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Globalization and Convergence

Steve Dowrick and J. Bradford DeLong

4.1 Introduction

We see "globalization" everywhere. The nineteenth century saw falls in the costs of transporting goods across oceans that made large-scale intercontinental trade in staples rather than just curiosities and luxuries possible for the first time in human history (see O'Rourke and Williamson 1998; Findlay and O'Rourke, ch. 1 in this volume). It also saw mass flows of capital and mass migration on an extraordinary scale (see Lewis 1978). The second half of the twentieth century saw a further advance in international economic integration. It is hard to argue today that there is any dimension—trade, communication, intellectual property, ideas, capital flows, the scope of entrepreneurial control—save that of mass migration in which we today are less "globalized" than our predecessors at the end of World War I.

By contrast, we do not see "convergence" everywhere. We certainly see convergence at some times and in some places. We see it in the sample of Organization for Economic Cooperation and Development (OECD) economies after World War II (see Dowrick and Nguyen 1989). We see it in East Asia after 1960 (see World Bank 1994). We believe we see the rapid growth in real incomes and productivity levels, the rapid adoption and adaptation of industrial-core technologies, and the shifts in economic struc-

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ture that are the hallmarks of the process of convergence to world leading-edge economies in China and in India today (see Sachs 2000). During the interwar period, there were signs that economies as diverse as Soviet Russia, colonial Ghana, and Argentina were closing the gap that separated them from the world's industrial core. But these examples of successful convergence have been much more the exception than the rule. Looking at the world as a whole, what convergence there has been has been limited in geography and in time. The rule has been, instead, "divergence, big time" (see Pritchett 1997).

Baumol and Wolff (1988) set out the idea that it would be fruitful to analyze the pattern of world economic growth in terms of membership in a "convergence club." Their insight was that it would be fruitful to distinguish between those economies in which the forces that economists would expect to be generating convergence were strong enough to overwhelm counterpressures, and those economies in which economists' expectations were not coming to pass. Lucas (2000) showed that such a framework with the assumption of a once-and-for-all switch for an economy's joining the convergence club could account in a stylized fashion for much of the global experience of the past two centuries.

In this paper we seek to push Baumol and Wolff's insight as far as we can. We do not believe that we can put forward a convincing causal analysis of why economies join (and leave) the convergence club. We restrict ourselves much more to description—description of geographic patterns and of correlations between measures of globalization and the power of forces making for convergence.

Our conclusions are four tentative theses about the extent of convergence and the relationship of convergence to globalization:

- The first era of globalization—the knitting together of the world economy into a single unit in which staples could be profitably traded across oceans in the years before World War I—was essential in spreading the possibility of convergence beyond the narrow North Atlantic. Successful economic growth and industrial development in what Lewis (1978) called the temperate economies of European settlement was possible only because of this degree of economic integration (see O'Rourke and Williamson 1998).
- However, outside the charmed circle made up of the western European economies plus the temperate economies of European settlement, the first era of globalization in 1870–1914 did not bring convergence. It brought much structural change and economic integration—the rubber plant to Malaya, the tea plant to Ceylon, the coffee bean to Brazil. It brought large-scale migration—workers from China to Java, from India to South Africa, from Japan to Peru. But the relative gap in income and productivity and the gap in industrial structure vis-à-vis the industrial core of the world economy continued to widen.

- During the interwar era of globalization retreat, there were signs that the world's convergence club was significantly expanding. Pieces of coastal Africa, much of Latin America, and the Stalin-ruled Soviet Union appeared to be closing the relative gap that separated their economies from those of the world's industrial core.
- The post–World War II period has brought an expansion in the size but also a shift in the location of the world's convergence club. First, the OECD economies—as they were defined in the 1980s—have effectively completed the process of convergence. Second, there is the East Asian miracle, which has seen the fastest-growing economies anywhere, any time. Third, successful post-1980 development in China and India has put countries that together amount for two-fifths of the world's population "solidly on the escalator to modernity," in Lawrence Summers's (1994) phrase. However, these episodes of successful economic growth and convergence have been counterbalanced by many economies' loss of their membership in the world's convergence club. Consider the stagnation of late-Communist and post-Communist economies, the disappointment of post-WWII growth in much of Latin America, especially in the southern cone, and the extreme disappointment of Africa's postcolonial economic performance.

If correct, these theses seem to immediately raise three large questions. First, why the limited extent of convergence under the first globalized economy in the decades before 1914? The integrating world economy was powerful enough to move tens of millions of people across oceans and shape crop and livestock patterns in Java, central Brazil, and Ceylon as well as on the pampas and in the outback. Yet it was not strong enough to induce convergence outside the narrow charmed circle. Second, why did the area subject to convergence enlarge in the interwar period, when by and large the forces of globalization have been in retreat? Third, what were the forces behind the change in the shape of the convergence club after World War II? However, the narratives and analyses we provide do not provide convincing answers to these questions.

4.2 Joining and Leaving the Convergence Club

4.2.1 Economists' Expectations

Some thirty years ago, geopoliticians and commentators spoke often of the countries of the globe as divided into three "worlds": first, second, and third. To be of the third world was to try to play off the United States against the Soviet Union (and hopefully receive large amounts of aid from both). To be of the third world was to stress the differences between one's own polity and economy and those of the industrial core grouped around the North Atlantic. To be of the third world was to be—relatively—poor.

Today the Communist second world is gone, but the term *third world* is still useful. It underscores the differences—the sharp economic divergence in living standards and productivity levels—in the world today. To use the more common "developed" and "developing" nomenclature for groups of countries is to suggest that differences are narrowing, that countries are converging. However, this is not the case—at least not for most of the post-WWII period. Those economies that were relatively rich at the start of the twentieth century have by and large seen their material wealth and prosperity explode. Those nations and economies that were relatively poor have grown richer too, but for the most part much more slowly. And the relative gulf between rich and poor economies has grown steadily.

That the pattern of economic growth over the twentieth century is one of striking *divergence* is surprising to economists, for economists expect *convergence*. World trade, migration, and flows of capital should all work to take resources and consumption goods from where they are cheap to where they are dear. As they travel with increasing speed and increasing volume as transportation and communication costs fall, these commodity and factor-of-production flows should erode the differences in productivity and living standards between continents and between national economies.

Moreover, most of the edge in standards of living and productivity levels held by the industrial core is no one's private property, but instead the common intellectual and scientific heritage of humankind. Here every poor economy has an excellent opportunity to catch up with the rich by adopting and adapting from this open storehouse of modern machine technology. Yet economists' expectations have, throughout the past century, been disappointed, whether the expectations were those of John Stuart Mill that the spread of democracy, literacy, and markets would develop the world; or of Karl Marx that the British millowners' building of a network of railroads across India would backfire and have long-run consequences the millowners had never envisioned.

We can view this particular glass either as half empty or as half full. It is half empty in that we live today in the most unequal world (at least in terms of the divergence in the relative lifetime income prospects of children born into different economies) ever seen. It is half full in that most of the world has already made the transition to sustained economic growth. Most people today live in economies that, while far poorer than the leading-edge postindustrial nations of the world's economic core, have successfully climbed onto the escalator of modern economic growth.

4.2.2 The Idea of the Convergence Club

Why have economists been disappointed in their expectation that economic forces—international trade, international migration, international investment, and technology transfer—will gradually smooth out the enormous gaps in productivity levels, real incomes, and living standards around the world?

Back in 1988, William Baumol and Edward Wolff proposed that we begin thinking about this problem by examining the membership over time of the convergence club, which they defined as that set of economies where the forces of technology transfer, increased international trade and investment, and the spread of education were powerful enough to drive productivity levels and industrial structures to (or at least toward) those of the industrial core. Baumol and Wolff believed that examining how it is that economies enter and fall out of this convergence club should reveal clues to what are the particular economic, political, and institutional blockages that keep convergence the exception in the world today, and not the rule.[1]

Steve Dowrick and Duc-Tho Nguyen were the first to powerfully argue that the countries that belonged to the OECD had converged over the course of the post-WWII period (see Dowrick and Nguyen 1989). Convergence *could* work powerfully if circumstances and institutions were sufficiently favorable. In the case of the OECD after World War II, the set of countries that converged by and large shared a common social-democratic political setup, a common mixed-economy market-oriented economic setup, and a commitment to cutting back on protectionist barriers and to an open world economy.[2] But the set of OECD economies were not the only ones that belonged to the world's convergence club in the post-WWII period. Before we can begin to answer Baumol and Wolff's question and analyze the relationship of globalization and convergence, we need to map the size of the world's convergence club.

4.2.3 Mapping the Convergence Club

The task, therefore, is to examine the evolution of the world's convergence club over time by taking snapshots of its membership during four different eras over the past two centuries: 1820–70, 1870–1913, 1913–50, and 1950–2000. Moreover, it is important to be somewhat sophisticated in how we define *convergence*. When growth macroeconomists use the word *convergence*, they tend to think of a reduction in the variance of the distribution of output per worker levels (or total factor productivity levels, or real wage levels) across countries, or possibly of an erosion over time of initial edges or deficits in relative productivity vis-à-vis other national economies. But for a historically oriented economist, *convergence* means something somewhat different. It means the assimilation of countries outside northwest Europe of the institutions, technologies, and productivity levels currently in use in northwest Europe and in the rest of the industrial core. What you are converging to is thus a moving target.

Moreover, it is as much a structural and organizational target as a target indicated by levels of gross domestic product (GDP) per worker. The World

1. There is in this notion of a convergence club an implicit (and largely valid) critique of one-size-fits-all cookie-cutter growth regressions that search for one common law of motion to apply to the whole world, as found in, for example, DeLong (1988).

2. Or so DeLong and Eichengreen (1994) argued.

Bank reports that Saudi Arabia and the Persian Gulf Emirates certainly have levels of GDP per worker and standards of living equivalent to those of Western Europe. Yet we would not want to claim that they have converged to the industrial core. Before World War II there were periods of as long as a generation during which Argentine or Australian productivity levels were falling relative to those of the industrial core, either because of declining terms of trade or because of prolonged drought (see Butlin 1970). However, throughout such periods the Argentine and Australian economies were building up their industrial sectors and raising their economies' educational levels. In economic structure they were thus converging to the industrial core, even if they were losing relative ground in terms of standards of living and value of output per worker (see Diaz-Alejandro 1970).

So our definition of which economies are in the convergence club over a time period is not merely those countries in which GDP per capita as a proportion of the North Atlantic level rose over the time period in question. It looks at the extent of industrial development and structural change as well.

4.2.4 The Convergence Club, 1820–70

By 1820 the British industrial revolution was in full swing. The steam engine was nearly a century old. The automated textile mill was no longer a novelty. The long-distance railroad was on the horizon. As the pace of structural change and industrial development accelerated in Great Britain, its technologies began to diffuse elsewhere, to the continent of Europe and overseas to North America.

As Sidney Pollard (1981, 45–46) put it, the process of diffusion

> found no insuperable obstacles in [spreading to continental Europe]. . . . The regions of Europe differed, however, very greatly in their preparedness. . . . There was . . . an "inner" Europe . . . closest . . . to the social and economic structure . . . in Britain. Surrounding that core . . . other areas . . . less prepared. . . . Moreover, this conquest did not proceed indefinitely outward. . . . [T]here came a line where the process stopped, sometimes for generations, and, in some cases, until today. Beyond it . . . only scattered outposts, too weak to affect much the surrounding country. . . .

As time passed, the process of diffusion gathered force and the size of the convergence club grew.

In the beginning the convergence club was very small. Between 1820 and 1870 it was, as Pollard (1981) notes, limited to Great Britain itself, Belgium, and the northeastern United States. Industrialization had begun to spread elsewhere, to Canada, to the rest of the United States, to the Netherlands, to Germany, to Switzerland, to what is now Austria, to what is now the Czech Republic, and to France. However, all of these economies found themselves further from Great Britain in industrial structure in 1870 than they had been back in 1820.[3]

3. See Pollard (1981), Maddison (1994), and Landes (1969).

Fig. 4.1 The world's "convergence club" ca. 1850
Note: Solid black: economies that are members of the "convergence club."

Note that here the focus on industrial structure rather than economy-wide productivity or labor productivity makes the biggest difference. The labor-scarce U.S. west and Canada certainly had higher real wages than Great Britain by the end of this period, as did labor-scarce Australia and New Zealand. The Netherlands was in all probability more prosperous in overall terms than Great Britain in 1820, and even in 1870 the productivity and living standard gap was relatively small.[4] But on an industrial-structure and an industrial-technology definition of convergence, the primary product-producing economies, even the richest ones like Canada, do not belong in the convergence club before 1870. They are rich primary-sector-based economies, not industrializing economies. And the Netherlands, also, is not yet an industrializing economy: It is still a rich mercantile economy. To the extent that one takes industrialization as the key measure of modernity or development in the middle and late nineteenth century, the mid-nineteenth-century convergence club (see fig. 4.1) was very small indeed.[5]

4.2.5 The Convergence Club, 1870–1914

Between 1870 and 1914 the convergence club expands considerably. What Arthur Lewis called the countries of temperate European settlement—Canada, the western United States, Australia, and New Zealand,

4. Indeed, the most parsimonious hypothesis explaining the slow industrialization of the Netherlands in the mid-nineteenth century is that Dutch workers had more productive and profitable things to do than work in the dark satanic mills and forges of the early industrial revolution. You can get coal to Amsterdam almost as cheaply as to Brussels, but real wages were much lower in the second than in the first; hence, that is where the mills were located. See Mokyr (1976).

5. It is, of course, debatable whether one should focus so exclusively on machines, factories, and manufacturing, and give the development of those sectors priority over wealth as defined by output per worker.

plus Argentina, Chile, Uruguay, and perhaps South Africa—clearly belong to the convergence club (see Lewis 1978). They are rich and are experiencing (for the most part) rapid income growth. But they are also making use of industrial technology, building up their materials-processing and factor sectors, and becoming industrial economies. Australia started the period as the sheep-raising equivalent of the Organization of Petroleum Exporting Countries (OPEC) of the late nineteenth century, but by the beginning of World War I it was clearly well on the way to being a successfully industrializing economy. Argentina before World War I had a large and rapidly growing portion of its labor force employed in railroads and in food processing. By 1913 Buenos Aires ranked in the top twenty world cities in terms of telephones per capita.

The successful spread of the convergence club to include the economies of temperate European settlement is an achievement of the first, 1870–1914, era of globalization. The coming of the steamship and the telegraph made the transoceanic shipment of staple commodities economically feasible for the first time in human history. However, ocean transport was not so cheap as to make it economically efficient to do all materials and food processing in the industrial core of northwest Europe and the northeast United States. Buenos Aires, Melbourne, Santiago, Toronto, and San Francisco became manufacturing as well as trade and distribution centers. And the ease of transport and communication brought about by this first late-nineteenth-century global economy made the technology transfer to enable this "rich peripheral" industrialization feasible.

In this period also the Industrial Revolution, and thus the convergence club, spread to include nearly all the countries of inner Europe: Belgium, the Netherlands, France, Germany, Switzerland, Spain (but probably not yet Portugal), Italy (even if surely not its south), Austria, what is now Hungary, what is now the Czech Republic, Denmark, Norway, Sweden, Finland, and Ireland (see Pollard 1981). Beyond that line, however, the convergence club did not extend, in spite of small and weak enclaves of industrialization. With one exception, the relative gap in per capita productivity and industrial structure between the industrial core and economies like Russia, Turkey, Egypt, and the rest was wider in 1914 than it had been in 1870. That one exception was Japan (see Ohkawa and Rosovsky 1973).

The failure of the tropical primary-product-producing regions to join the convergence club in the 1870–1914 period marks the limited scale of this first era of globalization. International trade, international investment, international migration, and international conquest profoundly affected economic, social, and political structures throughout the world. The British Empire brought the rubber plant to Malaysia. British investors financed the movement of indentured workers south from China to Malaysia to work the plantations to produce the rubber to satisfy demand back in the world economy's core. The British Empire brought the tea plant from China to

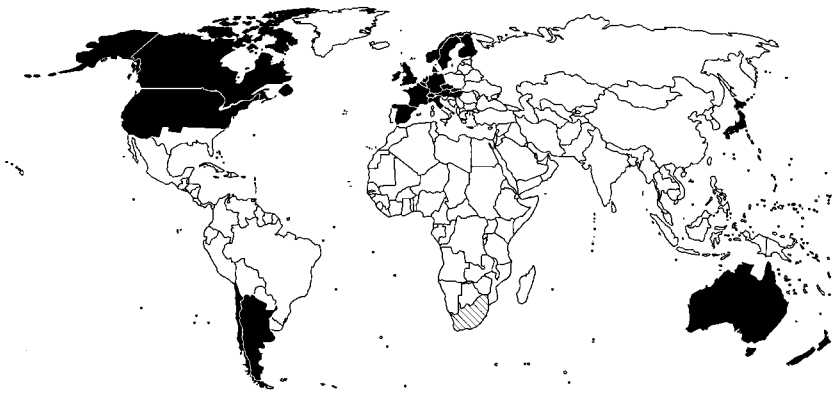

Fig. 4.2 The world's "convergence club" ca. 1900
Notes: Solid black: economies that are members of the "convergence club." Diagonal fill: economies that *might* be members of the "convergence club."

Ceylon. British investors financed the movement of Tamils from India across the strait to work the plantations to produce the tea to satisfy demand from the British actual and would-be middle classes. But these did *not* trigger any rapid growth in real wages. They did not trigger any acceleration in productivity growth or industrialization. They did not trigger any rapid growth in factory employment, or any convergence to the world's economic core (see Lewis 1978).

The convergence club remained of limited size, not touching continental Asia at all, and barely touching Africa and Latin America (see fig. 4.2).[6]

4.2.6 The Convergence Club, 1914–50

The enormous physical destruction wrought by two world wars, coupled with the enormous economic destruction of the Great Depression, makes it difficult to discern trends between 1914 and 1950. By 1950 the gap in productivity and living standards between Japan and the United States was larger than it had been in 1914. But does this mean that Japan had fallen further behind in technology and industrial structure? Perhaps, but perhaps not: It depends whether you take the as your benchmark the industrial structure of still war-ravaged Japan in 1950, or the level and quality of the technologies being installed in the rebuilding Japan, which were much

6. W. Arthur Lewis (1978) argued that it was the particular position of China and India in the Malthusian cycle at the end of the nineteenth century that gave rise to this peculiar wage increase–less, structural change–less form of development and growth, that whatever increases in demand for labor in the tropical periphery were produced by the first era of globalization were overwhelmed by the elastic supply of potential migrant labor from China and India. But an equally valid way to look at it is not that migrant labor supply from China and India was remarkably large, but that the amount of increased trade between tropical periphery and industrial core was relatively small.

closer to world best practice in 1950 than in 1914 and which by the 1970s would have world-leading productivity levels in some industries (see Patrick and Rosovsky 1976).

We argue, once again, for the second definition—we want to compare relative technology, industrial structure, and productivity gaps in 1914 to what they would have been in 1950 had postwar reconstruction been completed. Thus, from our perspective, Japan and its inner empire of Korea and Taiwan definitely belong in the convergence club over the extended interwar period from 1914 to 1950 (see fig. 4.3). During this interwar period the southern United States joins the convergence club. Its long economic decline relative to the industrial core comes to an end in this period (see Wright 1978). The Soviet Union joins as well. Stalinist industrialization was a disaster for human life, social welfare, and economic efficiency, but it was a powerful motor of industrialization. Elsewhere in Europe, however, there was little expansion in the convergence club.

However, the convergence club did expand outside of Europe. In Latin America, Venezuela, Peru, and Brazil appear to have joined. Brazilian real GDP per capita appears to have more than doubled in the years 1913–50 (see Maddison 2001). Because of the discovery and exploitation of oil, Venezuelan GDP per capita grew more than sixfold.

In Africa, Ghana, the Ivory Coast, Kenya, Tanzania, Nigeria, and perhaps other regions appear to make progress (see Hopkins 1973). French North Africa—Morocco, Algeria, and Tunisia—closed some of the relative gap between themselves and Western Europe (see Dumont 1966). Per capita income in such economies appears to grow as rapidly as in the industrial core. There are signs of, if not widespread industrialization, at least widespread integration of plantation and smallholder agriculture into the

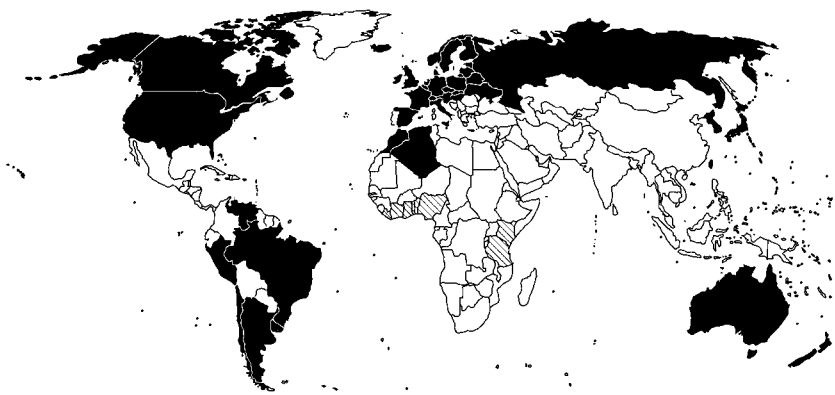

Fig. 4.3 The world's "convergence club" in the interwar period

Notes: Solid black: economies that are members of the "convergence club." Diagonal fill: economies that *might* be members of the "convergence club."

world economy. Whether this is sufficient structural change to qualify for full-fledged membership in the convergence club is debatable.

An optimist—a John Stuart Mill, say, looking for knowledge, education, trade, and markets to bring the whole world together in a march to a liberal utopia[7]—might have looked at the world in 1950 and been relatively optimistic. Naziism had been defeated. Communism was a bloody and authoritarian form of economic growth, but it might well become less bloody and less authoritarian over time. And elsewhere the convergence club was clearly growing, even if it was growing less rapidly than one would wish.

4.2.7 The Convergence Club, 1950–2000

However, the next period—the period between 1950 and 2000, which we have just lived through—has brought surprises. The convergence club both expanded and contracted massively, as for the first time many economies joined and, also for the first time ever, many economies dropped out. In Latin America, countries like Venezuela, Peru, Argentina, Chile, and Uruguay exhibited stunning relative economic declines over the last half century. Argentine relative income levels had declined during 1913 to 1950, as the value of primary products fell, but its industrial structure had converged toward industrial-core norms. But between 1950 and 2000 the sectoral distribution of the labor force froze, and Argentinians lost a third of their relative income vis-à-vis the industrial core.

Coastal West Africa fell out of the convergence club (if it had ever belonged in the first place); coastal East Africa fell out as well (if it, too, had ever belonged). South Africa did not maintain modern economic growth fast enough to close the gap with the industrial core over the second half of the twentieth century, and educational and industrial structure gaps vis-à-vis Western Europe grew substantially. Purchasing power parity–concept GDP per capita in South Africa was perhaps a quarter of that in the industrial core in 1950, and is less than a sixth of that in the industrial core today.[8]

Moreover, the countries of French North Africa fell out of the convergence club: Morocco, Tunisia, and Algeria are today further behind France in relative material productivity and industrial structure than they were in 1950. The former Soviet Union dropped its membership in the convergence club as well. First came the stagnation that began in the mid-1970s as the ability of the centrally planned system to deliver even its own kind of limited, resource- and capital-intensive economic growth eroded and effectively ended in the 1970s. Then came the collapse of economic activity in the 1990s that followed the end of communism.

This shrinkage of the convergence club during what was an era of ex-

7. See Mill (1848).

8. Neighboring Botswana, however, has been one of the fastest-growing economies in the world.

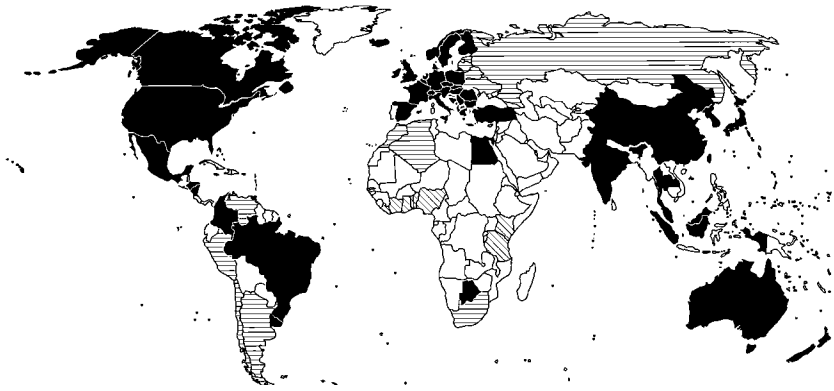

Fig. 4.4 The world's "convergence club" in recent years

Notes: Solid black: economies that are members of the "convergence club." Vertical fill: economies that *might* be members of the "convergence club." Horizontal fill: economies that used to belong to the convergence club, but have fallen out. Diagonal fill: economies that *might* have once belonged, but that have fallen out.

panded international trade and massive moves toward an open world economy is remarkable, and very much counter to economists' perhaps naïve expectations. In each case the driving factors may have been political. Agronomist Rene Dumont warned at the very beginning of African decolonization that the postcolonial governments were following policies that destructively taxed agriculture and enriched relatively parasitic urban elites (see Dumont 1966). The work of Robert Bates two decades later suggested that little had changed (see Bates 1981).

Diaz-Alejandro (1970) and DeLong and Eichengreen (1994) argued that the failure of the southern cone of South America in economic development after World War II was largely a political failure. And the (largely political) failure of the Soviet Union to live up to its potential both before and after its disintegration is well known. If correct, this would suggest that all the potential for international economic contact and technology transfer cannot survive bad economic policies. It would, however, beg the question of why such bad economic policies were so likely to be adopted by so many countries in the half-century after World War II.

As these economies fell out of the convergence club, other economies joined (see fig. 4.4). The East Asian miracle took hold: Japan, South Korea, Taiwan, Hong Kong, Singapore, Thailand, Malaysia, Indonesia (after 1965), and China (after 1978) clearly belong to the convergence club. Only the unreformed socialist governments of Burma, Cambodia, Laos, and Vietnam keep them from joining the rest of east and Southeast Asia.[9] In the Balkans, Yugoslavia, Romania, and Bulgaria join the convergence club:

9. However, the Philippines and Papua New Guinea go their own way as well.

Once again centrally planned economies succeed in growth at a particular stage of early industrialization, albeit at a large human cost. In the eastern Mediterranean, Greece, Turkey, Israel, and Egypt are now in the convergence club. In Latin America, Colombia and Mexico join. After 1980, India begins not only to grow economically but to narrow the gap in aggregate productivity and industrial structure (see Sachs et al. 2000).

In the first (1870–1914) era of globalization its implications for the size of the convergence club were clear. Globalization forces were sufficient to pull the temperate economies of European settlement into the convergence club, but insufficient to pull any other regions into the club even though they had powerful effects on economic structure. In the second (1950–2000) era of globalization, the implications of globalization for the size of the convergence club are less clear. Why has it been such a friend to East Asia but not to Latin America? Why has the eastern Mediterranean done so well and the southwestern Mediterranean so badly? What explains the economic collapse of Africa relative to the high hopes of the decolonization era and to the 1914–50 interwar period?

4.3 Debating Convergence while Incomes Diverge

4.3.1 Is "Conditional Convergence" Meaningful?

Recent debates on growth theory have contrasted the convergence predictions of the neoclassical growth models of Swan (1956) and Solow (1956) with predictions of potential nonconvergence from the newer models of endogenous technological progress of Romer (1990) and Aghion and Howitt (1998). Most of this debate has been in the context of closed economy modelling. The standard neoclassical assumption of diminishing returns to investment implies that each economy converges to its own steady-state level of labor productivity. Higher rates of saving and lower rates of population growth will raise the long-run level of income, but not its growth rate. Long-run growth is simply the world's rate of technical progress.

In this framework, empirical studies of short-run growth are predicted to find conditional convergence if they control for factor accumulation. A negative partial correlation between growth and initial income is confirmation of convergence toward steady state. (In the terms of modern time series econometrics, it is evidence of cointegration between income levels and the country-specific determinants of steady state.) Even when this negative partial correlation is observed on cross-country data, it has no implications for convergence across countries. Thus, studies such as Mankiw, Romer, and Weil (1992) can find strong conditional convergence, at a rate of around 2 or 3 percent per year, on postwar data covering both industrialized and unindustrialized economies.

Over recent years, the use of panel data and higher levels of econometric

sophistication (or sophistry?) have produced ever-increasing estimates of the magnitude of the conditional convergence coefficient. The annual rate of global convergence since 1960 is estimated to be around 10 percent both by Islam (1995) and by Caselli, Esquivel, and Lefort (1996), whereas Lee, Pesaran, and Smith (1998) suggest that the true figure is closer to 30 percent.[10] This focus on conditional convergence has tended to obscure the fact that, across the globe, income levels have actually been diverging rather than converging over the past forty years.[11]

Perhaps the foremost advocate of the position that there has been or is "convergence" in the world over the past fifty years and today is Harvard economist Robert Barro (1996). His work finds "strong support [for] the general notion of conditional convergence"—that is, that if other things are held equal then there is a strong tendency for countries to converge toward a common level of total factor productivity, a common level of labor productivity, and a common standard of living.

In Barro's view, strong and powerful forces are pushing countries together. His regressions show that, on average, a country with the same value of the other right-hand-side variables closes between 2.5 and 4.5 percent of the log gap between it and the world's industrial leaders each year. This means that even a country as poor as Mozambique could—if it attained the same values for the other right-hand-side variables—close half the (log) gap between its level of productivity and that of the United States in sixteen to twenty-nine years, and in such an eyeblink of historical time become as rich and productive as Thailand or Panama or Lithuania is today.

The joker in the deck, of course, is the assumption that other things—the other right-hand-side variables in Barro's regression—could be made equal. Barro's other right-hand-side variables include an index of democracy, an index of the rule of law, government noninvestment spending as a share of GDP, life expectancy, the male secondary-school attendance rate, and the fertility rate. And a moment's thought will convince anyone that these other right-hand-side variables could never be brought to the mean values found in the industrial core of the world economy in any country that has not already attained the productivity level and socioeconomic structure found in the industrial core.

First and most important, consider the fertility rate. At extremely low levels of income per capita—levels lower than found anywhere else in the world today save in exceptional years—there is a positive Malthusian

10. In this last case, the use of annual time series data and dummy variables for country-specific exogenous technical progress may have resulted in the convergence coefficient capturing the average frequency of the business cycle.

11. We need to qualify this statement as referring to an unweighted measure of global income dispersion. When population weights are applied, there is evidence of some decrease in global income inequality—but this depends entirely on the rapid growth of average real income in China over the past twenty years and in India over the past fifteen years.

causal relationship running from income to fertility. But once one passes over this Malthusian peak, there is a strong negative causal relationship running from income to fertility. In richer countries access to birth control is easier, and birth control means that those who did not wish to have more children could exercise their choice. Life expectancies are longer in richer countries, so parents no longer need to birth four sons to be reasonably sure that one will survive into middle age. Starting in eighteenth-century France and continuing in every single country we have observed since, as the resources and educational level of the average household rise, fertility falls.

The same argument applies to life expectancy and to educational levels as well. These are things that are at least as much results of wealth and productivity as causes of it. It is not possible to consistently imagine a counterfactual world in which a poor country like Mozambique could have a secondary-school enrolment rate and a life expectancy as high as those of the industrial core.

For the third group of his right-hand-side variables, the "government group" made up of the rule-of-law index, the democratization index, and government noninvestment spending as a share of GDP, Barro has more of a point. States that tax heavily and do not spend the proceeds on public investments, states too weak to enforce the rule of law or control the corruption of their functionaries, and states that rest not on the consent of the governed but on the bayonets of soldiers and the whispers of informers destroy economic growth. But here, as well, the cause-and-effect links run both ways. Richer countries with larger tax bases afford governments more resources that they can use to enforce the rule of law and control the corruption of their own functionaries. In richer countries the rewards from concentrating activity on the positive-sum game of production are greater relative to the rewards of grasping for a redistribution of rents from the export trade.

For these reasons we find demonstrations of convergence conditional on fertility, life expectancy, education, and even on the structure and effectiveness of government to be of dubious value. A claim that convergence is a powerful and active force in the world today but is masked by other factors suggests that there is an alternative, counterfactual set of political and economic arrangements in which that convergence would come to the forefront and be clearly visible. Yet we can see no way of bringing the poor-country values of Barro's other right-hand-side variables to their rich-country means that does not presuppose that full economic development has already been successfully accomplished.

This argument applies even more strongly to convergence regressions, like those of DeLong and Summers (1991), that include measures of investment in their list of right-hand-side variables. A poor country will face a high relative price of the capital equipment it needs to acquire in order to turn its savings into productive additions to its capital stock. This should

come as no surprise. The world's most industrialized and prosperous economies are the most industrialized and prosperous because they have attained very high levels of manufacturing productivity: Their productivity advantage in unskilled service industries is much lower than in capital- and technology-intensive manufactured goods. The higher relative price of machinery in developing countries means that poor countries get less investment—a smaller share of total investment in real GDP—out of any given effort at saving some fixed share of their incomes.

4.3.2 Development Traps, Conditional Convergence, and Absolute Divergence

So the coexistence of actual divergence and conditional convergence reflects the observation that some of the "conditioning" variables in the standard convergence regressions are distributed in such a way as to promote divergence—in particular, faster population growth and lower rates of investment in poorer countries. In autarkic models, this implies the existence of a development trap or poverty trap: A population living close to subsistence is unable to mobilize the surplus required for substantial domestic investment;[12] they will typically face high prices for imported capital goods; they may well be caught in a prisoner's dilemma whereby each family substitutes quantity of children for quality of human capital investment (schooling) in attempting to maximize family welfare, running afoul of diminishing returns to labor in the aggregate.

A related explanation for the limited range of convergence over the past century and a half is put forward by Richard Easterlin (1981), who attributes limited convergence to a lack of formal education throughout much of the world. As Easterlin puts it, the diffusion of modern economic growth has depended principally on the diffusion of knowledge about the productive technologies developed during and since the Industrial Revolution, and this knowledge cannot diffuse to populations that have not acquired the traits and motivations produced by formal schooling. Political conditions and ideological influences played the biggest role in restricting the spread of formal education before World War II. But Easterlin looks forward to a world in which formal education is universal, hence in which the blockages to convergence have vanished.

Perhaps the most interesting contribution to this literature over the past several decades has been that of Gregory Clark (1987), who suggests that the chief obstacle to convergence was not the inability to transfer technology to relatively poor economies, but the relative inefficiency of labor. Clark studies the state of cotton mills worldwide around 1900 and finds that the technologies of automated cotton-spinning had indeed been suc-

12. Ben-David (1997) models exactly such a development trap by introducing the notion of subsistence consumption into the neoclassical exogenous growth model.

cessfully transferred all around the world: There were cotton mills not just in Manchester and Lowell, but also in Tokyo, Shanghai, and Bombay, all using the same technology and all equipped with machinery from the same spinning-machine manufacturers in New England or in Lancashire. Yet, according to Clark, labor productivity in factories equipped with the same machines varied by a factor of ten-to-one worldwide, neatly offsetting the ten-to-one variation in real wages worldwide and so making the profitability of cotton-spinning mills approximately equal no matter where they were located.

Clark points out that given the enormous gaps in real wages, something like an equivalent gap in labor productivity was essential if competition were not to rapidly eliminate the cotton-spinning industry from large chunks of the globe. Capital costs were much the same worldwide: Factories did use common sources of machines. Raw material costs varied, but not grossly worldwide. Labor costs were the overwhelming bulk of total costs. Thus, unless labor productivity varied directly and proportionately with the real wage, a cotton-spinning mill in a low-wage economy would have an overwhelming cost advantage. And competition would lead to an international division of labor in which such low-wage economies dominated the worldwide industry of a good as easily and cheaply tradable as cotton thread.

Clark (1987) has been an extremely influential and disturbing paper for the decade and a half since it was first written. But its striking results may be due to some peculiarity of the cotton-spinning industry, rather than with the general nature of modern economic growth. Consider: In order for Clark to do his comparisons of productivity levels in one industry across the whole world, he needs to find an industry that is not heavily concentrated in one particular region or among one particular slice of the world income distribution. Thus, he needs to find an industry in which it is profitable to locate in a country no matter what that country's level of real wages—in which it is profitable to locate in Manchester, Milan, or Mobile as well as in Mumbai.

When will it be profitable to locate an industry in a country no matter what that country's relative level of real wages? It will be profitable if and only if labor productivity in that industry is proportional to the local real wage. Thus, Clark's major conclusion—that in the cotton-spinning industry at the turn of the last century there were extraordinary variations in labor productivity that were roughly proportional to the local real wage—could have been arrived at without any of his calculations just by observing that there were cotton-spinning mills in Mumbai and also in Manchester.

But how common are industries like the cotton-spinning industry? How much of the world's industry is of this character, in which labor productivity is proportional to the local real wage? We know that it is not the case today in toy manufacture: Mattel just closed down its last U.S. toy-

manufacturing plant. We know that it is not the case in steel: U.S. producers and unions continue to demand protection against steel makers in Brazil and Korea lest large chunks of their industry vanish. We know that it is not the case in microprocessor manufacture or (Bangalore aside) software design. We know that it is not the case in grain agriculture.

There are some industries in which labor productivity worldwide is roughly proportional to the local real wage. There are more industries in which it is not: Either labor productivity varies less than the real wage (and the industry tends to be concentrated in at least some relatively poor countries), or labor productivity varies more than the real wage (and the industry tends to be concentrated in the richest and most technologically capable economies). We are going to have to learn lessons from many more industries than just the cotton mills before we can understand why the whole world is not developed.

Our picture of world development is one in which some economic forces push in the direction of convergence while other forces are divergent. Globalization is typically presumed to reinforce the convergent trend—through the flow of capital toward capital-poor economies, through trade-induced factor price equalization, and through international knowledge spillovers. Why might globalization have failed to produce convergence over the past fifty years?

Lucas (1990) suggests that human capital complementarity may block the capital channel. The marginal product of capital in a capital-poor country may well be much higher than that in the United States, other things being equal. But typically those other things are not equal: in particular, the availability of the skilled labor required to operate and adapt a new technology. When physical and human capital are complementary, the problems of moral hazard in human capital investment explain the failure of international capital markets to invest in the capital-poor economies.

Similar problems are likely to impede the international transfer of technology, as is argued by Abramovitz (1986), who cites a lack of social capability as the major obstacle preventing the technologically backward from absorbing the technological developments of the advanced economies. This hypothesis is supported by Benhabib and Spiegel (1994), who find evidence that the growth rate of total factor productivity depends on the national stock of human capital.

4.3.3 Openness and Convergence

An alternative explanation for the failure of globalization to bring about convergence comes from Sachs and Warner (1995). They have constructed an index of openness for the twenty-year period 1970–89, in which the index takes the value of 1 for an open economy but a value of zero if the economy was closed according to at least one of the following five criteria:

1. Tariff rates averaging over 40 percent
2. Nontariff barriers covering at least 40 percent of imports
3. A socialist economic system
4. A state monopoly of major exports
5. A black market premium of 20 percent or more on foreign currency

They find evidence for the period 1970–89 of strong convergence in per capita GDP among the group of countries classified as open, but no convergence among the closed economies. The average growth premium for opening an economy is estimated to be a massive 2.5 percentage points on annual growth.

Sachs and Warner (1995) argue that globalization has indeed promoted both growth and convergence (i.e., faster growth for poorer countries), but only to those countries that allow relatively free movement of goods and capital. In other words, those countries that have failed to catch up have usually failed to jump on the globalization bandwagon.

The Sachs and Warner (1995) evidence has been criticized by Rodriguez and Rodrik (1999). They find that the crucial components of the Sachs-Warner index are the measures of export monopoly and black market premiums. These variables identify all but one of the sub-Saharan economies in Africa plus a group of largely Latin American economies with major macroeconomic and political difficulties. Rodriguez and Rodrik conclude that "The [Sachs-Warner] measure is so correlated with plausible groupings of alternative explanatory variables . . . that it is risky to draw strong inferences about the effect of openness on growth" (24).

We turn in the next section to an empirical examination of the robustness of the Sachs-Warner result. We investigate whether their result holds for the most recent decades, noting the contrary finding by Kevin O'Rourke (2000) for the beginning of the last century.

4.4 Evidence on Openness and Convergence, 1960–98

Descriptive statistics are given in table 4.1 for real GDP per capita (RGDP) for 109 countries in 1960, 1980, and 1998,[13] using the Penn World Tables 5.6a[14] and World Bank estimates of real GDP growth in the 1990s. We also report real GDP per member of the workforce (RGDPW) and real GDP per capita as adjusted by Summers and Heston (1991) for changes in

13. To reduce the influence of asynchronous business cycles, the data labeled 1960 are actually five-year averages for the period 1960–64; similarly, we give 1978–82 averages as 1980, 1988–92 as 1990, and 1994–98 as 1998.

14. We have identified some problems with the Penn World Tables data on population and real GDP growth for 1960 and 1970 for a number of countries such as Nigeria. This should not be a problem for the study reported here because the data mistakes appear to cancel out over the period 1960–80.

Table 4.1 **Breakdown of σ-Divergence 1960–98, Countries Ranked by 1960 Relative Real GDP Levels (in 1985$)**

	Real GDP Per Capita			Real GDP Per Worker			Real GDP Per Capita Terms-of-Trade Adjusted		
	1960	1980	1998	1960	1980	1990	1960	1980	1990
Whole sample: 1960–80									
Mean	2,454	4,170	5,544	4,079	6,629	6,971	1,631	2,628	2,831
Annual growth rate		0.025	0.010		0.027	0.005		0.027	0.007
Var (log)	0.815	1.004	1.347	0.955	1.047	1.156	0.815	1.015	1.209
Change in var (log)		+0.189	+0.343		+0.092	+0.109		+0.200	+0.194
Change in var, population weighted		+0.097	–0.158		–0.002	–0.035		+0.084	–0.081
Rich sample: Y60 > $5,000: $N = 19$									
Mean	7,117	11,475	14,788	17,168	25,588	28,182	6,906	11,365	13,127
Annual growth rate		0.027	0.015		0.022	0.010		0.028	0.014
Var (log)	0.042	0.023	0.064	0.049	0.016	0.032	0.050	0.025	0.066
Change		–0.019	+0.041		–0.033	+0.016		–0.025	+0.041
Middle sample: $1,500 < $Y60$ < $5,000: $N = 35$									
Mean	2,434	4,579	6,398	6,478	11,393	11,551	2,314	4,201	4,410
Annual growth rate		0.032	0.013		0.031	0.001		0.033	0.005
Var (log)	0.008	0.035	0.466	0.009	0.048	0.270	0.007	0.034	0.419
Change		+0.027	+0.431		+0.039	+0.222		+0.027	+0.385
Poor sample: $Y60 < $1,500: $N = 55$									
Mean	855	1,385	1,808	1,850	2,945	3,027	793	1,176	1,219
Annual growth rate		0.021	0.006		0.026	0.003		0.022	0.004
Var (log)	0.187	0.329	0.622	0.323	0.495	0.575	0.198	0.347	0.451

the terms of trade (RGDPTT). This terms-of-trade adjustment gives a better measure of changes in average welfare than the fixed-price measure. These latter two measures are available only up until 1992.

Dispersion is measured by the variance of the logarithm. Other measures of dispersion are often used, particularly in welfare analysis, but the log variance is particularly useful in that it can be directly related to the regression analysis of growth rates. In the fifth row of table 4.1 we report changes in population-weighted variances for the whole sample (a measure appropriate to analysis of inequality across individuals), but for the rest of our analysis we adopt a positivist approach to hypothesis testing and treat each country's performance over a period as a single, equally weighted observational unit.

All three measures show increasing dispersion. We have divided the sample of 109 countries into three groups, depending on whether 1960 RGDP was above or below I$1,500 or I$5,000 (measured in constant international prices with the international dollar [I$] normalized to the purchasing power of the U.S. dollar in 1985). Divergence has occurred within each group, except for the richest nineteen countries between 1960 and 1980. But the principal cause of divergence has been the failure of the poorest to match the growth of the more developed.

Between 1960 and 1980, the middle-income countries grew fastest, at 3.2 percent per year, followed by the rich at 2.7 percent and the poorest at 2.1 percent. Over the subsequent two decades growth rates slowed for all groups, with a meager 0.6 percent per year for the fifty-five poorest economies.

It is this falling-behind of the poorest countries, in a period of increasing globalization, that we investigate. From table 4.2 we can see that the fifty-five poorest countries in 1960 are characterized, relative to the richer groups, by high prices of investment goods and low rates of real investment, by low levels of education, by high population growth, low values of openness on the Sachs-Warner (S&W) index, low ratios of trade to GDP, and low growth of the working-age population relative to total population. These discrepancies are exaggerated if we examine the thirty-five slowest growers within the poor group.

The regressions reported in table 4.3 replicate some of the analysis carried out by Sachs and Warner (1995). We use the S&W distinction between open and closed economies for the period 1960–80 to construct a dummy variable equal to 1 for countries they deemed to be open for the period 1970–89. This restricts our sample to ninety-six countries. Since we are also examining growth over the period 1980–98, we extend the S&W classification to our later period, reclassifying countries as open if S&W report that they have been open for a significant number of years since 1980; table 4.3 gives the details of our classifications. This enables us to check whether the S&W results carry over to the 1990s—in particular for the twenty-four

Table 4.2 Average Characteristics of Country Income Groups

	Rich	Middle	Poor	Slowest Growers
Real GDP per capita ($)				
1960	7,117	2,466	855	800
1980	11,475	4,579	1,385	978
1990	13,416	5,365	1,555	878
1990	14,788	6,398	1,808	885
RGDP growth rate (annual average)				
1960–80	0.027	0.032	0.021	0.007
1980–98	0.015	0.013	0.006	–0.007
Proportion African	0.00	0.14	0.62	0.81
Proportion OECD	0.89	0.17	0.00	0.00
Proportion open (extended Sachs-Warner)				
1960–80	0.83	0.39	0.12	0.03
1980–98	0.88	0.75	0.32	0.22
(Imports + Exports)/GDP				
1960–80	0.62	0.70	0.51	0.47
1980–98	0.71	0.85	0.62	0.54
Adjusted trade share				
1960–80	0.01	–0.10	–0.22	–0.28
1980–98	0.20	0.17	0.10	–0.02
Real investment/GDP share				
1960–80	0.26	0.20	0.11	0.08
1980–98	0.23	0.17	0.11	0.07
Relative price of investment goods				
1960–80	1.02	1.35	2.37	2.89
1980–98	0.93	1.39	2.48	2.99
Average years of schooling				
1960–80	4.7	3.8	2.4	2.0
1980–98	6.2	5.2	3.6	3.1
Population growth rate (annual average)				
1960–80	0.010	0.020	0.025	0.026
1980–98	0.007	0.016	0.024	0.027
Growth of workforce/ population				
1960–80	0.005	0.002	–0.003	–0.005
1980–98	0.005	0.005	0.002	0.000

Sources: Penn World Tables 5.6 at [http://pwt.econ.upenn.edu/home.html] for trade share, investment share and price, and workforce/population up to 1992. World Bank (2000) for real GDP and population. Sachs and Warner (1995) for open (for adjustments, see our table 4.3). Barro and Lee (1993) and [http://www.nber.org/data/] for schooling, taken as average years of schooling in the adult population over the first decade.

Notes: The "rich" group is composed of nineteen countries with real GDP per capita 1960–64 averaging above I$5,000; the "poor" group comprises fifty-five countries with RGDP 1960–64 averaging below I$1,500. The "middle" group comprises the remaining forty-five countries. The "slow growers" are the thirty-five slowest-growing countries (1960–98) within the "poor" group.

Table 4.3 **Extension of the Sachs-Warner Classifications**

Benin	Open since 1990
Botswana	Open since 1979
Chile	Open since 1976
Colombia	Open since 1986
Costa Rica	Open since 1986
El Salvador	Open since 1989
Gambia	Reform 1985
Ghana	Open since 1985
Guatemala	Open since 1988
Guyana	Open since 1988
Israel	Open since 1985
Mali	Open since 1988
Mexico	Open since 1986
Morocco	Open since 1984
New Zealand	Open since 1986
Paraguay	Open since 1989
The Philippines	Open since 1988
Sri Lanka	Open since 1991
Tunisia	Open since 1989
Turkey	Open since 1989
Uganda	Open since 1988
Uruguay	Open since 1990

Note: These countries, classified as closed by Sachs and Warner (1995) for the period 1970–89, are ranked as open for the period 1980–98 based on the comment in their table 14.

poor and middle-income countries that have only recently opened their economies.

Regression 1 in table 4.4 confirms the S&W result that open economies grew substantially and significantly faster than closed economies over the period 1960–80. Our estimate of a 2.0 percentage point growth premium is only slightly lower than the S&W estimates for 1970–89. By any standards, it is a huge premium—implying that twenty years of openness lifts per capita GDP by a cumulative 50 percent.

When we interact openness with initial income, regression 2 indicates that the growth premium for openness tends to be higher for poorer countries—averaging 3.4 percentage points compared with 1.0 points for rich countries. This confirms the S&W finding that openness promoted convergence over the period 1960–80. The differences in growth rates for open and closed economies are illustrated in figure 4.5, where the solid trend-line represents the predicted growth rate from a regression on a cubic polynomial in log income.

Controlling for openness, these regressions show no evidence of conditional convergence. Indeed, the beta coefficients are positive: Conditional on openness, there were additional factors slowing the growth of the poorest relative to the richest countries. Regression 3 confirms that the usual sus-

Table 4.4 **Regressions Relating Convergence and Openness**

	N	Log *y*0	S&W Open	S&W Open × log *y*0	Investment	Population Growth	Workforce-Population Ratio Growth	Adjusted R^2	Standard Error of Estimate
				A. Variables Averaged Over 1960–80					
1	96	–0.0014**	0.020					0.208	.017
		(0.7)	(4.9)						
2	96	0.0026**	0.108	–1.10**				0.247	.016
		(1.0)	(3.3)	(–2.8)					
3	96	–0.004**	0.077	–0.8	0.078	0.09	0.68**	0.347	.015
		(–1.5)	(2.1)	–(1.8)	(2.9)	(0.4)	(2.1)		

	N	Log *y*0	S&W Open	Trade Open × log *y*0	School	School × log *y*0	Investment	Population Growth	Workforce-Population Ratio Growth	Adjusted R^2	Standard Error of Estimate
					B. Variables Averaged Over 1980–98						
4	96	0.004**	0.013**							0.174	
		(2.1)	(28)**								
5	96	0.003	0.010**	0.23**						0.286	
		(1.3)	(2.3)	(4.3)							
6	96	–.008**	0.005S&W	0.17**			0.104**	–0.80**	0.43	0.451	0.016
		(–2.6)	(1.2)	(2.9)			(2.7)	(–3.3)	(1.2)		
7	70	0.006	0.014**	0.25**	0.012**	–0.14**				0.341	.019
		(1.8)	(2.6)	(3.9)	(2.2)	(–2.2)					
8	70	–.007	0.009	0.15	0.007	–0.08	0.118**	–0.70**	0.57	0.495	0.017
		(–1.4)	(1.8)	(1.1)	(–1.0)	(2.2)**	(–2.1)**	(1.1)			

Notes: log *y*0 is the natural logarithm of real GDP per capita at the beginning of the period (Penn World Tables 5.6a). When used in interactive terms, it is divided by 100. "S&W open" is the extended Sachs and Warner dummy variable for openness. "Trade open" is the residual from regressing log (trade share in GDP) on log (population) for the full pooled sample with 218 observations. Regressions using investment are estimated using two-stage least squares (2SLS) with beginning of period investment and investment price as instruments. The dependent variable is the annual growth rate of real GDP per capita, measured at 1995 local prices. White's heteroskedasticity-adjusted *t*-statistics are reported in parentheses. Workforce-Population ratio denotes the ratio of the workforce to total population, as derived from the Penn World Tables.

**Statistically significant at the 5 percent level.

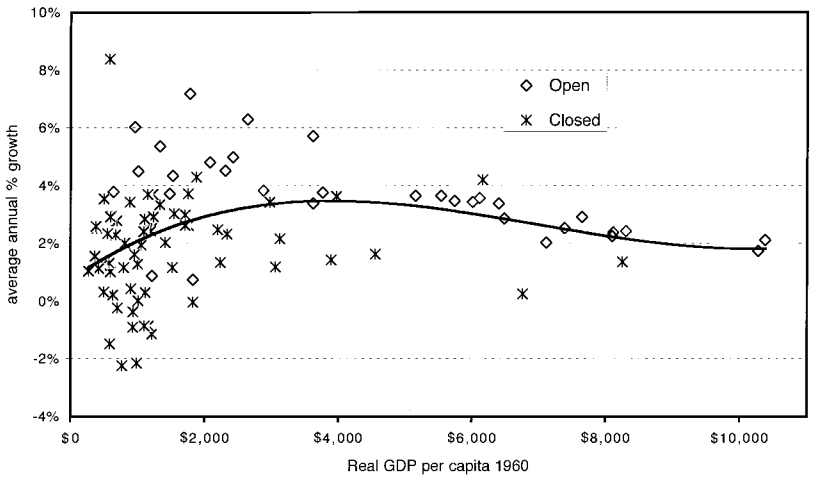

Fig. 4.5 Relative growth rates and initial income levels of "open" and "closed" economies, 1960–80

pects were involved. Multiplying the regression coefficients by the differences in sample means from table 4.2, we find that investment rates and demographic differences accounted for 1.3 percentage points of slower growth for the poor countries, relative to the group of rich countries.

Taking account of factor accumulation and of the differential effects of openness, we now find some weak evidence of conditional convergence. This should be interpreted as conditional convergence in multifactor productivity, proceeding at a slow rate of only 0.4 percent per year, possibly resulting from international technology transfer. Because the regression is controlling for trade effects, any such technology spillovers are not operating through trade.

We have followed Benhabib and Spiegel (1994) by adding a variable measuring the level of schooling in the adult population, and by adding the product of schooling with initial income. Neither variable adds significant explanatory power.

We perform similar analysis to explain growth between 1980 and 1998 (see regressions 4–8 in part B of table 4.4). Openness appears to deliver a smaller growth premium than that of the previous twenty years, although 1.3 percentage points is still a very substantial addition to annual growth rates. The positive sign on the interactive term, introduced in regressions 5–8, suggests that poorer countries benefit less from openness than do rich countries. This is the opposite of the S&W finding, which we confirmed for the earlier period 1960–80. The differences in growth rates for open and closed economies are illustrated in figure 4.6.

When we use the S&W measure of openness in the interactive term, we

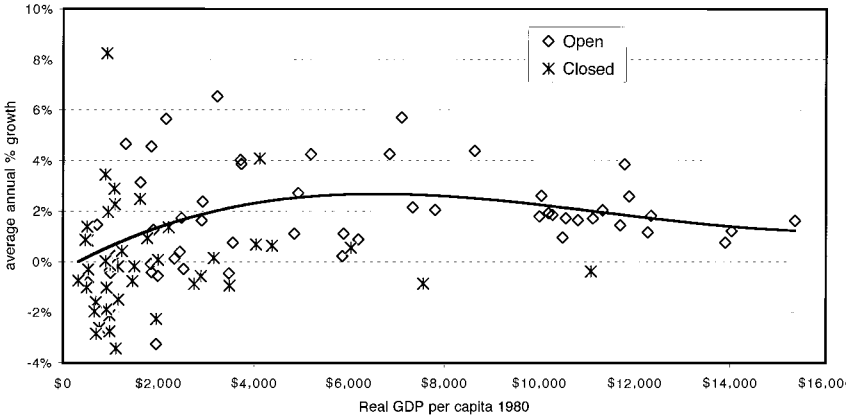

Fig. 4.6 Relative growth rates and initial income levels of "open" and "closed" economies, 1980–98

find that neither of the variables is statistically significant. In the reported regressions 5–8, in order to reduce multicollinearity, we have used instead a direct measure of trade openness, not the S&W variable, in the interactive term. This measure, based on the observation that countries with small populations tend to engage in more international trade than do more populous nations, consists of the residuals from an ordinary least squares (OLS) regression that explains half of the observed variation in trade shares over the pooled sample

$$\text{Log}\left(\frac{\text{exports} + \text{imports}}{\text{GDP}}\right) = 6.23 - 0.25 \log (\text{population});$$

$$N = 218, R^2 = 0.498.$$

Regression 6 adds in control variables for investment and demography. We calculate that, for the period 1980–98, the lower rate of capital deepening in the poorer countries now explains 2.2 points of slower growth, relative to the group of rich countries. Conditional convergence is statistically significant once we control for factor accumulation. The coefficient of –0.008 on the initial income term in regression 6 implies that, over the period 1980–98, the technology gap between countries was eroded at a rate approaching 1 percent per year.

The seventh regression reported in part B of table 4.4 includes the School and School × log (initial income) variables. These were found to be insignificant for the earlier period, but they add significant explanatory power in explaining growth over this later period. The sign pattern, positive on School and negative on School × log(initial income), confirms the Ben-

habib and Spiegel (1994) finding that a high level of initial human capital does promote growth, especially when initial income is low. It also provides some support for the Abramovitz (1986) hypothesis that successful technology transfer requires a certain level of social capability—although it is puzzling that the schooling variables are not significant when the investment and demographic variables are added in regression 8.

A summary of our empirical findings runs as follows:

- The failure of the world's poorest countries to catch up to the income levels of the richest countries over the past four decades is attributable to the poverty-trap conditions of subsistence income, low saving and investment, low levels of education, and high fertility.
- Openness to the world economy does appear to provide a significant boost to growth, but it does not necessarily promote convergence. A large number of the poorer countries have opened their economies since 1980. But it is precisely during this period that the benefits of openness appear to have diminished.

4.5 Conclusion

Our historical narrative makes it clear that globalization of the economy does not necessarily imply global convergence. Periods of expansion of transport and trade and flows of capital and migrants have marked the development of a club of convergent economies, but countries outside the club have fallen behind in relative terms even in eras of strong growth. Moreover, over the past two decades many countries have fallen behind, not just relatively but absolutely, in terms of both income levels and structural development.

The fact that the news has been very good for India and China over the past few decades has created a sharp division between the average experience of countries (in which divergence continues to be the rule, and in fact to accelerate) and the average experience of people (in which, for the first time in centuries, there are signs of *unconditional* convergence). It is also apparent that failure to join the convergence club is not just a consequence of a country's turning its back on the global economy and sheltering behind tariff barriers and capital controls. During the high years of the great Keynesian boom after World War II, openness to the world economy does appear to have been a magic bullet making for convergence, and those countries that closed their economies, whether in the southern cone of Latin America or in postindependence Africa, suffered enormous penalties. But things appear to have been somewhat different in other eras. At the beginning of the twentieth century, it is hard to see openness to trade and migration as promoting convergence outside a small charmed circle—a point

that was made by Lewis (1978) a generation ago. And at the end of the twentieth century, the growth benefits of opening up appear substantially lower than in the twentieth century's third quarter.

It remains an open question whether the growth benefits of openness have really declined in recent decades, or whether an early turn to openness is correlated with other growth-promoting factors omitted from standard cross-country studies.

In either case, there is little reason to be confident that opening doors to the world economy will guarantee a place at the high table. Poor countries remain poor, and so the purchase of investment goods from overseas that embody technology and assist in technology transfer remains expensive, and finding the resources to support mass education remains difficult. Last, the world's poorest countries have still not successfully completed their demographic transitions—and the failure to have shifted to a regime of low population growth puts pressure on resources and capital accumulation that will in all likelihood continue to sharpen the jaws of the poverty trap.

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Comment

Charles I. Jones

I greatly enjoyed the opportunity to read and think about this interesting paper. Its main contribution is to raise a number of important and fascinating questions related to globalization and convergence. This is a valuable contribution, and it provokes the reader to speculate about possible answers. In this, I found the paper to be a great success: It drew me in and got me thinking.

The main puzzle described in the paper involves changes in the relationship between globalization and convergence over time. It appears to be the case that countries that have taken their place at the global table in the second half of the twentieth century have grown faster than those that have not, and countries that have opened their economies have exhibited some convergence. The exact magnitude of this growth gain is uncertain, and the effects may have weakened toward the end of the century (as Dowrick and DeLong argue), but this is a point that is not greatly disputed.[1] On the other hand, as Dowrick and DeLong point out, globalization and convergence did not go hand in hand during the first era of globalization in the years before World War I. Rather, convergence was limited to a narrow charmed circle of countries consisting of some western and middle European countries and their more temperate colonies.

In many ways, this is surprising. Factors of production, including both capital and labor, as well as technologies for production were shifted around the globe because of this globalization. Yet the effects on incomes outside of the charmed circle are argued to be small. As the authors explain,

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1. Of course, Rodriguez and Rodrik (2000) represent an important exception.

> The British Empire brought the rubber plant to Malaysia. British investors financed the movement of indentured workers south from China to Malaysia to work the plantations to produce the rubber to satisfy demand back in the world economy's core. The British Empire brought the tea plant from China to Ceylon. British investors financed the movement of Tamils from India across the strait to work the plantations to produce the tea to satisfy demand from the British actual and would-be middle classes. But these did *not* trigger any rapid growth in real wages. They did not trigger any acceleration in productivity growth or industrialization. They did not trigger any rapid growth in factory employment, or any convergence to the world's economic core.

Why the difference between the two eras? And in particular, why did globalization in the first era not trigger rapid growth and convergence? In my discussion, I will comment on each of these eras and make an effort to suggest one possible resolution to the puzzle.

Let me begin with some remarks on globalization and convergence during the second half of the twentieth century. Until recently, I was under the impression that the absolute divergence in output per worker across countries that characterizes most of history had largely been halted, at least since 1970 or so. Although it is well known that there has not been any convergence in output per worker for the world as a whole, my impression was that the divergence had largely stopped.[2]

In fact, as Dowrick and DeLong document in table 4.1 of the paper, this absolute divergence largely continued throughout the second half of the twentieth century. This is especially apparent in the per capita GDP data, as shown in figure 4C.1. The data here are from the Penn World Tables through 1992 and from the World Bank until 1997.

According to this figure, the standard deviation of the log of GDP per capita across 109 countries shows a steady increase. In 1960, this standard deviation was about 0.9 and by 1997 it had risen to more than 1.2. To interpret these numbers, recall that if countries were normally distributed, then 4 standard deviations would span about 95 percent of the countries. This suggests that the ratio of the second-richest country in the sample to the second-poorest country would be a factor of $e^{4 \cdot 0.9} \approx 36$ in 1960 and would rise to $e^{4 \cdot 1.2} \approx 122$ in 1997. These numbers turn out to be off just a little: The ratio of GDP per capita in the richest country to that in the poorest country was 39 in 1960 and 112 in 1997.

To avoid an undue influence from outliers, figure 4C.1 also plots the ratio of incomes between the fifth-richest and fifth-poorest countries over time. This ratio rises from about 20 in 1960 to nearly 30 in 1990 and then rises quite sharply to more than 40 by 1997.

2. In my defense, if one looks at GDP per worker using the Summers-Heston (1991) data up until the late 1980s, this is the impression one gets.

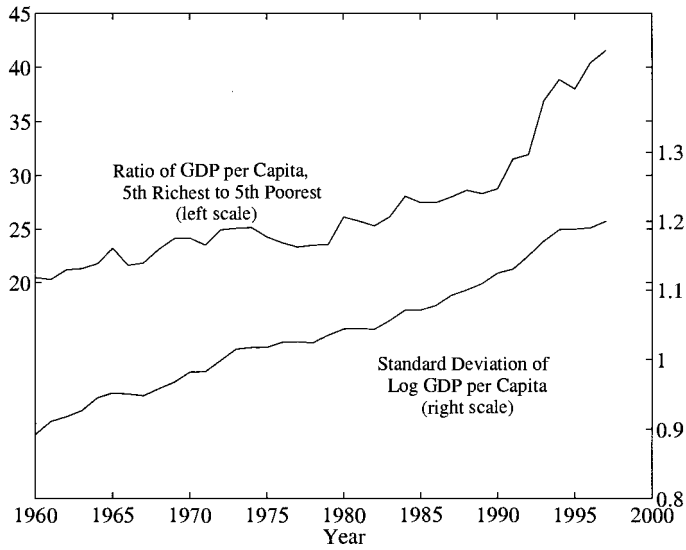

Fig. 4C.1 The dispersion of GDP per capita, 1960–97

Source: Author's calculations using the extension of the Penn World Tables created by Easterly and Yu (2000). One hundred nine countries are represented.

To what extent are these changes influenced by globalization? Figure 4C.2 provides another look at changes in the dispersion of per capita GDP, this time splitting countries into two groups, "open" and "closed." The open countries are those that were classified by Sachs and Warner (1995) as being open for at least half of the years during the period 1950–94.[3]

Among countries classified as open, income dispersion generally decreased over the 1960–97 period, with the bulk of the decline coming by 1970. Among countries classified as closed, dispersion increased slightly, again with the bulk of the change coming before 1970. However it is the "between" rather than the "within" evidence that is perhaps most informative with respect to globalization and convergence. First, the dispersion among the open countries is substantially less than the dispersion among the closed countries. The open countries are richer and less dispersed than the closed countries. Finally, between these two groups of countries, however, income dispersion increased substantially between 1960 and 1997, with the ratio of median incomes rising from 3 in 1960 to 8 by 1997.

Dowrick and DeLong document a related point, which is that the effects of openness on growth seem to have weakened after 1980 relative to before. One might reach a similar conclusion from this figure, but it is unclear if this

3. The actual openness data used are those from Hall and Jones (1999) and include some imputed values.

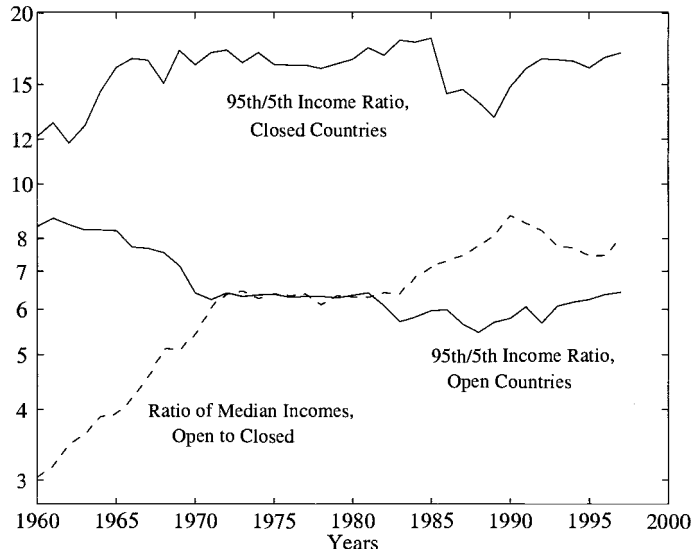

Fig. 4C.2 Dispersion: Open versus closed countries

Source: Author's calculations using the extension of the Penn World Tables created by Easterly and Yu (2000). Thirty-three countries are classified as open, and 76 are classified as closed.

conclusion is warranted. As time has passed, a larger number of countries have opened their economies, but the classification in the figure is held constant. Some of the weakening of the effects of openness apparent in the figure, then, could be an artifact of this classification.

In this most recent era, then, globalization and convergence appear to be linked. The tentative evidence presented here is not nearly persuasive, but there is a large literature on this question and Dowrick and DeLong themselves bring new evidence to bear.

What, then, about the first era of globalization? An aspect of the quotation at the beginning of my comment that strikes me as quite provocative is the claim that globalization did not have a substantial impact on the countries outside of the charmed circle, in what we might call the "poor periphery." The lack of global convergence during this first era could occur as growth rates increased in the charmed circle but remained unchanged and lower in the poor periphery. Alternatively, globalization could have raised growth rates in all countries that took part, but it could have raised them disproportionately in the charmed circle. In fact, I'd like to suggest that something closer to this second alternative may have been going on.

Consider the following possible scenario. In the charmed circle, industrialization was well under way, and these economies had already reached their take-off stage by 1870; globalization then increased growth even fur-

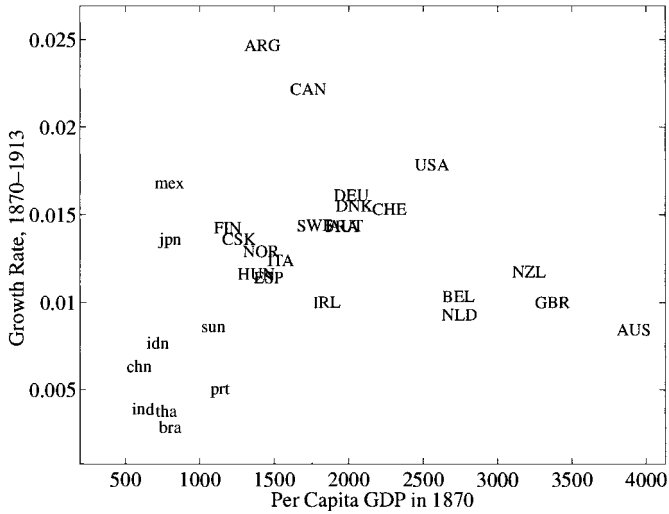

Fig. 4C.3 Growth rates in the first globalization era

Note: Upper-case letters indicate countries in the "charmed circle," and lower-case letters indicate countries in the "poor periphery." *Source:* Author's calculations using Maddison (1995).

ther. In the poor periphery, globalization began the take-off process and led these countries closer to industrialization. It is possible that globalization itself did promote convergence around the world, but the continued industrialization of the charmed circle kept their growth rates rising. By imagining two S-shaped take-off curves, one can easily see how something like this is possible: Divergence results simply because the charmed circle took off sooner and has reached the steep part of its S curve. I will show the empirical version of these S-shaped curves in figure 4C.4.

Some evidence for the rapid growth and convergence within the charmed circle and the lack of rapid growth outside of this circle can be seen in figure 4C.3. This figure plots per capita GDP growth between 1870 and 1913 against the initial level of per capita GDP in 1870. The uppercase letters correspond to the countries in the charmed circle, and the lowercase letters represent other countries for which Maddison (1995) reports data. The charmed circle consists of richer countries that generally exhibit faster growth than the other countries of the world. In addition, one can see the suggestive negative relationship between growth rates and initial income levels for these charmed countries, whereas the countries in the poor periphery lie to the southwest of this growth frontier.

However, it would not be correct to think that the countries outside of the charmed circle experienced no growth. Mexico exhibited the fastest growth of the poor periphery, with growth faster than that in most of the charmed countries, as it more than doubled its per capita GDP between 1870 and

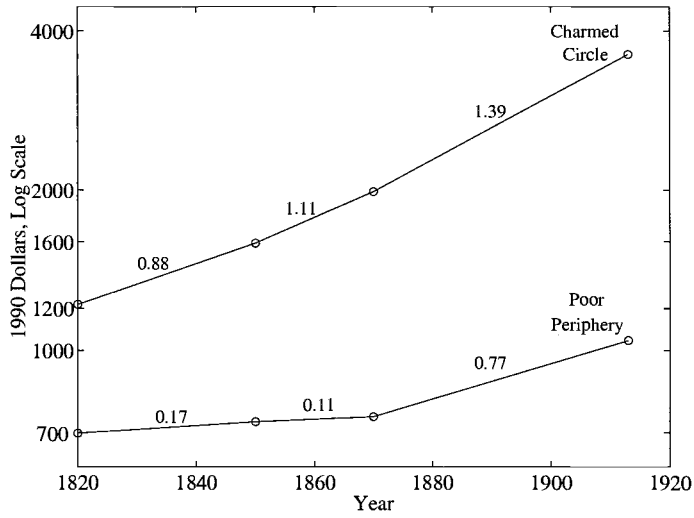

Fig. 4C.4 Per capita GDP: Charmed circle versus poor periphery

Note: The two series plotted represent the typical experience for countries in the charmed circle and the poor periphery. See figure 4C.1 for the countries in these two groups. The numbers above each line segment represent average annual growth rates. *Source:* Author's calculations using Maddison (1995).

1913. Even China and India exhibited substantial growth, with incomes rising by more than 30 percent in the former country and nearly 20 percent in the latter.

Was this growth in the poor periphery a continuation of a previous trend, or did it represent a change, perhaps associated with globalization? Figure 4C.4 sheds light on this question by plotting the level of GDP per capita for a typical charmed country and a typical country in the periphery.[4]

An important fact apparent in this figure is that growth rates in the poor periphery were substantially higher in the first era of globalization (1870–1913) than they were over the preceding half century. To take Maddison's data at face value, average GDP per capita increased from about $750 in 1870 to more than $1,000 by 1913. Although it is true that this era of globalization witnessed a divergence of incomes between the countries in the charmed circle and those outside, this does not mean that globalization brought no benefits to the periphery, or even that it was not a force working to promote convergence. A relevant question is the counterfactual: What would have happened to the poor periphery in the absence of globalization? It would be quite surprising if the substantial flows of capital, labor, and

4. By *typical*, we mean the following. The level in 1870 is equal to the unweighted average of the per capita GDPs in the two sets of countries. Values in previous and subsequent years are computed using the unweighted average growth rate of the countries for which data are available in each sample relative to 1870.

technology across countries did not have a significant impact on the periphery. Figure 4C.4 suggests that the impact may have been large. Perhaps globalization raised growth rates throughout the world, and perhaps the divergence between the charmed circle and the poor periphery would have been even greater in the absence of globalization.

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