzzle. Could it be that it is not so much trade, capital and labor flows that matter for income convergence but some other, less easily observable, forces like diffusion of information and technology?

JEL classification: F02, N30
Keywords: globalization, inequality, world, inter-war history

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1. Economic integration and income convergence

One of the main arguments in favor of economic integration is that, in addition to the fact that it raises incomes of all the participants, it helps proportionately more the poorer one. This is the view that has informed much of the recent literature on income convergence—whether of the conditional or unconditional variety. It is a view that has a long and distinguished pedigree in economic theory, and is supported by a fair amount of contemporary evidence. In theory, increased trade raises real incomes of all participants. But access of the poor country to superior technology embodied in goods or capital or simply through intellectual exchange, allows greater productivity gains in a poor country that is further away from the production possibility frontier. Free capital flows will also help the poor country more, by bringing in new technology and by allowing it to tap into larger savings pool of a rich country. Finally, migration too should contribute to convergence in incomes, as people from poor countries migrate to the rich. Thus, greater integration reflected in closer sharing of information and technology (knowledge spillover), more trade, greater capital flows, and labor migration should help reduce the gap between the poor and the rich.

This view is behind a score of empirical papers on income convergence. The earliest papers on the convergence among industrialized countries over the period of a century beginning in 1870 were by Baumol (1986), and Baumol and Wolff (1988). The convergence literature continued with papers by Barro and Sala-i-Martin (1992) on convergence among OECD countries, and then among European Community members (Ben-David, 1993), individual US states (Barro and Sala-i-Martin, 1992), European regions (e.g. Cannon and Duck, 2000, p. 418), Spanish provinces (Goerlich and Mas, 2001), and so forth. [2] In all such cases, greater economic integration among units (countries or regions or states) was shown to have resulted in income convergence—as we would expect from economic theory.

[2] See also the review of findings in Barro and Sala-i-Martin (1995).

More recently somewhat greater attention was paid to the historical process of income *divergence* (Maddison 1995 and 2001, Pritchett 1997) but that fact did not detract from the mainstream belief in strong causal link between economic integration and income convergence. This is because the "Great Divergence" (as named by Kenneth Pomeranz) was due to the technological breakthroughs of the Industrial Revolution, while the divergence in GDPs per capita [3] between the countries of the world over the last 20 years was explained away by the fact that the slow-growing (or declining) countries were precisely those that did *not* integrate. [4] The only possible shadow was cast by those who regarded the "Great Divergence" as not something that occurred—for whatever institutional or geographical reasons—in one part the world (the "North") and then (slowly) spread to the rest, but who held that the growth and industrialization in the North were linked with the decline and disindustrialization in the South. Under the latter hypothesis, it is clearly integration that is the cause of the South's decline and therefore divergence of incomes.[5] The view is expressed in Krugman (1991), and was recently summarized by Baldwin and Martin (1999, p.7): At a time before the Industrial Revolution, they write, "..regions are initially identical, so the question which region takes off is a matter of happenstance. Whichever region edges ahead initially, call it North finds itself in a virtuous circle. Higher incomes lead to a larger local market in the North and this in turn attracts relatively more investment to the North. Of course, the higher investment rate leads to a growing market-size gap and the cycle restarts…As the North experiences this stylized Industrial revolution, Southern industry rapidly disappears in the face of competition from northern exports. In a self-generating process, the North specializes in industry and the South in primary goods."

So, at least we see that there is a possibility of economic integration leading to a decline in incomes in a part of the world and/or to divergence. The introduction of increasing returns to scale in the context of neoclassical or endogenous growth models

[3] The terms "GDP" and "income" are used interchangeably unless otherwise stated.
[4] For the most recent manifestation of such a view see World Bank's report on globalization (2002).
[5] Even if the South's decline (see Bairoch, 1997, vol. 2, pp. 549, 576, 648; also 1989, p.238) may not be viewed as the *cause* of the Northern success. On a more radical note, Frank (1998) arguers that the South's decline helped North's advance (Frank, 1998).

(for a review see Easterly and Levine 2001) makes this a more realistic possibility. A similar point is made by Rodriguez and Rodrik (2000) who, based on numerous empirical evidence and reruns of a number of equations originally estimated by various authors, argue that economic integration and convergence are orthogonal, and find that σ convergence among the future European Community countries continued during the inter-war period.

However, this possibility is not very seriously contemplated by many economists. The finding of income convergence among the club of the rich countries (Western Europe and its offshoots—to use Maddison's terminology) during the earlier period of globalization 1870-1913 provides empirical support for the mainstream view.[6] The well-documented post World War II convergence in incomes among the OECD countries (Barro and Sala-i-Martin, 1992, p. 244, and more recently, Maudos, Pastor and Serrano, 2000; Li and Papell, 1999; Fuente, 1999; and Tsangarides, 2002) presents a further corroboration of the hypothesis. Then, following these results and theoretical predictions, we would expect that the period, 1919-1939—the period of retreat from globalization—be characterized by increasing income gaps between the countries. And indeed Lindert and Williamson (2001, p.13) write: "Real wages and living standards [sic!] converged among the currently-industrialized countries between 1850 and World War I" and then for the inter-war period, "..there was no period when divergence between countries was more 'big time'. We do not yet know how much of this should be attributed to the great depression, two world wars, anti-global policies and other forces" (p. 19).[7] Lindert and

[6] See Williamson (1998, Figure 1), Lindert and Williamson (2001), O'Rourke and Williamson (1999).

[7] In a different paper, Williamson (1991, p.34) mentions that his finding of wage divergence in rich countries between 1914 and 1945 is contradicted by the findings of Baumol, Blackman and Wolff (1989) and Abramowitz (1986, Table 1, p. 391) that convergence of GDP per capita or GDP per workerhour continued unabated except for the period of World War II. But the contradiction is never resolved, nor is it paid much attention to. This is strange for three reasons. First, most of the literature on convergence is couched in terms of GDP per capita. Why should we use a different criterion of convergence for this period? Second, the GDP per capita data, however problematic are probably less so that the real wage data whichare a real pot-pourri of average wages of five industries (Belgium), real wage of laborers in Sydney (Australia), average wage in manufacturing (Argentina), average daily wage of laborers in building trades (Canada) etc. Even within a country, the definitions of wages used by Williamson change over time quite a lot (see Appendix 1 in Williamson 1991). Third, GDP per capita is surely a much better indicator of living standards than wages, and particularly so where wage earners account for 50 or less percent of labor force as was the case in most of these countries during the period under study.

Williamson neatly summarize their results in a table where the period 1914-1950 is described as the period of retreat from globalization which widened (notice the causality) the gaps between nations. Foreman-Peck (1998, p. xxiii) in the introduction to an excellent compendium of texts on historical foundation of globalization, summarizes the inter-war period of deglobalization: "[b]etween the wars, trade migration and currency movement impediments became far more serious, setting in train deglobalisation and divergence." Williamson (1996a p. 278) writes, "I will by inference also suggest that convergence stopped between 1914 and 1950 because of deglobalization and implosition into autarchy", or "an anticonvergence regime intervened, which stopped convergence between 1914 and 1950" (p. 281). But, if we look at the data, was this really the case?

2. What happened to income convergence between 1919-39?

That the period 1919-39 is the one of disintegration of world economy, or "deglobalization" is well known and amply documented. Disintegration affected all economic flows: real volume of trade stagnated and its share in GDPs of countries decreased compared to pre-War values, trade barriers proliferated, international capital and labor flows dried to a trickle. A short review of some of these developments is given in Annex 1.

Such a violent process of disintegration of the world economy is, according to neoclassical economic theory, expected to lead to a slowdown in growth, and—what is important for our purposes—to affect disproportionately poorer countries. As the world economy disintegrates and trade and capital and labor flows dry out, the poorer countries would lose many advantages associated with greater economic integration: ability to use foreign technology, to receive capital, to export people and goods. All but the last are supposed to be greater for the poor members, since in a neoclassical world they benefit from easy application of the already known technology, and are supposed to be recipients of capital, and exporters of people.

Did then incomes really diverge during the inter-war years? We calculate Gini, Theil and coefficient of variation for unweighted GDPs per capita of twenty major Western counties (the WENAO: Western Europe, North America and Oceania)[8] and also for a more restricted sample of the countries of Western Europe and its offshoots.[9] These are measures of inter-country inequality (with each country counting the same). [10] Gini and Theil are, of course, measures of inequality closely related to the coefficient of variation (σ) which is often used in the convergence literature (the so called "sigma" convergence). We calculate Gini, Theil and sigma-convergence (σ) across the two groups of countries for the entire period 1820-1950 (annual data after 1870; see Figures 1 and 2). The data on GDP per capita (expressed in 1990 Geary-Khamis dollars) are taken from Maddison (2001).

Figure 1 shows that using either Gini, Theil or the coefficient of variation, we find that WENAO incomes did not diverge during the inter-war period. The annual values of the three coefficients with their standard errors are given in Annex 3. On the contrary, there was convergence. In 1919, the Gini, Theil and coefficient of variation were 19, 0.056 and 0.34; in 1939, they were respectively 15, 0.037 and 0.27. [11] It is the Second World War which wrought a massive disruption of economic activity in a number of continental European countries (between 1939 and 1945, Germany's GDP per capita decreased by 23 percent, France's by almost 50 percent, Greece's by two-thirds etc.). On the other hand, the US, Canada, and Australia surged ahead (by respectively 78, 50 and 18 percent), thus widening differences in GDPs per capita and "creating" the divergence.

[8] Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom and the US.

[9] That is, the same WENAO countries from the previous footnote minus Greece, Portugal and Spain. Western Europe and its offshoots is almost the same group of countries as "the Atlantic economy" as dubbed by Williamson. The difference with Williamson's (1998) classification is that Western Europe and its offshoots as defined here includes Austria, Canada, Denmark, Finland, Italy and New Zealand, and excludes Brazil.

[10] Inter-country inequality comes in two "forms": Concept 1 inequality which we calculate here and where each country's GDP per capita is assigned the same weight, or Concept 2 inequality, where each GDP per capita is weighted by country's population The former deals with convergence or divergence, the latter presents an approximation to inequality among individuals in the world (see Milanovic, 2002a).

[11] The Gini coefficient is expressed in percents.

The inter-country Gini went up from 15 just before the outbreak of the World War II to 31 at its end; the coefficient of variation from 0.27 to 0.58. Of course, income divergence is not unique to the Second World War. The same divergence in incomes, albeit of a smaller size, occurred during the First World War (see Figures 1 and 2). We shall return to the role of the wars below.

Contrary to expectations, the evidence for income convergence during the globalization period is weaker. There was an important shrinking of income differences between 1890 and 1895 but after that the three measures if inequality display no trend until the outbreak of World War I.

Figure 1. Gini, Theil , coefficient of variation of GDP per capita WENAO countries: 1820-1950 (annual data after 1870)

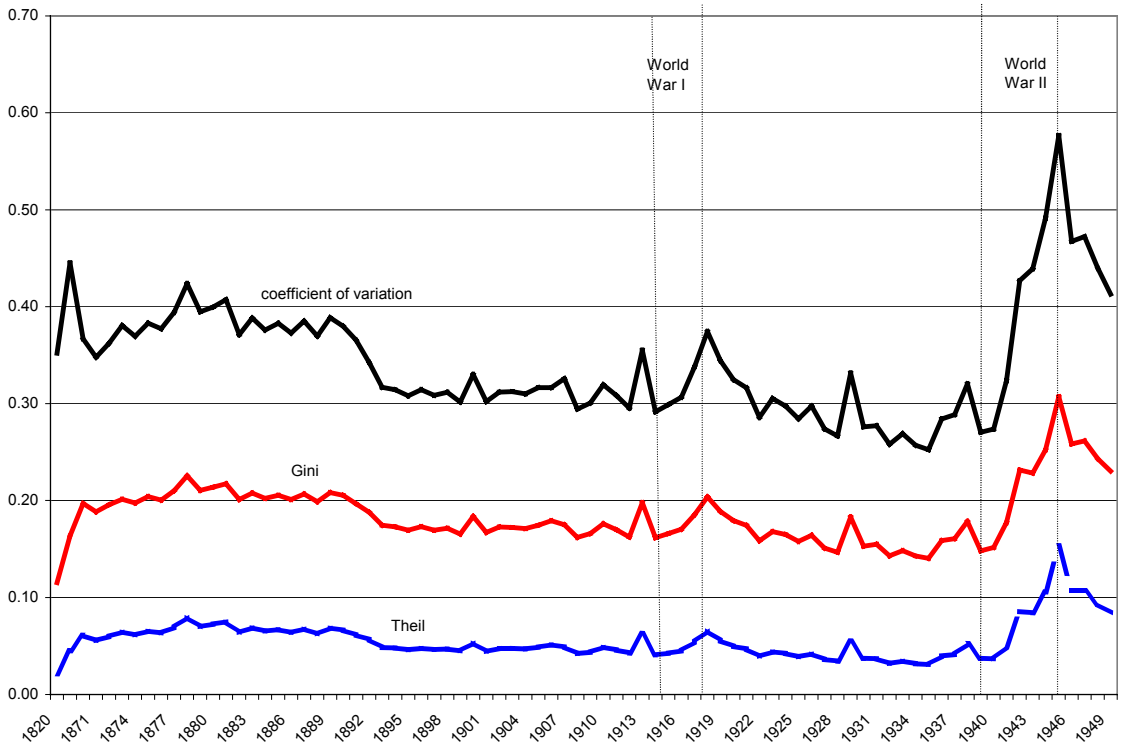
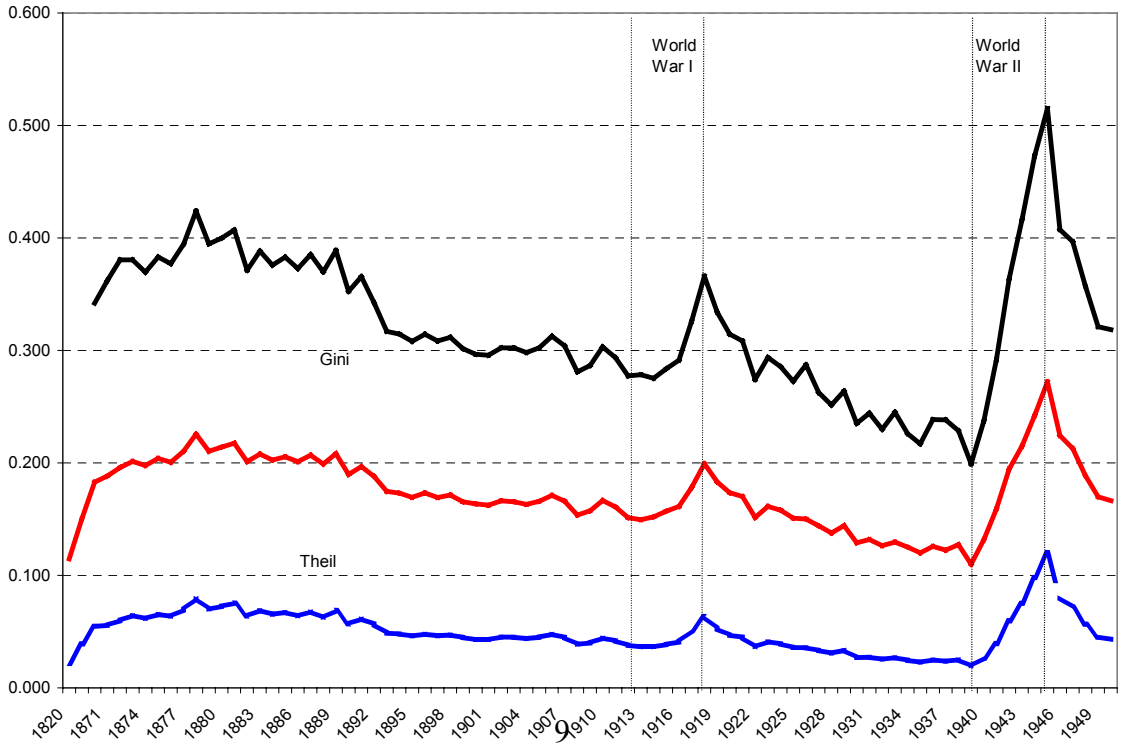


Figure 2. Gini, Theil, coefficient of variation of GDP per capita: restricted sample, 1820-1950



Even more dramatic and telling is the example of the more restricted sample of 17 countries. Figure 2 shows that the inter-war period witnessed the *fastest* income convergence ever recorded up to then. The negative slope of the Gini, Theil and coefficient of variation line is much steeper than during the heyday of the first globalization. The Gini coefficient in 1918 was 20; on the eve of the Second World War, it has almost halved: it was only 11. The coefficient of variation decreased from 0.38 in 1918 to 0.2 twenty years later. This is all the more interesting since it is with respect to this group that Lindert and Williamson claim that disintegration of world economy led to income divergence. As can be easily checked, their mistake stems from a comparison of 1913 and 1945. Indeed, income differences in 1945 were greater than in 1913, but that was entirely due to the huge difference in fortune during the Second World War. Ascribing the increase in between-country inequality to the developments during the inter-war period is entirely wrong. The Gini coefficient of GDPs per capita of the restricted sample declined almost uninterruptedly between 1919 and 1939. These countries' incomes have never (after 1870) been more similar than on the eve of the Second World War.

We can situate the changes between 1919 and 1939 in its longer-run historical perspective. As Table 1 illustrates, income differences between the rich world countries in 1939 were about the same as in 1973. It is only during the last thirty years that the differences between these countries have shrunk below the level that obtained in 1939. The Gini coefficient of GDPs per capita was (as already mentioned) only 11 on the eve of the Second World War, 11.2 on the eve of the first oil crisis, and 6.4 at the turn of the century.[12] In other words, it took almost thirty years of peacetime growth to undo the divergence effects of World War II. So, if we look at how wide was the dispersal of the rich economies' incomes in the past compared to today, it is only with greatest difficulty that we can discern some difference until rather recently. And note that we are comparing the two situations (in 1939 and 1973) where trade and capital flows and even

[12] In 1939, income ratio between the richest and poorest country was about 2 to 1. It widened to about 3 to 1 in 1973, and then shrunk to less than 2 to 1 today.

more so, trade ratios were vastly different. Incomes dispersion in a heavily integrated and a heavily disintegrated economy are thus shown to be fairly similar.

Table 1. Incomes of the rich countries in 1939, 1973 and 1999

	GDP per capita in 1939 (1990 PPP dollars)	Relative GDP per capita (richest country=1)	GDP per capita in 1973 (1990 PPP dollars)	Relative GDP per capita (richest country=1)	GDP per capita in 1999 (1995 PPP dollars)	Relative GDP per capita (richest country=1)
USA	6568	1.00	20106	0.89	30610	1.00
New Zealand	6492	0.99	13653	0.60	16660	0.54
Switzerland	6273	0.96	22674	1.00	26760	0.87
UK	5979	0.91	13469	0.59	20983	0.69
Denmark	5766	0.88	14688	0.65	23252	0.76
Australia	5631	0.86	13343	0.59	21173	0.69
Germany	5549	0.84	15199	0.67	21340	0.70
Netherlands	5409	0.82	14085	0.62	22469	0.73
Belgium	5040	0.77	14778	0.65	23668	0.77
Sweden	5029	0.77	14248	0.63	20339	0.66
France	4748	0.72	14671	0.65	22848	0.75
Canada	4518	0.69	15461	0.68	23162	0.76
Austria	4123	0.63	13414	0.59	23229	0.76
Norway	4108	0.63	11459	0.51	24074	0.79
Italy	3444	0.52	12360	0.55	20720	0.68
Finland	3310	0.50	12290	0.54	20985	0.69
Ireland 1/	3116	0.47	7036	0.31	22271	0.73
Gini	11.0		11.2		6.4	
Theil	0.019		0.025		0.008	
Richest-poorest ratio	2.1		3.2		1.9	

Sources: Data for 1939 from Maddison (1995). Data for 1973 and 1999 from World Bank SIMA database. Countries ranked by GDP per capita in 1939. The approximate conversion between 1995 and 1990 PPP dollars is 1.16 to 1.
1/ Data for 1938.

We can test for convergence also using standard regressions tests. As is conventionally done, we regress growth rate of GDP per capita (change in income logs) on initial level of income ($y_{i, t-1}$) where *i* indicates country subscript, and *t* time, [13]

[13] This formulation is rife with problems. Other than the most obvious econpometric problems of omitted variable and endogeneity (which we address below), formulation such as (1) suffers from Galton's fallacy (see Quah, 1993, Bliss 1999). The weakness of empirical tests used to test for the β convergence (so that beta convergence can be observed both when one moves forward and backward in time) and can exist

(1) $$\ln y_{it} - \ln y_{i,t-1} = \beta_0 + \beta_1 \ln y_{i,t-1} + \beta_2 \ln Z_{it} + u_i + v_t + e_{it}$$

and ln Zit = ln (n_{it}+g+δ) where n_{it}= population growth rate, g=rate of labor augmenting technological progress and δ=depreciation rate (all derived from the textbook Solow model of economic growth), and u_i, v_t, and e_{it}, country- time- and both-dependent error term. [14]All GDP per capita values are taken at 5 year intervals, and thus the growth rate (the dependent variable) is the average growth rate over a five year period.

Equations such as (1) potentially suffer from a number of econometric problems. The most obvious are the omitted variable bias where relevant country-specific information is not included, [15] and endogeneity where the dependent and independent variables are jointly determined. We thus run three formulations of (1). The results are shown in Table 2. Consider results for the entire sample of WENAO countries. In the first formulation, we simply run a pooled regression using indiscriminately cross-section and time-series data. For the pre-1914 period, we see no evidence of convergence; for the inter-war period, we obtain a statistically significant and negative coefficient on initial income. In the second formulation, we address potential endogeneity by instrumenting the right-hand side variables by their lagged values. No variable is still significant for the pre-1914 period; for the inter-war period, the coefficient on the initial income declines (as we would expect) and becomes significant at 5 percent level only. Finally, in the third formulation, we adjust for country-specific effects by estimating a fixed-effects model. [16]

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whether the underlying distribution diverges, converges or stays the same is emphasized in Wodon and Yitzhaki (2002). Even the interpreatation of the obtained results is questioned (Quah, 1996). We use this formulation because it is the simplest and the most commonly used in the (immense) literature on convergence. Our view is that direct tests of unconditional convergence (as implied in the calculation of the Gini coefficients) are superior to the tests based on the regression analysis.

[14] The sum of g and δ is assumed to be 0.05 (5 percent).

[15] The model is by necessity (since relevant variables like investment rates, education levels etc. are unavailable) a very stripped-down one. There are strong grounds to believe that relevant country-specific features are omitted. One of the ways to correct for this is to include country-specific dummy variables.

[16] In the STATA formulation, fixed effects do give an intercept term since unlike the constraint of intercept being equal to 0, the software imposes a different (equally arbitrary) constraint (the sum of country dummies=0). See http://www.stata.com/support/faqs/stat/xtreg2.html.

The results are again the same: the pre-1914 period exhibits no convergence, the inter-war period does, and a very strong one. The results for the restricted sample are, save for some small differences in the size of the coefficients, practically the same.

Table 2. Convergence in the two periods (1870-1913 and 1918-1939)
(dependent variable: annualized GDP per capita growth over the five-year interval)

(A) WENAO countries

	Pooled regression		IV regression		Fixed effects	
	1870-1913	1918-1939	1870-1913	1919-1939	1870-1913	1919-1939
ln y_{it}	-0.002	-0.018**	-0.002	-0.014*	-0.0009	-0.072**
	(0.62)	(0.003)	(0.68)	(0.05)	(0.91)	(0.00)
$\ln(n_{it}+\delta+\lambda)$	-0.007	0.027	-0.002	0.025	-0.011	0.090*
	(0.38)	(0.24)	(0.89)	(0.27)	(0.46)	(0.014)
Constant	-0.007	0.239*	0.02	0.20*	-0.01	0.857**
	(0.85)	(0.00)	(0.70)	(0.03)	(0.88)	(0.008)
No. of observations	127	90	109	88	127	90
R^2	0.01	0.09	0.01	0.08	0.01	0.21
R^2 between					0.26	0.40
R^2 within					0.01	0.11

(B) The restricted sample

	Pooled regression		IV regression		Fixed effects	
	1870-1913	1918-1939	1870-1913	1919-1939	1870-1913	1919-1939
ln y_{it}	-0.001	-0.026**	-0.002	-0.022*	-0.0008	-0.066**
	(0.72)	(0.003)	(0.70)	(0.02)	(0.92)	(0.001)
$\ln(n_{it}+\delta+\lambda)$	-0.008	0.041	-0.002	0.040	-0.012	0.089*
	(0.31)	(0.085)	(0.84)	(0.12)	(0.45)	(0.014)
Constant	-0.0008	0.346**	0.02	0.30*	-0.01	0.81**
	(0.98)	(0.00)	(0.70)	(0.012)	(0.88)	(0.000)
No. of observations	124	80	107	80	124	80
R^2	0.01	0.12	0.01	0.12	0.01	0.21
R^2 between					0.42	0.22
R^2 within					0.01	0.12

Note: Growth rate of population is calculated in exactly the same fashion, and over the same period, as that of GDP per capita.

In conclusion, the standard convergence regressions confirm the presence of convergence during the inter-war period, while it is entirely absent for the pre-1914

period. [17] Thus, the results cast doubt on two key points that seem to have become common wisdom thanks largely to many contributions by Jeffrey Williamson: first, that the pre-1914 globalization period witnessed both absolute convergence (real wage, real rent), and relative factor price convergence (wage/rental ratios) in the Atlantic economy (see Williamson, 1998, p. 68), as well as convergence of GDPs per capita (O'Rourke and Williamson, 1999, Chapter 2); second, that the de-globalization period was associated with increasing gaps between the nations. Regarding the first point, the evidence presented here gives certainly a less sanguine picture of convergence during the globalization period. It is actually somewhat surprising that the convergence was not stronger, bearing in mind how well integrated were financial markets and how open was migration. On the second point, the evidence allows us to reject the view that there was divergence of incomes among the rich countries, and thus that de-globalization must have been the cause of it. While we are agnostic as to the cause of inter-war income convergence, the fact of convergence seems beyond dispute. But this leaves us with a puzzle: Why should there be convergence while the world economy disintegrates, and moreover why would that convergence be even faster than during the period of rising trade, and capital and labor flows? We shall return to this question in the last section of the paper.

[17] For the results using two alternative data sources (Bairoch's and Prados de la Escosura's, see Annex).

Crises and wars

We have noted that the two World Wars produced remarkable income divergence among WENAO countries. But also the 1890 and 1929 crises led to a remarkable reduction in inequality between the countries. In both cases, the later crisis and war (that is, the Great Depression and World War II) produced more violent effects than the earlier episodes of crisis and war (Table 3).

Table 3. The two crises and two wars: changes in inter-country inequality

	Gini point change	Theil point change
The crises		
1890-1895	-3.7	-2.0
1929-1935	-4.3	-2.4
The wars		
1914-1918	+4.4	+2.5
1939-1945	+14.9	+11.7

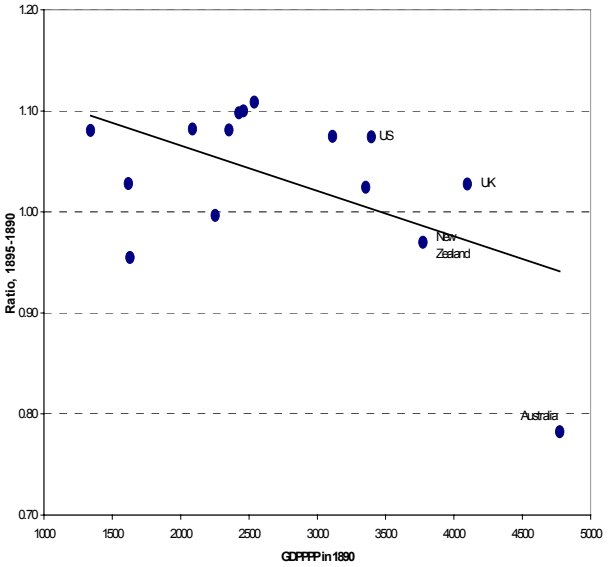
Note: The end-date for the effect of the crises is the year when the index of inequality (Gini or Theil) reaches its local minimum.

Figure 3 shows the ratio between end- and initial- period GDP per capita as function of their initial GDP per capita levels. The shrinking of income differences in 1890-1895 was driven by the severe decline in Australia (then the richest country in the world) whose per capita income declined by more than 20 percent. [18] During the Great Depression, the US played the role of Australia, but here the income declines were more neatly correlated with initial (1929) income levels. The two World Wars had exactly the opposite effect. In both, rich countries did much better than the poor (or less rich). In the First, widening income differences were created by fast growth of the United States, UK, New Zealand and Australia (the four richest countries in 1914), and in the World War II, by US, Switzerland, and New Zealand, again the three richest countries in 1939.

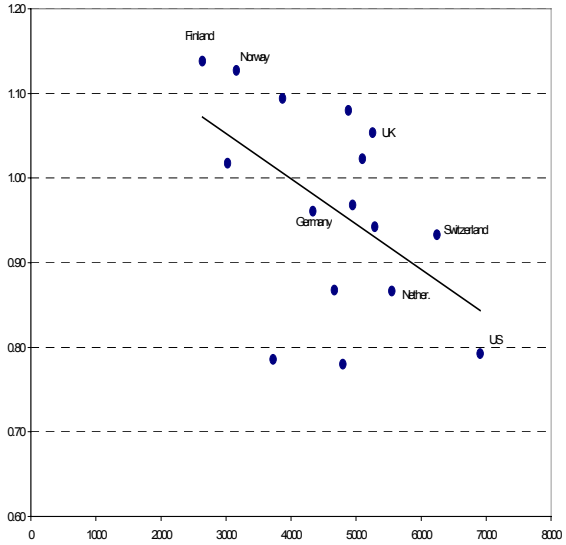
[18] Both Gini and Theil decline even if Australia is erxcluded. The declines however are smaller: 1.8 instead of 3.7 points for Gini, 0.9 instead of 2 points for Theil.

Figure 3: Ratio between end and initial year incomes plotted against initial income level

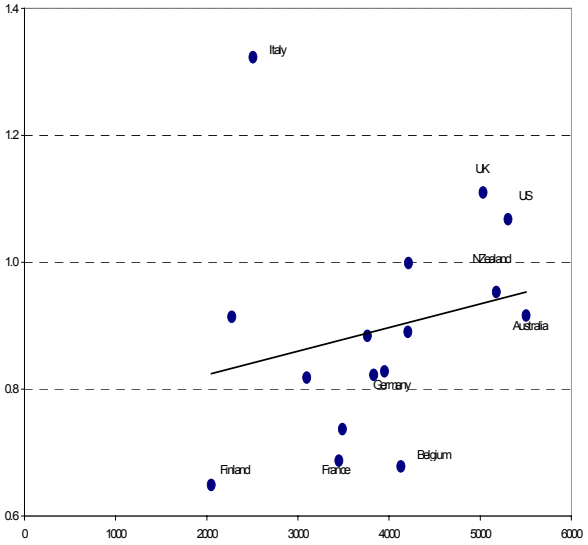
A. Crisis 1890-95



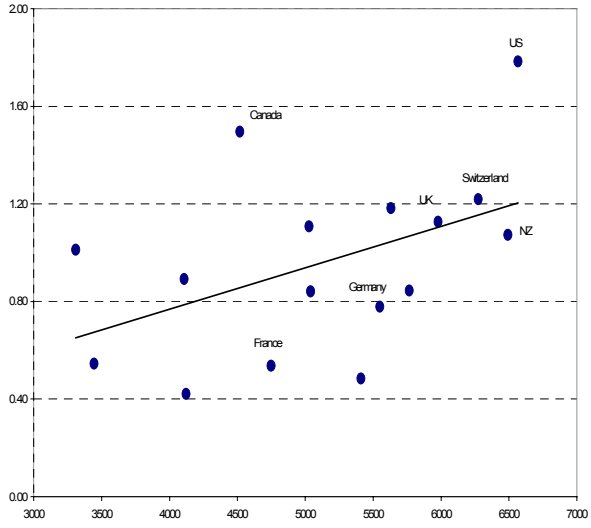
B. Crisis 1929-35



C. World War I, 1914-19



D. World War II, 1939-45



Growth rates

Finally, we may ask whether the inter-war period was unique by having had very low growth rates, as it is sometimes believed. Table 4 gives the population-weighted average growth rate of GDP per capita (using Maddison's data) for WENAO countries between 1870 and 1939. The end point of the first period is the peak before the crisis of 1890; the end point of the third period is the peak before the Great Depression. For the other two periods, the "natural" end-points are, of course, the two Wars. We see that the 1929-39 period displays a somewhat lower growth rate than the earlier periods. The differences however are not enormous.

Table 4. Average population-weighted growth rate of the WENAO region
(per capita, per annum)

	1870-1890	1890-1913	1919-1929	1929-1939
Growth rate	1.3	1.8	2.6	1.1
	1.53		1.67	

Note: Year *t* per capita growth rate of country *i* weighted by country's population in that year. The averages shown here are the means of thus calculated growth rates. Source: Calculated from Maddison (2001).

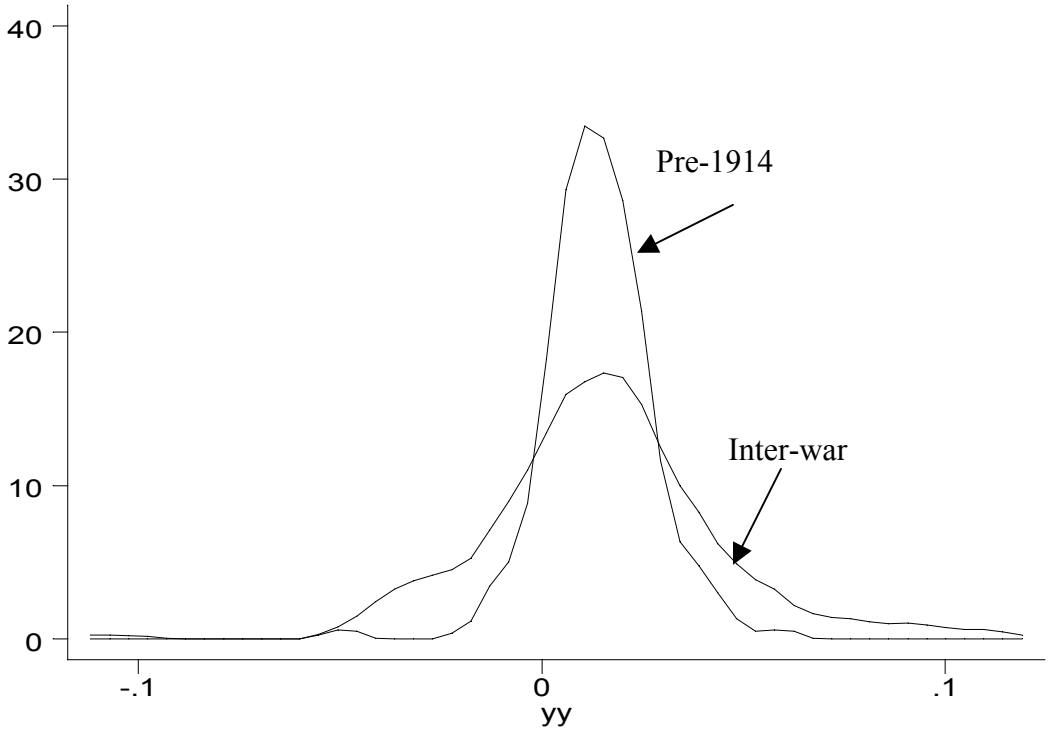
Table 5. Average unweighted GDP growth rates of the WENAO region
(annualized five-year averages; per capita)

	1870-1890	1890-1913	1919-1929	1929-1939
Growth rate	1.23	1.50	1.52	1.13
Observations	62	84	34	56
Average/median growth rate (stand. deviation)	1.35/1.34 (1.27)		1.28/1.48 (2.33)	

Source: calculated from Maddison (2001).

The differences between the periods are even less if we look at countries' growth rates abstracting from the population size (see Table 5). Both the median and mean (annualized five-year) growth rates were almost the same in the pre- and post-1914 periods (Tsble 5). It is only because of the Great Depression and due to the after-war rebound that the inter-war growth rates were more dispersed (see also Figure 4).

Figure 4. Distribution of countries' growth rates
(annualized five-year averages)



Source: Calculated from Maddison (2001).

Finally, one may wonder to what an extent income convergence in the inter-war period was due to Italy and Germany, the two major Fascist powers whose growth was fairly fast during a part of the inter-war period. Both Italy and Germany were less rich in 1919 than the median WENAO country.[19] Italy's per capita growth rate between 1922 and 1940 (1.8 percent) was almost exactly the same as the population-weighted WENAO average growth rate. Germany's rate between 1933 and 1940 was indeed much higher than the mean WENAO rate: 7.9 percent vs. 3.6.[20] But if we drop Germany from the sample, there is practically no change in the Gini or Theil index.

[19] Italy's rank was 11th, Germany's 12th out of 17 WENAO countries.

[20] Part of it was certainly due to the catch-up effect following upon an extremely high decline in GDP during the Great Depression..

3. The puzzle

We can now break down into its components the statement by Lindert and Williamson (2001) that the increasing income gap between rich countries during the inter-war period can be assigned miscellaneously to "the great depression, two world wars, anti-global policies and other forces". The gap is entirely due to the Second World War. Despite "anti-global" policies, income gap continued to shrink between 1919 and 1939; moreover it shrank faster than during the globalization period.

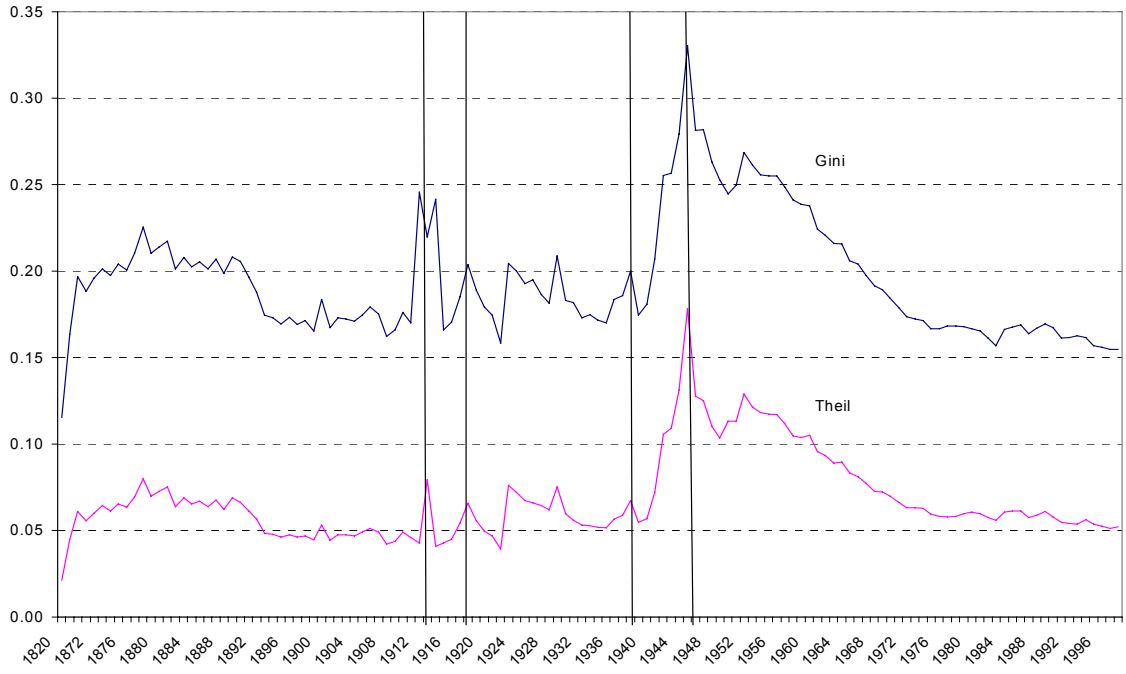
If both (i) greater integration of world economy, and more specifically closer links between the advanced capitalist economies (both before World War I and during the last 50 years), and (ii) disintegration of world economy, produce about the same effects on relative income gaps between the countries, then the trade-induced theory of convergence cannot be right. Our empirical findings would seem to suggest that convergence is a phenomenon independent of economic integration. Poorer countries catch up within the subset of rich (WENAO) countries, all the same whether there is economic integration or not. This could then, in turn, suggest several possibilities.

The first possibility is that endogenous or neoclassical models that display increasing returns to scale may explain what we have observed during the inter-war years. If there are increasing returns to capital or labor, then for the poorer countries to reduce trade links with the rest of the world, is a way to catch up. But this is doubtful as after World War II, the period of rising integration was also accompanied by income convergence.

A different explanation is as follows. Consider Figure 5 which shows the Gini coefficient of per capita incomes of WENAO countries for all years between 1870 and 2000. Over this long period of 130 years, income differences among the set of rich countries are either constant or decreasing during all peacetime periods. Only during wars do their incomes diverge. And it is only by the mid-1970's (there is a slight difference depending on whether we measure it using the Gini or Theil) that the level of similarity

between their incomes had reached the values achieved before the Second World War or even before the First. The underlying policies—integration or disintegration, openness or autarky—changed during this long period of 130 years but did not seem to have had much of an effect on convergence of countries' incomes. If whether countries trade more or less, or invest more or less into each other's economies, does not seem to matter for convergence of their incomes—or in other words, does not affect the growth rate of poor economies vis-à-vis rich economies—then what other factors might explain such an outcome? We propose the following hypothesis.

Figure 5. Inequality among WENAO countries, 1820-1998
Gini and Theil index



Note: After 1950, Israel and Turkey are added to the WENAO group.

Since we deal here with a subgroup of rich Western economies that are well integrated, in a cultural sense, so that technological transfers (via books, private exchange of information, personal and business travel etc.) do take place almost as much whether there is a lot of trade and direct foreign investment or not, then convergence may be simply a reflection of that deeper integration. Transmission of information is what may drive modernization of the techniques of production, total factor productivity growth and ultimately income convergence (as implied by endogenous growth literature; see Jones, 1997, p. 25 or Easterly and Levine, 2001, p. 185). Schiff and Wang (2002) following Keller (1998) find that, for the group of developed economies over the period 1971-90, disembodied diffusion of technology played a much larger role in stimulating total factor productivity than trade (more exactly, new technology embodied in goods and services).

It is not irrelevant to this line of thought that the inter-war period was characterized by the beginning of mass production of consumer durables (what was later

dubbed "Fordism"). Italy's industrialization, for example, despite its highly autarchic system was decisively influenced by the American example. Giovanni Agnelli, FIAT's owner, after a visit to Ford, copied Ford's techniques of production. Olivetti, the office-equipment maker, and Pirelli, the tire company, were set on the path of becoming large multinationals in these years—again applying American techniques of mass production. More generally, as Bairoch (1997, vol. 3, pp. 43-46) points out, the inter-war period witnessed the beginning of mass production of "non-essential" manufactured products. While mass production of manufacturing in the late 19th century concerned mostly clothing, in the early 20th century, there was a remarkable growth of consumer durables and chemical industries (artificial silk and other substitutes). For example, the number of cars in the world increased from 2.5 million in 1914 to 50 million on the eve of World War II; at the same date, 93 million households (one out of two) in developed countries owned radio. As pointed out by Bairoch (1997, vol. 3, p. 45) the expansion of radio ownership within twenty years of its first appearance is unprecedented even compared with today: twenty years after the appearance of the first personal computers, only 30 percent of American households owned one. Production of other household durables (refrigerators, vacuum cleaners, washing machines) grew from nothing to millions, and, significantly, airplane production came of age.

In conclusion, for economies similar in terms of their incomes, structure and cultural proximity, trade and direct investments may not matter as much. Within their "club", [21]the poorer economies' growth rate relative to the growth rate of the rich, may not be affected by greater or lesser trade and capital integration, but by diffusion of knowledge. Whether for dissimilar countries, where the links between the economies and populations are few, the same is true, or whether in that case, economic integration needs to be "embodied" in goods and capital in order for the catch-up to take place, remains an open question.

[21] The idea borrows from Dowrick and de Long (2001).

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Annex 1. Disintegration of the world economy 1919-1939: some facts

There is little doubt that the inter-war period was characterized by disintegration of the world economy. While the disintegration movement was not entirely clear until the mid-1920, as economies recovered from the War, and would, even under the best circumstances, have taken some time to regain the levels of financial or trade integration achieved before the outbreak of the conflict, the trend is unmistakable from the mid-1920's. There are several simultaneous developments which very clearly underline the trend. First, ideologically, protectionism was in the ascendant in Western Europe and the US. Its extreme form was achieved, of course, in autarkic systems set in place, first in the Soviet Russia, then in Italy, Germany, Spain, and gradually throughout most of Europe. It is important to stress that autarky was not viewed by the new Fascist ideologies as a reaction to other countries' unfriendly policies as it was regarded by the democracies when they engaged in competitive devaluations and tariff rises or even by the Soviet planners who faced the enmity of the capitalist powers. Autarky was viewed as a desirable attribute of a nation—the best economic policy one could pursue. [22]

Second, the responsive—non-ideological protectionism—was espoused by democracies during and after the Great Depression. The famous cobweb graph of world trade (Kindleberger, 1986) shows that the volume of world trade diminished for 49 consecutive months from January 1929 to February 1933—lots of it due to "beggar-thy-neighbor" policies. As a League of Nations document (1936, p. 186-7) puts it "in order to trade with countries of highly developed protectionism, it is often necessary to adopt methods complementary to their systems."

In consequence, by the early 1930's, there was little doubt that the world was engaged into a period of disintegration, reflected in all the statistics (trade, capital flows, migration), but also driven by a changed ideology and by the experience of the Great Depression. The changed ideological climate is well captured in the words of Arthur Lewis (1949, p. 155):

[22] The two German Four-year plans had as their objectives an increase in self-sufficiency and the development of synthetic products replacing the raw materials Germany did not produce.

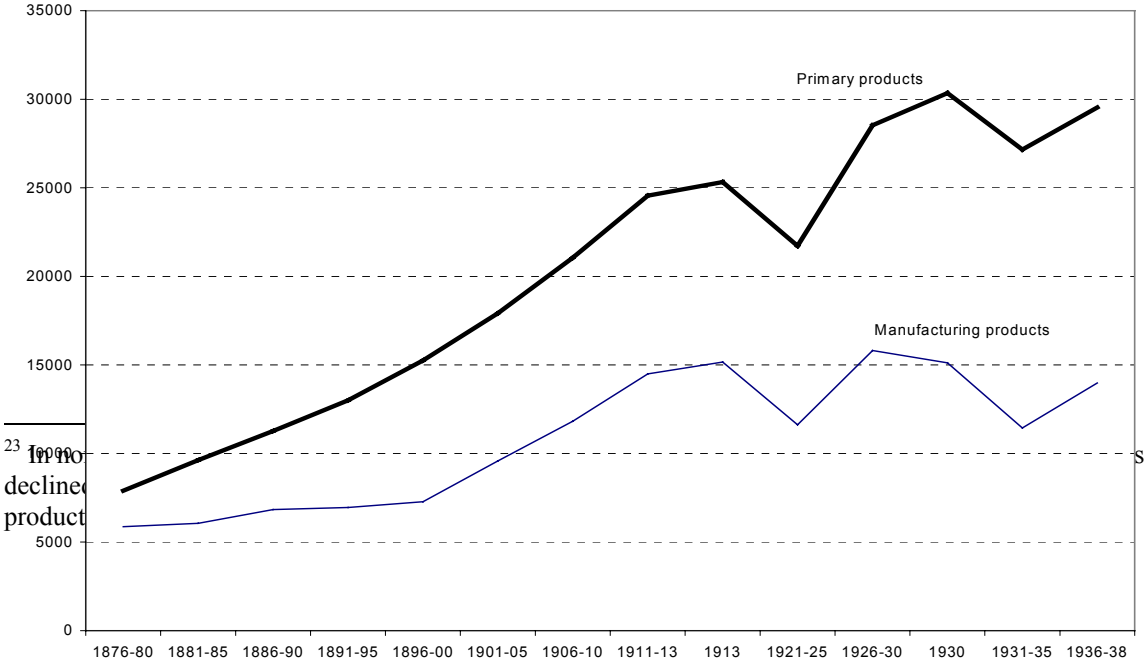
"it was then [after the Depression] that the international system seemed finally to break down; that currency controls multiplied; that tariffs reached enormous proportions and licenses became diminutive; and that the free multilateral flow of trade was constrained into bilateral channels. All these obstacles existed in the 1920, as an aftermath of war. But while in 1920 men regarded them as temporary, looked forward to their speedy removal…in the 1930's the obstacles came to be regarded by a much larger circle as desirable in themselves, and not just as temporary weapons for coping with a slump, but as a necessary part of national economic system."

Let us consider some facts.

Stagnation of trade volumes

Figure A1.1 shows world trade in manufactured and primary products (in constant prices and annual averages) for the period 1876-1938. After a fast real increase during the heyday of globalization (late 19th century and up to 1913), the volume of trade in manufactured products stagnated and then declined during the Great Depression. By 1938, it was still 8 percent below the 1913 level. Trade in primary products, however, continued to rise throughout the inter-war period reaching on the eve of the Second World War a level some 16 percent above the one on the eve of the Great War. Basically, overall world trade, after rising steadily prior to 1913, stagnated afterwards.[23]

Figure A1.1. World trade in manufactured and primary products, 1876-1938
(annual averages, in 1913 prices , $ million)



[23] In no
declined
product
s

Source: League of Nations (1945, p.157).

The share of trade in GDP either stagnated or declined. For the US, and especially, the UK, the decrease is quite clear. On the eve of the Great War, trade/GDP ratio amounted to 45 percent for the UK, and 12 percent for the US. The UK numbers steadily declined and by the mid-1930's were below 30 percent. In the US, the share dropped to 8 percent (see Baldwin and Martin, 1999, p. 15).

Increasing barriers to trade

Generally speaking, barriers to trade increased compared to the period before the War. While there is some debate regarding the extent of protectionism in the 1920's—with Paul Bairoch (1993) holding that the period saw a declining or steady level protection and Kindleberger (1989) arguing that protection was by then already higher than before the Great War—there is no dispute about the 1930's. With the Hawley-Smoot tariff act in the US, and then the Great Depression, tariffs increased worldwide.

More important, and more pernicious, was the erection of numerous non-tariff barriers (NTB), and following them the advent of bilateralism in trade with individual pairs of countries negotiating tariff rates, doing barter deals and using special currencies (the most famous of which was German ASKI mark) to pay each other for exports and imports. [24]

Tables A1.1 and A1.2 show different calculations of average tariff rates (trade-weighted and unweighted) in the 1920's and 1930's as compared to the pre-War period. There is little doubt that by the mid-1930's, both tariff rates and non-tariff barriers have risen manifold compared to the situation before the World War I. [25] As the League of Nations (1936, p. 188) eloquently put it, "whenever trade crosses these [restricted trade]

[24] Perusal of the League documents from the 1930's is indeed a melancholy exercise as both the author's and the reader's patience is taxed by a monotony enumeration of many restrictions, complicated bilateral arrangements and multitudes of exchange rates. The League of Nations continued providing very informative annual economic *Surveys* until 1944.

[25] While prior to World War I, quantitative restrictions were negligible, during the 1930's between 50 and 70 percent of world trade was estimated to have been subject to NTB (Crafts, 2000, p.29).

areas, and even within the area of freer trade, the present tendency seems to be for the new form of organization [protectionism] to gain ground, as if by a species of Gresham's Law."

Table A1.1. Barriers to trade, 1875-1930's

Tariff rates	1875	1913	1930s
France	12-15	20	30
Germany	4-6	17	21
Italy	8-10	18	46
Spain	15-20	41	63
United Kingdom	0	0	na
USA	40-50	44	48
Non-tariff barriers (% of all imports)			
France	na	0	58
Germany	na	0	100
Italy	na	0	100
United Kingdom	na	0	8
USA	na	0	5

Source: Bairoch (1993), Schoot (1994), Gordon (1941), Kuwahara (1998) as reported in Crafts (2000, p. 28). Tariff rates are average tariff rates on manufactured goods.

Table A1.2. Average unweighted tariff rate, 1913 and 1925

	1913	1925	Change
Argentina	26	26	0
Australia	17	25	+8
Austria	18	12	-6
Belgium	6	8	+2
Canada	18	16	-2
Czechoslovakia	18	19	+1
Denmark	9	6	-3
France	18	12	-6
Germany	12	12	0
Hungary	18	23	+5
India	4	14	+10
Italy	17	17	0
Netherlands	3	4	+1
Poland	--	23	
Spain	33	44	+11
Sweden	16	13	-3
Switzerland	7	11	+4
Yugoslavia	--	23	
UK	--	4	+4
USA	16	29	+13

Source: League of Nations (1927, p.15).

Moreover, by the mid-1930's, the world had broken into regional trading blocs. Germany established its dominance and signed bilateral treaties with a number of South-East European countries. Italy tried to do the same within its fledgling Empire. Britain introduced the system of Imperial preferences, and Japan created the East Asian Co-Prosperity zone. In addition, the United States withdrew behind the high protective wall (in 1931, the average tariff on dutiable imports was 55 percent as against 38 percent on the eve of the World War I)[26] and the Soviet Union, first out of necessity, and then out of ideology, led an explicit autarkic policy. Autarky, not entertained as a serious idea even by the early mercantilists, became an explicit goal and part of the ideology of the most authoritarian right-wing and Fascist movements that increasingly held sway in Europe (Italy, Germany, Spain, Poland, Baltic republics, the Balkans), and Asia (Japan). Table A1.3 illustrates the increasing importance of economic blocs.

Table A1.3. Trade with 'economic blocs' as percentage of total country's trade

	Economic bloc	Imports		Exports	
		1920	1938	1920	1938
United Kingdom	Commonwealth, colonies, protectorates	30	42	44	50
France	French colonies, protectorates and mandated territories	12	13	7	12
Netherlands	Dutch colonies	5.5	9	9	11
Italy	Italian colonies and Ethiopia	0.5	2	2	23
Japan	Korea, Formosa, Kwantung, Manchukuo	20	41	24	55
Germany	South-East Europe, Latin America	16.5	28	13	24.5

Source: League of Nations (1939, p.186).

[26] Bairoch (1993) quoted in Baldwin and Martin (1999, p.14).

Abandonment of convertible currencies

Coupled with protectionism and regional blocs was, quite naturally, the end of the Gold Standard. Table A1.4, taken from a League of Nations documents, charts the abandonment of the Gold Standard and the introduction of capital controls with, in almost all cases, multiple exchange rates. As the Table shows, between December 1929 and April 1933, thirty countries, including the two most important, the UK and the US, went off the Gold Standard. Thus, the entire mechanism of freely convertible currencies and fixed exchange rates that underpinned massive increase of trade and capital flows from the mid-1850's to 1914, came to an end.

Table A1.4. End of the Gold Standard and of convertible currencies

	Official abandonment of the gold standard	Official control of foreign exchange		Official abandonment of the gold standard	Official control of foreign exchange
South Africa	Dec. 1932	January 1933	Greece	April 1932	Sept. 1931
Germany		July 1931	Hungary		July 1931
Argentina	Dec. 1929	October 1931	India	Sept. 1931	
Australia	Dec. 1929		Ireland	Sept. 1931	
Austria	April 1933	October 1931	Japan	Dec. 1931	July 1932
Bolivia	October 1931	October 1931	Latvia		Oct. 1931
Brazil		May 1931	Malaysia	Sept. 1931	
Bulgaria		October 1931	Mexico	July 1931	
Canada	October 1931		Nicaragua		Novem. 1931
Chile	April 1932	July 1932	Norway	Sept. 1931	
Colombia	Sept. 1931	Sept. 1931	New Zealand	Jan. 1932	
Costa Rica		January 1932	Palestine	Nov. 1931	
Denmark	Sept. 1931	November 1931	Paraguay		August 1932
Egypt	Sept. 1931		Peru	May 1932	
Ecuador	February 1932	April 1934	Iran		May 1932
Spain		May 1931	Portugal	Dec. 1932	Oct. 1922
Estonia		November 1931	Romania		May 1932
USA	March 1933	March 1933	UK	Sept. 1931	
Finland	October 1931		El Salvador	Oct. 1931	
Thailand	May 1932		Yugoslavia	October 1931	
Sweden	September 1931		Turkey		February 1930
Czechoslovakia		September 1931	Uruguay	Dec. 1929	Sept. 1931

Source: Statistical Yearbook of the League of Nations 1932/33, Geneva 1933, p. 265.

Declining capital and labor flows

As trade protectionism and nationalism were on the rise, and capital controls became the norm, international capital flows dried out. Before World War I, most of capital flows took the form of purchases of railway and government bonds. According to the data quoted by Bordo, Eichengreen and Irwin (1999, p. 30) the UK, the largest creditor nation, held 40 percent of its overseas investments in railway, and 30 percent in government bonds. The taste for both declined as investors faced increased political and economic hurdles and risks.[27] The devastation of France and Belgium, and weakened financial position of the Great Britain, combined with huge reparations imposed on Germany, cut the potential supply of funds in the largest capitalist countries (other than the US). As Table A1.5 shows, foreign-held assets as a share of world GDP halved. Average (unweighted) current account deficit (or surplus) as percentage of GDP—the obverse side of capital transactions—decreased from about 4 percent in the 1870-1914 period, to as little as just over 1 percent in the 1930's (Baldwin and Martin, 1999, Figure 2, p. 9).

Table A1.5. Estimated foreign assets/world GDP (in percent)

1870	1900	1914	1930
6.9	18.6	17.5	8.4

Source: Crafts (2000, Table 2.3, p. 27). The original sources given there.

Labor migration which according to Williamson (1996) and O'Rourke and Williamson (1999) helped wage convergence within the Atlantic economy in the late 19th century, driving wages up in the out-migrant countries of Northern and Western Europe, and wages down in the in-migrant countries (US, Australia, New Zealand, Canada) all but stopped as the policies of the largest recipient country became much more restrictive in the early 1920's. The US immigration rate fell by almost 2/3 (see Table 6).

[27] Direct foreign investments were, compared to portfolio investments, much less important before 1914 than they are today (Bordo, Eichengreen and Irwin, 1999, p. 35).

Similarly, large trans-Oceanic or continental migrations (from India to the West Indies and South-East Asia; from China to the United States and South Asia, and from Africa to North and South America) also diminished as slavery and indentured serfdom were abolished. [28] In keeping with the fact that the inter-war period was a "political" period *par excellence*, many of the new migrants were political, escaping first from the Bolshevik revolution, then Hitler's tyranny and Francoist revanchism. America's closed doors, and European countries' unwillingness to absorb political refugees from neighboring countries led to the burgeoning of "stateless" persons. They lived in countries of refuge unprotected, and resented. In words of the president of International Red Cross, "it is impossible that in the twentieth century, there could be 800,000 men in Europe unprotected by any legal organisation recognized by international law" (quoted in Mazower, 2000, p.63).

Table A1.6. Immigration to the United States

	1870	1890	1910	1930
Immigration rate (per 1000 population)	6.4	9.2	10.4	3.5
Foreign born as % of population	13.9	14.6	14.6	11.5

Source: Crafts (2000, p. 30). The original source is the US Bureau of the Census.

[28] Between 1811 and 1870, about 2 million slaves from Africa were sent to the Americas (Bairoch, 1997, vol. 2, p. 691).

Annex 2. Convergence using Bairoch and Prados de la Escosura's data

In addition to Maddison's data which are the most complete, we have two other GDP per capita series that cover the period 1870-1939. They are Bairoch's (1997) data, and those produced by Prados de la Escosura (2000).[29] Figures 2A.1 and 2A.2 show the Gini and Theil coefficients using these alternative sources, and covering the same set of countries. For the period 1870-1938, the country coverage in the three databases (Maddison, Bairoch and Prados de la Escosura) is practically the same (see Table 2A.1). For the period before 1870, Prados de la Escosura's coverage is more limited (13 or 15 countries vs. 19 for Bairoch and Maddison).

Bairoch and Prados de la Escosura data are available only for selected years. [30]Using Bairoch's series, we find that both Gini and Theil indexes are stable between 1890 and 1929, and then display a very strong income convergence between 1929 and 1939. Using Prados de la Escosura's data, there is a convergence between 1860 and 1913, and then divergence during the inter-war years.[31]

As a glance at Figures 1 and 2 in the text reveals, original income divergence, according to Bairoch, is much sharper and seems to have lasted longer than the one obtained from Maddison's data. According to Bairoch, divergence starts around 1800 and goes on, almost without interruption, until 1890. After that, inequality is stable until the

[29] Bairoch's GDPs per capita are given in 1960 international dollars. Prados de la Escosura's are expressed in current dollars of equal purchasing power parity, so that between-country comparisons for a given year are possible, but not comparisons between the years. The data base is scaled (for each year) in such a way that the US GDP per capita is equal to 1.

[30] This is the reason why we cannot run the usual convergence regressions on these data.

[31] Prados de la Escosura data are obtained by the so-called "short-cut" method, that is from a regression between the price level (purchasing power exchange rate over market exchange rate) on the LHS, and GDP per capita at current exchange rate and several other controls (openness, current account balance) on the RHS. The regression is run, of course, only for the countries for which the data are available. The estimated parameters from such an equation together with values for each independent variable are then used to predict the price level (that is, PPP) for the missing years and countries (see Prados de la Escosura, 2000, pp. 8-11). The fact that Prados de la Escosura data show income divergence while both Bairoch and Maddison show income convergence *may* be explained by the use of current PPPs by Prados de la Escosura. The implication is that prices of non-tradables have increased more in rich than in poor countries.

Great Depression, and only during the last decade before the World War II, there is convergence. If we look at Maddison's data, however, the divergence begins in 1820 (when his series originate) and reaches its peak around 1880. After that, there is at first a slow, and then a faster convergence until the First World War. The inter-war period is characterized by a mild convergence. [32]

[32] The increase in inequality following the Industrial Revolution is much greater if one uses Bairoch's rather than Maddison's data. According to Maddison, the Gini in 1820 was 12 (see Figure 1). According to Bairoch, it was (for the same set of countries) only 6 in 1800 and 9 in 1830. This is due to the fact that Bairoch's data show poor WENAO countries with (relatively) higher GDPs per capita than Maddison's. For example, in 1820, the ratio between the richest and poorest WENAO country (UK and Finland) is 2.3 to 1 in Maddison's data, but in Bairoch's, it is only 1.9 to 1 in 1830 and 1.3 to 1 in 1800 (in both cases, UK vs. Finland). In general, Bairoch's estimates of (relative) income per capita of the future less developed countries at the time of the Industrial Revolution are generally higher than Maddison's.

Figure 2A.1. Gini coefficients, 1800-1938
(calculated using Bairoch and Prados de la Escosura data)

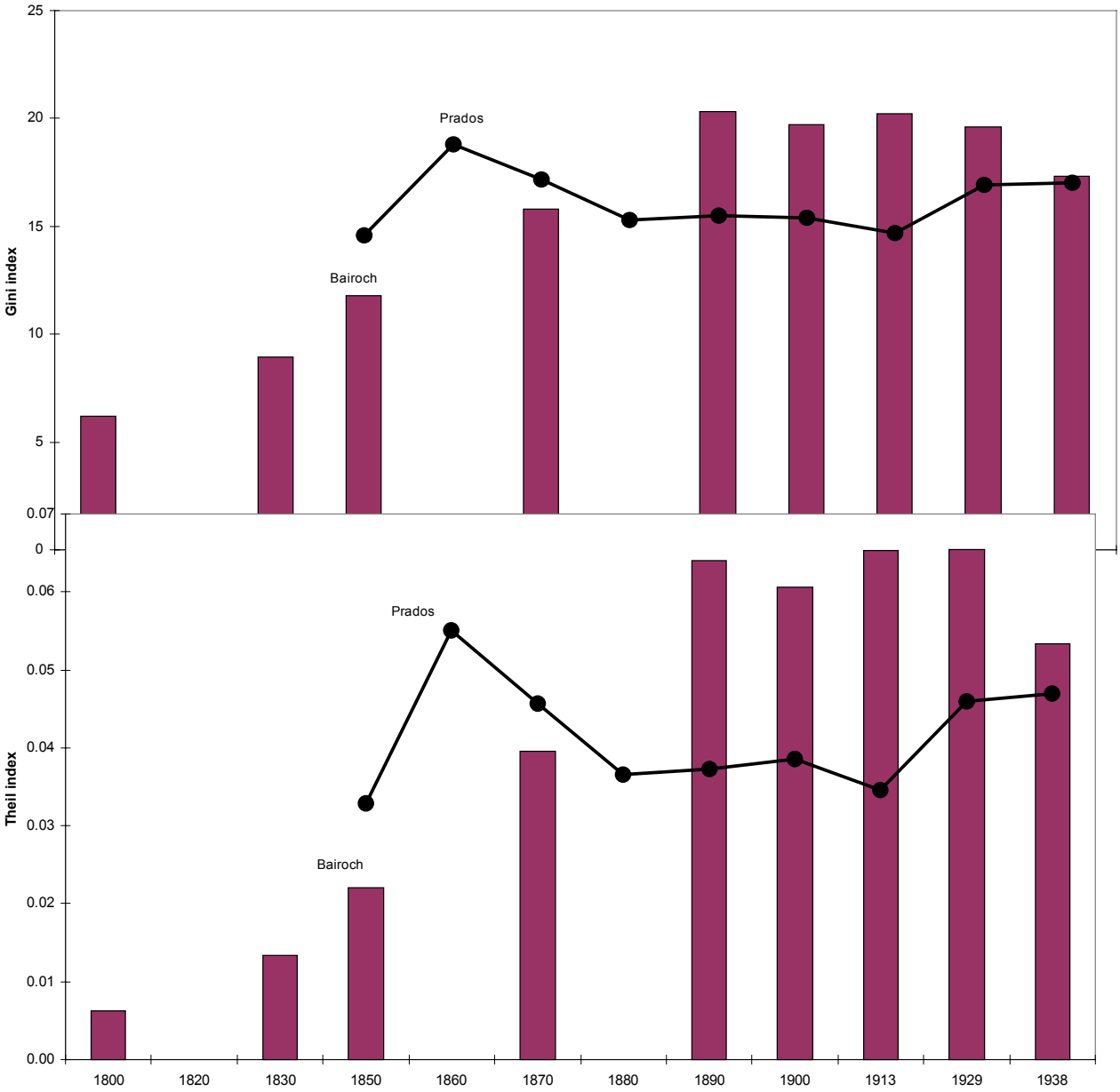


Figure 2A.2. Theil coefficients, 1800-1938
(calculated using Bairoch and Prados de la Escosura data)

Table 2A.1. *WENAO Countries included in Maddison's, Bairoch's and Prados de la Escosura's datasets*

Year 1870			Year 1890			Year 1900			Year 1913		
Maddison	Bairoch	Prados	Maddison	Bairoch	Prados	Maddison	Bairoch	Prados	Maddison	Bairoch	Prados
AUS	AUS	AUS	AUS	AUS	AUS	AUS	AUS	AUS	AUS	AUS	AUS
AUT	AHU	AUT	AUT	AHU	AUT	AUT	AHU	AUT	AUT	AUT	AUT
BEL	BEL	BEL	BEL	BEL	BEL	BEL	BEL	BEL	BEL	BEL	BEL
CAN	CAN	CAN	CAN	CAN	CAN	CAN	CAN	CAN	CAN	CAN	CAN
CHE	CHE			CHE	CHE	CHE	CHE	CHE	CHE	CHE	CHE
DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU
DNK	DNK	DNK	DNK	DNK	DNK	DNK	DNK	DNK	DNK	DNK	DNK
ESP	ESP	ESP	ESP	ESP	ESP	ESP	ESP	ESP	ESP	ESP	ESP
FIN	FIN	FIN	FIN	FIN	FIN	FIN	FIN	FIN	FIN	FIN	FIN
FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA
GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR
	GRC	GRC		GRC	GRC		GRC	GRC	GRC	GRC	GRC
IRL			IRL			IRL			IRL		
ITA	ITA	ITA	ITA	ITA	ITA	ITA	ITA	ITA	ITA	ITA	ITA
NLD	NLD	NLD	NLD	NLD	NLD	NLD	NLD	NLD	NLD	NLD	NLD
NOR	NOR	NOR	NOR	NOR	NOR	NOR	NOR	NOR	NOR	NOR	NOR
NZL	NZL	NZL	NZL	NZL	NZL	NZL	NZL	NZL	NZL	NZL	NZL
PRT	PRT	PRT	PRT	PRT	PRT	PRT	PRT	PRT	PRT	PRT	PRT
SWE	SWE	SWE	SWE	SWE	SWE	SWE	SWE	SWE	SWE	SWE	SWE
									TUR		
USA	USA	USA	USA	USA	USA	USA	USA	USA	USA	USA	USA

Note: AUS=Australia, AUT=Austria, AHU=Austria-Hungary, CHE=Switzerland.

Year 1929			Year 1938		
Maddison	Bairoch	Prados	Maddison	Bairoch	Prados
AUS	AUS	AUS	AUS	AUS	AUS
AUT	AUT	AUT	AUT	AUT	AUT
BEL	BEL	BEL	BEL	BEL	BEL
CAN	CAN	CAN	CAN	CAN	CAN
CHE	CHE	CHE	CHE	CHE	CHE
DEU	DEU	DEU	DEU	DEU	DEU
DNK	DNK	DNK	DNK	DNK	DNK
ESP	ESP	ESP	ESP	ESP	ESP
FIN	FIN	FIN	FIN	FIN	FIN
FRA	FRA	FRA	FRA	FRA	FRA
GBR	GBR	GBR	GBR	GBR	GBR
GRC	GRC	GRC	GRC	GRC	GRC
IRL		IRL	IRL		IRL
ITA	ITA	ITA	ITA	ITA	ITA
NLD	NLD	NLD	NLD	NLD	NLD
NOR	NOR	NOR	NOR	NOR	NOR
NZL	NZL	NZL	NZL	NZL	NZL
PRT	PRT	PRT	PRT	PRT	PRT
SWE	SWE	SWE	SWE	SWE	SWE
TUR		TUR	TUR		TUR
USA	USA	USA	USA	USA	USA

Annex 3. Inequality measures, WENAO countries, 1820-1945

Year	Gini	Standard Error of Gini	Theil	Standard Error of Theil	Coefficient of variation
1820	0.115	0.020	0.021	0.006	0.35
1850	0.164	0.032	0.045	0.017	0.45
1870	0.197	0.024	0.061	0.014	0.37
1871	0.188	0.027	0.056	0.014	0.35
1872	0.196	0.026	0.060	0.015	0.36
1873	0.201	0.028	0.064	0.016	0.38
1874	0.198	0.032	0.061	0.018	0.37
1875	0.204	0.028	0.065	0.016	0.38
1876	0.201	0.027	0.063	0.015	0.38
1877	0.210	0.029	0.069	0.018	0.39
1878	0.226	0.032	0.080	0.021	0.42
1879	0.210	0.030	0.070	0.019	0.39
1880	0.214	0.029	0.073	0.018	0.40
1881	0.217	0.033	0.075	0.020	0.41
1882	0.201	0.030	0.064	0.017	0.37
1883	0.208	0.029	0.069	0.017	0.39
1884	0.202	0.030	0.065	0.017	0.38
1885	0.205	0.031	0.067	0.018	0.38
1886	0.201	0.031	0.064	0.017	0.37
1887	0.207	0.032	0.068	0.019	0.39
1888	0.199	0.030	0.062	0.017	0.37
1889	0.208	0.030	0.069	0.018	0.39
1890	0.206	0.025	0.066	0.015	0.38
1891	0.197	0.033	0.061	0.020	0.37
1892	0.188	0.029	0.057	0.016	0.34
1893	0.175	0.026	0.048	0.013	0.32
1894	0.173	0.028	0.048	0.014	0.31
1895	0.169	0.026	0.046	0.013	0.31
1896	0.173	0.023	0.048	0.011	0.31
1897	0.169	0.027	0.046	0.013	0.31
1898	0.171	0.025	0.047	0.014	0.31
1899	0.165	0.029	0.045	0.014	0.30
1900	0.184	0.025	0.053	0.013	0.33
1901	0.167	0.023	0.044	0.011	0.30
1902	0.173	0.024	0.048	0.012	0.31
1903	0.172	0.026	0.047	0.012	0.31
1904	0.171	0.027	0.047	0.013	0.31
1905	0.175	0.021	0.049	0.011	0.32
1906	0.179	0.028	0.051	0.014	0.32
1907	0.175	0.028	0.049	0.014	0.33
1908	0.162	0.028	0.042	0.013	0.29

Year	Gini	Standard Error of Gini	Theil	Standard Error of Theil	Coefficient of variation
1909	0.166	0.022	0.044	0.011	0.30
1910	0.176	0.025	0.049	0.013	0.32
1911	0.170	0.026	0.046	0.013	0.31
1912	0.162	0.026	0.043	0.012	0.30
1913	0.198	0.029	0.063	0.017	0.36
1914	0.162	0.019	0.041	0.009	0.29
1915	0.166	0.022	0.043	0.011	0.30
1916	0.170	0.022	0.045	0.011	0.31
1917	0.185	0.025	0.054	0.013	0.34
1918	0.204	0.028	0.066	0.017	0.37
1919	0.189	0.022	0.056	0.012	0.34
1920	0.179	0.022	0.050	0.012	0.32
1921	0.174	0.021	0.047	0.011	0.32
1922	0.158	0.022	0.039	0.010	0.29
1923	0.168	0.023	0.044	0.012	0.31
1924	0.165	0.024	0.042	0.012	0.30
1925	0.158	0.022	0.039	0.010	0.28
1926	0.164	0.022	0.042	0.010	0.30
1927	0.151	0.021	0.036	0.010	0.27
1928	0.147	0.023	0.034	0.010	0.27
1929	0.183	0.026	0.055	0.015	0.33
1930	0.153	0.026	0.037	0.011	0.28
1931	0.155	0.020	0.037	0.009	0.28
1932	0.143	0.019	0.032	0.008	0.26
1933	0.148	0.016	0.034	0.007	0.27
1934	0.143	0.015	0.032	0.007	0.26
1935	0.140	0.017	0.031	0.007	0.25
1936	0.159	0.021	0.040	0.010	0.28
1937	0.161	0.019	0.041	0.009	0.29
1938	0.179	0.027	0.052	0.016	0.32
1939	0.148	0.029	0.037	0.013	0.27
1940	0.152	0.024	0.037	0.011	0.27
1941	0.177	0.029	0.049	0.016	0.32
1942	0.232	0.036	0.085	0.026	0.43
1943	0.229	0.036	0.084	0.026	0.44
1944	0.252	0.038	0.106	0.030	0.49
1945	0.307	0.046	0.154	0.044	0.58