



Globalization and Growth in
The Twentieth Century

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Abstract

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This paper reviews the experience of economic growth during the twentieth century with a view to highlighting implications for both growth economists and policy-makers. The unprecedented divergence in income levels between the OECD economies and many developing countries is documented but so too is a more optimistic picture of widespread progress in terms of the Human Development Index. Various aspects of the changes in economic structure are explored in terms of their implications for growth performance both in retrospect and prospect. The possibility that the growth process will lead to another globalization backlash reminiscent of the 1930s is analyzed.

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Contents	Page
I. Introduction	4
II. What Has Twentieth Century Economic Growth Delivered?	5
A. Trends in the Human Development Index	6
B. Historical National Accounting Growth Estimates	12
C. Adjusted GDP as a Guide to Long Run Living Standards	16
D. The Sources of Economic Growth	20
E. Convergence and Divergence	24
III. Globalization Then and Now	25
A. Globalization in Trade and Factor Flows	25
B. Explaining Trends in Protectionism	30
C. The Origins and Nature of the Great Slump	31
IV. An End Of The Century Perspective	34
A. The Paradoxical OECD Growth Slowdown	34
B. The Expansion of the Public Sector in the OECD	40
C. Will Rapid Catch-Up Growth Become More Widespread?	43
D. What Future for the East Asian Developmental State?	47
E. Is Another Globalization Backlash Likely?	49
F. Concluding Comments	52
 Tables	
1.1. The Human Development Index and its Components: Long Run Estimates	7
1.2. The Human Development Index and Its Components in the Recent Past	9
1.3. Catching Up and Falling Behind	11
1.4. Weighted Averages of HDI	12
1.5. Growth Rates of Real GDP/Person	14
1.6. Growth Rates Adjusted for Hours Worked and Mortality	17
1.7. Annual Hours Worked per Head of Population	18
1.8. Growth Accounting: Comparisons of Sources of Growth	22
2.1. Ratios of Merchandise Exports to GDP and to Merchandise Value-Added	26
2.2. Composition of World Merchandise Trade	27
2.3. Foreign Investment	27
2.4. Barriers to Trade: Average Tariffs on Manufactures and Import Coverage of NTBs	28
2.5. Immigration to the United States	30
3.1. The Structure of Employment in Five Leading Economies, 1900–95	36
3.2. Sectoral Productivity Growth Rates, 1950–95	37
3.3. Government Expenditures/GDP, 1870-1998	41
3.4. Comparisons of Institutional Quality	46

Boxes	
1.1. Measuring Long-Run Growth in Living Standards	68
2.1. Financial Crisis in 1930s America.....	72
3.1. Computers And Productivity Growth.....	74
References.....	53

I. INTRODUCTION

This report reviews the experience of economic growth during the twentieth century in the context of trends in globalization and with a view to highlighting implications relevant to early twenty-first century policymakers. Chapter 1 provides a descriptive analysis of trends in growth and living standards during the century, which highlights differences between periods and across countries. Chapter 2 looks at the roller-coaster progress of globalization both in trade and capital flows since the late nineteenth century with particular emphasis on explanations for the prolonged reverse to globalization from the backlash of the interwar years. Chapter 3 uses the building blocks of the earlier chapters to provide an end of century perspective on growth prospects and the extent to which they are likely to be enhanced by improved policies, technological progress and globalization.

The main objective of chapter 1 is to present a basic quantification of growth during the twentieth century drawing on the economic history literature. The central themes that emerge include the massive and unprecedented divergence in income levels and growth performance across countries especially between the OECD and many developing countries in both the first and second halves of the century. The consequences in terms of income foregone of poor policy and/or inadequate institutions were much more serious than in earlier centuries. Nevertheless, a great deal of progress has been made everywhere in terms of the Human Development Index and the spectacular improvements in mortality that have taken place are a major reason to believe that historical national income accounts tend to underestimate growth in living standards. The contribution of technological progress to economic growth both in the advanced and the developing world has varied substantially over time for reasons that are not fully understood either by growth theorists or economic historians.

Chapter 2 spells out what is known about the dimensions of globalization over time. In many respects, the information is patchy but a clear pattern emerges of increases in trade flows and stocks of capital assets relative to levels of GDP before World War I and in recent decades, with the opposite characterizing the 1920s through the 1950s. Many aspects of the current situation are shown to be unprecedented, driven not only by changes in technology but also in economic policy. The retreat of globalization in the interwar period was, of course, driven by policy not technology and was, in large part, a response to the depression. A review of recent historical research concludes that a combination of macroeconomic policy errors and structural faults in banking systems and labor markets rather than globalization per se provoked the slump.

In Chapter 3 the historical experience is linked to insights from modern applied growth economics to examine growth potential after the liberalization and globalization of the recent past. It is argued that globalization itself could be subject to a renewed backlash either, as in the 1930s, in the event of a major world recession or in a new context of the impossibility of governments continuing to meet increased demands for economic security in a world of severe tax competition. In a less apocalyptic scenario, the impact of globalization on fiscal policy

could address some of the growth inhibiting effects of the late twentieth century expansion of the public sector in OECD Europe. Prospects for catch-up growth and an escape from the divergence in incomes that has characterized the twentieth century are argued to depend very largely on policy/institutional reform in the developing world to reduce problems of agency costs, rent-seeking, asymmetric information, and opportunism thereby facilitating financial development, investment and innovation. The present policy consensus in favor of markets and outward orientation in the developing world potentially represents a significant improvement from the state led industrialization stance that was prevalent 25 years ago but the political economy of supply-side policy is central to further progress yet little understood. Despite the confidence of many stock market players, long run growth prospects for the United States are particularly hard to predict, both because theory suggests that they depend crucially on scale effects in innovation on which the jury is still out, and also because at this point of history it remains unclear whether the ICT revolution will eventually deliver a major boost to total factor productivity equivalent or superior to that of the era of electricity.

II. WHAT HAS TWENTIETH CENTURY ECONOMIC GROWTH DELIVERED?

Since World War II, trend growth of real GDP per person has become a key policy objective in virtually all countries. This is not surprising since it is usually thought to be central to raising living standards and because, despite doubts raised by economic theorists, it is generally believed that government policy can influence long run growth outcomes. The twentieth century has seen unprecedented economic growth in many parts of the world but the benefits of growth have often been quite unequally distributed both between and within countries and growth rates have exhibited considerable variation over time. Moreover, it is now frequently suggested that GDP growth is a poor, or perhaps quite misleading, indicator of changing well being and, even within the national accounts framework, it has become widely accepted that important measurement issues have to be addressed, particularly when considering the long run.

In this section, experience of economic growth in the twentieth century is assessed both in terms of its impact on standards of living and also with a view to extracting the lessons that it can offer on why growth rates differ. Two questions are of central concern:

- What has been the relationship between economic growth and changes in living standards ?
- What explains the uneven pace and spread of economic growth ?

The renaissance of research in growth economics since the mid 1980s makes this a good time to conduct such a survey. So also does the proliferation of alternatives to national income accounting for the measurement of standards of living (Box 1.1). In addition, however, the end century vantage point suggests answers to these questions that are somewhat different from earlier conventional wisdom simply as a result of recent economic history.

A. Trends in the Human Development Index

One of the most widely discussed measures of the impact of economic development on well being is the Human Development Index (HDI). This has been designed to facilitate long run comparisons and is a measure of the distance traveled from minimum to maximum development in terms of three components, education, income and longevity (see Box 1.1). The focus of HDI is on the escape from poverty. Human development is regarded as a process of expanding people's choices; income is assumed to impact on this primarily at low levels of material well-being and, above a threshold level, is considered to make a sharply diminishing contribution eventually tailing off to nothing. Life expectancy and education are taken to be central to the enhancement of human capabilities but not generally dependent on private income given the important role that public services usually play in these aspects.

While, as noted in Box 1.1, there are serious index number problems associated with HDI, it offers an important perspective on changing living standards to be considered together with the evidence on growth in real GDP per person. UNDP (1998) Provides estimates only for the period since 1960 but it is possible to extend this back to 1950 for many countries and earlier than that for a few cases. These long run HDI estimates, reported in Table 1.1, provide a comparative context in which to place recent Third World development and, taken together, Tables 1.1 and 1.2 offer a different angle on divergence between the First and Third Worlds from that which emerges from historical national accounting.

Using these tables, comparisons across countries can be made both of levels of HDI and also of the speed of reduction in the distance from maximum development in different eras. In addition, HDI gaps between advanced and developing countries can be considered. There are, of course, data problems but the broad outlines of the estimates in Tables 1.1 and 1.2 are robust enough for present purposes (Crafts, 1997a). The coverage of the tables is determined by data availability.

The most striking feature of these tables is that the 1995 HDI scores for poor developing countries in Table 1.2 are well ahead of the 1870 scores for the leading countries of that time shown in Table 1.1. Australia's score of 0.539 in 1870 would rank 127th in the world in 1995. Conversely, Mozambique's 1995 score of 0.281 (166th in the world) is distinctly above the levels achieved in some parts of Europe, for example, Italy and Spain, in 1870. At the same time, assuming that the HDI score of 0.055 for India in 1913 represents the lowest level, the absolute HDI gap of 0.775 in 1995 between the best and worst in the world (UNDP, 1998) is slightly bigger than in 1913. Since 1950, however, there has been a substantial fall in the gap between average HDI Africa and in the advanced countries of Western Europe, North America, and Oceania from 0.608 to 0.391.

Table 1.1. The Human Development Index and its Components: Long Run Estimates

	1870		1913		1950		1996		1995
	GDP/ Head	HDI	GDP/ Head	HDI	GDP/ Head	HDI	GDP/ Head	HDI	
Austria	1875	0.261	3488	0.501	3731	0.731	17951	0.933	
Belgium	2640	0.429	4130	0.621	5346	0.833	17756	0.933	
Denmark	1927	0.448	3764	0.677	6683	0.857	19803	0.928	
Finland	1107	0.151	2050	0.389	4131	0.740	15864	0.942	
France	1858	0.400	3452	0.611	5221	0.818	18207	0.946	
Germany	1913	0.397	3833	0.632	4281	0.787	19622	0.925	
Ireland	1773		2733	0.563	3518	0.736	15820	0.930	
Italy	1467	0.187	2507	0.441	3425	0.666	16814	0.922	
Netherlands	2640	0.450	3950	0.676	5850	0.867	18504	0.941	
Norway	1416	0.374	2473	0.588	5403	0.862	22256	0.943	
Spain	1376	0.219	2255	0.368	2397	0.581	13132	0.935	
Sweden	1664	0.412	3096	0.628	6738	0.858	17566	0.936	
Switzerland	2172	0.457	4207	0.679	8939	0.843	20252	0.930	
United Kingdom	3263	0.496	5032	0.730	6847	0.844	17326	0.932	
Australia	3801	0.539	5505	0.781	7218	0.853	18169	0.932	
Canada	1620	0.411	4213	0.682	7047	0.842	19109	0.960	
New Zealand	3115		5178	0.797	8495	0.868	15621	0.939	
United States	2468	0.467	5330	0.733	9617	0.866	23719	0.943	
Argentina	1311		3797	0.521	4987	0.758	8271	0.888	
Brazil	740		839	0.159	1673	0.371	5346	0.809	
Chile			2653	0.360	3827	0.620	9250	0.893	
Mexico	710		1467	0.182	2085	0.418	4979	0.855	
India	558		663	0.055	597	0.160	1643	0.451	
Japan	741	0.160	1334	0.381	1873	0.607	19582	0.940	
Bulgaria			1498	0.332	1651	0.540	4301	0.789	
Czech Republic	1164		2096	0.471	3501	0.713	7595	0.884	
Hungary	1269		2098	0.431	2480	0.634	5852	0.857	
Russia	1023		1488	0.252	2834	0.651	4120	0.769	
	e_0	Literacy	e_0	Literacy	e_0	Literacy	e_0	Literacy	
Austria	31.7	40	42.2	66	65.7	99	76.7	99	
Belgium	40.0	66	49.6	86	67.5	97	76.9	99	
Denmark	45.5	81	57.7	99	71.0	99	75.3	99	
Finland	36.5	10	46.2	59	66.3	90	76.4	99	
France	42.0	69	50.4	92	66.5	96	78.7	99	
Germany	36.2	80	49.0	97	67.5	99	76.4	99	
Ireland			53.8	91	66.9	96	76.4	99	
Italy	28.0	32	47.2	62	66.0	86	78.0	98	
Netherlands	38.9	78	56.1	97	72.1	99	77.5	99	
Norway	49.3	55	57.2	98	72.7	99	77.6	99	
Spain	33.7	30	41.8	52	63.9	82	77.7	97	
Sweden	45.8	75	57.0	98	71.8	99	78.4	99	
Switzerland	41.0	85	52.2	99	69.2	99	78.2	99	
United Kingdom	41.3	76	53.4	96	69.2	99	76.8	99	

	e ₀	Literacy	e ₀	Literacy	e ₀	Literacy	e ₀	Literacy
Australia	48.0	64	59.1	96	69.6	99	78.2	99
Canada	42.6	79	52.5	94	69.1	99	79.1	99
New Zealand			61.4	95	69.6	99	76.6	99
United States	44.0	75	51.6	92	69.0	97	76.4	99
Argentina			46.3	64	62.7	86	72.6	96
Brazil			31.0	35	51.0	49	66.6	83
Chile			30.3	63	54.1	80	75.1	95
Mexico			29.5	29	50.7	57	72.1	90
India			24.8	9	38.7	19	61.6	52
Japan	37.0	21	44.4	72	64.0	98	79.9	99
Bulgaria			42.3	53	64.1	81	71.2	98
Czech Republic			42.4	92	65.9	96	72.4	99
Hungary			39.5	87	63.9	95	68.9	99
Russia			36.7	38	64.1	90	65.5	99

Sources: HDI from Crafts (1997a), with coverage extended using the same underlying sources, and from UNDP (1998); GDP/head from Maddison (1995) (1997) (1998) measured in purchasing power parity adjusted 1990 dollars and updated where required using IMF (1999) and OECD (1998a); GDP data for Latin America are for 1995; Germany refers to West Germany.

Table 1.2. The Human Development Index and Its Components in the Recent Past

	e ₀		Literacy		GDP/Head		HDI	
	1950	1995	1950	1995	1950	1990	1950	1995
Algeria	43.1	68.1	18	62	1383	2815	0.227	0.746
Angola	30.0	47.4	3	42	986	654	0.086	0.344
Botswana	42.5	51.7	21	70	390	4215	0.170	0.678
Egypt	42.4	64.8	20	51	517	2030	0.178	0.612
Lesotho	37.4	58.1	35	71	324	1027	0.191	0.469
Malawi	36.2	41.0	7	56	306	584	0.113	0.334
Mauritius	51.0	70.9	52	83	2428	6868	0.434	0.833
Mozambique	33.5	46.3	2	40	1001	859	0.112	0.281
Nigeria	36.5	51.4	12	57	547	1118	0.124	0.391
South Africa	45.0	64.1	47	82	2251	3719	0.385	0.717
Sudan	37.2	52.2	12	46	1014	1123	0.150	0.343
Swaziland	35.6	58.8	14	77	566	2052	0.134	0.597
Tunisia	44.6	68.7	13	67	1134	3234	0.212	0.744
Bahrain	51.0	72.2	13	85	5424	10418	0.500	0.872
China	40.6	69.2	16	82	537	1858	0.159	0.650
Hong Kong	60.9	79.0	58	92	2499	17434	0.498	0.909
Iran	46.1	68.5	13	69	1892	3662	0.267	0.758
Iraq	44.0	58.5	12	58	1046	1882	0.201	0.538
Indonesia	37.5	64.0	60	84	874	2525	0.265	0.679
Malaysia	48.5	71.4	38	84	1696	5638	0.344	0.834
Mongolia	45.0	64.8	60	83	643	2259	0.297	0.669
Nepal	36.3	55.9	5	28	729	1175	0.111	0.351
Philippines	47.5	67.4	60	95	1293	2300	0.398	0.677
Singapore	60.4	77.1	46	91	2038	14663	0.454	0.896
South Korea	47.5	71.7	77	98	876	8977	0.380	0.894
Sri Lanka	59.9	72.5	68	90	969	2752	0.440	0.716
Taiwan	53.3	74.5	56	94	922	10324	0.363	0.892
Thailand	47.0	69.5	52	94	848	4173	0.316	0.838
Albania	55.2	70.6	46	85	1007	2500	0.377	0.656
Poland	61.3	71.1	94	99	2447	5113	0.612	0.851
Romania	61.1	69.6	77	98	1182	3460	0.474	0.767
Cyprus	67.0	77.2	61	94	2067	9501	0.538	0.913
Greece	65.9	77.9	74	97	1951	10250	0.558	0.924
Portugal	59.3	74.8	56	90	2132	11017	0.470	0.892
Turkey	47.0	68.5	32	82	1299	4254	0.289	0.782
Bolivia	40.4	60.5	32	83	1884	1744	0.284	0.593
Colombia	50.6	70.3	62	91	2089	4917	0.425	0.850
Costa Rica	57.3	76.6	79	95	1968	3923	0.507	0.889
Cuba	58.8	75.7	78	96	3651	3000	0.620	0.729
Ecuador	48.4	69.5	56	90	1329	3037	0.358	0.767
Guatemala	42.1	66.1	29	65	1677	2461	0.272	0.615
Haiti	37.6	54.6	10	45	984	1037	0.157	0.340
Honduras	42.3	68.8	35	73	1036	1510	0.244	0.573
Jamaica	57.2	74.1	77	85	1103	3079	0.445	0.735
Nicaragua	42.3	67.5	38	66	1772	1505	0.304	0.547
Panama	55.3	73.4	70	91	1636	3481	0.459	0.868
Paraguay	62.6	69.1	66	92	1340	2670	0.467	0.707
Peru	43.9	67.7	41	89	2263	3000	0.363	0.729
Trinidad & Tobago	57.9	73.1	74	98	4537	9310	0.678	0.880
Venezuela	52.3	72.3	52	91	7424	8139	0.621	0.860

Sources: as for Table 1.1.

Looking at the components of HDI, the low level of life expectancy at birth (e_0) in leading countries in 1870 is apparent with the highest figure at only 49.3 years, a level which has now been exceeded by almost all countries. Research in historical demography long ago confirmed that, during the twentieth century, improvements in mortality resulting from advances in medical science and public health measures, have been largely independent of changes in real income (Preston, 1975). The levels of life expectancy (and HDI) now enjoyed by countries like Algeria and Tunisia were simply not attainable in 1870 for any country given the state of medical technology. By contrast, levels of literacy, which in 1950 were still very low in much of Africa and India, still compare unfavorably in many cases with the leading countries of 1870.

The levels of real GDP per person of many countries in 1990 reported in Table 1.2 were still well below those already attained by the leaders of 1870 shown in Table 1.1. Thus, the average of \$1336 for Africa (Maddison, 1995, p. 228) is below the median of \$1894 for the countries of Western Europe, North America, and Oceania in 1870. The level of real GDP per person in 1870 of \$480 in Africa (Maddison, 1995, p. 228) was about an eighth of the leading country. In 1990, however, the African level was only about one sixteenth of the leading country. The gap between rich and poor measured in these terms has widened enormously or, as one author recently put it, the central feature of growth as measured by the national accounts is “divergence, big time” (Pritchett, 1997).

In order to fill out this point, Table 1.3 considers catching up and falling behind in real GDP/person in terms of regional aggregates. Over the long run since 1870, the most marked and sustained relative declines have been in Africa and in Eastern Europe, areas which account for about 20 per cent of the world's population in most of this period. Latin America, then a very small fraction of total world population, improved its relative position during the globalization episode prior to World War I but has subsequently lost some ground relative to the United States. Prior to 1950, however, the most important aspect of divergence was the big decline in real GDP/person in Asia, which accounted for well over half the world's population, relative to the leading country. According to the estimates in Maddison (1998, p. 158) real GDP/person in China in 1950 was only at the 1870 level while India experienced negative economic growth from 1920 to 1950 (Maddison, 1995). In recent decades China and East Asia have, of course, advanced very strongly, although China's relative position at 11.2 percent of the United States in 1996 is still below its 13.2 percent of Britain in 1890. South Asia now is a similar proportion of the US level to that of 1950.

The estimates in Maddison (1995) permit a more detailed analysis of changes between 1950 and 1990, years for which he provides a much more detailed country breakdown of income levels. This reveals that 1123 million people (20.1 percent of the non-American world population) in 1990 lived in countries where the level of real GDP/person as a proportion of the US level had fallen since 1950, while another 3151 million (56.1 percent) lived in countries where the level relative to the US had risen by less than 5 percentage points. 16 countries

Table 1.3. Catching Up and Falling Behind

	Percent World Population	Percent GDP/ Person in Leading Country	Real GDP/Person
1870			
Africa	6.6	14.7	480
Asia	61.0	17.8	580
Latin America	3.0	23.3	760
Eastern Europe	11.2	35.4	1085
1913			
Africa	6.2	10.8	575
Asia	55.0	13.9	742
Latin America	4.5	27.0	1439
Eastern Europe	14.1	31.7	1690
1950			
Africa	8.9	8.6	830
Asia	54.0	8.0	765
Latin America	6.5	25.9	2487
Eastern Europe	11.4	27.4	2631
1996			
Africa	12.7	5.5	1309
China	21.0	11.2	2653
East Asia	7.2	23.6	5587
South Asia	21.5	6.1	1456
Latin America	10.0	21.7	5155
Eastern Europe	7.3	17.8	4211

Sources: area GDP and population levels based on definitions and data in Maddison (1995) updated using IMF (1999), except for East and South Asia which comprise the countries listed under these headings in Collins and Bosworth (1996); the leading country is defined as the UK in 1870 and the USA thereafter.

with a population of 165 million had a level of real GDP/person lower in absolute terms than in 1950 while in only 12 countries (of which only Hong Kong and Singapore were outside the OECD area) was the absolute gap in real GDP/person lower than in 1950.

The HDI measure shows much less divergence. This is partly because of its (controversial) discounting of higher incomes and partly through its taking into account mortality. It is clear, however, that any index of living standards that gives a substantial weight to life expectancy will make present day developing countries look much better relative to either past or present OECD countries than do comparisons based on real GDP/person. This might provoke one of two basic reactions, both of which are probably valid, either that this shows how important it is not to judge progress in development by GDP alone or that this underlines how important it is to pay more serious attention to the index number problems involved in measuring living standards.

Table 1.4 confirms that international comparisons of HDI generally exhibit long run convergence rather than divergence at the level of the large regional bloc and the contrast with Table 1.3 is striking. All regions, including South Asia and Africa, exhibit strong catch-up of

Table 1.4. Weighted Averages of HDI.

	1870	1913	1950	1995
Australasia	0.539	0.784	0.856	0.933
North America	0.462	0.729	0.864	0.945
Western Europe	0.374	0.606	0.789	0.932
Eastern Europe		0.278	0.634	0.786
Latin America		0.236	0.442	0.802
East Asia			0.306	0.746
China			0.159	0.650
South Asia		0.055	0.166	0.449
Africa			0.181	0.435

Sources: Western Europe defined as in Maddison (1995) and East and South Asia as in Collins and Bosworth (1996); weighted averages of countries for which data is available using sources as in Table 1.1.

the leading countries after 1950. The averages for both South Asia and Africa in 1995 are quite near to the North American level in 1870. Indeed, all developing countries for which an estimate of HDI is possible for 1950 reduced the gap with the leading country both proportionately and absolutely between 1950 and 1995. In the period 1913 to 1950 there is catch up in HDI for both Eastern Europe (markedly) and Latin America.

The HDI is most useful in looking at the escape from poverty or, in UNDP terminology, the move from a low to a medium level of human development marked by HDI exceeding 0.500. Taking the change in HDI as a measure of the speed of this transition, we find an interesting contrast between the late nineteenth and the twentieth centuries. The 16 countries observable in Table 1.1 in a state of low human development in 1870 posted an average HDI gain of 0.212 by 1913. The 48 countries in Tables 1.1 and 1.2 with an HDI below 0.500 in 1950 had achieved an average HDI gain of 0.350 by 1995. The pace of human development has been markedly higher in the more recent period.

B. Historical National Accounting Growth Estimates

Index number problems loom large in any long run economic growth estimates. National income accounting provides estimates of GDP in current prices which need to be deflated by a suitable price index to obtain inflation adjusted estimates in constant prices. The longer the period under investigation the more difficult this is to do well because the problem of allowing for new goods and services and of quality changes resulting from technological progress becomes much greater. In addition, if, as is often the case, the reason for making the growth estimate is to provide information on changes in living standards, it will be necessary to take account of aspects of well-being that are omitted from GDP such as changes in leisure or longevity and it may also be appropriate to consider the sustainability of consumption (see Box 1.1 and Chapter III).

It is generally accepted that, in advanced western economies in the recent past, inflation has been exaggerated by conventional measurement techniques and thus the growth

rate of real GDP has been understated. This has been studied intensively for the United States, and in a recent survey of the evidence, Shapiro and Wilcox (1996) argue that the present day bias is probably somewhere between 0.6 and 1.5 percentage points per year. The problem is not new although it has probably become more serious during the last hundred years as the composition of GDP has moved away from run of the mill commodities towards more difficult to measure services, government activities and durable goods. By contrast, in Communist countries it is common for official statistics to underestimate inflation; for example, the recent study by Maddison (1998) finds it necessary to reduce official estimates of Chinese growth since 1978 by about 2 percent per year—a correction that is incorporated into the tables in this chapter.

Leaving aside the index number problems for the moment, Table 1.5 reports the available estimates and changes the focus from levels to growth rates. The table is based on the periodization in Maddison (1995) which is useful for OECD countries in particular for separating out the disturbed years around the depression and the two world wars (1913–50) and what is often termed the golden age of growth prior to the first OPEC shock (1950–73). Obviously, for some countries and some purposes, for example, an examination of the impact of communism on Eastern European growth or of reform on Chinese growth, this framework is not so suitable. Nor is this design set up to highlight shorter run fluctuations in growth rates such as the collapse of the early 1930s.

The first point to note from Table 1.5 is that twentieth century growth has generally been much stronger than that prior to 1870. Thus, regions like India and Latin America where citizens are perhaps disappointed not to have matched the East Asian growth rates of the last four decades have nevertheless performed much better than in the mid nineteenth century and over the whole period since 1950 have grown faster than did the U.K. and the U.S. between 1820 and 1870. Under mid and even late nineteenth century conditions, 1.5 to 1.8 percent per year was about the maximum growth rate except in a few ‘regions of recent settlement’ such as Argentina and Canada.

This, however, represented a major breakthrough from pre-Industrial Revolution growth capabilities where long run growth at 0.2 percent per year was a good result. Recent research has established that, even during the First Industrial Revolution, Britain achieved a growth rate of real GDP per person no higher than about 0.4 percent per year between 1780 and 1830 (Crafts and Harley, 1992). Indeed, the experience of Industrial Revolution Britain, while representing a major breakthrough from the past in terms of technological advance and resulting in extremely rapid industrialization and urbanization, is also remarkable, viewed through a modern lens, for what it reveals about the limits to growth in the leading economy of the mid nineteenth century.

By modern standards, Industrial Revolution Britain had a very modest growth potential. Investment rates and formal schooling were very low relative to twentieth century levels and research and development spending was negligible. Market sizes were still small and traditional rent-seeking occupations absorbed much of the talent in the economy. The

costs both of inventing and protecting the profits from invention were relatively high compared with later periods. Growth was based on quite different foundations from those characterizing twentieth century success stories (Crafts, 1998).

Table 1.5. Growth Rates of Real GDP/Person
(Percent per year)

	1820-70	1870-1913	1913-50	1950-73	1973-96
Australia	1.8	0.9	0.7	2.4	1.7
Austria	0.7	1.5	0.2	4.9	2.0
Belgium	1.4	1.0	0.7	3.5	1.8
Canada	1.2	2.2	1.4	2.9	1.5
Denmark	0.9	1.6	1.6	3.1	1.7
Finland	0.8	1.4	1.9	4.3	1.7
France	0.8	1.5	1.1	4.0	1.5
Germany	1.1	1.6	0.3	5.0	1.8
Ireland	1.2	1.0	0.7	3.1	3.6
Italy	0.6	1.3	0.8	5.0	2.1
Japan	0.1	1.4	0.9	8.0	2.5
Netherlands	1.1	0.9	1.1	3.4	1.6
New Zealand		1.2	1.3	1.7	1.0
Norway	0.5	1.3	2.1	3.2	3.4
Spain	0.5	1.2	0.2	5.8	1.8
Sweden	0.7	1.5	2.1	3.1	1.2
Switzerland		1.5	2.1	3.1	0.5
United Kingdom	1.2	1.0	0.8	2.5	1.6
United States	1.3	1.8	1.6	2.4	1.6
Argentina		2.5	0.7	2.1	0.2
Brazil	0.2	0.3	1.9	3.8	1.4
Chile			1.0	1.2	2.7
Mexico	-0.1	1.7	1.0	3.1	0.8
China	0.0	0.6	-0.3	2.1	5.4
Hong Kong				5.1	4.9
Indonesia	0.1	0.8	-0.1	2.5	3.6
Korea			-0.2	5.2	6.8
Philippines			-0.2	1.8	0.8
Singapore				4.3	6.1
India	0.1	0.4	-0.3	1.6	2.9
Bulgaria			0.3	5.2	-0.8
Czechoslovakia	0.6	1.4	1.4	3.1	0.3
Hungary		1.2	0.5	3.6	0.2
Poland				3.4	0.4
Russia	0.6	0.9	1.8	3.4	-1.2
Africa	0.1	0.4	1.0	2.0	-0.3
Latin America	0.2	1.5	1.5	2.5	0.6

Sources: as for Table 1.1.

The next obvious feature of Table 1.5 is that, despite twentieth century acceleration, growth rates for real GDP per person above 2 to 3 percent per year have still been relatively

unusual. For both Western and Eastern Europe, the early post World War II decades stand out as the episode of by far the most rapid growth followed by a marked slowdown. One way of reading the table might seem to be that in the late decades of the twentieth century OECD economies have returned to historically normal modern economic growth after periods of disruption followed by recovery. Indeed, the hypothesis that growth has returned to the pre-1914 trend rate cannot be rejected for six of the Maddison 16 countries, although in all but two of these cases at a higher level of GDP per person than would have resulted from simple extrapolation of the pre-1914 growth rate (Crafts and Mills, 1996). Nevertheless, as later sections will establish this would be a seriously misleading view of the evolution of the twentieth century growth process.

Table 1.1 shows that during the first half of the twentieth century the United States established a large lead in real GDP per person relative to Europe and East Asia. The American lead was based on successful exploitation of natural resources and a large domestic market together with prowess in high-technology based on tertiary education that other countries found hard to emulate. Also the World Wars did not damage the American economy unlike the experience elsewhere, for example in Germany and Japan. Since 1950, many Western European and East Asian countries have considerably reduced the percentage (if not the absolute) gap with the U.S. Thus, in 1950 levels of GDP per person in France and South Korea were 54 and 9 percent respectively of that in the United States but 77 and 54 percent respectively in 1996 and 69 and 21 percent respectively in 1900. While the gap between the richest and poorest has continued to widen, there has been a significant catch-up of the leader by OECD and Tiger economies.

The fastest growth has been achieved by economies that are successfully catching up from well behind the leader, such as high performing East Asian economies in recent decades, while the United States has not exceeded 2.4 percent per year in any of these periods. The fast growth in postwar Europe also benefited from catch-up and seems to owe a good deal to the reduction in barriers to the emulation of American technology, as well as the reversal of earlier policy errors and the return to peacetime. Nelson and Wright (1992) stress the reduction in the advantage that America had gained from cheap natural resources and a large domestic market as transport costs fell and European integration and trade liberalization proceeded. Investments by Europeans in human capital and in research and development (R&D) facilitated the codification and spread of technological knowhow while high volumes of physical investment were achieved on either side of the Iron Curtain. It should also be recognized, however, that growth slowed down again well before the Europeans (or the Japanese) had completed their catch-up of the United States.

This is especially true of the communist countries which in the 1960s were sometimes thought likely to overtake the United States before the end of the twentieth century. Although they mobilized huge investment programs, capital accumulation ran into severely diminishing returns and incentive structures under communism were not conducive to sustaining high rates of innovation (Easterly and Fischer, 1995). Had catch-up been as successful as in Western Europe, countries like the Czech Republic and Hungary could have been expected to have

GDP/person in 1996 at around the level of Austria or Italy, i.e., at least \$10,000 (1990 international) higher (Fischer et al., 1998).

Among the now advanced economies, Table 1.5 reports striking differences in growth performance that have been reflected in relative advance and decline in levels of real GDP/person. The U.K., which in 1900 still had the highest real GDP per person, was by 1996 only 13th of the countries listed and had been overtaken by most European and several Asian countries including Hong Kong and Singapore. Conversely, Japan ranks 8th in 1996 but in 1900 had an income level below that of Russia. The damage done by communism is underlined by comparing the post-1950 performance of Czechoslovakia and Hungary (data refer to the area of those countries as in 1990) with that of Austria and Italy.

Prima facie, Table 1.5 may seem to suggest that there was more reason to be bullish about twentieth century growth in 1973 than now. The obstacles of colonialism, the World Wars and Depression seemed to be in the past and to many it seemed reasonable to suppose that rapid catch-up growth might spread much more widely. For the West, the power of technology, and the computer revolution in particular, seemed to promise sustained fast growth. Clearly, there has been a substantial slowdown in world growth in the last quarter century from which only Asia (until recently) has largely escaped.

So the growth experience of the last quarter century has produced several puzzles for growth economists. One is to produce an adequate account of the reasons for very strong growth in East Asia while in many other regions, including most of Africa, have had a dismal growth failure. It seems clear that a full explanation of these contrasting outcomes requires something more than can be found in conventional growth models and this has promoted investigations of what, following Abramovitz (1986), might be termed "social capability" for catch-up growth. Another new issue that has emerged following the development of endogenous growth models is to explain the failure of growth to accelerate in the United States despite increased investment in human capital and R&D (Jones, 1995).

C. Adjusted GDP as a Guide to Long Run Living Standards

During the twentieth century there have been big changes in hours spent on market work and in mortality in the countries for which we have long run estimates. Table 1.1 showed that average life expectancy at birth has roughly doubled since 1870 in leading OECD economies. In the same period, hours worked per person employed have roughly halved (Maddison, 1995). Both of these are aspects of improved living standards that would not have been captured by growth in real GDP. Usher (1980) argues that it is both possible and desirable to augment measures of economic growth to include these components of well-being (see Box 1.1). Although there is no consensus on exactly how best to accomplish imputations of this kind, it is useful to consider illustrative calculations along the lines proposed by Usher simply because the changes have been so great.

Crafts (1997a) explains in detail the method used to obtain the undeniably crude estimates in Table 1.6 which are almost certainly underestimates of the imputations that should be made for changing market work hours and mortality. Improvements in life expectancy that are unrelated to personal consumption expenditure are valued on a willingness to pay basis based on nineteenth century rather than twentieth century behavior, which would yield much bigger welfare gains (Nordhaus, 1998), while reductions in market work, valued using wages foregone, ignore the possibility of technical progress in non-market work. Even

Table 1.6. Growth Rates Adjusted for Hours Worked and Mortality
(Percent per year)

	GDP/Head	Mortality Adjustment	Work Adjustment	Augmented GDP/Head
1870–1950				
Australia	0.8	0.5	0.3	1.6
Austria	0.9	0.8	0.4	2.1
Belgium	0.9	0.6	0.3	1.8
Canada	1.9	0.6	0.3	2.8
Denmark	1.6	0.6	0.1	2.3
Finland	1.7	0.7	0.2	2.6
France	1.3	0.6	0.2	2.1
Germany	1.0	0.7	0.1	1.8
Italy	1.1	0.9	0.4	2.4
Japan	1.2	0.6	0.5	2.3
Netherlands	1.0	0.8	0.3	2.1
Norway	1.7	0.5	0.2	2.4
Sweden	1.8	0.6	0.3	2.7
Switzerland	1.8	0.6	0.3	2.7
United Kingdom	0.9	0.6	0.2	1.7
United States	1.7	0.6	0.2	2.5
1950–1996				
Australia	2.0	0.5	0.0	2.5
Austria	3.5	0.6	0.3	4.4
Belgium	2.6	0.5	0.7	3.8
Canada	2.2	0.5	-0.2	2.5
Denmark	2.4	0.2	0.5	3.1
Finland	3.0	0.5	0.5	4.0
France	2.8	0.6	0.9	4.3
Germany	3.3	0.5	0.8	4.6
Italy	3.5	0.6	0.5	4.6
Japan	5.2	0.8	-0.1	5.9
Netherlands	2.5	0.3	0.6	3.4
Norway	3.1	0.3	0.6	4.0
Sweden	2.1	0.4	0.5	3.0
Switzerland	1.8	0.5	0.2	2.5
United Kingdom	2.0	0.4	0.5	2.9
United States	2.0	0.4	-0.1	2.3

Source: updated from Crafts (1997a), see text.

so, the results raise growth rates and, in some cases, by a substantial amount. Applications of this methodology would not always give this result—for example, in industrial revolution

Britain there may well have been periods when the adjustment would tend to reduce growth (Crafts, 1999b).

Table 1.7 highlights the variability of hours worked per person over time and across countries. These differences result partly from demographic factors, partly from female labor force participation and partly from hours worked per employee. With regard to this last, Latin American and East Asian countries are now similar to Western Europe in the 1950s and the 1920s, respectively, but work years in both regions are well below the level of almost 3000 characteristic of late nineteenth century Europe.

Table 1.7. Annual Hours Worked per Head of Population.

	1870	1950	1996
Australia	1145	778	749
Austria	1349	916	725
Belgium	1245	883	595
Canada	1004	720	794
Denmark	1279	1058	797
Finland	1318	995	732
France	1364	1058	600
Germany	1213	1047	661
Italy	1425	866	641
Japan	1598	925	976
Netherlands	1133	833	592
Norway	1198	996	686
Sweden	1360	952	693
Switzerland	1439	1022	874
UK	1251	989	764
USA	1089	859	931
China			1110
Hong Kong			1127
Indonesia			903
Korea			1099
Philippines			679
Singapore			1193
Taiwan			988
Thailand			1394
Bangladesh			671
India			852
Pakistan			638
Argentina			642
Brazil			697
Chile			679
Colombia			648
Mexico			608
Peru			643
Venezuela			548

Sources: Maddison (1995) updated for 1996 as in Crafts (1999a); estimates for South Asian and Latin American countries refer to 1992.

Labour inputs per person are reported in Table 1.7 for Latin America in 1992 to be much lower than for Western Europe in 1870. This has important implications for comparative productivity performance as well as for welfare comparisons. Thus, while the real GDP/person in Latin America in 1996 of \$5155 reported in Table 1.3 is less than 60 per cent ahead of the UK level of \$3263 in 1870, real output per hour worked was over three times that of the UK in 1870. The gap in real GDP/person clearly hugely understates the extent to which economic welfare in Latin America has outstripped the level attained in Britain in 1870, not only because life expectancy is so much higher but also because labor inputs are so much lower.

Differences in the age structure of the population and/or hours worked per person employed per year can also mean that comparative real GDP per person is a poor indicator of labor productivity in the present day. This turns out to matter most when comparisons are made between East Asia and Europe. Thus, whereas, by 1996, the leading Tiger economies, Hong Kong and Singapore, had overtaken most of Western Europe in real GDP per person there was still a substantial gap in terms of labor productivity. Their continued fast growth prior to the recent Asian crisis is less paradoxical when it is recognized that their scope for catch-up of the leading OECD economies continues to be quite substantial (Crafts, 1999a).

The adjustments considered thus far have tended to give reasons why conventionally measured real GDP growth per person may underestimate the improvement in living standards, at least for the OECD economies in the twentieth century. There are, of course, a number of other omissions from GDP which impinge on living standards and where a more negative view might be appropriate. The most often advanced reason why growth measured by historical national accounting might exaggerate growth in living standards is the neglect of environmental damage and depletion of non-renewal resources which might imply that NNP is an overestimate of sustainable consumption (Hicksian income).

This argument clearly has some validity. A recent calculation by Weitzman (1999) suggests that depletion of the most significant exhaustible minerals costs the world the equivalent of a little over 1 percent of average consumption each year compared with a counterfactual of a constant flow of resources at this year's extraction cost. On the other hand, it is necessary to correct NNP not only for unmeasured natural resource capital depletion but also for additions to knowledge capital coming from technological advance to infer correctly sustainable consumption. Depending what is assumed about future technological progress, this may well imply a much bigger correction to NNP in a positive direction, as Nordhaus (1995) has argued.

It is, in fact, the possibility that returns to R&D may be falling, with an implication of reduced future productivity growth, rather than natural resource depletion that is by far the most important reason to suppose that in recent decades sustainable consumption has been growing much less fast than real GDP. Amendments to the correction to NNP for growth in knowledge capital as projections of future technological progress are revised are likely to dominate other adjustments to national accounts measures in assessing sustainability.

Economic historians have rightly warned that economic growth as measured by historical national accounts is not always a good guide to the rate of improvement of average living standards. For most of the twentieth century, it seems likely that, on balance, GDP growth has been an underestimate in a world of falling mortality, increasing leisure, new goods and greater technological prowess.

D. The Sources of Economic Growth

A useful technique with which to examine long run growth is growth accounting. This approach, which is well explained in Barro (1998) and Maddison (1987), seeks to attribute growth to its proximate sources in terms of growth of factor inputs and of total factor productivity (TFP). TFP is the weighted average of the growth of productivity of the individual factor inputs. The basic formula used in growth accounting is the following:

$$\Delta Y/Y = \alpha \Delta K/K + \beta \Delta L/L + \Delta A/A$$

where the growth rate of output (Y) is accounted for in terms of the contribution of the growth of the capital stock ($\Delta K/K$) times the elasticity of output with respect to capital (α), the contribution of the growth of the labor force ($\Delta L/L$) times the elasticity of output with respect to labor (β) and the growth of TFP ($\Delta A/A$).

In practice, α and β are approximated by the shares of profits and wages, respectively, in GDP and TFP growth is found as a residual when all the other components of the growth accounting equation have been entered. Capital stocks are estimated using the perpetual inventory method of adding up past investment flows and assuming a lifetime for capital assets, while labor inputs are usually measured in hours worked adjusted for the educational composition of the labor force based on human capital theory. This formula would be exactly right if, as in traditional neoclassical growth theory, the economy could be thought of as an aggregate Cobb-Douglas production function, $Y = AK^\alpha L^\beta$ operating under conditions of perfect competition and constant returns to scale. The parameter A would reflect the state of technology and TFP growth would measure exogenous (Hicks-neutral) technological change.

Caution is required before assuming that residual TFP growth actually measures the contribution of technological change to economic growth. According to traditional analysis, the bias may go in either direction. First, technological change may be less than TFP growth if there are scale economies or improvements in the efficiency with which resources are used or if improvements in the quality of factors of production are underestimated, for example due to unmeasured human capital accumulation (Abramovitz, 1993). Second, if the elasticity of substitution between factors of production is less than 1 and technological change has a Hicks-labor saving bias, as many analysts think is the case, then conventional TFP growth underestimates the contribution of technological change and the mismeasurement increases

with the growth in the capital to labour ratio, the degree of labor-saving bias and the inelasticity of substitution (Rodrik, 1997).

Since faster technological change raises the steady state rate of growth of the capital stock in a traditional neoclassical growth model and so part of its impact on growth compared with the counterfactual of no technological change shows up in capital's measured contribution. The advent of endogenous growth theory strengthens this kind of reason to believe that the contribution of technological change exceeds TFP growth. Thus, in models which envisage endogenous innovation driving growth through expanded varieties of capital inputs a fraction of the contribution of the growth in varieties of capital facilitated by R&D accrues to capital and is not captured by the Solow residual. The undermeasurement will be greater the larger is the endogenous component in technological progress (Barro, 1998).

Table 1.8 reports a selection of growth accounting results which permit a long run view of the sources of growth in some G7 countries. The main trends are as follows. First, in the U.S. the contribution of capital seems to have been stronger in the nineteenth century than in the twentieth both absolutely and proportionately. In other countries, the strongest absolute contribution of capital came in the Golden Age investment boom after World War II. The late twentieth century decline in capital's contribution is associated both with rising capital to output ratios and falling shares of investment in GDP but gross non-residential investment rates in most G7 countries are several percentage points above their late nineteenth century levels (Maddison, 1992).

Second, the contribution of labor inputs to growth has been strongest in the United States reflecting, in particular, higher population growth there than elsewhere in the G7 countries. Measured on this neoclassical basis education's contribution has been steady but not spectacular—for example, contributing a little less than 0.5 percent per year in each period since 1913 in the United States where years of formal education rose from about 6 at the start of the century to 9.5 in 1950 and 13.5 in 1995 (Maddison, 1996; OECD, 1998b). In much of the OECD, declining hours worked has been a significant restraint on the growth of labor inputs during the twentieth century.

Third, the contribution from TFP growth has been highly variable ranging from 0.2 percent per year in the U.S. in 1973–92 to 3.6 percent per year in Japan in 1950–73. The interwar productivity surge in the United States appears to owe a good deal to electrification which raised TFP growth across the board in American manufacturing (David and Wright, 1999). By contrast, catching up, scale effects and improvements in resource allocation made strong contributions to TFP growth in Golden Age Europe and Japan (Maddison, 1996). The broad picture is that generally TFP growth rose from the late nineteenth century through the Golden Age and then declined sharply in the recent growth slowdown. The low TFP growth in both Britain and the U.S. in the nineteenth century is suggestive of the limits to growth at that time, discussed above. Rising TFP growth through the 1970s correlates with spending on R&D which was negligible in the nineteenth century, around 0.2 and 0.5 percent of GDP in the interwar U.K. and U.S. respectively (Edgerton and Horrocks, 1994), and rose to 2.3 and

2.9 percent respectively by the 1960s (United Nations, 1964). However, the decline in American (and G7) TFP growth in the last period occurred despite increased R&D spending.

Table 1.8. Growth Accounting: Comparisons of Sources of Growth
(Percent per year)

	Capital (percent)	Labor (percent)	TFP (percent)	Output
1855-90				
United States	2.0 (50%)	1.6 (40%)	0.4 (10%)	4.0
1873-1913				
United Kingdom	0.8 (42%)	0.6 (32%)	0.5 (26%)	1.9
1913-50				
Japan	1.2 (55%)	0.3 (13%)	0.7 (32%)	2.2
United King	0.8 (62%)	0.1 (7%)	0.4 (31%)	1.3
United States	0.9 (32%)	0.6 (21%)	1.3 (47%)	2.8
West Germany	0.6 (46%)	0.4 (31%)	0.3 (23%)	1.3
1950-73				
Japan	3.1 (34%)	2.5 (27%)	3.6 (39%)	9.2
United Kingdom	1.6 (53%)	0.2 (7%)	1.2 (40%)	3.0
United States	1.0 (26%)	1.3 (33%)	1.6 (41%)	3.9
West Germany	2.2 (37%)	0.5 (8%)	3.3 (55%)	6.0
1973-92				
Japan	2.0 (53%)	0.8 (21%)	1.0 (26%)	3.8
United Kingdom	0.9 (56%)	0.0 (0%)	0.7 (44%)	1.6
United States	0.9 (38%)	1.3 (54%)	0.2 (8%)	2.4
West Germany	0.9 (39%)	-0.1 (-4%)	1.5 (65%)	2.3
1978-95				
China	3.1 (41%)	2.7 (36%)	1.7 (23%)	7.5
1960-94				
Hong Kong	2.8 (38%)	2.1 (29%)	2.4 (33%)	7.3
Indonesia	2.9 (52%)	1.9 (34%)	0.8 (14%)	5.6
Korea	4.3 (52%)	2.5 (30%)	1.5 (18%)	8.3
Philippines	2.1 (55%)	2.1 (55%)	-0.4 (-10%)	3.8
Singapore	4.4 (54%)	2.2 (27%)	1.5 (19%)	8.1
1960-94				
South Asia	1.8 (43%)	1.6 (38%)	0.8 (19%)	4.2
Latin America	1.8 (43%)	2.2 (52%)	0.2 (5%)	4.2
Africa	1.7 (59%)	1.8 (62%)	-0.6 (-21%)	2.9
Middle East	2.5 (56%)	2.3 (51%)	-0.3 (-7%)	4.5

Sources: 1855-90 USA from Abramovitz (1993). 1873-1913 UK from Matthews et al. (1982). G7 countries: 1913-50 from Maddison (1991), 1950-92 from Maddison (1996). East Asia from Collins and Bosworth (1996) except for Hong Kong which is based on Young (1995) and China based on Maddison (1998) both with factor shares adjusted to match Collins and Bosworth's assumptions. South Asia, Latin America, Africa, Middle East from Collins and Bosworth (1996).

The contrasts in TFP growth over time in the United States probably do reflect real changes in the contribution of technological change to growth but surely exaggerate the movements. The nineteenth century American economy experienced a rapid rise in the capital to labor ratio combined with strongly labor saving technological change such that the share of profits in national income rose. Early in the twentieth century, the bias in technological change seems to have ceased to be labor saving and to have been replaced by a capital saving (human

capital using) bias and the share of profits fell (Abramovitz, 1993). In recent decades, this capital saving bias has been less apparent and the share of profits has fluctuated with no strong trend. In the light of our earlier discussion, it seems probable that conventionally measured TFP growth significantly understates the role of technological change in the nineteenth century and overstates it between the 1920s and the 1960s. The recent decline in TFP growth in the United States appears paradoxical in the light of the computer revolution and this has prompted many to suspect that it may be, at least to some extent, a statistical artifact (Griliches, 1994). We return to this issue in Chapter 3.

The developing world clearly offers some striking comparisons with the advanced world, although data limitations restrict measurement to the post-1960 period. The startling contrasts in this period are between the much faster growth in East Asia in a still to be completed process of catching up the OECD and the growth failure in Africa which has fallen further behind and has seen real GDP per person in the continent declining in the last quarter century.

Table 1.8 shows negative TFP growth for Africa in the period 1960–94, and contributions from factor inputs which look respectable until it is recalled that population growth was nearly 3 percent per year. Probing behind these numbers, the investment rate in Africa has been held down in real terms by the very high price of capital goods in highly protectionist economies and educational levels have remained low rising from 1.6 years in 1960 to only 3.5 years in 1994 (Collins and Bosworth, 1996). In East Asia the investment rate has been high relative to historical norms and has translated into a strong contribution from the capital stock because of unusually low capital to output ratios (Fukuda, 1999). The contribution from labor inputs has been boosted by a favourable demographic transition and rapid increases in schooling, from an average of 2.7 years in 1960 to 7.2 years in 1994 (Collins and Bosworth, 1996). The stronger TFP growth in East Asia may partly reflect effectiveness in technology transfer which compares very favorably with other Third World experience (Dahlman, 1994).

Comparisons of East Asian with European growth in the recent past are somewhat beside the point given the differences in capital to output ratios, scope for catch-up in TFP and demography. Examining differences in the sources of recent fast growth in East Asia and of rapid growth in Europe during catch-up in the 1950s and 1960s is instructive, however. Here, the obvious point to stand out from Table 1.8 is that East Asian growth has relied much more heavily on factor inputs, both labor and capital, and less on TFP growth than that of Golden Age West Germany. Although measurement error occasioned by factor-saving bias may exaggerate the TFP growth difference somewhat, the conclusion that East Asian TFP growth has been outstanding relative to that of Africa but not so impressive by earlier European standards seems robust (Crafts, 1999a).

E. Convergence and Divergence

The large divergence in income levels and growth rates that has emerged since the start of modern economic growth seems hard to square with the traditional neoclassical growth model which assumed constant returns to scale, diminishing returns to capital accumulation and universal technology which improved like manna from heaven. Although some early work in the growth regressions literature argued that differences in income levels across the world could largely be explained by human and physical capital per worker (Mankiw, Romer and Weil (1992) and tended to interpret β -convergence (i.e., the negative relationship between growth rates and initial labor productivity levels found in cross-section regressions when enough conditioning variables are included) as consistent with the Augmented-Solow growth model with convergence at 2 percent per year (Barro and Sala-i-Martin, 1991), these interpretations are now generally rejected (Temple, 1999).

Economic historians reviewing the experience have tended to stress the importance of technological congruence and social capability (Abramovitz and David, 1996). The former relates to the profitability of using technology developed in the leader(s) in potential follower countries with different factor endowments and demand conditions. Thus, in the first half of the twentieth century, American technology which was natural resource intensive, physical capital-using and scale dependent was frequently not the optimal choice of technique in European conditions. Greater integration of world markets, reductions in the cost advantages of domestic natural resource endowments combined with increased importance of intangible capital (R&D and education) subsequently reduced the obstacles to catch-up first within the OECD and later elsewhere in East Asia. Social capability refers to a country's culture, institutions and policy framework which influence the attractiveness of investment and innovative activity and the efficiency with which technological possibilities are exploited. The productivity gap with the leader informs the potential for rapid catch-up growth but catching-up is not automatic. This coheres with the more recent econometric evidence.

Prescott (1998) explores the possibilities of calibrating a neoclassical production function to account for cross-country labor productivity differences in terms of human and physical capital per worker with TFP common to all countries and concludes that the evidence is not remotely consistent with this hypothesis. While econometric evidence strongly supports diminishing returns to (broad) capital accumulation, estimates of rates of conditional convergence are now known to be highly sensitive to econometric specification and there appears to strong evidence both of differences in levels and/or rates of growth of TFP across countries. This strongly suggests that both policy and institutions matter for growth performance (Temple, 1999).

III. GLOBALIZATION THEN AND NOW

Many economists have discussed the twentieth century in terms of a phase of globalization ending with World War I followed by a phase of disintegration through until the postwar reconstruction after World War II. The last fifty years is then seen in terms of a gradual liberalization of trade and capital flows followed by a new and deeper version of globalization in the last quarter century or so. In both the OECD and the third world, perspectives on the advantage of outward orientation have clearly varied dramatically over time as has the impetus to globalization from technological change. The objectives of this section are to establish some of the key dimensions of globalization and to explain why the process was reversed in the interwar period as governments retreated to financial autarchy and trade protectionism.

A. Globalization in Trade and Factor Flows

It is widely known that for many countries the proportion of merchandise trade to GDP has now returned to levels quite similar to those at the start of the century. *Prima facie*, it might appear that the world economy has simply returned to its old level of economic integration and that international trade has merely resumed its earlier importance. As has increasingly been recognized, that view is seriously misleading. The nature of international trade is in several respects quite different now compared with one hundred years ago and it plays a much larger part in world economic activity (Bordo et al., 1999).

Table 2.1 reports ratios of world merchandise trade relative to world GDP and largely matches the stylized facts set out above. The trade ratio was increasingly rapidly before World War I, did not exceed the 1913 level until the late 1960s, and has risen sharply in recent decades. It should be noted, however, that the present level is unprecedentedly high and represents both a massive increase over the estimate of 1 percent for 1820 and a near doubling of the 7 percent in 1950 (Maddison, 1995, p. 233). On the other hand, for U.K., the leading player in the global economy of the late nineteenth century, merchandise trade is now a much smaller proportion of GDP than it was then and for the U.S. the increase in the trade ratio is quite modest.

The picture is rather different when changes in the structure of OECD economies are taken into account, in particular, the shift away from commodity to service sector production. Table 2.1 shows that when merchandise trade is expressed as a percentage of merchandise value added most countries now have a much higher ratio than in 1913. Most obviously, this is true of the United States where the trend since 1970 is a striking new development. The U.S. has also experienced a rapid growth in service sector exports which by the mid 1990s were around 40 percent of merchandise exports up from 30 percent in 1960 and dwarfing the 3 percent or so of 1900 (Bordo et al. 1999). This probably reflects both the increasing tradability of some services and also shifts in comparative advantage. It is not unprecedented, however, in the sense that service/merchandise proportions around 40 percent also characterized British exports in the period 1870–1913 (Imlah, 1958).

Table 2.1. Ratios of Merchandise Exports to GDP and to Merchandise Value-Added
(Percent)

	1890	1913	1960	1970	1990
X/GDP					
Australia	15.7	21.0	13.0	11.5	13.4
Canada	12.8	17.0	14.5	18.0	22.0
Denmark	24.0	30.7	26.9	23.3	24.3
France	14.2	15.5	9.9	11.9	17.1
Germany	15.9	19.9	14.5	16.5	24.0
Italy	9.7	14.4	10.0	12.8	15.9
Japan	5.1	12.5	8.8	8.3	8.4
Norway	21.8	25.5	24.9	27.6	28.8
Sweden	23.6	21.2	18.8	19.7	23.5
United Kingdom	27.3	29.8	15.3	16.5	20.6
United States	5.6	6.1	3.4	4.1	8.0
World	6.0	9.0	8.0	10.0	13.0
X/MVA					
Australia	27.2	35.6	24.4	25.6	38.7
Canada	29.7	39.4	37.6	50.5	69.8
Denmark	47.4	66.2	60.2	65.9	85.9
France	18.5	23.3	16.8	25.7	53.5
Germany	22.7	29.2	24.6	31.3	57.8
Italy	14.4	21.9	19.2	26.0	43.9
Japan	10.2	23.9	15.3	15.7	18.9
Norway	46.2	55.2	60.0	73.2	74.8
Sweden	42.5	37.5	39.7	48.8	73.1
United Kingdom	61.5	76.3	33.8	40.7	62.8
United States	14.3	13.2	9.6	13.7	35.8

Sources: Feenstra (1998) except estimates for World which are derived from Maddison (1995).

It is also important to recognize that the composition of world merchandise trade has change very substantially during the twentieth century, as Table 2.2 reports. The most obvious change is the huge relative decline of primary products and rise of manufactured goods especially since World War II. In many ways, perhaps the most significant development is the rise of the developing countries' share of manufactured exports which was very low and showing no upward tendency through the 1960s but has grown dramatically in the last thirty years to around 25 percent by the mid 1990s.

Also noteworthy in Table 2.2, is the steady increase throughout the century from a low initial level in the proportion of capital goods, represented here by machinery and transport equipment, in manufactured trade. It also seems clear that this has been accompanied in the recent past by a rapid increase in both outsourcing and vertically specialized trade which may now have reached 20 to 25 percent of world trade (Hummels et al., 1998). In the U.S., imports of SITC 7 manufactures (machinery and transport equipment) were still only 5 percent of total merchandise imports as recently as 1955 but are now around 50 percent (Yates, 1959; UNCTAD, 1997).

Another interesting development during the twentieth century has been the part played by multinationals in world trade and production. Multinational enterprise was already quite well established in the early twentieth century, as Table 2.3 reports and the book value of foreign direct investment relative to world GDP is probably only a couple of percentage points higher now than in 1914. Nevertheless, the market value of U.S. direct investment abroad has been estimated as 20 percent of GNP in 1996 compared with around 7 percent in 1914 (Bordo et al., 1999). Also, in recent decades, multinationals have become more important in technology transfer (Nelson and Wright, 1992) and in the proliferation of outsourcing (Lawrence, 1996).

Table 2.2. Composition of World Merchandise Trade
(Percent, current prices)

	1913	1955	1973	1994
Categories of Goods				
Primaries	64.1	54.8	39.5	25.3
Manufactures	35.9	45.2	60.5	74.7
Machinery/Transport Equip.	6.3	17.5	28.7	38.3
Manufactured Exports Shares				
Developed Market	95.4	85.2	83.9	72.9
Developing	4.6	4.4	6.6	24.7
(Former) Iron Curtain		10.4	9.5	2.4

Sources: UNCTAD (1983) (1997) except for 1913: Yates (1959).

The story of foreign portfolio investment in the twentieth century is of flourishing growth through World War I followed by a pronounced retreat from the 1930s through the 1950s and then accelerating growth from the 1960s to the present. Table 2.3 reports that the stock of total foreign assets relative to world GDP regained the 1914 level around 1980 and has risen dramatically since that time.

Table 2.3. Foreign Investment

A. Foreign Assets/World GDP (in percent)				
1870	6.9	1945	4.9	
1900	18.6	1960	6.4	
1914	17.5	1980	17.7	
1930	8.4	1995	56.8	
B. Foreign Direct Investment: Accumulated Stocks (\$mn) and Multinationals Active in British Manufacturing				
	1914	1938	1960	1995
Stock of FDI (current)	14	26	66	2464
Stock of FDI (\$1990)	153	350	362	2053
MNEs in British Manufacturing				
	111	361	718	1507

Sources: foreign assets/GDP from Obstfeld and Taylor (1999); stock of FDI from Jones and Schroter (1993) except for 1995 from OECD (1998); multinationals from Bostock and Jones (1994) except for 1995 from OECD (1997).

Obstfeld and Taylor (1999) interpret these trends in terms of a macroeconomic policy trilemma, i.e., that a country can have at most two of a fixed exchange rate, free capital movements, and independent monetary policy. At the start of the century, the advanced country norm was to eschew the last of these in an era when politicians denied responsibility for the level of domestic economic activity and working class votes still did not matter in most countries. In the crisis of the 1930s, independent monetary policy ruled the roost, widespread capital controls were introduced and devaluations were commonplace. During the Bretton Woods period, fixed exchange rates returned and capital controls were retained in a world in which aggregate demand management was widely attempted while since the early 1970s the trend has been toward floating exchange rates, independent monetary policy and abandonment of capital controls.

This macroeconomic background is central to explaining trends in quantities of foreign investment but other factors have impinged on the composition of capital flows. It has long been recognized that portfolio investment before World War I was heavily concentrated in lending to the transportation and government sectors while relatively little went to banks or industry. According to estimates in Simon (1967), 69 percent of British portfolio investment between 1865 and 1914 was in social overhead capital, and 35 percent went to governments while only 4 percent was in manufacturing. Lending to emerging markets in the 1990s involves much more exposure to the financial sector and much less to infrastructure (Bordo et al., 1999). A plausible explanation for this may be that problems of asymmetric information and contract enforcement are, on average, somewhat reduced relative to the pre-1914 era.

Table 2.4. Barriers to Trade: Average Tariffs on Manufactures and Import Coverage of NTBs
(In percent)

	1875	1913	1930s	1950	1989	Post UR
Tariffs						
France	12-15	20	30	18		
Germany	4-6	17	21	26		
Italy	8-10	18	46	25		
Spain	15-20	41	63			
UK	0	0	17	23		
EU					5.7	4.6
USA	40-50	44	48	14	4.6	3.0
NTBs						
France		0	58			
Germany		0	100			
Italy		0	100			
Spain		0				
United Kingdom		0	8			
European Union					11.6	3.8
United States		0	5		10.1	2.1

Sources: Tariffs from Bairoch (1993) and Schott (1994); NTBs based on Gordon (1941) and Daly and Kuwahara (1998). For the 1930s, tariffs are for 1931, except UK for 1932, and NTBs are for 1937.

The disintegration of world trade after World War I resulted from a surge of protectionism. Prior to World War I, the use of quantitative trade restrictions was negligible (Gordon, 1941) but during the 1930s they proliferated. Some estimates suggest that as much as 70 percent of world trade was affected, although Gordon herself suggests the figure was more like 50 percent. Trade liberalization after World War II centered initially in Europe on removing import controls but during the 1970s and 1980s there was a return to higher non-tariff barriers to trade including new devices such as voluntary export restraints which evaded the GATT. Many of these NTBs embodied levels of protection equivalent to quite high tariffs. The Uruguay Round placed considerable emphasis on removing NTBs with some success, as Table 2.4 reports.

Trends in tariff protection are similar in some respects but differ in others. It is worth bearing in mind that the late nineteenth and early twentieth century were a period when tariff barriers to trade were generally increasing somewhat. Although the U.K. stood out as a committed free trader prior to World War I, the U.S. was a high tariff country throughout until World War II. Tariffs increased markedly during the trade wars triggered off by the Smoot-Hawley tariff of 1930 but were reduced steadily under the various multilateral GATT rounds especially from the Kennedy Round on. These reductions were not reversed during the macroeconomic turbulence of the 1970s. In sum, it seems quite probable that Bordo et al (1999) are right to claim that trade barriers today are quite likely lower than a century ago.

The early twentieth century was also a time of high international migration characterized in particular by emigration from Europe, increasingly from southern and eastern Europe, and immigration to the New World. This had a substantial impact in reducing wage gaps between sending and receiving regions and put downward pressure on wage rates of the unskilled in the United States (Williamson, 1996). In turn, the adverse implications for unskilled workers appear to have been a major reason for the tightening of restrictions from the 1860s onwards and ultimately the shutting of the door to immigrants in the United States and other countries in the 1920s (Timmer and Williamson, 1998). Thus, by the 1930s, tendencies to factor price equalization were much weakened by obstacles to factor flows and protectionism.

There has been no comparable relaxation of immigration controls to accompany the liberalization of trade and capital flows. As Table 2.5 reports, the proportion of foreign born population in the U.S. has risen from the nadir reached in 1970 and immigrant flows have revived a little. In Western Europe the proportion of foreign born population has risen from 3.6 percent in 1965 to 6.1 percent in 1990 (Zlotnik, 1998), a record figure, but this period has also seen severe immigration restrictions imposed in a region previously accustomed to substantial net emigration. Indeed, absent these barriers, one might have anticipated very much larger total flows of migrants given lower transport costs and higher incomes in less-developed countries.

Table 2.5. Immigration to the United States

	Immigration Rate / 1000 population	Foreign Born as Percentage of Population (in percent)
1870	6.4	13.9
1890	9.2	14.6
1910	10.4	14.6
1930	3.5	11.5
1950	0.7	6.9
1970	1.7	4.7
1990	2.6	7.9

Source: U.S., *Bureau of the Census*

B. Explaining Trends in Protectionism

It is now widely accepted that openness is good for productivity growth (Edwards, 1998) and the relative decline of economies that adopted import-substituting industrialization strategies rather than outwardly orientated policies in recent decades has both strengthened this conventional wisdom and encouraged trade liberalization in the third world. These beliefs and policy stances were not widely shared until recently. And, in any event, big countries may seek to exploit optimal tariff policies even at some cost in productivity performance while in depressions considerations of external and internal balance may make expenditure switching policies an attractive short-term fix. The rise of protectionism through the middle of the century resulted from a combination of adverse macroeconomic shocks, the aggressive behavior of the new "hegemon", the United States, and an absence of the link between openness and growth that emerged in more recent times.

It is well-known that downturns in economic activity are conducive to protectionism in societies where governments respond to the balance of interest group pressures (Gallarotti, 1985). Trends in protectionism in the United States during the twentieth century have repeatedly been shown broadly to conform with this generalization (Bohara and Kaempfer, 1991; Takacs, 1981). It is not therefore surprising that the world economic crisis of the 1930s saw a surge in trade restrictions of all kinds.

American tariff policy in the late 1920s was essentially the outcome of log-rolling by special interests in Congress rather than a carefully calculated foreign policy move by the administration (Irwin and Kroszner, 1996). Nevertheless, the trade wars of the 1930s can also be seen as equivalent to a move by the United States to exploit its position as a big country which backfired. The introduction of the Smoot-Hawley tariff in 1930 provoked retaliation on a wide scale notably by larger countries and, in retrospect, represents a serious miscalculation. The tactics adopted later in the decade following the Reciprocal Trade Agreements Amendment were a better way of seeking optimal tariffs which effectively distinguished between countries of relatively high and low bargaining power (Conybeare, 1987). During the

Pax Americana after World War II the United States moved toward sub-ordinating trade policy to foreign policy and this aided considerably the shift back toward trade liberalization.

In recent decades protectionism seems to have reduced growth rates as a consequence of the distortions to which it gave rise. A detailed analysis of long-run Latin American growth performance by Taylor (1998) found that the key impact worked through a whole series of distortions that raised the price of capital goods rather than high tariffs per se. Similarly, Ades and di Tella (1997) have argued that there are serious adverse impacts of industrial policy from the corruption that it generally spawns which is fostered by protected markets.

In the early twentieth century, the inverse correlation between tariffs and growth was absent. A careful study by O'Rourke (1997) which uses all the obvious controls confirms the intuitions of earlier writers like Bairoch (1993). The reason for this result may well be that, in general, tariffs at this time tended to reduce the relative price of capital goods and thus to stimulate rather than to discourage real investment. This is suggested by the evidence in Collins and Williamson (1999) who found that prior to 1950 tariffs tended to lower the price of capital goods relative to consumer goods. More speculatively, it may also be that in an era when "industrial policy" was in its infancy there was less reason to associate protection with additional distortions.

C. The Origins and Nature of the Great Slump

The tendency to disintegration of the world economy in the interwar period was hugely exacerbated by the slump of the early 1930s. It seems highly probable that a return to global economic crisis of similar proportions would provoke similar antipathy to international capital mobility and free trade leading to widespread adoption of policies aimed at reimposing controls. Understanding the reasons for the depression, in particular of the parts played by structural faults and policy errors, is central to assessing the risk of a repeat and is thus a key building block in weighing up the likelihood of a future backlash against globalization. Also, understanding the propagation of the initial adverse shocks is fundamental to averting a repetition of a major slump and an associated retreat from openness.

The traditional literature on the Great Depression stressed catastrophic errors in American monetary policy which provoked a huge aggregate demand shock that reduced output and prices both domestically and then, through secondary effects, the rest of the world (Friedman and Schwartz, 1963). This is still a valid, but now clearly incomplete, picture as more recent research has brought out the importance of wage stickiness and aggregate supply in real output falls, of the operation of the newly restored Gold Standard in the inadequacy of the world macroeconomic policy response, and of the fragility of banking systems in the onset of financial crisis.

Those who argue for the fragility of the world economy prior to the depression are typically pointing to various legacies of World War I such as adjustment problems linked to world agricultural over-production and loss of export markets by European countries

(Kindleberger, 1973). Their claims are not that the world economic crisis was inherent in early twentieth century globalization but that the shock delivered by the war seriously impaired subsequent macroeconomic policymaking, led to increased pressures for protection and/or had adverse implications for the volatility of capital flows. Indeed, the main line of argument is now that the war shock was primarily responsible for the instability of the interwar gold standard but the significance of the changed economic environment was perceived too late (Temin, 1989).

Eichengreen (1992) established a picture of the pre-1914 Gold Standard as an era in which Britain was frequently able to operate as a Stackelberg leader because of sterling's reserve currency role and as a world in which international cooperation sustained the system when under pressure. The priority given to gold convertibility co-existed with quite high volatility in domestic levels of economic activity but domestic politics permitted neglect of internal balance objectives. By the 1920s all this had changed with the rise of New York, the differing views of major players on the appropriate conduct of monetary policy, and the pursuit of working class votes. American monetary policy first provoked a general world tightening and then presided over a sensational collapse in the domestic money supply and output. This episode is discussed in detail in Eichengreen and Sussman, 2000.

A substantial rise in real interest rates and real wages ensued in the advanced world. Newell and Symons (1988) estimated that in the representative European country real wages rose by 13.8 percent and the real interest rate increased by 7.2 percentage points between 1928 and 1931 while the price of traded goods fell by 27.2 percent and domestic prices by 15.2 percent. The prices of primary goods fell dramatically from an index value of 28.01 in 1928 to 10.15 in 1932 compared with 48.31 in 1920 (Grilli and Yang, 1988). The terms of trade moved very sharply against primary producers—in Latin America by about 32 percent between 1929 and 1931. Capital flows from first to third world ceased and were then reversed; capital exports of \$355mn in 1929 became inflows of \$1.4bn and \$1.7bn in 1931 and 1932 (Maddison, 1985). Currency and debt crises followed for many third world countries.

The depression was also notable for financial crises in many advanced countries featuring significant bank failures, switches from bank money into cash and drying up of the supply of bank loans (Bernanke and James, 1991). The most spectacular of these debacles was in the United States (see Box 2.1). Here research has established that a badly regulated banking system had engaged in excessive risk taking in the boom years preceding the depression and that the interruption to supplies of credit in the financial crisis of the early 1930s added extra deflationary pressure to that expected from a conventional negative money supply shock (Calomiris, 1993).

Money wages generally proved to be very sticky downwards such that during 1931-1934 real wages were 20 to 40 percent above the 1929 level in most countries. Estimated wage adjustment equations for a panel of 22 countries confirm that wages generally reacted very sluggishly to price declines (Bernanke and Carey, 1996). This ensured that the

deflationary shocks were translated into output reductions. In some cases, like that of Britain, the spread of collective bargaining arrangements and the implications of unemployment benefits in placing a floor under nominal wages may partly explain this (Crafts, 1989). The stickiness of money wages remains quite puzzling, however, especially in view of the much greater flexibility that they displayed both in Britain and the United States in the early 1920s. Calibrations of a Taylor overlapping contracts model for the United States indicate that a change to much slower wage adjustment in the early 1930s than a decade earlier is implied and the explanation of this is not yet clear (Bordo, et al., 1997).

Recent research has placed the operation of the non-cooperative interwar gold standard at the heart of the problems of the early 1930s. In the absence of cooperative monetary expansion, the fixed exchange rate regime buttressed by fiscal orthodoxy ensured that the representative country faced adverse aggregate demand shocks to which there was no effective policy remedy.

It has also become clear that leaving gold was the key to early recovery which was associated with the pursuit of independent monetary policies (which mitigated price declines and thus real wage increases) besides having more conventional implications for aggregate demand (Campa, 1990; Eichengreen and Sachs, 1985). Early devaluation also helped prevent currency crises which translated into banking crises (Grossman, 1994). At the same time, imposing capital controls, and erecting barriers to trade were seen as attractive ways to escape from conflicts of external and internal balance and, in effect, openness was increasingly seen as an obstacle to prosperity at least in the short term. Even in the hitherto staunchly free trade U.K. the macroeconomic downturn prompted the imposition of the General Tariff as long-standing protectionist interest groups seized their moment (Rooth, 1992).

If, ex post, the interwar Gold Standard turned out so badly, why ex ante did so many countries seek to return to gold after World War I? Obviously, a major reason was that the pre-1914 system had operated as an effective commitment technology for many countries (Bordo and Kydland, 1995) and the advantage of a rules based system for macroeconomic policy was highly valued—as Montague Norman said it was ‘knave proof’. Recent research has also stressed the role of gold standard membership as the best available signal to capital markets of financial rectitude and thus as a means to borrowing from abroad at substantially lower interest rates (Bordo, Edelstein and Rockoff, 1999). In this way, globalization was tied to the gold standard and thus, given the international economic policy context of the early 1930s, carried with it the seeds of its own demise.

The upshot of this research is to highlight three key ingredients of the depression, namely, inappropriate international monetary and exchange rate policy, fragile banking systems, and inflexible labor markets. The chances of avoiding a replay of the 1930s will be better the less these apply in future. As noted above, the solution to the policy trilemma increasingly is to drop the fixed exchange rate and this removes a key aspect of the 1930s crisis. It might also be noted that in a world of floating exchange rates the G7 response to the stock market crash of 1987 indicates that policymakers both were alive to the lessons of

history and able to take appropriate action. Inflexible labor markets seem to remain a problem, notably in Europe. The reasons for wage stickiness in the 1930s are not yet understood and are a priority for further research. At present, it is unclear whether there would now be greater downward wage flexibility in response to deflationary pressure but it would be unwise to rely on it (Akerlof et al., 1996).

The Asian crisis in 1997/8 is a reminder of the acute problems that can be created by the policy trilemma in the face of inadequately supervised and regulated banking systems. Attempts to use interest rate policy for domestic demand management with a pegged exchange rate were counterproductive in the face of capital inflows and the excessive risk taking which ensued threatened financial stability (Mishkin, 1999). In turn, as bank balance sheets deteriorated sharply, the fiscal implications of implicit government guarantees risked a currency crisis which itself would exacerbate the banking crisis (Burnside et al., 1999). *Mutatis mutandis*, the unholy combination of inappropriate monetary and exchange rate policy together with a fragile banking system is quite reminiscent of 1930s America. As with that episode, *ex post*, these errors seem to be widely recognised and improvements in the design of policy can be expected.

In sum, the message from the interwar period is that economic policymaking rather than globalization *per se* was the root of the Great Depression. Accordingly, there seem to be reasons to be optimistic both that a similar downturn can be averted in future and, if so, the probability of a reversal of globalization is lower.

IV. An End Of The Century Perspective

A. The Paradoxical OECD Growth Slowdown

One of the most discussed aspects of twentieth century economic growth is the productivity slowdown of the last quarter century in the OECD economies, and especially in the United States. In the context of the information and communications technology revolution, this has been seen by many as a considerable puzzle. The episode raises a number of important issues both for economic policymakers and growth economists. These include

- Is structural change responsible for slower OECD growth?
- Is there a post Golden Age hangover effect?
- Is the growth slowdown sufficient to refute the endogenous growth hypothesis?

The most straightforward reason why fast growth comes to an end is that it is based on an investment boom that runs into diminishing returns and/or involves an episode of catch-up growth at the end of which productivity growth will naturally slow down. It is generally agreed that there are diminishing returns to routine physical investment and that as productivity gaps with leading countries narrow, *ceteris paribus*, TFP growth will decline

(Temple, 1999). These are clearly facets of the growth slowdown of the 1970s in OECD countries. At that point, however, catch-up of the United States was clearly far from complete and subsequent slower TFP growth seems to reflect something more than this. And, of course, for the United States itself the catch-up effect carries no weight and greater investments in innovative activity might have led to faster growth according to some recent growth theorizing.

A striking feature of twentieth century economic growth in leading economies has been the associated structural change, as Table 3.1 reports. There has been a large decline in the proportion of employment devoted to agriculture and manufacturing and a substantial rise in the shares of both marketed and non-marketed services. This has made the measurement of economic growth more difficult and has probably exacerbated the underestimation of productivity growth. In addition, these structural shifts may also have reduced potential productivity improvement.

The measurement problem should not, however, be exaggerated since the sectoral shift has been gradual and is unlikely to account for much of the recent productivity slowdown since the shift to hard to measure sectors was similar before and after 1973. Using the assumptions in Sichel (1997a), an upper bound estimate of the impact of the change in employment weights since 1973 in the economies of Table 3.1 is in no case more than 0.4 percent per year while the difference between 1900 and 1995 weights might add up to about 1 percent per year.

Table 3.2 confirms that there have been notable differences in sectoral productivity growth rates in G7 countries in the postwar period. Estimated growth of both labor productivity and TFP in manufacturing has been appreciably higher than in services. If these estimates are accurate, this appears to suggest that the marked de-industrialization of the last thirty years or so has reduced OECD growth potential. Again, however, a glance at Tables 3.1 and 3.2 suggests that the impact of de-industrialization cannot have been large compared with the within sector productivity slowdowns. An interesting question is whether technological change in the age of computers will eventually stimulate productivity growth in services and manufactures in fairly equal measure whereas in the ages of steam and electricity the impact on the latter was much greater.

The person in the street might well suggest that macroeconomic shocks bring fast growth to an end. It is certainly true that severe recessions, currency and financial crises can have a severe short term impact on growth as occurred in the West both in the 1930s and 1970s. It is much less clear that there will be a long run effect and conventional macroeconomics would suggest that this should only be the case if the reaction to the crisis involves policy responses that damage the long run growth rate of productive potential. Clearly this does happen, as with the adoption of inwardly-orientated policies in Latin America in the 1930s. On the other hand, the United States in the 1930s rehabilitated its banking system, adopted an expansionary monetary policy and by the end of the 1930s had resumed its earlier strong trend growth which continued on through the 1960s (see Box 2.1).

Table 3.1. The Structure of Employment in Five Leading Economies, 1900-95

	France	Germany	Japan	United Kingdom	United States
c1900					
Goods	74.7	78.9	79.3	56.7	66.8
Agriculture	43.4	39.9	64.8	13.0	38.3
Manufacturing	26.0	28.5	12.4	32.1	21.0
Market Services	19.5	15.7	16.6	36.4	27.2
Non-Market Services	5.8	5.4	4.1	6.9	6.0
1950					
Goods	61.6	66.3	68.9	50.9	43.7
Agriculture	28.0	23.9	43.6	6.4	10.5
Manufacturing	25.8	32.6	18.3	33.9	24.8
Market Services	21.9	24.2	26.0	36.6	40.1
Non-Market Services	16.5	9.5	5.1	12.5	16.2
1973					
Goods	48.0	54.5	53.3	44.8	32.4
Agriculture	10.2	7.2	16.1	3.2	3.2
Manufacturing	26.9	36.5	27.1	32.2	21.9
Market Services	29.6	30.8	38.9	38.5	43.9
Non-Market Services	22.4	14.7	7.8	16.7	23.7
1995					
Goods	30.3	38.4	41.1	26.7	21.8
Agriculture	4.6	2.8	7.3	2.1	1.6
Manufacturing	18.1	27.2	22.5	18.7	13.9
Market Services	38.4	41.7	50.1	53.1	52.6
Non-Market Services	31.3	19.9	8.8	20.2	25.6

Sources: 1950, 1973 and 1995 from O'Mahony (1999). For 1900, France: Carre et al. (1972); Germany and U.S.: Bairoch (1968); Japan: Ohkawa and Rosovsky (1973) U.K.: Feinstein (1972). Goods comprise agriculture, manufacturing, construction, mining and public utilities, market services include transport and communications, distributive trades, financial services, personal and domestic services and non-market services are government employment plus education and medical services. Except for 1900, Germany refers to West Germany.

Although these usual suspects have some relevance to the growth slowdown, a deeper underlying problem lay in the difficulty of adapting to new circumstances, i.e., in the political economy of growth. In early postwar Western Europe, many countries sought to create a "social contract" that sought to generate wage moderation in return for high investment and in which the expansion of welfare state provision was an integral part (Eichengreen, 1996). The downside of these postwar settlements emerged later on in the 1970s and 1980s, when catch-up growth weakened and the macroeconomic environment turned sour. At that point, however, a form of status quo bias (Fernandez and Rodrik, 1991) seems to have meant that an implicit coalition of definite and possible losers was powerful enough to prevent reform. The bad news came in the form of growth of the public sector (de la Fuente, 1997), and inflexible labor and product markets (Koedijk and Kremers, 1996) which were detrimental to productivity performance.

Table 3.2. Sectoral Productivity Growth Rates, 1950-95
(Percent per year)

	France	Germany	Japan	United Kingdom	United States
Output/Hour Worked					
1950-73					
Goods	5.4	6.3	7.0	4.2	2.7
Manufacturing	5.8	6.6	8.5	4.7	2.8
Market Services	3.7	4.8	7.5	2.4	1.9
Non-Market Services	2.3	3.4	0.1	0.0	0.4
1973-95					
Goods	3.8	2.7	3.3	2.7	1.6
Manufacturing	3.7	2.9	4.6	3.3	2.1
Market Services	1.5	2.7	2.5	1.9	1.1
Non-Market Services	1.9	1.4	1.9	0.4	-0.3
Total Factor Productivity					
1950-73					
Goods	3.7	3.7	3.5	2.8	1.6
Manufacturing	4.2	4.1	4.0	3.3	2.0
Market Services	2.2	2.1	3.0	0.7	0.9
Non-Market Services	1.8	3.0	-0.2	-0.3	0.4
1973-95					
Goods	2.6	2.6	1.2	2.0	0.8
Manufacturing	2.5	2.5	2.3	1.8	1.2
Market Services	0.2	0.2	0.2	1.0	0.3
Non-Market Services	1.6	0.9	1.6	0.2	-0.3

Source: Derived from O'Mahony (1999).

An acute version of this phenomenon has emerged in Japan which has suffered a severe decline in TFP growth and has failed to fulfil the projections of catch-up made by authoritative observers in the 1970s (Denison and Chung, 1976). Disappointing Japanese TFP growth reflects excessive investment and industrial policies that have diverted resources away from high growth sectors towards declining industries and did not have a positive effect on TFP growth during 1960-1990 (Beason and Weinstein, 1996). The Japanese economy has also been heavily regulated which has been costly in terms of productivity, and has continued to have high hidden unemployment in non-tradables. The scope for TFP gains from deregulation in Japan appears to be about 6 times larger than in the United States (Blondal and Pilat, 1997).

Fast growth in Golden Age Japan was predicated on a number of institutional innovations made in the 1940s including the main bank system, the keiretsu and lifetime employment based on deferred compensation (Noguchi, 1998) geared to deliver rapid mobilization of resources based on low cost rather than efficient use of capital (Ide, 1996) and productivity growth concentrated on manufacturing while sheltered/non-tradable sectors of the economy sustained employment based on low labor productivity. By the 1990s, these features of the Japanese economy were increasingly seen as obstacles to further catch-up of

the United States but very difficult politically to reform (Ito, 1996). Japan is perhaps a good example of both of the need for and the difficulties of transition from the institutions designed to achieve a Gerschenkronian escape from backwardness, see below, section 3C.

The issue of endogenous growth continues to excite economists. It seems increasingly clear that the study of (conditional) convergence based on the Summers-Heston dataset cannot provide answers. The common finding that growth is inversely related to the initial income level or labor productivity gap does not discriminate well between rival growth models even though this clearly is a prediction of the neoclassical Solow or Augmented-Solow growth models. For example, if there are obstacles to technological diffusion, then should the costs of technology transfer fall, there may be periods of catch-up even when the underlying growth process is endogenous and long run growth rates show no tendency to equalize across countries (Sala-i-Martin, 1996). In fact, this seems a possible interpretation of recent OECD experience given that time-series analysis of the Maddison dataset rejects the hypotheses that long run forecasts of differences in output per person tend to zero or are proportional with a single long term trend (Mills and Crafts, 1999).

Jones (1995) argues that long run time series evidence is indeed the key to evaluating the endogenous growth hypothesis. He stresses that the failure of OECD, and especially the United States, trend growth rates to accelerate in recent decades appears to contradict the predictions of endogenous growth models that increased investments in human capital and R&D will permanently raise the growth rate and thus also calls into question the central claim of endogenous growth, namely that good policy can raise the growth rate rather than merely have a levels effect as in the Solow model.

The growth accounting estimates discussed earlier provide a useful input to this discussion. It has already been noted that the changes over time in measured TFP growth which inform the discussion in Jones (1995) are not necessarily a good guide to the rate of technological change and so a fortiori need not be a good guide to the rate of endogenous innovation. Indeed, the TFP growth exhibited by the United States at mid-century is "too good to be true" in the sense that it would imply a phenomenal rate of return on the R&D expenditure of the time. This opens the possibility that TFP growth may have slowed down for reasons other than declining returns to innovative effort. Econometric investigation of the TFP growth slowdown in American manufacturing in the 1960s and 1970s strengthens this suspicion as it finds that the underlying rate of technological change (which accounted for less than half of conventionally measured TFP growth) did not decline but productivity improvement from economies of scale fell substantially (Morrison, 1992).

If there are diminishing returns to research effort, then increases in the share of national income devoted to R&D will raise the level of GDP per person and will have a transitory but not a permanent positive effect on the growth rate which in the long run will be determined by the exogenous natural rate, i.e., we are back in an Augmented-Solow world. This can be illustrated by the following simplified model (Jones, 1999):

$Y = A^\sigma L_y$ where A is the stock of ideas and L_y is labor used in goods production

$\Delta A = \delta L_A A^\phi$ where $\phi < 1$.

In the steady state, $\Delta A/A$ and thus the growth of income per head is $n/(1 - \phi)$ where n is the population rate and is independent of the allocation of labor to research.

Modellers have also discussed the impact of a proliferation of product varieties. Suppose $\Delta A/A = \delta L_A/V$ where V is the variety of products available then the nature of scale effects will depend on whether the number of varieties grows more or less rapidly than population. The growth rate will depend only on allocation of labor to research and not on scale when population and variety grow at the same rate.

Jones (1997) claimed that not only is this permutation on the Augmented-Solow model the best available interpretation of the long run data on productivity growth but also, since investment in R&D and human capital have been rising relative to American GDP, the economy must have been growing above the steady state rate. He therefore projected a substantial slowdown when this transition phase is complete. A long run perspective suggests, however, that the historical experience has been variable and would indicate some caution before accepting Jones's projection.

In particular, the impact of innovative effort on overall TFP growth seems to depend on whether it results in the invention of new general purpose technologies such as electricity in the early twentieth century (David and Wright, 1999) or unconnected real costs reductions in individual sectors as in recent decades (Harberger, 1998). In Harberger's striking metaphor the former is a yeast type growth process and the latter is a mushrooms type. Moreover, general purpose technologies are also thought by some economists to be likely to involve a productivity slowdown prior to a subsequent acceleration as a result of the adjustment costs of the new opportunities.

The information and communications technology revolution is clearly the big technological development of the late twentieth century. At least until quite recently, however, it has not had dramatic effects on either labor productivity or TFP growth and economists' assessments of its likely impact have tended to be sceptical (Gordon, 1999). Growth accounting estimates suggest that this is because computers remain a relatively small, although fast-growing, component of the capital stock and because there appears to be relatively little evidence of strong spillover effects (Jorgenson and Stiroh, 1999)(see Box 3.1). This will not surprise new economic historians since a staple finding in the cliometric literature is that even dramatic changes in technology like railways or the steam engine have modest effects on overall GDP growth, especially in the early days (Fogel, 1964; von Tunzelmann, 1978).

Nevertheless, the long run TFP implications of changes in technology are often unclear initially. Thus, while American productivity surged in the 1920s when electrification was

developed as a general purpose technology this was fully 40 years after electricity was first commercially generated (David, 1991). On this analogy, it is too soon to assess the productivity implications of the computer revolution. Moreover, it seems likely that well-informed observers at the end of either the eighteenth or nineteenth centuries would have failed to predict subsequent productivity improvement given the very limited implications of steam and electricity at those junctures. If, however, substantial yeast-like implications for TFP growth are to come from the computer revolution, it will need to progress to a new phase such as a massive increase in teleworking that has substantial implications for capital savings in terms of transport infrastructure and commercial buildings (David and Wright, 1999).

The bottom line of this review of the OECD productivity slowdown is that only a small part seems to be due to the impact of structural change including associated increases in measurement error. The end of the Golden Age left a legacy of much expanded public sectors which probably has reduced growth rates somewhat, see Section B below. The modest impact of the ICT revolution on economic growth thus far is not surprising from a growth accounting perspective. The growth slowdown is paradoxical in the light of some endogenous growth theorizing and it remains unclear whether the long run rate of productivity improvement from technological progress will respond positively to more innovative effort. Depending on one's prior about scale effects in innovation, a case can be made that OECD growth in the first quarter of the next century is about to speed up as the delayed effects of greater spending on R&D feed through or slow down as transitional dynamics unwind.

B. The Expansion of the Public Sector in the OECD

To the Victorians perhaps the most surprising feature of late twentieth century economies would be the very large share of government spending, especially on transfer payments, in national income in the rich countries. Two questions need to be addressed:

- Has the rise of the public sector now come to an end?
- Is the growth of public spending an important reason for slower OECD growth?

Table 3.3 reports the rise of public spending in a number of OECD economies since 1870. This shows that a major difference before and after World War II was that in the latter period government expenditure as a share of GDP expanded primarily due to increased social transfers which had been negligible in late Victorian times. The period of the most rapid growth in this aggregate was generally from the 1940s through the 1970s and in some countries there has been a noticeable retreat from a peak reached in the early 1980s. Understanding why public expenditure has grown over the long run may be helpful in projecting its future trajectory.

At one level, the growth of public expenditure can be understood in terms of its roles in correcting market failure. The first of these roles predominated a century ago in terms of

Table 3.3. Government Expenditures/GDP, 1870-1998
(Percent)

	1870	1913	1937	1960	1980	1998
Total Outlays						
Australia	18.3	16.5	14.8	21.2	31.6	32.9
Belgium ^a		13.8	21.8	30.3	58.6	49.4
France	12.6	17.0	29.0	34.6	46.1	54.3
Germany		14.8	34.1	32.4	47.9	46.9
Italy ^a	11.9	11.1	24.5	30.1	41.9	49.1
Japan		8.3	25.4	17.5	32.0	36.9
Netherlands ^a	9.1	9.0	19.0	33.7	55.2	47.2
Norway	5.9	9.3	11.8	29.9	37.5	46.9
Sweden	5.7	10.4	16.5	31.0	60.1	58.5
United Kingdom	9.4	12.7	30.0	32.2	43.0	40.2
United States	7.3	7.5	19.7	27.0	31.8	32.8
	1880	1910	1930	1960	1980	1990
Social Transfers						
Australia	0.0	1.1	2.1	7.4	12.8	15.4
Belgium	0.2	0.4	0.6	13.1	30.4	29.7
France	0.5	0.8	1.1	13.4	22.6	27.8
Germany	0.5	na	5.0	18.1	25.7	21.2
Italy	0.0	0.0	0.1	13.1	21.2	24.5
Japan	0.1	0.2	0.2	4.0	11.9	16.1
Netherlands	0.3	0.4	1.2	11.7	28.3	31.7
Norway	1.1	1.2	2.4	7.9	21.0	23.0
Sweden	0.7	1.0	2.6	10.8	25.9	21.3
United Kingdom	0.9	1.4	2.6	10.2	16.4	16.8
United States	0.3	0.6	0.6	7.3	15.0	16.3

Sources: total outlays from Tanzi and Schuknecht (1997) updated using OECD (1999); social transfers, defined to include spending on pensions, welfare, unemployment compensation and health by national and local governments, from Lindert (1994) (1996) updated using Oxley and MacFarlan (1995) and OECD (1997).

a. Central government only through 1937.

the provision of the classic public goods (defense, law and order etc.). The later expansion of government economic activity generally included provision of public utilities, infrastructure, regulation, and secondary/tertiary education where there were typically important market failure issues to do with market power and/or externalities. Concerns about government failure through rent-seeking, agency problems etc were certainly well understood by nineteenth century economists but did not re-emerge as a big issue until the 1970s (Tanzi, 1997). In response both to the recognition of the inefficiency of public sector production and to fiscal pressures, the last 15 years has seen an acceptance of privatization that would have seemed unlikely to most OECD citizens during the Golden Age.

As the privatization movement suggests, the claim of Wagner's Law that there is an income elasticity for government real output greater than one, is rejected empirically in time series tests (Gemmell, 1990). There has, however, been a powerful impetus to the growth of the ratio of government consumption to overall activity, especially since the 1950s from the

relative price effect first brought to prominence by Baumol (1967). This is not surprising given the large share of wages in the public sector and the relative productivity performance reported in Table 3.2.

Another type of market failure (for example, due to severe problems of adverse selection and moral hazard) is associated with government's increased role in protecting people against risk. Here, however, considerations of redistributing income and vote-seeking were also prominent. Rodrik (1997) showed that there is a strong correlation in OECD countries in recent times between the exposure of an economy to external risk and the amount of government spending on social security and welfare systems. The interwar period plainly saw very large shocks from the international economy both through trade and capital flows and it is perhaps not surprising therefore that the postwar attempts to restore international economic integration were accompanied by much stronger government efforts to reduce the risks involved for its citizens—an undertaking that was to prove very expensive in some countries, for example, Sweden, in the renewed economic turbulence of the 1970s.

An econometric study of the growth of social transfers reported in Lindert (1994) found that the most important influences through 1930 were the extension of the electoral franchise which in some countries profoundly altered the identity of the median voter, and the aging of the population. For the 1960s to the 1980s, when democracy was already mature, population age structure was by far the dominant factor in explaining the rise of social spending over time (Lindert, 1996). In both periods there was also evidence of a weak Wagner's Law effect.

If Lindert's model is used to project the future course of social spending, then the rise in social spending as a share of OECD GDP is forecast to cease at about present levels because many OECD have reached the point (285 elderly per 1000 adults aged 20-64) at which the further ageing of their populations is estimated to stop raising social spending (Lindert 1996, p. 14, 31). There are, however, built in increases in state spending on pensions in all OECD countries which result from the interaction of demographics and pay as you go pension schemes established several decades ago (Roseveare et al. 1996). These entail rises from the 1995 level that with unchanged entitlements will by 2030 raise pension expenditures by about 7 percentage points of GDP in Finland, Germany, Italy, Japan, and Portugal, the countries where the impact will be largest, but by only 1 percentage point in the UK as a result of its greater reliance on private pensions and the reduced generosity of its scheme stemming from the Thatcher years. The policy response to this problem in a period that is likely to experience increased tax competition between countries will be intriguing.

The implications of fiscal policy for economic growth remain quite controversial. Theoretical predictions are sensitive to model specification, particularly in terms of the magnitude of effects while empirical studies vary considerably in their conclusions (Tanzi and Zee, 1997). Nevertheless, there are good reasons to suppose that in general government capital spending has a positive but diminishing impact through raising expected returns to private investment while taxation does the opposite. This implies that, eventually, the

disincentive effects of the taxes dominate. Econometric modeling by Dowrick (1996) found that OECD countries are already past the break-even point.

The general tendency of recent empirical work has been that larger government budgets and their associated tax burdens have had a negative effect on growth in OECD countries. Based on growth regressions, de la Fuente (1997) estimated that a reduction of 5 percentage points in government current spending would raise the growth rate by 0.6 percentage points. A slightly smaller effect is suggested by Engen and Skinner (1996). Their 'bottom-up' aggregation of the American evidence which argued for impacts on human capital formation, physical investment, and research and development such that a reduction of 2.5 percentage points in the average tax rate from a 5 percentage point cut in all marginal tax rates would raise growth by about 0.2 percentage points. Taken together, this evidence suggests that the increase of about 15 percentage points in government spending/GDP in the average OECD country since 1960 may well have reduced the OECD growth rate by one percentage point or more.

C. Will Rapid Catch-Up Growth Become More Widespread?

This section considers growth prospects for regions that have missed out on rapid catch-up growth in recent decades, namely, Africa, Eastern Europe, India, and Latin America. Two questions are considered:

- Is growth severely constrained by geography or history?
- Will institutional quality be conducive to rapid catch-up growth?

Earlier sections stressed two important aspects of twentieth century economic growth. First, that the long run experience has mostly been of divergence rather than convergence. Second, that achieving rapid catch-up growth is relatively rare and has required social capability which derives from appropriate policies and institutions. Two kinds of society appear to have been especially disadvantaged, namely, colonies and communist countries. Post-colonial experiences have been very different thus far—compare South Korea with Angola—and early signs are that the same may be true for the former communist bloc—compare Poland with Ukraine.

Economic historians have always stressed the importance of institutions for growth outcomes. The huge literature on the Rise of the West has traditionally pointed to its relative success in containing rent-seeking and enforcing well-defined property rights which promoted market based activities and innovation on an increasingly wide scale (Rosenberg and Birdzell, 1986). North (1990) has developed these ideas the furthest. He argues that well-defined, enforceable property rights that ensure low transactions costs and limit opportunism and which are predicated on strong but limited government are the central underpinnings of growth capability. Transactions costs are seen as still much greater in the Third World than in the earlier history of OECD countries. North also points out, however, that what is much less well understood is the political economy of successful institutional reform.

In practice, the optimal solution to transactions costs problems may well differ in the early stages of development and later on in the catch-up process. The developmental state approach to industrialization adopted in some East Asian countries (Amsden, 1989; Wade, 1990) and, indeed, the well-known Gerschenkronian schema for escape from economic backwardness (1962) through investment banking, state-directed investment, vertically-integrated enterprises and weak anti-trust policy can be thought of as the rational substitution of hierarchies for markets to cope with initially severe problems of asset specificity, moral hazard, and unreliable legal systems. At the same time, these market-substituting arrangements have a downside in terms of dulling incentives to productivity improvement and maybe highly vulnerable to capture by rent-seeking groups. In practice, outside East Asia, this seems to have been the typical outcome.

Since the mid-1990s the growth regressions literature has followed the lead given by North and other economic historians and has tended to emphasize the role of social capability (both through institutional quality and policy choice) in growth outcomes with impacts both through investment and TFP growth. The variance in these characteristics across countries means that recent experience has offered some interesting experiments from which to make inferences about these aspects of growth. Broadly speaking, it seems clear that strong commitment to enforcement of property rights, the development of a legal system that reduces moral hazard and opportunism and policies of openness toward international trade are all positive for growth (Edwards, 1998; Knack and Keefer, 1995; Levine, 1998; Sachs and Warner, 1995).

Equally clearly, East Asian countries have on average scored far better on all these attributes than do countries from regions of the world in which catch-up has been relatively weak such as Africa (Collier and Gunning, 1999), India (Bajpal and Sachs, 1996) or Latin America (Burki and Perry, 1997). The vast majority of countries in these regions from the 1950s through the 1980s sought economic development through heavy reliance on the state to promote industrialization while paying relatively little attention to strengthening the microeconomic institutions required to sustain market based growth perhaps reflecting an understandable suspicion of governments and multinational enterprises in the advanced world. The potential for rapid catch-up growth depends on the size of the productivity gap. Since this has become much larger in recent decades, the penalties in terms of foregone growth for having inferior institutions and policies and attempting state-led industrialization have become much greater.

Civil war also has a severe impact on growth outcomes. By reducing expected returns and the security of property rights it lowers the desired capital stock and promotes capital flight. Whether there is a postwar boost to growth turns on the extent to which, in the new peace environment, investment is revitalized by making good some or all of the wartime reduction in capital conditional on expectations of sustained peace and renewed enforceability of property rights. Growth regressions reported in Collier (1999) predict a growth reduction of over 2 percent per year during the war and, in the case of short wars, for a further 5 years

afterwards. Only in the case of long wars (5 years or over) does the estimated model predict that postwar growth will be higher than the peacetime norm.

The message of these growth regressions reinforces a central theme of the new growth economics, namely that incentive structures which affect expected returns to investment or to innovation, matter for growth. Given the sunk cost nature of much of this activity, it is crucial that hold-up threats whether by private agents or by government are kept in check. Similarly, it is imperative that a solution is found to problems arising from asymmetric information that may otherwise vitiate the financing of investment and innovation. It is also clear, however, that productivity outcomes depend on how well agency problems in large organizations in both public and private sectors are mitigated and it seems likely that this also depends both on institutional design and the extent to which competition can operate.

Recent developments in the growth regressions literature have taken into account both the impact of natural resource endowments, climate and ease of access to sea transport on the one hand and the policy framework reflected in openness, property rights and the legal infrastructure on the other. Two points emerge, both of which resonate with nineteenth century economic history (Morris and Adelman, 1988), namely, that geography can indeed be a handicap but that its effects are quite small relative to the difference made by good policy choices. Thus, Sachs and Warner (1997, p. 357) found that the contribution of policy and institutions to slow African growth has been more than six times larger and their results imply that, with appropriate reforms, African countries could achieve per capita income growth of 5 percent or more (assuming that demographic transition ensues).

Analysis of growth in other regions comes to rather similar conclusions. Progress in reform in the Transition Economies has been a more important determinant of growth outcomes than the initial economic structure or institutional legacy, the impact of which has been weakening steadily (de Melo et al. 1997). India's weak productivity performance from the 1950s through the 1980s has reflected rent-seeking (Hamilton et al., 1988) and protectionism (Ahluwalia, 1991) both of which persisted in the absence of an appropriate policy response. In the 1990s, this has been partly forthcoming but bolder reforms could deliver more (Joshi, 1998). Latin American growth outcomes were held back by weak institutions and unfortunate policy frameworks but growth potential can be expected to have strengthened as a result of recent moves to greater openness, privatization and liberalization (Edwards, 1995).

Clearly, there are some grounds for optimism in the new consensus in favor of less intervention and a greater role for the market economy, prompted by earlier failure, the East Asian miracle, and macroeconomic crises. At the same time, it is important not to confuse privatization and trade liberalization with the development of a wider set of institutions conducive to long run growth. To name but the most obvious example, Russia has the former but not the latter as has been highlighted by the EBRD (1998) in its measurement of transition in banking and corporate governance. It is clear on standard measures that, despite recent progress, a widespread shortfall in institutional quality still exists, as Table 3.4 reports.

The ICRG (International Country Risk Guide) variable, an indicator of the quality of institutions developed to inform foreign investors, see Table 3.4, has been much used in growth regressions. The variable is typically estimated to have a big impact on growth, for example, the ICRG difference between Singapore and Somalia would account for 2.1 percentage points of the growth rate difference between these countries using the estimated equation in Knack (1996). Taking account of this leads to much less optimistic growth projections than those based on equations that only consider broad capital accumulation and the initial productivity gap.

The basic rationale for the ICRG variable can be found in the idea that reducing transactions costs and asymmetric information problems is central to achieving adequate investment and supply of external finance. It is much less clear exactly what this variable may

Table 3.4. Comparisons of Institutional Quality

	ICRG	ENFORCE	Corruption Perception
Western Europe & Japan	44	9.4	7.8
Central Europe	44		5.2
East Asia	40	7.0	4.8
Latin America	32	5.4	3.0
South Asia	30	4.5	2.4
Russia	28		2.3
Africa	26	4.7	2.5

Sources: ICRG for 1995 from International Country Risk Guide. High scores are better, maximum = 50. The index is based on survey data relating to five components: corruption in government, quality of bureaucracy, expropriation risk, rule of law, and repudiation of contracts by government. ENFORCE is an index of the last two of these, high scores are better, maximum = 10 which is used by Levine (1998) as a key predictor of banking development. Corruption perception, high scores are least corrupt, maximum = 10, is from Tanzi (1998)

capture, for example, is it primarily failure of the legal system to enforce contracts which hobbles the financial system as suggested by Levine (1998) or do the main effects work through the impact of corruption as a kind of tax on foreign direct investment as argued by Wei (1997)? Nevertheless, both aspects of ICRG give cause for concern, as columns 2 and 3 of Table 3.4 report.

The econometric analysis of Latin American growth in Taylor (1998) suggests that retardation in financial development has been at least as important as lack of openness in holding back private sector investment and growth. Yet, across the developing world, progress in achieving the institutional reforms needed to address this issue has generally been much slower than the moves to privatization and trade liberalization. It may be that the lead time required to improve the legal environment is longer or that the political obstacles are even harder to overcome or that the lessons from East Asia have been less helpful.

Given that further institutional reform is required, will it happen? Here the lessons from history are less clear. There have been striking examples of policy and institutional reform promoting episodes of fast growth—for example, in recent decades, Chile and South

Korea. Generally speaking, however, changes in ICRG scores have been small since the inception of the index in 1982. And the conclusions reached by economic historians are not very encouraging. North (1990) stressed that not only is there no natural selection process that ensures the replacement of inefficient with efficient institutions but that network externalities, informal constraints and the vested interests that surround existing arrangements tend to make institutional change a slow, incremental process and give it a path-dependent character.

D. What Future for the East Asian Developmental State?

The assessment in World Bank (1993) has been highly influential. High performing East Asian economies were seen as benefiting from excellent TFP growth linked to their outwardly oriented policies and their unusual success was attributed to governmental success in solving coordination problems while adopting policy frameworks that contained rent-seeking and were generally market-friendly. Rapid deepening of financial markets was taken to be a big stimulus to investment and growth while industrial and directed credit policies were not seen as damaging. These countries have rightly been praised for their policies to foster human capital accumulation and high domestic savings rates, and for the quality of their government bureaucracies. Country dummy variables in growth regressions suggested that these economies had outperformed the world sample by about 1.7 per cent per year compared with underperformance signalled by Latin American and African dummies of 1.3 and 1.0 per cent respectively (World Bank, 1993, pp. 54).

To the economist in the street brought up on “The East Asian Miracle” the trauma that began in 1997 and brought growth in many countries to an abrupt halt must have come as a dreadful surprise. Two questions arise:

- Were there aspects of the East Asian development model that exposed the region to the crisis?
- How should the crisis affect assessments of East Asian growth?

Economic history offers many examples of financial crises occurring in basically sound and strong economies with high growth potential but exposed to macroeconomic shocks where the banking system was fragile, for example, in nineteenth and early twentieth century America, and most notoriously in the American Great Depression of the 1930s.

Recent appraisals of East Asian banking systems have commented on a number of serious weaknesses that were common, although with differing severity, through much of the region. These include low capital-adequacy ratios of banks, excessive exposure of banks to single borrowers, unduly lenient provisioning rules for non-performing loans, weak supervision, absence of proper auditing and accounting etc which combined with high leverage of the corporate sector have implied vulnerability to financial shocks (World Bank, 1998). The implication of these weak balance sheets was a high risk of financial crisis with mounting asymmetric information problems if the macroeconomic environment turned difficult

(Mishkin, 1999). Financial liberalization in many East Asian countries overburdened the regulatory authorities and incurred a high risk of a subsequent financial crisis.

What then does the current crisis tell us about the preceding East Asian growth process? It should not be taken to suggest that several decades of strong growth should be seen as some sort of mirage. Rather, it reminds us that a key lesson of history is that, without adequate regulation of the banking system, severe disruptions to economic growth are always likely. It probably reinforces suggestions that capital has been badly used in some countries. It need not, however, imply that, in general, long term growth potential is weak or has been permanently damaged. Favorable features of East Asian growth noted by the World Bank such as high savings, strong human capital formation and effective technology transfer mechanisms are unlikely to be damaged by the financial crisis.

Indeed, the 1930s American experience (see box 2.1) may have some optimistic implications for Asian crisis countries. In the long run, the trend rate of growth was unaffected despite the severity of the economic shock (Ben David and Papell, 1995). While this example suggests that even a massive financial crisis need not damage long term growth potential provided that the banking system is rehabilitated and re-regulated, this does not detract from the case for wider-ranging reforms to the conduct of both firms and governments in East Asia if future growth potential is to be fully realized.

From Table 1.5, it is clear that East Asian growth has relied much more on the contribution of rapid factor accumulation, of both capital and labor, than did Europe's fast growth of its Golden Age. Normalizing for the opportunities for catch-up presented by the initial productivity gaps and levels of education, the Tigers' TFP growth seems rather disappointing (Crafts, 1999a). Growth accounting reveals that the East Asian dummies in the World Bank's growth regressions were largely the result of favorable demography and initial capital to output ratios rather than superior policy.

The East Asian developmental states delivered a long period of high investment and very rapid growth but their policy prescriptions appear to have been much more successful in promoting high levels of investment than in achieving exceptional productivity performance. Recent econometric studies have found that selective interventions on balance retarded rather than stimulated growth. In Korea, directed loans and the clout of the chaebols appear to have distorted credit flows to the detriment both of profitability and productivity growth (Borensztein and Lee, 1999). An analysis of industrial productivity growth across sectors in Korea during 1963-83 found that tax and financial incentives did not enhance productivity growth while non-tariff barriers to trade reduced both capital accumulation and TFP growth (Lee, 1995). A comprehensive review of industrial policy in East Asian countries concluded that government intervention has generally had adverse effects (Smith, 1995).

In the absence of effective control by shareholders, the best restraint on inefficient management of firms is competition (Nickell, 1996). Yet competition policy in East Asia has been seriously neglected; for example, ASEAN countries with the exception of Thailand do

not have anti-trust laws and in the Thai case the law has been used as an instrument of price control rather than to promote economic efficiency (Lall, 1997). This is also an area where reform seems to be urgently required.

In the longer term, it seems likely that in the later stages of development it will be desirable for East Asian countries to move away from bank-dominated finance and to develop better methods of corporate governance. In most cases, this will entail the establishment of better legal rights for outside shareholders and will be facilitated by the emergence of ownership characterized by large and powerful investors (La Porta et al., 1997). The importance of investor protection and availability of equity finance appears to be especially important in fostering growth in R&D intensive activities which are starting to be important in the leading Tiger economies (Carlin and Mayer, 1998).

The industrial policy prescriptions of the developmental state, which are liable to result in the support of declining industries at the expense of the rapid exploitation of new service sector opportunities, are likely to be still less helpful to further catch-up in East Asia. Stronger market disciplines are likely to be conducive to better productivity performance.

Recognizing both the need for and some of the difficulties of a move back from hierarchies towards markets to strengthen productivity performance as development progresses is clearly important in refining perspectives on the East Asian developmental state. Nevertheless, these are, in an important sense, problems of success and still appear to leave the Asian developmental state as an escape route out of economic backwardness. The deeper problem for other countries may be that this model is hard to replicate in that political economy will pervert its interventions much further in the direction of rent-seeking and wasteful investment.

E. Is Another Globalization Backlash Likely?

The retreat from globalization in the interwar period was much accelerated by the depression. At the same time, there were other forces that pulled in the same direction. Losers from the operation of free world markets put pressure on governments to protect them and trade wars loomed large in any case. Clearly, similar issues have surfaced in the context of the renewed globalization of recent decades. There have been fears that increasing regionalism will give rise to trade hostilities and that the consensus in favor of free trade in OECD countries, especially the United States, might evaporate in the face of the problems of sunset industries and unskilled workers.

A new focal point for unease in first world countries is the suggestion that, in a world of greatly increased capital mobility, tax competition may jeopardize the provision of social insurance just when the external economy is seen as a source of increased risk exposure. In the third world, while the evidence of recent times has persuaded most policymakers that greater openness is conducive to faster economic growth in the long run, there may yet be risks that old nationalist resentments directed at perceived exploitation by multinational

enterprises return and obstacles to foreign direct investment are reinstated, especially in countries where the income gap with the rich continues to grow.

The early twenty first century differs from the 1930s in several important respects. There was no equivalent to the GATT/WTO with tariff binding in place then. The range of policy instruments with which to shield losers is rather wider now in many countries. Globalization has much deeper roots. The egregious macroeconomic policy errors of the interwar period are widely recognized and lessons have been learnt. It is generally agreed among "informed economists" that the problems of unskilled workers in the OECD countries are very largely due to skill-biased technological change rather than factor price equalization through trade (Slaughter, 1999). So, *prima facie*, there may be less risk of a backlash. Nevertheless, the pressure points highlighted above deserve some consideration.

It is well-known that larger countries typically will have higher optimal tariffs in a noncooperative trade environment. Retaliatory trade policy was a distinct feature of the 1930s retreat from globalization. It does not, however, follow that end-century moves towards greater regionalism imply a return to the trade wars of the interwar period especially given the results of that episode. It might be argued that, at intergovernmental level, the current situation is more akin to an infinitely repeated game in which cooperation is preserved by the prospect of future payoffs (Perroni and Whalley, 1996).

Nevertheless, the circumstances that gave rise to unequivocal support for freer trade in early postwar US policymaking have been eroded. Changing patterns of comparative advantage and the catching up of other countries have increased the number of industries that fear foreign competition, organized labor and a significant part of the Democratic party has become protectionist as many workers' real wage rates have stagnated and the elite consensus that arose as a foreign policy reaction to the 1930s has evaporated (Destler, 1992). To many interest groups protectionism is attractive. Similar considerations have informed the European Commission's use of nontariff barriers such as antidumping measures in the recent past (Tharakan, 1991).

The policy processes at work in the earlier retreat from globalization in the United States have been the object of a good number of detailed analyses. These tend to emphasize the importance of shifting coalitions in Congress as well as political responses to substantial numbers of losers. Thus, Goldin (1994) found both that immigration impacted heavily on unskilled wages and that trends in wages informed the votes of legislators on immigration policy in the early twentieth century. But she also found that the coalition that eventually was formed to pass the acts of the 1920s depended on the South's urge to protect its relative population share and political clout and a growing antipathy to immigration by other rural Americans who were not threatened in any direct way.

The Fordney-McCumber (1922) and the Smoot-Hawley (1930) tariffs offer similar lessons. The former exhibits a clear pattern of protection for labor intensive industries, industries that were geographically concentrated and/or produced agriculturally based

consumer goods products (Hayford and Pasurka, 1992). The latter provided relief for agricultural distress in a log-rolling coalitions process that also raised tariffs for specific industrial interests (Eichengreen; 1989 and Irwin and Kroszner 1996). The implication of these examples is that, absent the early postwar consensus, American trade policy is liable to be unpredictable. Although the representatives of unskilled labor have been unable to prevent NAFTA, there may yet be new protectionist coalitions.

Rodrik (1997) pointed to the danger of an eventual globalization backlash as a result of the tension between its implications of, on the one hand, increased demands for social protection of workers and, on the other hand, reduced ability to finance these from taxes on capital. He supported this argument empirically by suggesting that capital taxes have been reduced in the face of increased capital mobility and that, *ceteris paribus*, exposure to terms of trade volatility is correlated with greater social insurance expenditure by governments. This would hardly have been an issue in the 1920s when governments generally relied very little on direct taxes other than those on real estate and when social transfers were very modest (see Table 3.3).

While Rodrik's regressions point to a potential problem, the experience of OECD countries thus far appears more benign. The evidence reviewed in Schulze and Ursprung (1999) does confirm that capital tax rates started to decline moderately from the early 1980s but also shows that capital tax revenues have been stable and that capital market integration effects depend heavily on political institutions with a tendency to increase social transfers in corporatist, high consensus democracy countries. They conclude that globalization so far has had its main impact in terms of a modification of the tax structure rather than through retrenchment of the welfare state.

Detailed empirical research on the impact of fiscal policy on growth in advanced countries for the 1970-95 period has confirmed that "productive expenditures" by government on infrastructure, education etc are growth enhancing while distortionary (direct) taxation is growth reducing (Kneller et al., 1999). It might be expected that competition for footloose investment will tend to push governments both to reduce distortionary taxes and to raise expenditures that encourage private capital formation. The implication may be that the pressures of globalization are actually helpful in steering fiscal policy to a more pro-growth stance.

Although there is clear evidence in both Latin America (Taylor, 1998) and Africa (Collier and Gunning, 1999) that closed economy development strategies have been expensive failures, there is a danger that recent liberalizations may deliver less than their proponents expect and that, at some point, there will be a backlash. For example, there is no evidence that abolishing capital controls *per se* raises the rate of growth (Grilli and Milesi-Feretti, 1995) but quite good reason to believe that financial liberalization significantly increases the risk of a subsequent financial/currency crisis (Kaminsky and Reinhart, 1999). As recent Malaysian experience testifies, this may undermine support for liberalization. The issue is perhaps one of

sequencing but history suggests that there may have been a tendency to premature reform in the absence of adequate financial supervision and regulation.

Similarly, earlier nationalist critics probably were right to question the impact of multinational enterprises on host LDCs. A recent summary of the evidence in Caves (1996) concluded both that theory and empirical evidence is ambiguous as to the implications of multinationals for host country growth. Positive spillovers and crowding out can both be envisaged. In the case of extractive industry in particular, linkage effects may be weak and repatriated profits high (Rodriguez-Clare, 1996). Moreover, indiscriminate attraction of foreign direct investment can be welfare reducing when it is based on tariff protection (Encarnation and Wells, 1986). Thus, despite the potential advantages of multinational enterprise as a vehicle for technology transfer, it would not be surprising to find some of the resentments that were so evident in the 1950s through the 1970s resurfacing.

F. Concluding Comments

The preceding material contains a great deal of detail and will not be summarized here. Rather, the opportunity will be taken to underline a few central arguments around the general theme that an assessment of future growth prospects now must be less confident (in both senses—less optimistic and less precise) than would have been the case thirty years ago. Now, there is much less consensus among mainstream growth economists and we are more aware of the transience of epochs in world economic development.

Three points from the evidence explored in this section deserve to be underlined. First, and foremost, is that policy matters for growth outcomes. This is most obviously true and has the largest impact on growth outcomes in developing economies but is also evident in the OECD as is confirmed by the contrasting fortunes of Ireland and Sweden since the end of the Golden Age. Second, this is a point at which there are wildly different beliefs about the likely future growth of the leading economy. While the new paradigmists and some believers in endogenous growth theory seem to imagine that the ICT revolution will lead to much enhanced productivity growth, many economic historians and those still wedded to some version of the Augmented-Solow growth model are unconvinced. At the very least, the next two or three decades should be an interesting test for competing ideas in growth theory.

Finally, it should be recognized that the analysis in this section is quite skeptical of the projections of future growth performance that international organizations such as OECD seem to favor (Richardson, 1997). In the view developed here, sustaining strong catch-up growth performance is seen as rather difficult and dependent on unpredictable success in achieving policy reform and institutional innovation as the economy develops. Thus, *mutatis mutandis*, China faces the problems of moving on from initial success that have caused Japan to falter. We know that policy reform can turn around “basket cases” and that crises can initiate long-needed reform or encourage seriously growth-retarding policy responses, as in the 1930s. These decisions lie fundamentally in the realm of political economy and we still know remarkably little about what determines the outcomes.

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Box 1.1. Measuring Long-Run Growth in Living Standards

Both development economists and economic historians have become increasingly concerned to develop measure of living standards that are more comprehensive than real wages or real GDP per head. Partly, this is because attention has increasingly turned to the lives that people lead rather than the incomes that they enjoy and partly because in most circumstances a substantial element of well-being is derived not on the basis of personal command over resources but depends on provision by the state—this tends to be true of health and education in many countries and is universally the case for civil and political rights.

Unfortunately, in any attempt to quantify changes in a comprehensive concept of living standards index number problems are liable to be acute, since weights have to be developed for the various components of a broad concept of economic welfare. In addition, some important aspects of well-being may not lend themselves readily to cardinal measurement.

The HDI has been described and refined in successive issues of the *Human Development Report*. Its focus is the escape from poverty and this is seen as depending on public services as well as private incomes. HDI is a composite of three basic components: longevity measured by life expectancy at birth (e_0), knowledge measured by a weighted average of literacy (LIT) and school enrolment (ENROL), and income (Y_{adj}). Human development is seen as a process of expanding people's choices. The components are combined in a single index by measuring them in terms of the distance traveled between the minimum and maximum values ever observed and averaging these scores into one index. HDI has been quite controversial and a useful extended review of various criticisms is provided in a technical note in the 1993 *Human Development Report*.

The precise formula for the version of HDI used in this paper was adopted by UNDP to fix the maxima and minima as the most extreme values observed or expected over a long period with a view to facilitating historical comparisons. It is as follows:

$$\begin{aligned}\text{Life Expectancy (L)} &= (e_0 - 25)/(85 - 25) \\ \text{Schooling (S)} &= 0.67\text{LIT} + 0.33\text{ENROL} \\ \text{Income (I)} &= (Y_{adj} - 200)/(5385 - 200)\end{aligned}$$

Each of these components has a value between 0 and 1 as does $\text{HDI} = (\text{L} + \text{S} + \text{I})/3$.

Adjusted income is measured by the following formula which heavily discounts income above the threshold level, $y^* = 5120$ (\$1990int)

$$\begin{aligned}Y_{adj} &= y^* + 2[(y - y^*)^{1/2}] && \text{for } y^* < y < 2y^* \\ Y_{adj} &= y^* + 2[(y - y^*)^{1/2}] + 3[(y - 2y^*)^{1/3}] && \text{for } 2y^* < y < 3y^*\end{aligned}$$

and so on. \$5385 is an approximate maximum for this formula.

There are problems in using HDI as a measure of economic welfare. In common with heights, the approach runs into difficulties with weighting. It is possible in this case to calculate the implicit set of weights that it embodies but when this is done their justification is obscure, they vary dramatically at different income levels and are quite sensitive to the choice of extreme values. The very low weight given to income above an arbitrary threshold level is particularly hard for many commentators to accept (Gormely, 1995). Moreover, if the basic rationale of the index stems from a concern with capabilities and with the impact of social arrangements, then the coverage of HDI might well be regarded as too narrow. Despite these reservations about HDI, it may be valuable in historical research (Costa and Steckel, 1997).

Dasgupta and Weale (1992) stress that the HDI ignores other important aspects of well-being which depend on state provision rather than private income. In particular, they argue for the inclusion of civil and political rights in a more comprehensive Quality of Life Index.

Usher (1980) provides a detailed rationale for making imputations to growth rates for environmental changes, i.e., for variables that contribute to welfare but are not commonly regarded as part of income where the average amount enjoyed is changing over time. Pollution, crime, life expectancy, and leisure are potentially important examples. Improvements in environmental variables yield a positive imputation to growth rates.

Real income (Y^*) in year 0, the income that makes the representative agent as well off in the base year as with the average income in year t is defined implicitly in the equation

$$U(Y^*, p^0, e^0) = U(Y^t, p^t, e^t)$$

where p is an index of prices and e an index of environmental conditions. This can be approximated as

$$Y^* = \sum p^0 q^0 + \sum s^0 (x^t - x^0)$$

that is, real income in year t with respect to the base year is the value at base year prices of total commodities consumed in the year t plus the change in environmental conditions from the base year to year t evaluated at the shadow prices of the base year. In the case where only leisure is considered as an environmental variable, Usher suggests the formula

$$Y^* = Y^t + w^t(L^t - L^0)$$

where w is the real wage rate in year t .

Nordhaus and Tobin (1972) found that their attempt to estimate the long run rate of growth of 'Measurable Economic Welfare' (MEW) for the United States was totally

dominated by adjustments for leisure/non-market work time. This is noteworthy for three reasons. First, leisure has been ignored in all the recent work on living standards. Second, how best to handle time use in measuring living standards is highly controversial; while Usher (1980) argued that it is best treated as an environmental variable, he recognized that others might prefer to see it as a regular commodity, in which case the total value of hours not spent in market work needs to be added to income. The environmental assumption valuing changes tends to raise measure growth rates for OECD countries while the commodity assumption tends to do the opposite unless leisure time is assumed to have increasing productivity. Third, an assumption needs to be made as to whether there is technological progress in the enjoyment of leisure and/or performance of non-market work. This case is reviewed graphically in Crafts (1997b).

The adjustment to real GDP growth suggested by Usher (1980) for changes in mortality is as follows

$$\Delta Q/Q = \Delta Y/Y + (\Delta E/E)/\beta \quad (1)$$

where Q is GDP adjusted for mortality changes, E is an age-structure weighted average of discounted life expectancies and β is the elasticity of annual utility with respect to annual consumption. In this formula an increase in mortality is treated as a completely exogenous change in the consumers' environment which cannot be bought but for which a price would willingly be paid. A more general formulation suggested by Williamson (1984) for use in historical circumstances where, for example, nutritional improvements may be part of the story is

$$\Delta Q/Q = \Delta Y/Y + (z\Delta E/E)/\beta \quad (2)$$

where z is the proportion of mortality change taken to be exogenous. This version is used to produce the imputations for mortality reported in Table 1.4.

Instead of looking at current flows of income, the sustainability of consumption may be of concern. The standard national accounting concept of relevance here is NNP per person which can be thought of as what is available to consume while maintaining capital intact. It is widely recognized that this will exaggerate sustainable consumption if there is unmeasured depletion of natural resources capital which is an input to production. It is less widely recognized that NNP is an underestimate of sustainable consumption for an economy that experiences technological progress. In this case, an estimate of the present value of technological improvements should be added to NNP and this correction is likely to be much the bigger of the two (Nordhaus, 1995).

NNP can be thought of as the annuity equivalent of future consumption. Weitzman (1999) notes that this is calculated as if the present consumption of exhaustible resources will be available indefinitely at today's real extraction cost whereas in fact conventional NNP includes an element which is a form of temporary income based on the use of a finite stock

which can be measured in principle as (price minus marginal extraction cost) x resource use. This amount expressed as a percentage of NNP represents the required correction.

The implications of future technological progress for sustainable consumption should also be recognized. TFP growth will raise production and thus consumption possibilities. If the average since 1950 were used as a projection for future TFP growth in the United States, then this would raise the annuity equivalent of future consumption to about 40 per cent above NNP (Weitzman, 1999). This suggests that the future productivity of R&D expenditures is a critical and that the decline in TFP growth in the last quarter of the twentieth century may well have a bigger impact on estimates of sustainable consumption than imminent exhaustion of raw materials supplies.

Box 2.1. Financial Crisis in 1930s America

Recent discussions of the 1930s American depression have emphasized the importance of a financial crisis in which the role of asymmetric information was central rather than treating the event simply as a monetary shock to aggregate demand. The implication is that there was a drying up of the supply as well as a collapse in the demand for loans. This has been most clearly shown in the analysis of New York City banks by Calomiris and Wilson (1998). In the economic downturn, depositors (who were not insured) faced increased risks of default by banks and banks faced strong incentives to limit deposit risk. Adverse economic shocks impaired bank capital, sharply raised adverse selection costs of raising equity and reduced quasi rents from lending. Faced with this situation, banks opted for holding much higher reserves thereby lowering asset risk and curtailed loans, while depositors held more of their money in the form of cash. The symptoms of these problems are reported in Table 2.1.1 in the form of high deposit default premia reflecting the decline in bank stock values and of the doubling in bid-ask spreads on bank shares which indicates the increased issuing costs that banks faced.

It follows, as contemporaries realized, that economic recovery needed not only policies to raise spending, which in a large economy could be provided by domestic demand stimulus following the suspension of the Gold Standard, but also a government strategy to rehabilitate the banking system and restore the supply of credit. Tackling the banking crisis proved too difficult for the Hoover presidency, although the plan ultimately adopted under Roosevelt with the legitimacy of a newly elected leader had actually been formulated by the outgoing administration (Olson, 1988).

The plan involved, firstly, the March 1933 Bank Holiday in which banks were inspected and re-licensed if they were perceived to be sound. This was deemed crucial to restoring public confidence and was followed by the 1934 Federal Deposit Insurance Act, under which qualifying banks had to achieve appropriate capital adequacy, and the Glass-Steagall Act which separated commercial and investment banking. The Emergency Banking Act allowed new powers to bank receivers to prevent a small minority of shareholders obstructing capital restructuring by refusing to accept losses and to waive a proportion of creditors' claims provided 75 per cent approved (O'Connor, 1938). About three-quarters of the 4000 banks (25 percent of the total) that were initially refused licenses after the Bank Holiday were eventually recapitalized and re-opened and the others were closed. This was facilitated by substantial purchases of preferred capital by government credit agencies, notably the Reconstruction Finance Corporation which also made substantial loans to aid both recapitalization and to speed up payment of dividends to depositors. By the end of 1935, the government in effect owned about a third of all bank capital and total state aid extended to the financial system including loans was \$9.4 billion, i.e., about 13 percent of GNP (Chandler, 1971, p. 268).

This was a clear departure from the previous approach to bank failure which amounted to straightforward liquidation and payoff in which depositors typically lost about a third of all deposits and shareholders usually lost all their capital (Upham and Lamke, 1934). The switch from liquidation towards recapitalization was not, however, a bailout and the government appears to have suffered no overall losses on its temporary banking investments and loans (O'Connor, 1938). Shareholders were usually called upon to make as substantial a contribution to the recapitalization as possible, large depositors were still exposed to losses in the event of bank failure and, with new tighter regulation, moral hazard was contained while the danger of bank runs was much reduced and non-viable banks were eliminated fairly quickly.

Clearly, different options for bank restructuring involve trade-offs (World Bank, 1998, p. 49) and the Roosevelt administration sacrificed speed in favor of sustaining confidence in the banking system and limiting the fiscal costs of intervention. The outcome reflected in Table 2.1.1 was one in which banks continued to hold far more reserves than in the 1920s, where bank failures virtually ceased and bank deposits partly recovered but in which the costs of issuing new bank equity remained high. The politicians appear to have over-reacted in the prohibition of universal banking which subsequent research has shown threatened neither capital adequacy nor the liquidity of the banking system and also did not lead to widespread defrauding of investors (Kroszner and Rajan, 1994; White, 1986).

Box 3.1. Computers And Productivity Growth

Everyone is familiar with Robert Solow's 1987 remark that "you can see the computer age everywhere but in the productivity statistics". Since that time a great deal of research has been done to clarify the impact of information technology on economic growth, see the fine survey in Triplett (1999). Much of this investigation has been in the growth accounting tradition. This treats the contribution of computers to growth as partly coming directly through additions to the capital stock (quantity and quality) and the income accruing to the owners of this new form of capital and partly indirectly through TFP growth either because there are spillovers or because the conventional assumption of normal profits is too conservative.

Four hypotheses to explain the absence of a dramatic impact of computers on growth that deserve some discussion have emerged from this literature. These are the following:

- Computer capital is a relatively small part of the capital stock and has to a substantial extent substituted for other capital.
- Spillover effects from computers have been small so their impact on TFP growth has been modest.
- There is a serious mismeasurement problem such that both growth in output and computers' contribution have been underestimated.
- The main impact of the ICT revolution on productivity performance has yet to come.

Table 3.1.1 reports one set of growth accounting estimates which address the first two hypotheses.¹ These indicate that computers accounted directly for about 0.12 percentage points of growth in 1973-90 and 0.16 percentage points in 1990-96. This should not be too surprising since computers account for only about 2 percent of the capital stock. At the same time there was a substantial reduction in the contribution of other capital to growth—in 1990-96 it was roughly half that of 1948-73—and in TFP growth which continued to slow to 0.23 percent in 1990-96. In addition, Stiroh (1998) found that at the sectoral level in manufacturing there is no evidence of a positive relationship between Office, Computing and Accounting Machinery capital stock growth and TFP growth suggesting that spillovers are weak. Very similar estimates of the direct component can also be found in Sichel (1997b) who undertook a sensitivity analysis in particular of the possibility that excess returns should perhaps be assumed to have accrued to computing capital. He shows both that this is unlikely to have happened and also that the maximum likely impact might be to double the estimated 0.2 percent contribution.

¹The study does not take account of the recent change in National Income Account definitions, which have led to a significant upward revision in recent growth rates, largely through reclassifying spending on computer software as investment.

Computers are intensively used in relatively few sectors of the economy—78 percent of the 1996 stock was in just ten sectors. Many of the biggest users are service sector activities (finance, real estate, wholesale trade, business services etc.). This makes mismeasurement of output (and thus productivity) growth potentially serious. The most detailed study has been undertaken by McGuckin and Stiroh (1999) who used estimates of the output elasticity of computer capital in relatively well-measured manufacturing sectors to obtain an upper bound figure for the understatement of output growth in 13 computer-intensive, non-manufacturing industries comprising around a sixth of GDP in which the measurement problem is probably most serious. They concluded that increasing measurement problems have led to an understatement of aggregate productivity growth by an additional 0.36 per cent per year in the 1990s (0.22 per cent rising output share effect and 0.14 per cent within sector effect). This could raise computers' apparent contribution to growth appreciably without implying a productivity miracle (cf Table B2.1.1.).

The suggestion that the best is yet to come from the ICT revolution is often based on the analogy between the computer and the dynamo presented in David (1991). The main productivity impact of electrification in American manufacturing showed up in a surge of TFP growth that was delayed until the 1920s some 40 years into the electricity era. This comparison may be misleading, however, for two reasons. First, there has already been a really enormous fall in the price of computing power—a decline of more than 2000 fold in about 45 years—far in excess of the fall in the cost of electric power prior to 1920 (Triplett, 1999, pp.323-4). Second, it is clear that to have a really big impact would parallel the transformation in the American factory in the 1920s. A future productivity surge from the reorganization in production remains possible but the author of the computer and dynamo paper cautions against placing too much weight on projections based on this historical comparison (David and Wright, 1999).

The spectacular decline of the real price of computing has surely benefited consumers. Their gains are, however, unlikely to have been captured by the price index numbers that are used to deflate output measured in current prices. In order to capture the full effect of new goods in measured economic growth an estimate is required of the (non-observed) price at which demand would have been zero. In practice, new goods are introduced into the price index number at much lower prices observed at some point later in the diffusion process. This problem is likely to be acute where, as with computers, the services delivered are radically different from anything previously available (Shapiro and Wilcox, 1996, pp. 25-36). It may be that the proliferation of new goods and services has contributed to an increasing understatement of the growth of real incomes in the national accounts (Nakamura, 1995).

The growth accounting explanation of the limited impact of the ICT revolution on American economic growth is fairly plausible but it should not be accepted uncritically. In particular, there are good reasons to believe that the productivity implications of ICT have been underestimated in some services sectors and the well-known new goods problem looms large in this context.”
