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

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ABSTRACT

Some economists have argued that the process of disintegration of the world economy between the two World Wars led to income divergence between the countries. This is in keeping with the view that economic integration leads to income convergence. The paper shows that the view that the period 1919-39 was associated with divergence of incomes among the rich countries is wrong. On the contrary, income convergence continued and even accelerated. Since the mid-19th century, rich countries' incomes tended to converge in peacetime regardless of whether their economies were more or less integrated. This, in turn, implies that it may not be trade and capital and labor flows that matter for income convergence but some other, less easily observable, forces like diffusion of information and technology.

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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.

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[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 between the countries 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. [3] 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 divergence of incomes.[4] 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, "..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 model (for a review see Easterly and Levine 2001) makes this a more realistic possibility. A similar view is forcefully made by Rodriguez and Rodrik (2000) who, based on numerous

[3] For the most recent manifestation of such a view see World Bank's report on globalization (2002).
[4] 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).

empirical evidence and reruns of a number of equations originally estimated by various authors, argue that economic integration and convergence are orthogonal.

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. [5] Then, following these results and theoretical predictions, the next period, 1919-1939—the period of retreat from globalization—is to be characterized by increasing income gaps between the countries. And indeed Lindert and Williamson (2001, p.13) write: "Real wages and living standards 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). Lindert and 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.

We have shown elsewhere (Milanovic, 2002) that Lindert and Williamson's claim of income convergence during the globalization phase (1870-1913) is true only for a narrow subset of countries (the Western Europe and its offshoots) and not for the world as a whole. However, this finding does not necessarily invalidate the claim that globalization did lead to income convergence because one can argue that other countries were not really integrated in the world economy. Here however we shall address the second part of their statement, namely that the process of de-globalization during the inter-war period was accompanied by (or caused) income divergence between the rich countries. Contrary to what they argue, we shall show that income convergence *accelerated* in the period between the two wars and did so precisely amongst the select

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

club of rich countries that were the main leaders in globalization before the First World War, and were the main leaders in deglobalization between the two wars. [6]

In the next section, we review briefly, the relatively well known facts that show that the period 1918-1939 was indeed characterized by economic disintegration. In Section 3—the main part of the paper—we show that this period witnessed fast income convergence particularly among the "most important" subset of rich economies, and in Section 4, we discuss what this finding implies for our views on the relationship between economic integration and income convergence.

2. 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. [7]

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[6] Rodriguez and Rodrik (2000, p. 47) is, to my knowledge, the only paper that shows, using Maddison's data, that σ convergence among the future European Community countries continued during the inter-war period.

[7] 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.

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):

> "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 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.[8]

Figure 1. World trade in manufactured and primary products, 1876-1938
(annual averages, in 1913 prices , $ million)
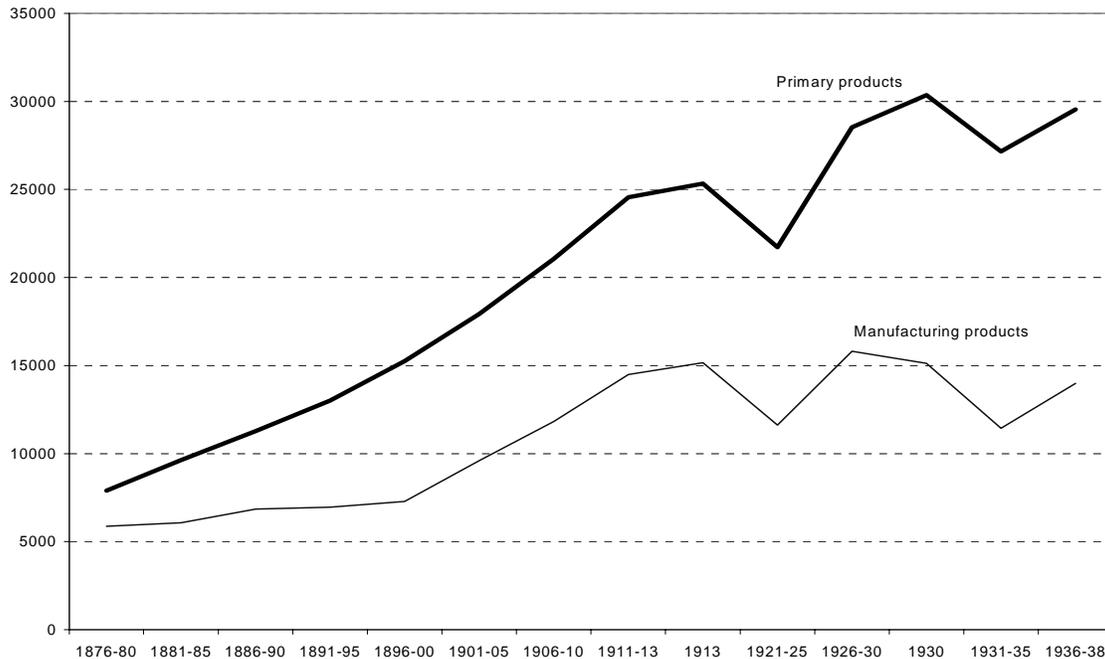
Source: League of Nations (1945, p.157).

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

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[8] In nominal terms, trade declined quite significantly as prices of both manufactured and primary products declined. By 1938, manufactured unit price was 23 percent below the 1913 level while prices of primary products declined by more than 40 percent (League of Nations, 1945, p.157).

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 bilaterism 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. [9]

Tables 1 and 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. [10] As the League of Nations (1936, p. 188) eloquently put it, "whenever trade crosses these [restricted trade] 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."

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[9] 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.

[10] 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).

Table 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 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)[11] 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 3 illustrates the increasing importance of economic blocs.

Table 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).

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[11] 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 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 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.[12] 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 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 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[13] 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).

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

[13] "Atlantic economy" is defined to include other countries of European settlement like Austrialia and New Zealand.

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. [14] 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 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.

Conclusion

All these data—decline in capital flows and migration, stagnation in trade, increased obstacles to free trade—show a clear pattern of economic disintegration during the period between the two World Wars. Trade as a share of GDP decreased, as did capital flows and the importance of foreign-held assets. Trade barriers increased in all major countries, and in some of them—which strived for autarky—they became practically impassable. Bilateral trade, championed by Germany, increased all around. And, of course, underlining all of this was the fact that currencies ceased to be convertible, and migration virtually stopped—except for the trickle driven by political conflicts.

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

3. What happened to income convergence?

Using Maddison's data

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)[15] and also for a more restricted sample of the countries of the Atlantic economy (as called by Lindert and Williamson).[16] Gini and Theil are, of course, measures of inequality, closely related to the coefficient of variation (σ) which is often used in convergence discussions (so called "sigma" convergence). We prefer Gini or Theil because they are better established measures of inequality and also allow us to move easily between measurement of inter-national,[17] domestic, and global inequality (the latter is inequality among all individuals in the world). It was the Gini coefficient that was originally used to measure convergence (Summers, Kravis and Heston, 1984) until it was overtaken by β and σ convergence. We calculate however all three measures of inequality as shown in

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

[16] That is, the same WENAO countries from the previous footnote minus Greece, Portugal and Spain. This is the group called "Western Europe and its offshoots" by Maddison (2001).

[17] Inter-national inequality comes in two "forms": Concept 1 inequality which we calculate here 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 (see Milanovic, 2002a).

Figures 2 and 3. The data on GDP per capita (expressed in 1990 Geary-Khamis dollars) are taken from Maddison (2001).

Figure 2 shows that using either Gini, Theil or the coefficient of variation, we find that WENAO incomes (GDPs per capita) did not diverge during the inter-war period. If anything, there was a mild convergence. In 1919, the Gini, Theil and coefficient of variation were respectively 19, 0.06 and 0.34; in 1939, they were 15, 0.04 and 0.27. [18] 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. The Gini went up from 15 just before the outbreak of the War 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 2 and 3).

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[18] The Gini coefficient is expressed in percents.

Figure 2. Gini, Theil , coefficient of variation of GDP per capita (WENAO countries, 1820-950)
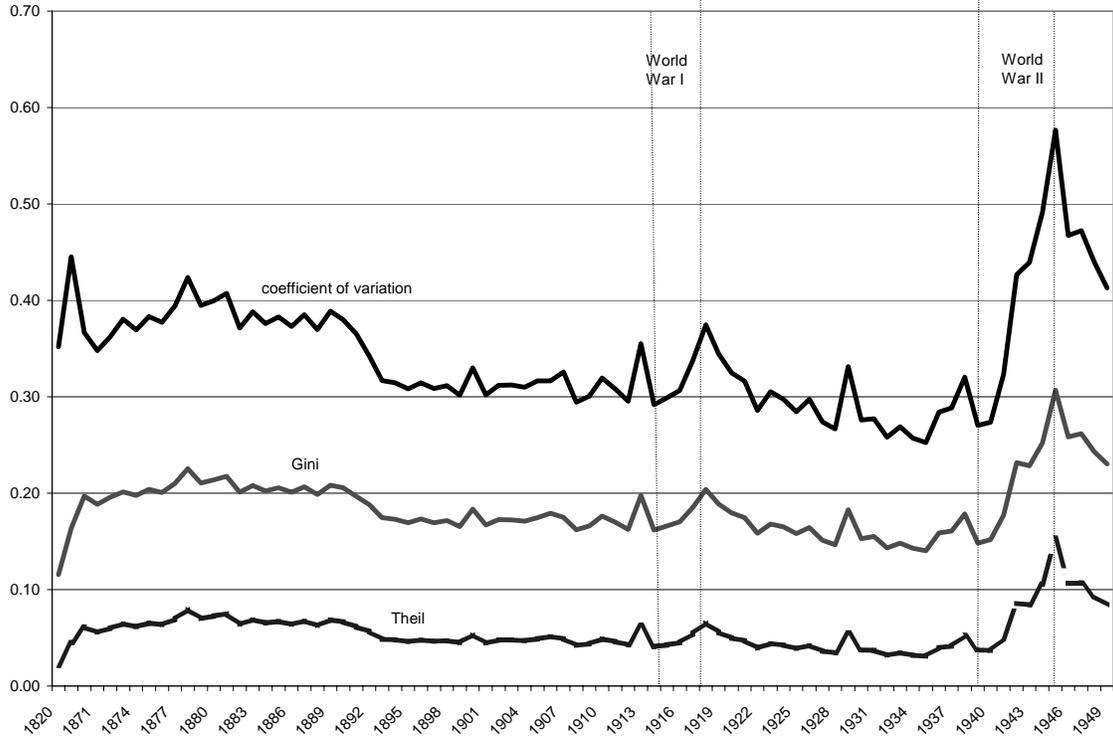

Figure 3. Gini, Theil, coefficient of variation of GDP per capita (Atlantic economy, 1820-1950)
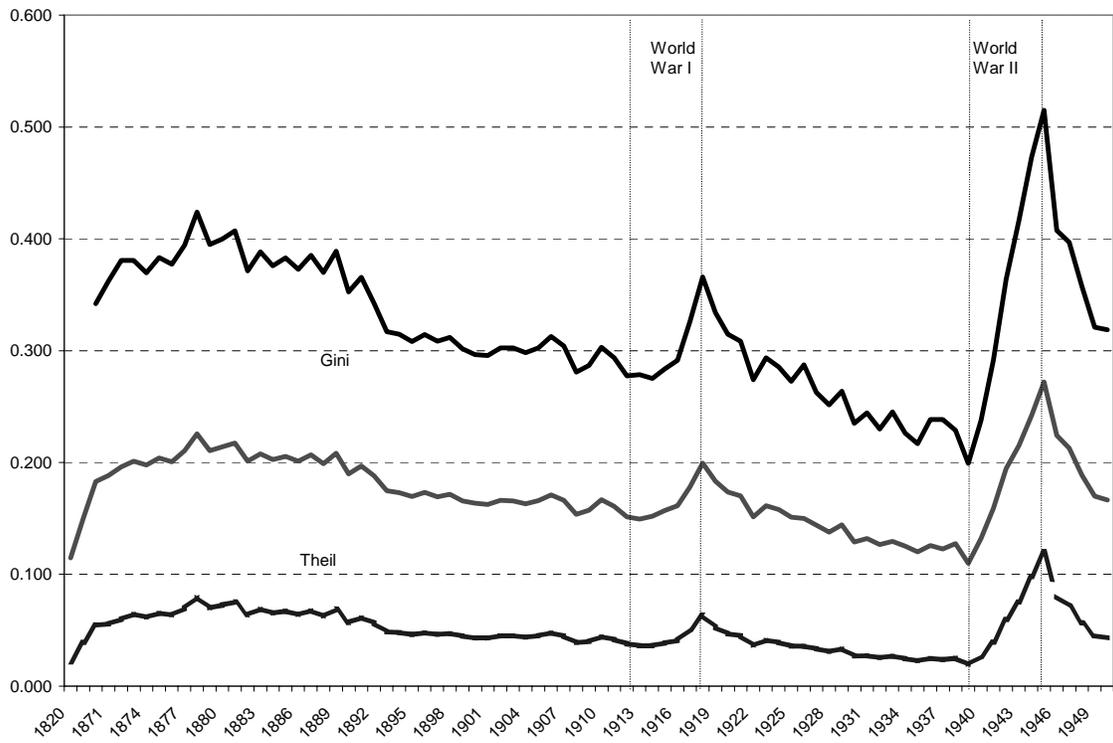
But much more dramatic and telling is the example of the Atlantic economy. Figure 3 shows that the inter-war period witnessed the *fastest* income convergence ever recorded up to then. The negative slope of the Gini, Theil and coefficient of variation line is much steeper than during the heyday of the 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 Atlantic economy countries declined almost uninterruptedly between 1919 and 1939. Their incomes have never after 1870 been more similar than on the eve of the Second World War.

As Table 7 illustrates, income differences between the countries of the Atlantic economy 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 today. [19]So, if we look at how wide was the dispersal of the Atlantic 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 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.

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[19] 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.

Table 7. Incomes in the Atlantic economy 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 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. "Atlantic" economy includes New Zealand and Australia.
1/ Data for 1938.

We can test for convergence also using more standard regressions test. 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, [20]

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[20] This formulation is rife with problems. Other than the most obvious econpometric problems of omitted variable and endogeneity (which we also address below), formulation such as (1) suffers from Galton's fallacy (see Quah, 1993, Bliss 1999), 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 whether the underlying distribution diverges, converges or stays the same (see Wodon and Yitzhaki, 2002), and even interpreatation of the obtained results (Quah, 1996). We use it because it is the simplest and the most commonly used formulation in the (immense) literature on convergence. As explained above, our view is that direct tests of unconditional convergence (as implied in the calculation of the Gini coefficients) are far superior to the regression analysis.

(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 $\ln Z_{it} = \ln (n_{it}+g+\delta)$ 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. 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, [21] and endogeneity where the dependent and independent variables are jointly determined. We thus run three formulations of (1). The results are shown in Table 8. 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 1 percent level. Finally, in the third formulation, we adjust for country-specific effects by estimating a fixed-effects model. The results are again the same: the pre-1914 period exhibits no convergence, the inter-war period does, and a very strong one.

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[21] Since our model is by necessity (since other relevant variables like investment rate, education levels etc. are unavailable) very stripped-down, there are strong grounds to believe that relevant country-specific features are omitted.

Table 8. Convergence in the two periods (1870-1913 and 1918-1938)
(dependent variable: annualized GDP per capita growth over the five-year interval)

	Pooled regression		IV regression		Fixed effects	
	1870-1913	1918-1938	1870-1913	1919-1938	1870-1913	1919-1938
ln y_{it}	-0.001	-0.018*	-0.016	-0.013**	-0.0009	-0.057*
	(0.78)	(0.02)	(0.68)	(0.01)	(0.91)	(0.02)
ln($n+\delta+\lambda$)	-0.008	0.025	-0.002	0.024	-0.011	0.073
	(0.32)	(0.38)	(0.89)	(0.12)	(0.46)	(0.12)
Constant	-0.0007	0.235*	0.02	0.19	-0.01	0.69**
	(0.99)	(0.02)	(0.70)	(0.10)	(0.88)	(0.008)
No. of observations	127	90	109	69	127	90
R^2	0.01	0.05	0.00	0.13	0.01	0.07

Note: For most of the pre-1900 years, the annualized growth rate is calculated over a ten-year interval since GDP per capita data are available at such intervals only. 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 that the evidence of convergence is stronger during the inter-war period, while it is entirely absent for the pre-1914 period.

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).[22] Figures 4 and 5 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 Annex). 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. Using Bairoch's series, we find that both Gini and Theil indexes are stable between 1890

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[22] 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.

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.[23]

As a glance at Figures 2-5 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 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. [24]

Table 9 summarizes the findings regarding convergence and divergence using the data from the three authors.

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[23] 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.

[24] 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.

Table 9. Income convergence and divergence according to different authors

	Beginning of the 19th century to 1870 (Modern era)	1870 to 1913 (Heyday of globalization)	Between the two wars (Deglobalization)
Maddison	Strong divergence	Convergence	Mild convergence (strong convergence for Atlantic economy)
Bairoch	Very strong divergence	Divergence and then stability after 1890	Convergence
Prados de la Escosura	No data	Convergence	Divergence

Figure 4. Gini coefficients, 1800-1938
(calculated using Bairoch and Prados de la Escosura data)
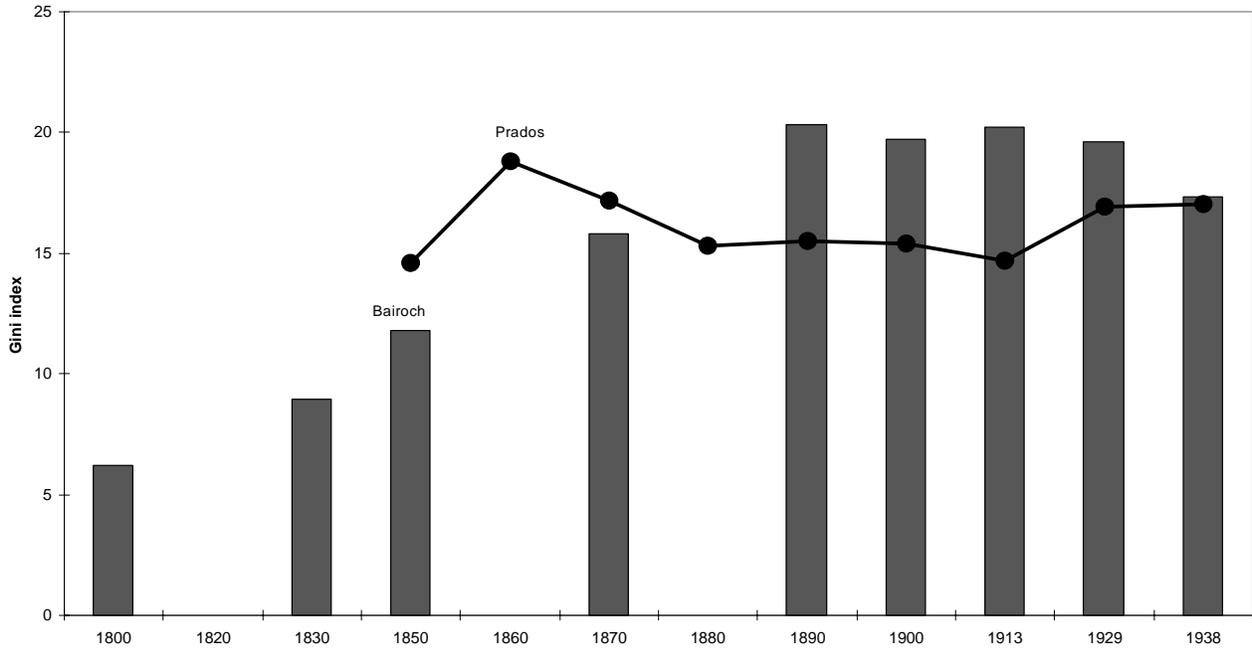
Figure 5. Theil coefficients, 1800-1938
(calculated using Bairoch and Prados de la Escosura data)
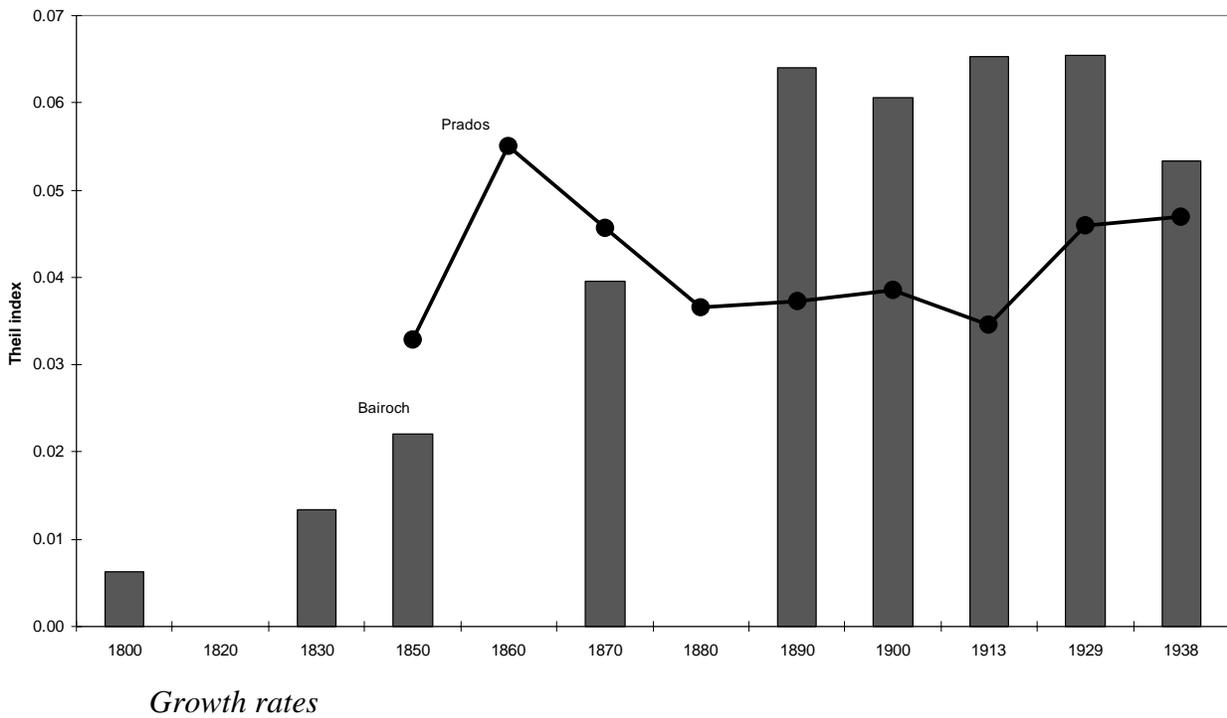
Growth rates

Finally, we may ask whether the inter-war period was unique by having had very low growth rates, as it is sometimes believed. Table 10 gives the population-weighted average growth rate of GDP per capita (using Maddison's data) for WENAO countries. 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 40+ years of the first globalization. The differences however are not enormous. After a generation (twenty years) of growth at 0.61 percent per annum, a person's real income would be some 13 percent higher than in the beginning; if the growth rate were 0.45 percent per annum, his income would be 9 percent higher.

Table 10. Average population-weighted growth rates of the WENAO region
(per capita, per annum)

	1870-1890	1890-1913	1919-1929	1929-1939
Growth rate	0.58	0.67	0.98	0.45

Note: growth rates calculated using a log-regression. These are average growth rates taking into account the entire population of WENAO.
Source: Calculated from Maddison (2001).

Table 11. Average unweighted GDP growth rates of the WENAO region
(annualized five-year averages)

	1870-1890	1890-1913	1919-1929	1929-1939
Growth rates	1.21	1.43	1.52	1.55
Observations	62	65	34	56
Average growth (stand. deviation)	1.4 (1.3)		1.5 (2.9)	

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 11). Both the median and mean (annualized five-year) growth rates were almost the same in the pre- and post-1914

periods. 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 Figure 6).

Figure 6. Distribution of countries' growth rates
(annualized five-year averages)
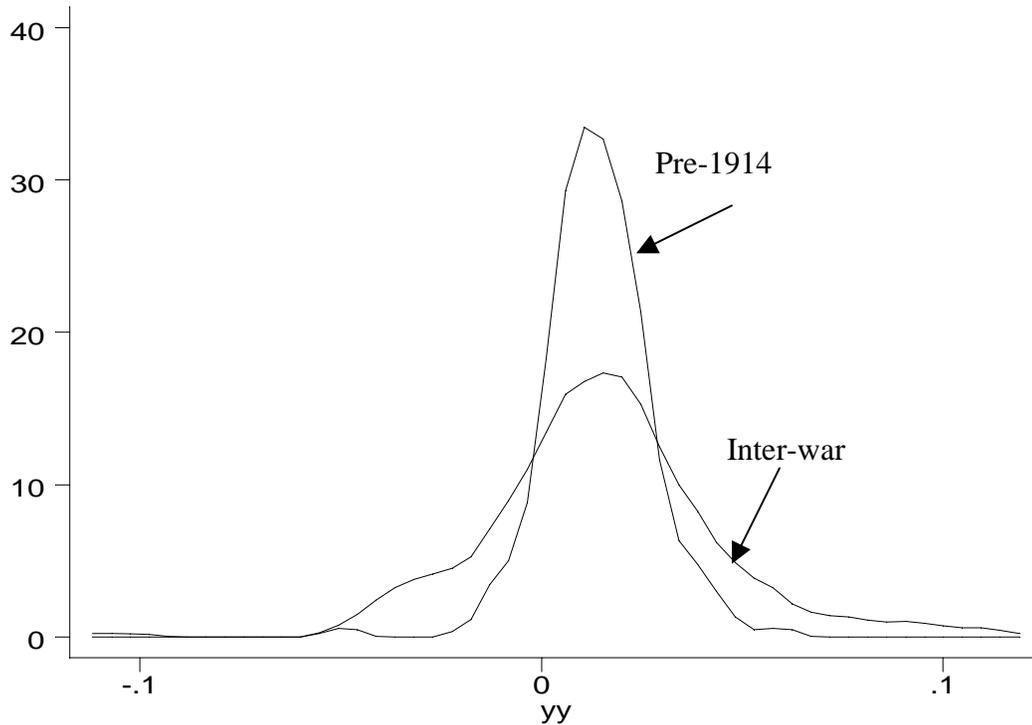
Finally, one may wonder to what an extent income convergence in the inter-war period was due to Italy and Germany, the two major Fascist powers whose growth was fairly fast during a part of the inter-war period. Both Italy and Germany were less rich in 1919 than the median WENAO country. [25] Italy's growth rate between 1922 and 1940 was only slightly higher than the unweighted WENAO average: 1.1 percent per person per annum vs. the mean of 0.93. Germany's rate between 1933 and 1940 was indeed much higher than the mean WENAO rate: 7.2 percent vs. 2.7.[26] But if we drop Germany from the sample, there is practically no change in the Gini or Theil index.

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

[26] Part of it was certainly due to the catch-up effect following upon an extremely high decline in GDP during the Great Depression. That catch-up element would have been here with or without the Nazis.

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4. The implications

We can now see that the statement in Lindert and Williamson (2001) that the disintegration of world economy generated income divergence is quite misleading. After comparing inequality in incomes on the *eve* of World War I and at the *end* of World War II—which in itself is a rather dubious way of making a comparison akin to comparing the peak to a trough of a business cycle—and finding that inequality in 1945 was much greater, they "assigned" the increasing income gap miscellaneously to "the great depression, two world wars, anti-global policies and other forces". Now we can readily see that all of the increased gap was due to the effects of the World War II, and none to "anti-global policies." Despite "anti-global" policies, income gap continued to shrink between 1919 and 1939.

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. In other words, greater trade, migration, or capital flows, have no discernable effect on the catch-up of the poorer countries. In effect, 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 cut off the 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 7 which shows the Gini coefficient of per capita incomes of WENAO countries for all years between 1870 and 1998. Over this long period of almost 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 7. Inequality among WENAO countries, 1820-1998
Gini and Theil index
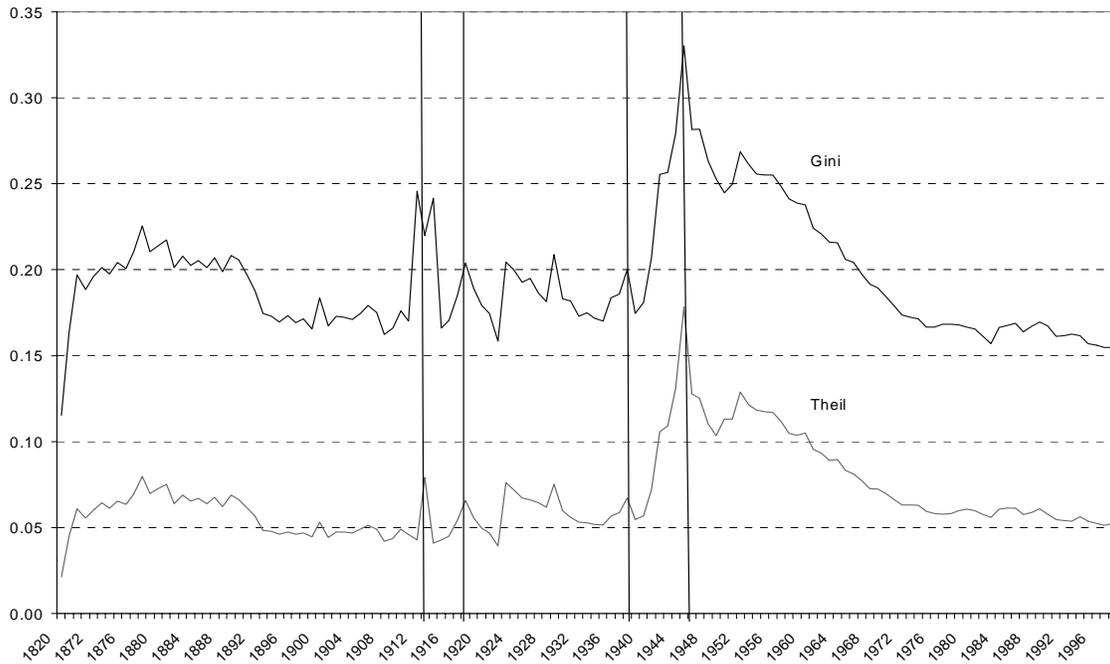
Note: After 1950, Israel and Turkey are added to the WENAO group.

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). It is not irrelevant to this line of thought that even during the era of the 1930's, Italy's industrialization, for example, 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 (i.e. what was later termed "Fordism").

In conclusion, for economies similar in terms of their incomes, structure and cultural proximity, trade and direct investments may not matter as much (or at all). Within their "club", the poorer economies' growth rate relative to growth rate of the rich, may not be affected by greater or lesser integration. 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.

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Annex. 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.

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	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