CHAPTER 1.1

The Growth Competitiveness Index: Recent Economic Developments and the Prospects for a Sustained Recovery[1]

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World output growth has slowed to one of its lowest rates in decades. According to the September 2002 issue of the International Monetary Fund's *World Economic Outlook*, global output expanded by only 2.2 percent in 2001. In 2002, a moderate recovery to 2.8 percent is expected, which would still be the second-lowest reading since the global slowdown in the early 1990s. These estimates mask important regional differences: although the slowdown in the advanced countries has been remarkably synchronized, it has been particularly pronounced in the United States where economic growth fell from 3.8 percent in 2000 to just 0.3 percent in 2001. In Japan, output actually shrank in 2001, and in the European Union economic growth more than halved to just 1.6 percent in that year.

The developing countries have not remained unaffected by the economic slowdown in the industrialized world. The adverse external environment has had a particularly pronounced impact on Latin America, exacerbating the domestic economic problems in several countries, notably in the Southern Cone—Argentina's output fell by almost 4.5 percent in 2001—but also in Mexico, where economic activity shrank after an expansion of more than 6.5 percent the year before. In developing Asia, by contrast, output growth remained relatively robust, registering an increase of around 5.5 percent in 2001. Similarly, in the transition countries in central and eastern Europe, the decline in economic growth from 3.8 percent in 2000 to 3 percent in 2001 was relatively modest. The only region where economic growth accelerated in 2001 was Africa.

The short-term economic outlook remains clouded with exceptional uncertainty. Although the United States seems to have weathered the economic impact of the terrorist attacks of September 11, 2001, reasonably well, global asset prices continue to show a high degree of volatility. Taking into account that the terrorist attacks were not the only shock—Enron and other corporate scandals, the severe tensions in the Middle East, and the financial crises in some emerging markets could each have caused serious effects—the recent recession in the United States and the global slowdown appear relatively mild. At the same time, however, the recovery seems rather slow, and important risks exist that could derail the expected return to a steeper growth trajectory. Private institutions, governments, and international organizations have continued to lower their economic forecasts for 2002 and 2003. According to the consensus forecasts, a considerable output gap is expected to persist in the short term in the advanced economies. In the developing world, output growth is expected to accelerate markedly in 2003. However, important interregional differences are forecast to remain.

Although the short-term outlook for a sustained recovery is currently subject to a huge amount of uncertainty, the longer-term growth itself is determined by the set of institutions, market structures, and economic policies supportive of higher productivity growth and increases in output. This set of factors is precisely what the Growth Competitiveness Index (GCI) is concerned with. Rather than attempt to make short-term economic forecasts, we are interested primarily in the potential of a large cross-section of countries to achieve sustained economic growth over the next five to eight years.

To put our analysis in an appropriate context, we begin by reviewing global economic developments over the last five years and discuss the extent to which these developments were broadly consistent with our assessment of national competitiveness five years ago. We then review the recent growth performance in the industrialized countries and the main emerging-market economies and discuss the short-term risks countries are currently facing in struggling to return to a sustained growth path. In the second part of the chapter, we outline the construction of the Index and then discuss the empirical results.

Recent economic developments and short-term outlook

Global economic growth since 1997

In the last few years of the past decade, the world economy enjoyed a period of rapid economic growth. Between 1997 and 2000, global output expanded by almost 4 percent per year (IMF 2002). As far as the industrialized countries are concerned, the United States outperformed most other advanced economies, with real activity expanding by more than 1 percentage point per annum faster than in the European Union. In Japan, by contrast, economic growth averaged less than 1 percent during that period. In 2001, however, economic growth in virtually all industrialized countries fell in a remarkably synchronized fashion.

Most Asian economies recovered reasonably well from the financial crises in 1997–98. Korea, for example, achieved a turnaround in output from a decline of almost 7 percent (year-over-year) in 1998 to gains of almost 11 and 10 percent in 1999 and 2000, respectively. In Malaysia, the Philippines, and Thailand, the recovery was somewhat less pronounced, but still considerable. China proved largely unaffected by the crisis and has continued to grow at a rapid rate of around 7 to 8 percent per year.

The Asian financial crisis radiated more widely, however, affecting especially Brazil where market forces led the authorities to introduce a flexible exchange rate regime in January 1999. Greater exchange rate flexibility helped Brazil recover after output growth was essentially flat in 1998 and 1999. In Argentina, whose economy had enjoyed rapid economic growth in the mid 1990s, serious doubts emerged as to whether the currency board arrangement could be sustained. In contrast to Brazil, the crisis in Argentina deepened beginning in the late 1990s. With output shrinking at an increasing rate—real activity in 2001 is estimated to have fallen by around 4.5 percent—the currency board of Argentina was abandoned and the exchange rate has depreciated by around 70 percent since then. In Chile, economic growth also slowed markedly in 1998–99, but recovered strongly thereafter. Mexico, finally, has largely followed the US economy, recording strong economic growth in the second half of the 1990s and a significant slowdown in 2001.

In Africa, average economic growth in 1997–2001 hovered around 3 to 3.5 percent per year. However, with population growth remaining relatively strong, standards of living have not much improved. In many African countries, economic growth continues to be driven primarily by commodity prices and domestic factors. By contrast, few countries are integrated enough to have felt the global business cycle. One exception is, of course, South Africa, whose economy suffered in 1998–99 from the flight to quality in the wake of the Asian financial crisis. Since then, South Africa has enjoyed a moderate recovery. One of the worst performers remains Zimbabwe, where the economic downturn accelerated substantially in 2001 and 2002.

Finally, regarding the transition economies in central and eastern Europe, Russia has shown a sharp turnaround, after having defaulted on its foreign debt and moving to a flexible exchange rate regime in 1998. Although real output shrank by almost 5 percent in 1998, economic growth was already positive in 1999, and in 2000 activity expanded by 9 percent. In the Ukraine, the turnaround was achieved somewhat later, but in 2000 and 2001 the country outperformed most other economies in the region. Among the EU accession candidates, the Baltic countries have shown solid economic performance, although they all suffered in 1999 from a temporary slowdown in growth. Among the more advanced transition economies, Hungary and Poland have enjoyed the relatively fastest growth rates.

How do the competitiveness rankings we published in 1997 appear in light of the actual performance over the past five years? Recall that the competitiveness index ". . . is intended to identify factors determining economic growth. More specifically, it is designed to measure the capacity of national economies to achieve high rates of per capita GDP growth in the medium term. . . ." (Hu and Sachs 1997, p 23).

Table 1 shows the growth performance in 1997–2001 of the 53 countries included in the 1997 competitiveness rankings, with the first column showing average annual economic growth in percent and the second column showing the countries' relative position ranging from 1(best) to 53 (worst). In general, countries that were found

to be relatively competitive tended to outperform those that were found to be less competitive. Note that the table shows average absolute economic growth rates rather than growth rates per capita, which represents the endogenous (or left-hand side variable) in the competitiveness analysis. In some cases where population growth has remained particularly rapid (eg, Egypt) or slow or even negative (eg, Germany and Japan), this will obviously affect the results. Overall, however, the picture remains materially unchanged.

Although the 1997 Competitiveness Index was adjusted for income levels, in a period as short as 1997–2001 it is difficult to detect a catch-up effect. Of the ten best growth performers, five belonged to the group of high-income countries (Ireland, Luxembourg, Singapore, Finland, and Iceland). Among the low-income countries, China, India, and Vietnam enjoyed the highest average growth rates in absolute terms.

There are four broad groups of countries where the 1997 rankings clearly missed something: a group of Asian economies (Thailand, Indonesia, Hong Kong SAR, and Korea); post-socialist countries (China, Vietnam, Hungary, Poland, Czech Republic, Ukraine, and Russia); countries in the European periphery (Ireland Spain, Portugal, and Greece); and "banking centers" (Luxembourg and Switzerland).

The experience in Asia is particularly interesting. Clearly, the 1997 rankings missed the negative impact of the financial crisis. To the extent that this crisis was precipitated by international financial panic, this is precisely the kind of surprise that the rankings were not designed to predict and in fact never were expected to predict. With the important exception of Indonesia, five of the countries hit by this crisis in 1997 or 1998 have bounced back with positive and fairly high economic growth, suggesting that despite the crisis, there remains a strong underlying growth potential. Korea had two years with growth above 7 percent, Hong Kong grew just under 6 percent in 2000, Malaysia had back-to-back growth of 3.5 and 4 percent in 1999 and 2000, Singapore achieved growth of 3.9 and 6.4 percent in the same two years, and even Thailand achieved a more modest 3.2 and 4.0 percent in 1999 and 2000. Most Asian countries subsequently suffered from the global demand slowdown in 2001–02.

The 1997 rankings also underpredicted the performance of European post-socialist economies such as Hungary and Poland. Since these economies were in the midst of restructuring toward private enterprises, it is probably not surprising that a framework designed to explain global growth of countries not in this circumstance did poorly in accounting for growth in these countries. For these countries, the transition entailed a major structural change characterized by a massive movement of resources from state industries and the elimination of subsidies for inefficient enterprises. In this context, the post-socialist countries remain a difficult case for our competitiveness rankings, since there is so little empirical history on which to base the rankings.

On the whole, however, if we take into account the fact that we do not pretend to predict the unpredictable, such as the Asian financial crisis, the rankings appear moderately satisfactory. Nevertheless, there remains considerable room for improvement. Since 1997, we have changed the ranking procedure in a number of ways. We are now placing more emphasis on fundamental drivers of growth such as technology and innovation. Moreover, since the 2000 *Report*, we are no longer sticking to a one-size-fits-

Table 1: Average annual growth 1997–2001 and 1997 competitiveness index rankings

Country	Average annual real GDP growth 1997–2001 (in %)	Growth rate rankings	Competitiveness index rankings
Argentina	0.66	50	37
Australia	3.88	16	17
Austria	2.38	36	27
Belgium	2.76	31	31
Brazil	2.04	40	42
Canada	3.94	15	4
Chile	3.20	24	13
China	7.80	2	29
Colombia	0.78	48	41
Czech Republic	1.06	47	32
Denmark	2.36	37	20
Egypt	5.08	6	28
Finland	4.40	9	19
France	2.92	30	23
Germany	1.78	44	25
Greece	3.42	19	48
Hong Kong SAR	2.66	34	2
Hungary	4.54	8	46
Iceland	4.36	10	38
India	5.40	4	45
Indonesia	0.06	51	15
Ireland	9.54	1	16
Israel	3.08	26	24
Italy	2.02	41	39
Japan	0.70	49	14
Jordan	3.52	18	43
Korea	4.30	12	21
Luxembourg	6.36	3	11
Malaysia	2.96	29	9
Mexico	4.34	11	33
Netherlands	3.36	21	12
New Zealand	2.44	35	5
Norway	2.74	32	10
Peru	2.10	39	40
Philippines	3.12	25	34
Poland	4.14	13	50
Portugal	3.36	22	30
Russian Federation	3.08	27	53
Singapore	4.72	7	1
Slovak Republic	3.28	23	35
South Africa	2.22	38	44
Spain	3.88	17	26
Sweden	3.00	28	22
Switzerland	1.92	43	6
Taiwan	4.14	14	8
Thailand	–0.22	52	18
Turkey	1.20	46	36
Ukraine	1.98	42	52
United Kingdom	2.74	33	7
United States	3.38	20	3
Venezuela	1.30	45	47
Vietnam	5.28	5	49
Zimbabwe	–1.72	53	51

Sources: IMF (2002); WEF (1997)

all approach. Introduced in last year's *Report*, we distinguish between two groups of countries, the "core innovators" and the "non-core innovators" (a terminology not to be construed as a value judgment, as explained below). This year's approach remains basically unchanged, with one slight refinement. We review the rankings in more detail after considering the current economic situation.

The current situation and short-term prospects

Seldom has there been a period with greater uncertainty than the year after the publication of last year's *Global Competitiveness Report* in October 2001. In the two weeks following the terrorist attacks of September 11, 2001, the world equity markets lost approximately two trillion US dollars, with 20 of the world's major stock exchanges dropping more than 10 percent. There was widespread agreement that in the near term the horrific event would accelerate and deepen the slowdown in the global economy that had already been underway, by causing substantial disruptions of the global transport networks and production chains and also by causing a steep drop in consumer and business confidence. There was less agreement, however, as to how fast the global economy would recover and return to a sustained growth path in the medium term. Even greater uncertainty existed with regard to the long-term impact of the terrorist attacks.

A year later, the global economic outlook still remains clouded by tremendous uncertainty. Asset prices have remained subject to substantial volatility. In the two-and-a-half-year period between March 2000, when equity prices peaked, and end-September 2002, some of the major stock indices lost up to two-thirds of their value, with the Nikkei having hit a 19-year low. The NASDAQ and other tech-laden stock exchanges have suffered even greater losses, with some markets—including Germany's Neuer Markt and Switzerland's New Market—being dissolved. Moreover, the latest GDP revisions in the United States confirm that the situation a year ago was actually worse than thought. Rather than merely slowing, we now know that the largest economy in the world was already in recession when the terrorist attacks occurred, with output having shrunk for the first nine months of 2001.

Nevertheless, in each of the three subsequent quarters GDP growth has been positive, and judged by the fears many had a year ago, one might argue that the US economy has weathered the economic impact of the tragic events of September 11 reasonably well. In fact, from the peak to trough, GDP fell by only 0.6 percent, compared with an average decline of over 2 percent during recessions in the post-war era. Although it is true that nominal GDP growth in the G-7 countries fell to its slowest rates for decades, it is important to bear in mind that the terrorist attacks were not the only shock. The failure of Enron, WorldCom, and other high-profile corporate scandals; the collapse of Argentina's currency board; and the severe tensions in the Middle East might each have been expected to have a considerable impact on the global economic outlook, too. Taken together, their impact could have been far more serious, possibly pushing the world economy into a prolonged recession. Considering the potential damage these shocks could have caused, the world economy and the global financial system seems to have proved surprisingly resilient thus far.

One important reason for the robustness that the global economy has shown so far is the resilience of the global financial system. The infrastructure of the system proved strong, and even in the immediate aftermath of massive disruptions in New York City, the world's leading financial center, the system continued to function effectively. The same can be said with regard to the energy market after the collapse of Enron, one of the world's biggest energy traders. Although the US commercial paper market was most affected, corporate bond issuance rose to record levels and many firms were able to fall back on prenegotiated arrangements with their banks. Moreover, consumers in many industrialized countries as well as in some emerging-market economies gained greater access to consumer and mortgage credit, helping private consumption and residential construction to hold up well.

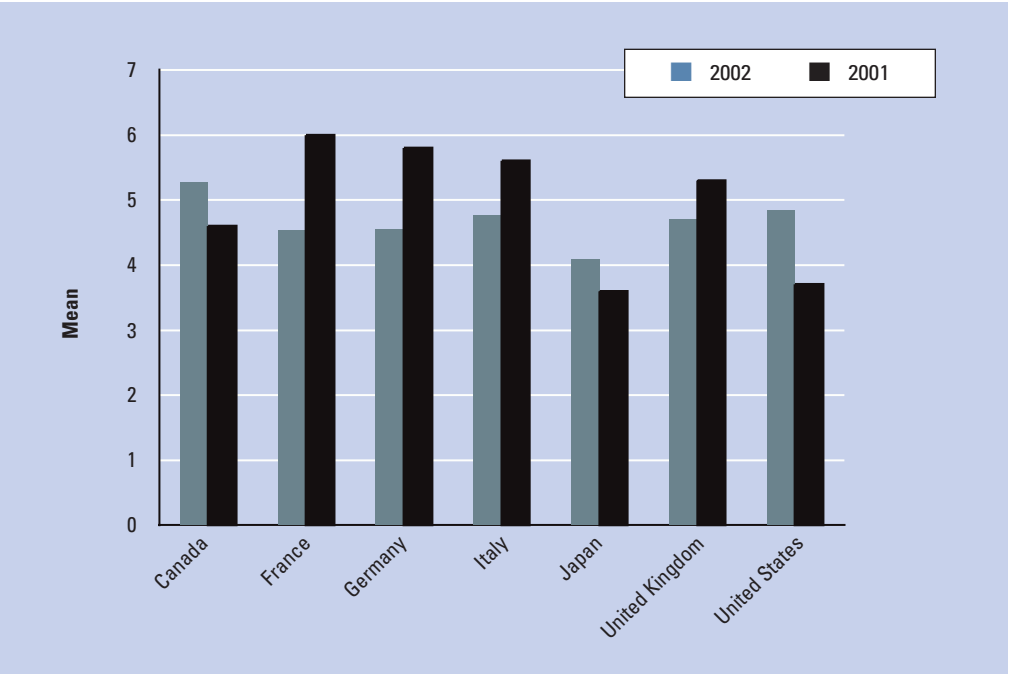
Another remarkable aspect of the robustness of the global economy is that, unlike the cases of the Long-Term Capital Management (LTCM) and Russian crises in 1998, in 2001 there was no panic flight to liquidity (Bank for International Settlements 2002, pp 3 ff); nor was there a sudden drying up of financing for countries with current account deficits due to increased risk aversion. The external funding requirements of the United States continued to be met, and emerging markets of good credit standing seeking funds in the international bond markets still had ready access, with sovereign spreads actually narrowing for several countries.

Much credit for the global economy's resilience is due to the sharp monetary easing in most countries, especially in the United States where at the time of this writing the federal funds target rate stood at just 1.25 percent. This monetary easing has been accompanied by a more expansionary fiscal stance. In the United States, sizeable tax cuts were implemented and public expenditure has been rising strongly, especially in the aftermath of the terrorist attacks, and in 2002, the easing of the budgetary stance is estimated to amount to around 1.5 percent of GDP. Fiscal policy has become significantly more expansionary in several other countries, including Canada, Norway, Sweden, and especially the United Kingdom.

That the global economy has been relatively resilient should not lead to complacency, however. The short- and medium-term economic risks are considerable, and they exist regardless of the enormous uncertainties associated

Figure 1: Recession expectations

(1 = your country's economy will likely be in a recession next year; 7 = your country's economy will have strong growth next year)



with the possibility of a protracted war in Iraq or new terrorist threats. For one thing, corporate and private debts still appear rather large in the United States. Lower interest rates have encouraged a boom in the housing market that has partially offset losses in the stock market, helping insulate private wealth and maintain consumer spending. Once households reduce their borrowing propped up by higher mortgages, they will spend less and save more, which could lead to a prolonged period of sluggish growth. US monetary policy has not much ammunition left if, under such a scenario, the economy stumbles. The rest of the world would not remain unaffected, and with the US current account deficit becoming harder to finance, there is concern that a sharp fall in the US dollar could help export deflationary pressures to other countries. At the same time, to the extent that the economy has become more open, fiscal policy might have become less effective to cushion downturns than in previous cycles.

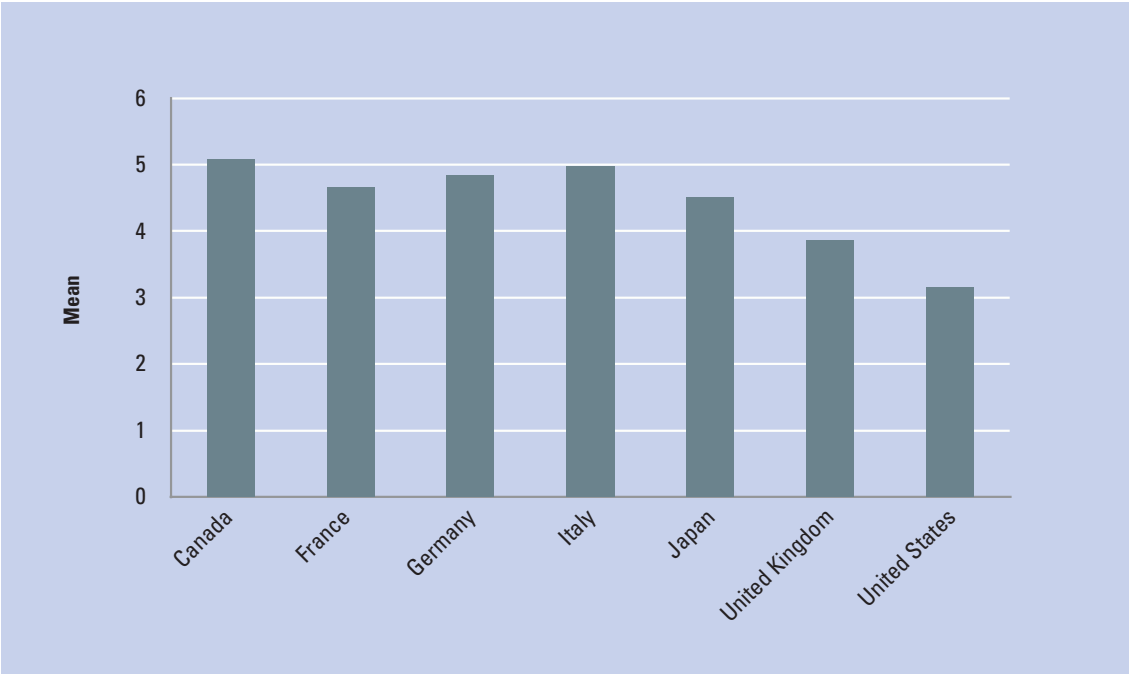
Given the enormous uncertainties that continue to exist, forecasters have continually lowered their 2003 forecasts for the United States and most other OECD countries. Although economic activity in the "Triad" of the United States, Europe, and Japan is expected to increase, the recovery is forecast to be rather gradual, with output remaining below production potential for the foreseeable future. Under this scenario, inflation is expected to remain tame, but unemployment in many countries will remain high or even rising. A slower-than-expected recovery in the OECD countries has obvious implications for the developing world, where in many countries economic growth has also slowed considerably.

This scenario is more or less in line with the responses to our Executive Opinion Survey, which was conducted in the spring of 2002. Asked about their recession expectations (1 = very high probability of a recession next year; 7 = very low probability of a recession next year), respondents from Canada were most optimistic among G-7 participants, with a mean score of 5.3 (see Figure 1). By contrast, Japanese executives showed the highest degree of pessimism, with a mean score of 4.1. Overall, however, the Survey results show relatively little variation. Although a rapid recovery does not appear to be in the cards, responses of the senior executives who participated in the Survey do not suggest a particular fear of a recession in any of the G-7 countries.

Interestingly, US executives were actually considerably more optimistic in early 2002, with a mean score of 4.8, than they had been 12 months earlier, when the mean response to our question was a 3.7. Although in retrospect US executives showed a considerable degree of foresight—the unforeseeable terrorist attacks and other shocks notwithstanding—the global slowdown took their European counterparts by surprise, with their mean responses ranging from 5.3 (United Kingdom) to 6.0 (France) in early 2001. Japanese executives have also become slightly more optimistic, with the mean response increasing from 3.6 in early 2001 (for 2002) to 4.1 in early 2002 (for 2003).

Figure 2: Terrorism and the cost of doing business

(1 = the threat of terrorism imposes significant costs on business; 7 = the threat of terrorism does not impose significant costs on business)



Asked about the cost impact of the threat of terrorism on their business, US executives show by far the highest degree of skepticism, followed by their fellow executives in the United Kingdom. Although executives in continental European countries and in Japan were less pessimistic, the results suggest a high degree of caution in the sense that none of the respondents ruled out the possibility that terrorism could seriously affect their businesses (see Figure 2).

Notwithstanding the tremendous short-term uncertainties currently facing the world economy, those countries that have in place the set of institutions, policies, and regulations that support high levels of productivity and drive productivity growth should be expected to return to a sustained growth path faster than less competitive countries. Which are these countries? How much growth can they reasonably expect once the clouds of uncertainty disappear? This is precisely what the growth competitiveness rankings are concerned with: estimating the underlying prospects for growth over the next five to eight years in a large number of individual economies. Our analysis includes 80 economies, with six new countries being covered by the Growth Competitiveness Index this year: Botswana, Croatia, Haiti, Morocco, Namibia, and Tunisia. Egypt, however, had to be dropped this year due to the lack of Survey data.

The Growth Competitiveness Index

The overall Growth Competitiveness Index (GCI) aims to measure the capacity of the national economy to achieve sustained economic growth over the medium term, controlling for the current level of development.

There are several issues in this definition that are worth noting. First of all, we say *sustainable* to emphasize that we are thinking beyond the shorter-term business cycle. Moreover, our calculations aim to track growth potential after taking into account the temporary catch-up phenomena, whereby poorer countries can grow quickly for a time as they catch up to richer countries. The catch-up phenomenon is temporary because it disappears after countries have caught up to richer countries; however, it can take many years for this to happen. Roughly speaking, our rankings rate growth potential after taking out the part of growth that is related to catching up. For a poorer country such as China, this adjustment can make a large difference. China's growth rate during the period 1991–2001 was over 8 percent per year, the highest of the 80 countries in the *Report*. If our rankings were keyed to unadjusted growth rates, China would look highly competitive.

The rankings are fact driven in the sense that we aspire to include in the rankings only those factors that have some demonstrated correlation with rates of economic growth over the medium term. We construct the rankings on the basis of recent theoretical literature on the

determinants of economic growth, as well the past 10 years' empirical evidence on economic growth. The Index is tested each year to confirm that it does indeed correlate with rates of economic growth from the recent past.

The rankings provide a "rough guide" to the potential for growth. There are two reasons that the rankings are rough. The first is that the rankings inevitably leave out any special circumstances in each country. This means essentially that a significant fraction of growth is left unexplained. Sometimes the rankings are criticized for encouraging the view that there is a single recipe that all countries should follow to achieve competitiveness and fast growth. There is nothing in the *Global Competitiveness Report* that denies the importance of each country's special circumstances. At the same time, the international evidence shows that there are indeed important common factors that influence growth in all countries.

The second reason the rankings are rough is that there is little meaningful distinction between countries ranked close to each other. Very fine differences in the data can shift countries up or down in the rankings if the countries happen to be similar in terms of the underlying indicators. Therefore small changes in the rankings are best attributed to statistical error. A reasonable rule of thumb is that any given country could easily have been ranked five positions in either direction due to random differences in the data. However, if two countries differ by more than ten positions, it is very likely that the difference reflects something real rather than a random error.

Therefore the rankings provide a rough summary of the environment for rapid growth in each country, as best as can be judged by recent evidence. We identify critical determinants of growth and use them to construct the index. As in previous years, the rankings are built from a base that starts with an extensive data set. This data set includes information from official sources such as national statistical agencies and international organizations such as the United Nations (UN), the World Bank, the World Trade Organization (WTO), the International Monetary Fund (IMF), and the World Intellectual Property Organization (WIPO). It also includes data collected through the annual Executive Opinion Survey of the *Global Competitiveness Report*. The Executive Opinion Survey is relied on to provide qualitative data or data on issues that are not measured by alternative sources. A discussion of the characteristics and methodology behind this year's Executive Opinion Survey can be found in Part 4 of this *Report*.

The construction of the GCI essentially follows last year's approach. Developed by Jeffrey D. Sachs and John W. McArthur (McArthur and Sachs 2002), this approach represents the result of continuous research efforts published in previous *Global Competitiveness Reports*. As outlined in detail in last year's *Report* and summarized in the Appendix of this chapter, the GCI is based on three broad categories of variables that are found to drive economic growth in the medium- and long-term. These categories are technology, public institutions, and the macroeconomic environment.

Without technological progress, countries may achieve a higher standard of living, for example, through a higher rate of capital accumulation, but they will not be able to enjoy continuously high economic growth. Institutions are crucial for their role in ensuring the protection of property rights, the objective resolution of contract and other legal disputes, efficiency of government spending, and transparency in all levels of government. In the absence of good governance, the division of labor is likely to be impeded and the allocation of resources inefficient. Monetary and fiscal policies, and the stability of financial institutions, have important effects on short-term economic dynamics as well as on the long-term capacity to grow.

The role of technology in the growth process has attracted a particularly great deal of attention in the literature. Since the onset of the first industrial revolution, economists have struggled to understand why growth proceeds slowly at some times and in some nations, but rapidly in others. During the past two decades, a new growth theory has taken the economics profession by storm, identifying technological change as a key factor in economic development.

Given the central role technology plays in the growth process, the key question for the future, of course, is whether a brisk pace of technological advance can be sustained. As Scherer (1999, p 119) emphasizes, "(t)here is a centuries-old tradition of gazing with wonder at recent technological achievements, surveying the difficulties that seem to thwart further improvements, and concluding that the most important inventions have been made and that it will be much more difficult in the future to achieve comparable rates of advance. Such views have always proved to be wrong in the past, and there is no reason to believe that they will be any more valid in the foreseeable future."

Whether the recent pace of technological progress can be sustained is also a key issue in the present *Report*. Perhaps the most hotly debated question in this regard is currently whether the acceleration in US productivity growth in the second half of the 1990s can be expected to continue, an issue that represents the focus of Chapter 3.2 by Robert Gordon. But even if this acceleration in productivity growth proved to be a temporary phenomenon, the most fundamental observation in the growth literature remains intact—namely that each new technological innovation triggers yet further innovation, in a kind of chain reaction that fuels long-term economic growth. Examining

national competitiveness thus requires, first and foremost, analyzing the extent to which individual countries are able to achieve technological progress.

Technology plays a critical role at all stages of economic development, but the way this driver affects economic growth varies according to the level of economic prosperity a country has already achieved. At early stages of economic development, a country's ability to launch its economy on a steeper growth path depends primarily on the transfer of technology from abroad. Countries that have experienced rapid economic growth are typically those that are successful in adopting and adapting a technology that has been developed abroad, a process known as *technological diffusion*. At more advanced stages of economic development, technological diffusion becomes increasingly important for countries to sustain rapid economic growth.

Taking into account the different channels through which technology affects economic growth at different stages of development, in this *Report* we continue to distinguish between two groups of countries. The group of *core innovators* comprises those countries whose companies have registered at least 15 US utility patents granted per million population in 2001. This criterion is met in 24 economies (see Table 2). All other countries are said to be *non-core innovators*. Empirical tests find that technology plays a particularly critical role in the core innovating countries, a finding that is reflected in the weights we attach to the different growth drivers. In these countries, technology has a weight of 50 percent in the overall GCI, compared with 25 percent each for public institutions and the macroeconomic environment. By contrast, equal weights of one third are attached to each of the three drivers in the case of the non-core innovators.

For the core innovators, the technology index is a simple average of the innovation subindex and the information and communication technology subindex, both of which are comprised of hard and soft data (note that the innovation subindex is different from the "innovative capacity index" constructed by Michael E. Porter and Scott Stern in Chapter 3.1. While the innovation subindex seeks to explain the elements of innovation that are linked to economic growth, the innovative capacity index seeks to explain the underlying factors that contribute to innovation). In the case of non-core innovators, by contrast, technology transfer plays a considerably more important role than innovation, which is reflected in relative weights of three eighths for the technology transfer index versus one eighth in the innovation subindex. Information and communication technology represents the other subindex of the technology index, with a weight of one half.

This year's *Report* includes one important adjustment: the technology transfer subindex includes new Survey evidence on the licensing of foreign technology as an important source of new technology. This evidence replaces a variable that was created to measure the extent of manufacturing technology in the export structure of non-core innovators. The reasoning behind including this variable was that countries with a technology-based export sector may be expected to be more adept at absorbing technologies from abroad than economies with a primary commodity-based export structure. Empirical tests suggest that the new variable has significant explanatory power.

Technology can not be examined in isolation. As discussed in Chapter 3.1, Porter and Stern find a substantial degree of variation among a large sample of countries in terms of their innovative capacity. Although this study focuses primarily on innovation rather than technology transfer, a country's ability to adopt and adapt new technologies developed abroad also depends on a complex set of factors determining the quality of the business environment. Reviewing the growth and technology literature, Scherer (1999, p 124) emphasizes three main barriers in developing countries. The most important one is the lack of, or critical shortcomings in, a legal and institutional framework that encourages vigorously independent risk-taking and dynamic competition. The second barrier lies in the scarcity of business entrepreneurs willing and able to take advantage of the opportunities for development offered by modern technology. And third, because devel-

Table 2: Core technology-innovating economies in the 1980s and in 2001

Country	Average annual US utility patents granted per million population, 1980 to 1989	1980s rank	US utility patents granted per million population, 2001	2001 rank
1980s Core technology innovators				
Switzerland	189.70	1	195.65	4
United States	165.90	2	314.43	1
Japan	101.30	3	260.99	2
Sweden	94.40	4	195.62	5
Germany	85.10	5	135.73	8
Netherlands	52.00	6	83.27	11
Canada	50.40	7	115.80	9
United Kingdom	43.30	8	66.44	17
France	43.00	9	68.15	16
Israel	42.20	10	163.32	6
Austria	40.40	11	72.43	13
Finland	37.10	12	140.21	7
Denmark	31.80	13	89.55	10
Belgium	26.50	14	70.25	15
Norway	22.70	15	58.82	19
Australia	21.50	16	44.99	20
Italy	16.50	17	29.64	24
New Zealand	15.20	18	32.28	23
1980s Non-core economies that became core innovators by 2000				
Taiwan	12.80	19	239.78	3
Iceland	9.00	21	63.33	18
Ireland	8.80	22	37.24	21
Hong Kong SAR	5.40	23	34.34	22
Singapore	2.40	25	72.12	14
Korea	1.30	28	73.99	12

Source: US Patent and Trademark Office, April 2002

oping countries have, by definition, low real per capita incomes, they face particularly harsh constraints in allocating funds to research and development whose benefits tend to accrue only after considerable lags.

Although the boundaries between core and non-core innovators are not rigid, the progress from non-core to core innovator is not a simple one. The lack of an appropriate legal and institutional framework, the scarcity of entrepreneurship, and extremely limited funds for research and development are the most important—but not the only—barriers that explain why the group of core innovators has remained so small as a share of the world's population. The non-core countries often achieve very high rates of growth, but catch-up growth has its inherent limits. As the income gap with the technological leaders narrows, the ability to narrow the income gap still further diminishes and may even disappear. The non-core economy must become a technological innovator to close the income gap fully. This final step of becoming part of the core is typically the most difficult one, and understanding this process requires assessing technology in a broader context of economic development.

As mentioned earlier, and discussed in detail in Daniel Kaufmann's essay on governance in this *Report* (Chapter 3.6), public institutions play a particularly important role. Reflecting this importance, this year's Executive Opinion Survey includes several new questions in this area. For example, four questions alone were added to understand the role of corruption in an economy better. We also asked new questions, for example, on whether newspapers can publish stories of their choosing without fear of censorship or retaliation, and whether illegal donations to political parties are common. The average answers to these and other questions are reported in Part 4 of this *Report*. However, in order to allow for inter-temporal comparisons of the public institutions rankings, we decided to keep its structure unchanged. As detailed in the Appendix, the public institutions index consists of two subindexes with equal weights: one that reflects the perceived degree of corruption and one that focuses on the role of contracts and law. Both subindexes are based solely on Survey evidence.

The macroeconomic environment index has also remained unchanged. It includes a subindex on macroeconomic stability (mirroring, among other things, inflation, national savings, and real exchange rate developments) as well as country credit ratings and general government expenditure. Although the rationale of the construction of the macroeconomic environment index has been discussed in detail by McArthur and Sachs (2002), a few points of clarification appear warranted. To begin with, the optimal level of government expenditures is a highly complex issue to which our simple index is unable to do justice. High levels of government expenditure relative to GDP are usually found to be associated with low economic growth (see, for example, Barro 1997). But to infer from this that economic growth would be maximized at zero government expenditures (though the index could be interpreted this way) would certainly be incorrect. When government spending is too low, then the public sector does not meet even the core needs for education, health, and other public services. The most extreme case in this regard is Haiti, a new entrant in this year's rankings, whose government expenditure-to-GDP ratio was only around 10 percent in 2001.

Similarly, it would be incorrect to infer from the inflation rankings that extremely low inflation is always desirable. In 2001, three countries—Argentina, Hong Kong, and Japan—actually recorded negative consumer price inflation (year-over-year). Deflation can be extremely dangerous for jump-starting an economy and bringing it back to a sustainable growth path, as evidenced by Japan's recent experience. Moreover, the jury is still out as to where inflation begins to be harmful for economic growth. High inflation, say, above 40 percent annually, is widely viewed as bad for growth, but there is much less agreement on the effects of less severe inflation. This lack of consensus may reflect possible complexities of the inflation-growth relationship: nonlinearities, interaction effects with other growth determinants, and differences between short-run and steady state relationships. In a recent study, Ghosh and Philipps (1998), for example, find that at very low inflation rates (less than 2 to 3 percent), inflation and growth are positively correlated; otherwise, they are negatively related, but the relationship is convex, so that the decline in growth associated with an increase from 10 to 20 percent inflation is much larger than that associated with moving from 40 to 50 percent.[2]

Competitiveness rankings 2002–2003

This year's rankings are presented in Table 3. The United States tops the GCI rankings, followed by Finland, last year's number 1. Taiwan, Singapore, and Sweden follow. Switzerland enjoys the relatively biggest improvement to the 6th position in this year's rankings from number 15 in the previous year. Japan's position also improves considerably, to the 13th rank. Other economies that move up on the GCI include China and India, the world's two most populous countries. Conversely, there are several countries that have slipped considerably this year. Ranked 30th, France is one of the least competitive economies within the European Union, outperforming only Greece (38th) and Italy (39th).[3] The most dramatic decline concerns Turkey, which slips to the 69th place this year, compared with a rank of 54 in 2001. Argentina, having suffered from a similarly severe financial crisis and an even larger fall in output, drops by 14 places to 63 on this year's rankings.

Table 3: Growth Competitiveness Index rankings and 2001 comparisons

Country	GCI 2002 rank	GCI 2002 score	GCI 2002 rank among GCR 2001 countries*	GCI 2001 rank
United States	1	5.93	1	2
Finland	2	5.74	2	1
Taiwan	3	5.50	3	7
Singapore	4	5.42	4	4
Sweden	5	5.40	5	9
Switzerland	6	5.36	6	15
Australia	7	5.36	7	5
Canada	8	5.27	8	3
Norway	9	5.24	9	6
Denmark	10	5.23	10	14
United Kingdom	11	5.17	11	12
Iceland	12	5.16	12	16
Japan	13	5.08	13	21
Germany	14	5.06	14	17
Netherlands	15	5.03	15	8
New Zealand	16	5.03	16	10
Hong Kong SAR	17	4.93	17	13
Austria	18	4.93	18	18
Israel	19	4.93	19	24
Chile	20	4.89	20	27
Korea	21	4.89	21	23
Spain	22	4.88	22	22
Portugal	23	4.87	23	25
Ireland	24	4.86	24	11
Belgium	25	4.81	25	19
Estonia	26	4.73	26	29
Malaysia	27	4.70	27	30
Slovenia	28	4.64	28	31
Hungary	29	4.63	29	28
France	30	4.62	30	20
Thailand	31	4.52	31	33
South Africa	32	4.47	32	34
China	33	4.37	33	39
Tunisia	34	4.35	—	—
Mauritius	35	4.34	34	32
Lithuania	36	4.33	35	43
Trinidad and Tobago	37	4.32	36	38
Greece	38	4.32	37	36
Italy	39	4.31	38	26
Czech Republic	40	4.26	39	37
Botswana	41	4.22	—	—
Uruguay	42	4.19	40	46
Costa Rica	43	4.19	41	35
Latvia	44	4.14	42	47
Mexico	45	4.11	43	42
Brazil	46	4.09	44	44
Jordan	47	4.07	45	45
India	48	4.03	46	57
Slovak Republic	49	4.02	47	40
Panama	50	4.00	48	53
Poland	51	3.98	49	41
Dominican Republic	52	3.96	50	50
Namibia	53	3.93	—	—
Peru	54	3.87	51	55
Morocco	55	3.86	—	—
Colombia	56	3.86	52	65
El Salvador	57	3.85	53	58
Croatia	58	3.80	—	—
Sri Lanka	59	3.80	54	61
Jamaica	60	3.76	55	52
Philippines	61	3.70	56	48
Bulgaria	62	3.68	57	59
Argentina	63	3.66	58	49
Russian Federation	64	3.64	59	63
Vietnam	65	3.63	60	60
Romania	66	3.59	61	56
Indonesia	67	3.36	62	64
Venezuela	68	3.35	63	62
Turkey	69	3.31	64	54
Guatemala	70	3.20	65	66
Nigeria	71	3.17	66	74
Paraguay	72	3.14	67	72
Ecuador	73	3.13	68	68
Bangladesh	74	3.12	69	71
Nicaragua	75	2.99	70	73
Honduras	76	2.98	71	70
Ukraine	77	2.97	72	69
Bolivia	78	2.96	73	67
Zimbabwe	79	2.80	74	75
Haiti	80	2.47	—	—

* Only 74 countries out of the 75 covered last year are shown, as Egypt is not included in this year's *Report*.

Argentina's and Turkey's declines would have been slightly less dramatic in an unchanged sample, but still very substantial. With the exception of Haiti, all new entrants are ranked higher than Argentina and Turkey, technically exacerbating the decline in their competitiveness rankings. Tunisia is the highest new entrant at number 34. Further down the list are Botswana at number 41, Namibia at 53, Morocco at number 55, and Croatia at number 58. Haiti, at the bottom, is known to be going through one of the most difficult periods in its history.

What explains the relative country positions on the GCI, and what are the factors that have resulted in the changes in the rankings? As Tables 4 and 5 show, the United States owes its position mainly to its stellar performance on technology-related factors. As was the case last year, the United States tops the rankings on the technology index. A deeper analysis reveals that this performance is due to a wide range of factors. Research and development, collaboration between universities and businesses, the level of tertiary education, and a sophisticated and innovative business and academic community all contribute to the high ranking of the United States, topping the innovation subindex and enjoying a 4th position on the information and communication technology subindex index (see Table 6).

The United States' macroeconomic environment is also found to be favorable, at least in comparison with most other economies (see Table 7). Clearly, most macroeconomic indicators have deteriorated quite significantly over the last two years. However, relative to other economies, the United States continues to show important competitive advantages. For example, the US budgetary situation still looks considerably better than it does in many other countries, particularly Japan and several European Union countries where the global slowdown has also had a major impact on public finances. Furthermore, the United States scores very well with regard to its creditworthiness. On the other hand, the national savings rate in the United States has remained among the lowest in the world, posing substantial risks in the current fragile environment.

Another area where the United States faces important challenges is the perceived quality of its public institutions (see Table 8). Overall, the United States is ranked only 16th on the public institutions index, occupying the 15th and the 20th position on the contracts and law subindex and the corruption subindex, respectively. Note that on both subindexes the United States has dropped this year, especially on the corruption subindex. Irregular payments paid in relation to the supply of public utilities or in connection with tax payments, for example, are perceived to be a serious issue by the Survey respondents.

Table 4: Growth Competitiveness Index component indexes

Technology index

Country	Rank	Score
United States	1	6.36
Taiwan	2	5.87
Finland	3	5.83
Sweden	4	5.77
Japan	5	5.34
Switzerland	6	5.19
Israel	7	5.16
Canada	8	5.13
Australia	9	5.05
Norway	10	5.03
Denmark	11	5.03
Germany	12	4.94
Portugal	13	4.91
Estonia	14	4.91
United Kingdom	15	4.91
Iceland	16	4.90
Singapore	17	4.89
Korea	18	4.87
Netherlands	19	4.82
Czech Republic	20	4.81
Hungary	21	4.77
Belgium	22	4.73
Austria	23	4.68
Spain	24	4.68
Slovenia	25	4.65
Malaysia	26	4.62
New Zealand	27	4.57
France	28	4.46
Latvia	29	4.41
Greece	30	4.41
Ireland	31	4.40
Hong Kong SAR	32	4.37
Chile	33	4.35
Slovak Republic	34	4.31
Brazil	35	4.30
Poland	36	4.21
Costa Rica	37	4.13
South Africa	38	4.11
Italy	39	4.08
Lithuania	40	4.05
Thailand	41	4.04
Trinidad and Tobago	42	3.99
Croatia	43	3.98
Argentina	44	3.98
Mauritius	45	3.90
Jamaica	46	3.85
Mexico	47	3.84
Dominican Republic	48	3.83
Panama	49	3.82
Uruguay	50	3.78
Jordan	51	3.72
Philippines	52	3.69
Venezuela	53	3.64
Turkey	54	3.62
Romania	55	3.60
Bulgaria	56	3.55
India	57	3.55
Colombia	58	3.53
Namibia	59	3.52
Tunisia	60	3.51
Botswana	61	3.51
Morocco	62	3.47
China	63	3.45
Peru	64	3.43
Indonesia	65	3.27
Russian Federation	66	3.23
Sri Lanka	67	3.12
Vietnam	68	3.04
El Salvador	69	3.02
Ecuador	70	2.99
Nigeria	71	2.94
Ukraine	72	2.85
Nicaragua	73	2.82
Guatemala	74	2.80
Zimbabwe	75	2.74
Paraguay	76	2.68
Bolivia	77	2.66
Honduras	78	2.65
Bangladesh	79	2.60
Haiti	80	1.83

Public institutions index

Country	Rank	Score
Finland	1	6.60
Denmark	2	6.50
Iceland	3	6.39
New Zealand	4	6.32
Australia	5	6.23
United Kingdom	6	6.19
Singapore	7	6.17
Switzerland	8	6.07
Canada	9	6.00
Netherlands	10	5.95
Austria	11	5.90
Norway	12	5.89
Hong Kong SAR	13	5.88
Germany	14	5.85
Sweden	15	5.81
United States	16	5.76
Israel	17	5.76
Ireland	18	5.76
Chile	19	5.62
Uruguay	20	5.54
Portugal	21	5.50
Belgium	22	5.36
Slovenia	23	5.33
Tunisia	24	5.31
Japan	25	5.27
Spain	26	5.25
Taiwan	27	5.25
Estonia	28	5.22
France	29	5.15
Hungary	30	5.15
Botswana	31	5.14
Korea	32	4.96
Malaysia	33	4.94
South Africa	34	4.93
Mauritius	35	4.91
Lithuania	36	4.89
Italy	37	4.71
China	38	4.68
Thailand	39	4.68
Jordan	40	4.67
Namibia	41	4.65
Sri Lanka	42	4.57
Trinidad and Tobago	43	4.56
Greece	44	4.53
Brazil	45	4.45
Costa Rica	46	4.33
Bulgaria	47	4.30
El Salvador	48	4.24
Peru	49	4.24
Czech Republic	50	4.20
Jamaica	51	4.18
Latvia	52	4.12
Slovak Republic	53	4.11
Colombia	54	4.10
Panama	55	4.06
Morocco	56	4.05
Croatia	57	4.04
Mexico	58	3.99
India	59	3.96
Dominican Republic	60	3.93
Poland	61	3.83
Vietnam	62	3.65
Turkey	63	3.52
Nicaragua	64	3.50
Russian Federation	65	3.45
Argentina	66	3.38
Romania	67	3.38
Zimbabwe	68	3.31
Bolivia	69	3.13
Philippines	70	3.11
Paraguay	71	3.09
Ukraine	72	3.07
Venezuela	73	3.07
Guatemala	74	2.98
Ecuador	75	2.98
Honduras	76	2.93
Indonesia	77	2.90
Nigeria	78	2.89
Bangladesh	79	2.56
Haiti	80	2.11

Macroeconomic environment index

Country	Rank	Score
Singapore	1	5.72
United States	2	5.26
Hong Kong SAR	3	5.10
Australia	4	5.08
Switzerland	5	5.00
Taiwan	6	5.00
Norway	7	4.99
China	8	4.98
Ireland	9	4.88
Korea	10	4.86
Thailand	11	4.85
Canada	12	4.81
Chile	13	4.71
Finland	14	4.70
Spain	15	4.70
United Kingdom	16	4.69
New Zealand	17	4.66
India	18	4.57
Netherlands	19	4.55
Malaysia	20	4.53
Mexico	21	4.50
Germany	22	4.49
Austria	23	4.47
Iceland	24	4.43
Trinidad and Tobago	25	4.41
Belgium	26	4.40
Italy	27	4.39
France	28	4.39
Japan	29	4.36
South Africa	30	4.36
Denmark	31	4.35
Philippines	32	4.29
El Salvador	33	4.29
Sweden	34	4.23
Russian Federation	35	4.23
Mauritius	36	4.22
Tunisia	37	4.22
Vietnam	38	4.21
Bangladesh	39	4.21
Portugal	40	4.20
Dominican Republic	41	4.14
Panama	42	4.13
Costa Rica	43	4.10
Morocco	44	4.07
Lithuania	45	4.06
Estonia	46	4.06
Greece	47	4.02
Botswana	48	4.01
Hungary	49	3.98
Slovenia	50	3.95
Colombia	51	3.95
Peru	52	3.95
Indonesia	53	3.92
Poland	54	3.90
Latvia	55	3.89
Guatemala	56	3.83
Jordan	57	3.83
Romania	58	3.79
Czech Republic	59	3.77
Sri Lanka	60	3.70
Nigeria	61	3.67
Israel	62	3.66
Paraguay	63	3.65
Slovak Republic	64	3.64
Argentina	65	3.62
Namibia	66	3.61
Brazil	67	3.51
Haiti	68	3.48
Ecuador	69	3.43
Croatia	70	3.38
Honduras	71	3.36
Venezuela	72	3.35
Uruguay	73	3.26
Jamaica	74	3.25
Bulgaria	75	3.20
Bolivia	76	3.10
Ukraine	77	2.99
Turkey	78	2.80
Nicaragua	79	2.63
Zimbabwe	80	2.36

Table 5: GCI component indexes ranking comparison

Country	GCI ranking			Technology ranking			Public institutions ranking			Macroeconomic environment ranking		
	2002	2001*	Difference	2002	2001*	Difference	2002	2001*	Difference	2002	2001*	Difference
Argentina	63	49	–14	44	48	4	66	54	–12	65	40	–25
Australia	7	5	–2	9	5	–4	5	8	3	4	17	13
Austria	18	18	0	23	16	–7	11	15	4	23	26	3
Bangladesh	74	70	–4	79	73	–6	79	74	–5	39	48	9
Belgium	25	19	–6	22	13	–9	22	22	0	26	24	–2
Bolivia	78	66	–12	77	66	–11	69	61	–8	76	70	–6
Botswana	41	—	—	61	—	—	31	—	—	48	—	—
Brazil	46	44	–2	35	49	14	45	46	1	67	33	–34
Bulgaria	62	58	–4	56	50	–6	47	50	3	75	69	–6
Canada	8	3	–5	8	2	–6	9	11	2	12	13	1
Chile	20	27	7	33	42	9	19	21	2	13	21	8
China	33	39	6	63	53	–10	38	49	11	8	6	–2
Colombia	56	64	8	58	56	–2	54	56	2	51	66	15
Costa Rica	43	35	–8	37	32	–5	46	36	–10	43	42	–1
Croatia	58	—	—	43	—	—	57	—	—	70	—	—
Czech Republic	40	37	–3	20	20	0	50	52	2	59	49	–10
Denmark	10	14	4	11	12	1	2	3	1	31	31	0
Dominican Republic	52	50	–2	48	44	–4	60	53	–7	41	46	5
Ecuador	73	67	–6	70	68	–2	75	67	–8	69	62	–7
El Salvador	57	57	0	69	58	–11	48	59	11	33	47	14
Estonia	26	29	3	14	8	–6	28	29	1	46	43	–3
Finland	2	1	–1	3	3	0	1	1	0	14	10	–4
France	30	20	–10	28	17	–11	29	20	–9	28	22	–6
Germany	14	17	3	12	15	3	14	17	3	22	19	–3
Greece	38	36	–2	30	38	8	44	39	–5	47	32	–15
Guatemala	70	65	–5	74	67	–7	74	69	–5	56	52	–4
Haiti	80	—	—	80	—	—	80	—	—	68	—	—
Honduras	76	69	–7	78	69	–9	76	71	–5	71	72	1
Hong Kong SAR	17	13	–4	32	33	1	13	10	–3	3	4	1
Hungary	29	28	–1	21	21	0	30	26	–4	49	38	–11
Iceland	12	16	4	16	19	3	3	2	–1	24	34	10
India	48	56	8	57	65	8	59	48	–11	18	45	27
Indonesia	67	63	–4	65	61	–4	77	65	–12	53	41	–12
Ireland	24	11	–13	31	28	–3	18	18	0	9	2	–7
Israel	19	24	5	7	26	19	17	14	–3	62	61	–1
Italy	39	26	–13	39	31	–8	37	27	–10	27	23	–4
Jamaica	60	51	–9	46	43	–3	51	42	–9	74	71	–3
Japan	13	21	8	5	23	18	25	19	–6	29	18	–11
Jordan	47	45	–2	51	54	3	40	28	–12	57	54	–3
Korea	21	23	2	18	9	–9	32	43	11	10	8	–2
Latvia	44	47	3	29	34	5	52	47	–5	55	59	4
Lithuania	36	43	7	40	41	1	36	33	–3	45	56	11
Malaysia	27	30	3	26	22	–4	33	38	5	20	20	0
Mauritius	35	32	–3	45	37	–8	35	32	–3	36	30	–6
Mexico	45	42	–3	47	36	–11	58	55	–3	21	36	15
Morocco	55	—	—	62	—	—	56	—	—	44	—	—
Namibia	53	—	—	59	—	—	41	—	—	66	—	—
Netherlands	15	8	–7	19	14	–5	10	5	–5	19	9	–10
New Zealand	16	10	–6	27	11	–16	4	4	0	17	14	–3
Nicaragua	75	72	–3	73	70	–3	64	66	2	79	74	–5
Nigeria	71	73	2	71	74	3	78	72	–6	61	55	–6
Norway	9	6	–3	10	7	–3	12	16	4	7	5	–2
Panama	50	52	2	49	57	8	55	58	3	42	44	2
Paraguay	72	71	–1	76	72	–4	71	73	2	63	65	2
Peru	54	54	0	64	62	–2	49	44	–5	52	58	6
Philippines	61	48	–13	52	40	–12	70	63	–7	32	28	–4
Poland	51	41	–10	36	35	–1	61	40	–21	54	50	–4
Portugal	23	25	2	13	25	12	21	25	4	40	35	–5
Romania	66	55	–11	55	47	–8	67	51	–16	58	67	9
Russian Federation	64	62	–2	66	60	–6	65	60	–5	35	57	22
Singapore	4	4	0	17	18	1	7	6	–1	1	1	0
Slovak Republic	49	40	–9	34	29	–5	53	37	–16	64	64	0
Slovenia	28	31	3	25	30	5	23	30	7	50	39	–11
South Africa	32	34	2	38	46	8	34	34	0	30	27	–3
Spain	22	22	0	24	27	3	26	23	–3	15	11	–4
Sri Lanka	59	60	1	67	59	–8	42	57	15	60	60	0
Sweden	5	9	4	4	6	2	15	7	–8	34	29	–5
Switzerland	6	15	9	6	24	18	8	13	5	5	3	–2
Taiwan	3	7	4	2	4	2	27	24	–3	6	15	9
Thailand	31	33	2	41	39	–2	39	41	2	11	16	5
Trinidad and Tobago	37	38	1	42	52	10	43	35	–8	25	25	0
Tunisia	34	—	—	60	—	—	24	—	—	37	—	—
Turkey	69	53	–16	54	51	–3	63	45	–18	78	68	–10
Ukraine	77	68	–9	72	63	–9	72	70	–2	77	73	–4
United Kingdom	11	12	1	15	10	–5	6	9	3	16	12	–4
United States	1	2	1	1	1	0	16	12	–4	2	7	5
Uruguay	42	46	4	50	45	–5	20	31	11	73	63	–10
Venezuela	68	61	–7	53	55	2	73	64	–9	72	53	–19
Vietnam	65	59	–6	68	64	–4	62	62	0	38	37	–1
Zimbabwe	79	74	–5	75	71	–4	68	68	0	80	75	–5

* Only 74 countries out of the 75 covered last year are shown, as Egypt is not included in this year's *Report*.

Table 6: Technology index components

	Technology index		Innovation subindex						ICT subindex						Technology transfer subindex*	
			OVERALL		HARD DATA		SURVEY DATA		OVERALL		HARD DATA		SURVEY DATA			
Country	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Argentina	44	3.98	30	2.84	29	2.68	66	3.32	47	3.51	41	3.79	71	2.95	20	4.98
Australia	9	5.05	9	4.41	6	4.30	21	4.74	14	5.70	12	6.07	15	4.95	—	—
Austria	23	4.68	16	3.88	18	3.48	12	5.08	18	5.48	18	5.74	14	4.95	—	—
Bangladesh	79	2.60	79	1.59	77	1.13	76	2.96	78	1.71	80	1.02	69	3.10	45	4.13
Belgium	22	4.73	15	4.09	14	3.77	14	5.03	20	5.38	19	5.68	22	4.78	—	—
Bolivia	77	2.66	58	2.10	49	1.87	79	2.79	72	2.30	69	2.03	73	2.85	55	3.33
Botswana	61	3.51	77	1.72	79	1.08	53	3.64	59	2.95	59	2.58	50	3.70	25	4.84
Brazil	35	4.30	53	2.19	60	1.46	26	4.38	41	3.86	45	3.61	35	4.37	3	5.58
Bulgaria	56	3.55	39	2.63	32	2.52	75	2.97	44	3.58	43	3.74	66	3.26	50	3.82
Canada	8	5.13	8	4.43	8	4.19	11	5.14	11	5.83	14	5.99	4	5.50	—	—
Chile	33	4.35	37	2.67	39	2.20	38	4.10	33	4.37	35	4.25	27	4.60	24	4.89
China	63	3.45	61	1.97	75	1.18	28	4.34	62	2.88	62	2.30	40	4.05	29	4.70
Colombia	58	3.53	55	2.15	52	1.68	57	3.57	56	3.19	55	2.81	42	3.95	40	4.43
Costa Rica	37	4.13	36	2.68	41	2.10	24	4.40	45	3.56	44	3.63	62	3.42	7	5.37
Croatia	43	3.98	50	2.24	43	2.03	78	2.86	37	3.99	38	4.16	51	3.67	35	4.54
Czech Republic	20	4.81	42	2.53	48	1.92	27	4.37	28	4.83	30	4.94	26	4.61	4	5.55
Denmark	11	5.03	13	4.12	13	3.82	15	5.00	7	5.94	4	6.45	18	4.91	—	—
Dominican Republic	48	3.83	46	2.38	51	1.80	35	4.14	55	3.22	54	2.90	46	3.86	14	5.12
Ecuador	70	2.99	60	2.00	57	1.60	69	3.20	66	2.51	63	2.27	70	3.00	47	3.94
El Salvador	69	3.02	59	2.07	55	1.62	63	3.41	65	2.57	68	2.04	55	3.62	49	3.93
Estonia	14	4.91	28	3.05	28	2.70	37	4.10	23	5.18	27	5.13	10	5.28	11	5.16
Finland	3	5.83	3	5.47	3	5.34	3	5.87	3	6.19	6	6.34	1	5.87	—	—
France	28	4.46	18	3.84	19	3.46	17	4.96	25	5.09	26	5.36	29	4.56	—	—
Germany	12	4.94	10	4.38	11	3.93	4	5.70	16	5.51	16	5.80	16	4.92	—	—
Greece	30	4.41	27	3.05	27	2.80	46	3.81	31	4.59	28	5.08	53	3.63	31	4.62
Guatemala	74	2.80	75	1.76	69	1.26	68	3.25	71	2.34	67	2.17	75	2.69	51	3.77
Haiti	80	1.83	80	1.33	80	1.00	80	2.32	80	1.43	78	1.18	80	1.93	56	2.53
Honduras	78	2.65	71	1.80	61	1.43	77	2.89	76	1.85	74	1.52	78	2.51	46	3.99
Hong Kong SAR	32	4.37	32	2.78	36	2.28	31	4.25	6	5.97	7	6.34	11	5.24	—	—
Hungary	21	4.77	34	2.73	37	2.24	32	4.21	29	4.77	31	4.76	21	4.81	6	5.45
Iceland	16	4.90	21	3.54	22	3.04	13	5.04	2	6.27	2	6.71	9	5.40	—	—
India	57	3.55	62	1.95	72	1.22	33	4.16	69	2.38	76	1.31	31	4.52	2	5.65
Indonesia	65	3.27	63	1.95	64	1.37	47	3.71	73	2.22	71	1.67	65	3.32	15	5.09
Ireland	31	4.40	22	3.47	24	2.97	16	5.00	22	5.33	20	5.64	23	4.71	—	—
Israel	7	5.16	6	4.71	7	4.29	2	5.95	15	5.61	21	5.54	3	5.74	—	—
Italy	39	4.08	25	3.22	25	2.97	40	3.98	27	4.94	24	5.38	38	4.05	—	—
Jamaica	46	3.85	69	1.88	68	1.28	49	3.68	48	3.49	50	3.27	43	3.93	19	4.99
Japan	5	5.34	5	5.18	5	5.05	7	5.59	17	5.50	15	5.94	25	4.61	—	—
Jordan	51	3.72	57	2.15	53	1.67	56	3.57	50	3.38	58	2.72	24	4.71	30	4.69
Korea	18	4.87	11	4.33	9	4.13	18	4.91	19	5.40	25	5.38	7	5.45	—	—
Latvia	29	4.41	26	3.09	26	2.82	43	3.89	35	4.24	33	4.33	39	4.05	16	5.09
Lithuania	40	4.05	33	2.77	34	2.47	51	3.66	40	3.94	39	4.04	49	3.75	32	4.61
Malaysia	26	4.62	52	2.19	62	1.39	22	4.59	32	4.43	37	4.21	19	4.87	1	5.68
Mauritius	45	3.90	72	1.79	71	1.22	61	3.51	39	3.95	40	4.02	48	3.81	36	4.53
Mexico	47	3.84	56	2.15	54	1.64	48	3.69	46	3.53	48	3.49	54	3.62	27	4.81
Morocco	62	3.47	64	1.94	67	1.30	45	3.85	64	2.61	70	1.96	44	3.91	13	5.12
Namibia	59	3.52	68	1.89	70	1.22	42	3.89	61	2.95	60	2.49	47	3.85	26	4.82
Netherlands	19	4.82	17	3.86	17	3.54	20	4.82	12	5.77	9	6.25	20	4.82	—	—
New Zealand	27	4.57	19	3.76	16	3.55	25	4.39	21	5.37	17	5.76	28	4.60	—	—
Nicaragua	73	2.82	70	1.81	63	1.39	73	3.06	75	1.89	72	1.58	79	2.49	42	4.40
Nigeria	71	2.94	78	1.64	78	1.10	67	3.27	79	1.67	79	1.08	72	2.85	17	5.07
Norway	10	5.03	12	4.13	12	3.90	19	4.82	8	5.93	3	6.66	32	4.48	—	—
Panama	49	3.82	41	2.54	40	2.17	52	3.65	53	3.27	51	3.16	58	3.49	21	4.97
Paraguay	76	2.68	73	1.78	66	1.33	72	3.12	68	2.41	64	2.27	74	2.69	54	3.34
Peru	64	3.43	48	2.38	44	2.01	62	3.48	60	2.95	56	2.81	68	3.23	41	4.41
Philippines	52	3.69	45	2.40	46	1.97	50	3.67	63	2.85	65	2.24	37	4.08	9	5.24
Poland	36	4.21	29	2.90	31	2.58	44	3.86	36	4.03	34	4.25	56	3.58	23	4.90
Portugal	13	4.91	31	2.83	30	2.60	60	3.53	24	5.12	23	5.40	30	4.55	8	5.32
Romania	55	3.60	54	2.17	50	1.85	71	3.14	54	3.23	52	3.10	59	3.49	34	4.56
Russian Federation	66	3.23	35	2.73	35	2.46	59	3.54	58	3.07	53	2.98	67	3.26	52	3.62
Singapore	17	4.89	20	3.76	20	3.24	9	5.31	5	6.02	10	6.13	2	5.79	—	—
Slovak Republic	34	4.31	44	2.45	47	1.93	39	4.00	34	4.28	32	4.59	52	3.66	22	4.96
Slovenia	25	4.65	24	3.33	23	3.00	30	4.31	26	5.08	22	5.42	33	4.42	38	4.50
South Africa	38	4.11	49	2.31	56	1.61	23	4.42	42	3.72	46	3.56	41	4.04	10	5.21
Spain	24	4.68	23	3.37	21	3.06	29	4.31	30	4.75	29	4.99	36	4.29	18	5.01
Sri Lanka	67	3.12	74	1.76	76	1.15	55	3.60	70	2.34	73	1.57	45	3.90	33	4.60
Sweden	4	5.77	4	5.25	4	5.11	6	5.66	1	6.29	1	6.71	5	5.46	—	—
Switzerland	6	5.19	7	4.51	10	4.11	5	5.68	9	5.87	8	6.28	12	5.04	—	—
Taiwan	2	5.87	2	5.89	2	6.07	8	5.33	10	5.86	13	6.06	6	5.45	—	—
Thailand	41	4.04	40	2.57	42	2.06	36	4.11	52	3.29	57	2.75	34	4.37	5	5.52
Trinidad and Tobago	42	3.99	67	1.89	73	1.20	41	3.95	43	3.64	42	3.78	63	3.35	12	5.15
Tunisia	60	3.51	51	2.22	58	1.59	34	4.14	57	3.13	66	2.24	17	4.92	39	4.45
Turkey	54	3.62	66	1.89	59	1.47	70	3.18	49	3.48	47	3.50	60	3.45	43	4.38
Ukraine	72	2.85	38	2.63	33	2.50	74	3.04	67	2.49	61	2.40	76	2.68	53	3.41
United Kingdom	15	4.91	14	4.10	15	3.71	10	5.25	13	5.71	11	6.08	13	4.99	—	—
United States	1	6.36	1	6.62	1	6.77	1	6.19	4	6.09	5	6.42	8	5.43	—	—
Uruguay	50	3.78	43	2.51	38	2.22	65	3.37	38	3.98	36	4.21	57	3.50	48	3.93
Venezuela	53	3.64	47	2.38	45	2.00	58	3.54	51	3.29	49	3.27	64	3.34	37	4.52
Vietnam	68	3.04	65	1.91	65	1.35	54	3.62	74	2.01	77	1.29	61	3.44	28	4.79
Zimbabwe	75	2.74	76	1.75	74	1.20	64	3.40	77	1.85	75	1.49	77	2.56	44	4.26

* This subindex is used only in the calculation of the technology index for the 56 non-core innovators.

Table 7: Macroeconomic environment index components

Country	Macroeconomic environment index		Macroeconomic stability subindex		Country credit rating*		Government expenditure	
	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Argentina	65	3.62	65	3.63	72	1.89	20	5.32
Australia	4	5.08	20	4.65	20	6.10	27	4.90
Austria	23	4.47	17	4.70	8	6.62	75	1.86
Bangladesh	39	4.21	42	4.28	71	2.06	5	6.19
Belgium	26	4.40	25	4.58	12	6.52	72	1.95
Bolivia	76	3.10	67	3.58	68	2.25	57	2.98
Botswana	48	4.01	21	4.62	34	4.22	65	2.55
Brazil	67	3.51	61	3.75	54	3.06	48	3.49
Bulgaria	75	3.20	68	3.55	56	2.94	61	2.74
Canada	12	4.81	13	4.77	10	6.55	52	3.17
Chile	13	4.71	33	4.39	28	4.75	21	5.29
China	8	4.98	5	4.95	32	4.30	16	5.72
Colombia	51	3.95	66	3.60	55	3.00	18	5.58
Costa Rica	43	4.10	69	3.44	50	3.36	7	6.18
Croatia	70	3.38	41	4.29	49	3.40	77	1.54
Czech Republic	59	3.77	51	4.12	30	4.56	66	2.30
Denmark	31	4.35	12	4.77	9	6.56	79	1.29
Dominican Republic	41	4.14	58	3.82	60	2.77	8	6.13
Ecuador	69	3.43	63	3.64	76	1.58	30	4.84
El Salvador	33	4.29	54	4.02	52	3.29	14	5.83
Estonia	46	4.06	38	4.33	36	4.20	50	3.38
Finland	14	4.70	3	5.07	11	6.53	69	2.14
France	28	4.39	19	4.66	5	6.84	78	1.39
Germany	22	4.49	26	4.55	2	6.89	71	1.98
Greece	47	4.02	27	4.54	22	5.45	76	1.54
Guatemala	56	3.83	75	3.10	62	2.56	2	6.56
Haiti	68	3.48	78	2.85	79	1.22	1	7.00
Honduras	71	3.36	70	3.37	73	1.87	31	4.81
Hong Kong SAR	3	5.10	9	4.85	25	4.93	15	5.78
Hungary	49	3.98	47	4.17	27	4.82	60	2.76
Iceland	24	4.43	44	4.20	24	5.32	39	4.02
India	18	4.57	36	4.36	46	3.61	9	5.96
Indonesia	53	3.92	45	4.20	74	1.73	19	5.54
Ireland	9	4.88	28	4.49	14	6.32	36	4.21
Israel	62	3.66	43	4.26	35	4.20	73	1.93
Italy	27	4.39	24	4.59	17	6.27	70	2.12
Jamaica	74	3.25	64	3.63	70	2.08	46	3.63
Japan	29	4.36	22	4.62	15	6.31	74	1.90
Jordan	57	3.83	40	4.29	58	2.85	40	3.88
Korea	10	4.86	10	4.84	29	4.66	23	5.10
Latvia	55	3.89	32	4.40	44	3.63	53	3.13
Lithuania	45	4.06	37	4.35	47	3.49	38	4.03
Malaysia	20	4.53	7	4.93	37	4.13	37	4.14
Mauritius	36	4.22	56	3.99	38	3.88	24	5.00
Mexico	21	4.50	60	3.75	33	4.27	4	6.23
Morocco	44	4.07	18	4.66	51	3.31	45	3.64
Namibia	66	3.61	48	4.15	57	2.94	51	3.19
Netherlands	19	4.55	34	4.37	3	6.87	64	2.58
New Zealand	17	4.66	16	4.71	21	5.78	49	3.44
Nicaragua	79	2.63	76	3.06	77	1.51	58	2.90
Nigeria	61	3.67	55	4.01	78	1.46	22	5.21
Norway	7	4.99	2	5.27	7	6.75	63	2.68
Panama	42	4.13	39	4.30	48	3.47	35	4.43
Paraguay	63	3.65	73	3.29	69	2.18	13	5.84
Peru	52	3.95	49	4.15	59	2.84	34	4.65
Philippines	32	4.29	50	4.13	53	3.21	17	5.71
Poland	54	3.90	62	3.71	31	4.44	43	3.76
Portugal	40	4.20	57	3.99	19	6.12	62	2.72
Romania	58	3.79	71	3.31	66	2.38	6	6.18
Russian Federation	35	4.23	53	4.03	64	2.49	3	6.36
Singapore	1	5.72	1	5.39	18	6.23	11	5.88
Slovak Republic	64	3.64	52	4.05	43	3.67	59	2.77
Slovenia	50	3.95	35	4.36	26	4.88	68	2.21
South Africa	30	4.36	30	4.48	41	3.75	32	4.74
Spain	15	4.70	15	4.72	16	6.31	54	3.06
Sri Lanka	60	3.70	59	3.76	65	2.45	29	4.85
Sweden	34	4.23	14	4.75	13	6.44	80	1.00
Switzerland	5	5.00	4	4.99	1	7.00	55	3.04
Taiwan	6	5.00	11	4.83	23	5.39	26	4.93
Thailand	11	4.85	8	4.92	45	3.63	10	5.92
Trinidad and Tobago	25	4.41	29	4.48	39	3.83	28	4.86
Tunisia	37	4.22	23	4.60	40	3.83	42	3.84
Turkey	78	2.80	74	3.20	63	2.55	67	2.26
Ukraine	77	2.99	72	3.29	75	1.71	44	3.66
United Kingdom	16	4.69	31	4.43	4	6.86	56	3.04
United States	2	5.26	46	4.20	6	6.78	12	5.85
Uruguay	73	3.26	79	2.74	42	3.68	41	3.88
Venezuela	72	3.35	77	2.89	61	2.64	25	4.97
Vietnam	38	4.21	6	4.94	67	2.28	33	4.68
Zimbabwe	80	2.36	80	2.46	80	1.00	47	3.51

*The underlying values for these data are the Institutional Investor country credit ratings.

Table 8: Public institutions index components

	Public institutions index		Contracts and law subindex		Corruption subindex	
Country	Rank	Score	Rank	Score	Rank	Score
Argentina	66	3.38	76	2.35	58	4.42
Australia	5	6.23	4	6.03	8	6.44
Austria	11	5.90	8	5.79	19	6.02
Bangladesh	79	2.56	66	2.93	80	2.20
Belgium	22	5.36	22	5.14	30	5.58
Bolivia	69	3.13	70	2.69	71	3.56
Botswana	31	5.14	23	5.01	36	5.27
Brazil	45	4.45	45	4.08	46	4.82
Bulgaria	47	4.30	67	2.87	27	5.73
Canada	9	6.00	14	5.52	7	6.49
Chile	19	5.62	24	4.90	10	6.34
China	38	4.68	44	4.18	39	5.19
Colombia	54	4.10	64	3.05	41	5.14
Costa Rica	46	4.33	43	4.25	59	4.41
Croatia	57	4.04	60	3.26	45	4.83
Czech Republic	50	4.20	49	3.75	51	4.65
Denmark	2	6.50	2	6.28	3	6.72
Dominican Republic	60	3.93	56	3.42	57	4.43
Ecuador	75	2.98	78	2.29	69	3.67
El Salvador	48	4.24	58	3.33	40	5.16
Estonia	28	5.22	36	4.58	25	5.86
Finland	1	6.60	1	6.32	1	6.89
France	29	5.15	32	4.62	28	5.69
Germany	14	5.85	10	5.64	17	6.06
Greece	44	4.53	40	4.46	52	4.61
Guatemala	74	2.98	79	2.15	66	3.81
Haiti	80	2.11	80	1.80	79	2.41
Honduras	76	2.93	75	2.45	74	3.41
Hong Kong SAR	13	5.88	13	5.53	15	6.24
Hungary	30	5.15	30	4.66	29	5.65
Iceland	3	6.39	3	6.05	2	6.73
India	59	3.96	39	4.48	73	3.43
Indonesia	77	2.90	68	2.80	77	2.99
Ireland	18	5.76	20	5.25	14	6.26
Israel	17	5.76	12	5.55	22	5.97
Italy	37	4.71	47	4.03	32	5.39
Jamaica	51	4.18	52	3.61	49	4.75
Japan	25	5.27	37	4.56	21	5.97
Jordan	40	4.67	27	4.78	54	4.56
Korea	32	4.96	28	4.72	38	5.20
Latvia	52	4.12	50	3.66	53	4.59
Lithuania	36	4.89	51	3.64	16	6.13
Malaysia	33	4.94	34	4.59	34	5.29
Mauritius	35	4.91	25	4.88	42	4.94
Mexico	58	3.99	62	3.17	47	4.82
Morocco	56	4.05	46	4.07	64	4.03
Namibia	41	4.65	31	4.62	50	4.68
Netherlands	10	5.95	11	5.59	13	6.30
New Zealand	4	6.32	5	5.95	4	6.69
Nicaragua	64	3.50	69	2.69	60	4.31
Nigeria	78	2.89	61	3.18	78	2.60
Norway	12	5.89	16	5.46	12	6.32
Panama	55	4.06	53	3.60	55	4.52
Paraguay	71	3.09	72	2.63	72	3.55
Peru	49	4.24	59	3.27	37	5.21
Philippines	70	3.11	63	3.14	76	3.07
Poland	61	3.83	54	3.55	62	4.11
Portugal	21	5.50	17	5.43	31	5.57
Romania	67	3.38	65	2.96	67	3.80
Russian Federation	65	3.45	71	2.69	61	4.22
Singapore	7	6.17	9	5.78	5	6.55
Slovak Republic	53	4.11	57	3.39	44	4.84
Slovenia	23	5.33	26	4.83	26	5.82
South Africa	34	4.93	35	4.59	35	5.28
Spain	26	5.25	41	4.46	18	6.05
Sri Lanka	42	4.57	29	4.67	56	4.48
Sweden	15	5.81	18	5.28	11	6.33
Switzerland	8	6.07	7	5.79	9	6.36
Taiwan	27	5.25	33	4.61	23	5.89
Thailand	39	4.68	38	4.49	43	4.86
Trinidad and Tobago	43	4.56	42	4.35	48	4.78
Tunisia	24	5.31	19	5.28	33	5.34
Turkey	63	3.52	48	3.78	75	3.27
Ukraine	72	3.07	73	2.57	70	3.58
United Kingdom	6	6.19	6	5.85	6	6.54
United States	16	5.76	15	5.50	20	6.01
Uruguay	20	5.54	21	5.20	24	5.88
Venezuela	73	3.07	77	2.29	65	3.85
Vietnam	62	3.65	55	3.50	68	3.80
Zimbabwe	68	3.31	74	2.54	63	4.07

Finland, swapping positions with the United States this year, continues to perform extremely well with regard to its public institutions. Moreover, it is one of the most technologically advanced economies in the world, ranked number 3 on both the innovation subindex and the information and communication technology subindex. However, Finland falls to the 14th rank in terms of its macroeconomic environment, a decline that is primarily due to Finland's deteriorating position with regard to government expenditure.

Taiwan, ranked 7th last year, overtakes Singapore, whose overall position remains unchanged. Taiwan owes the improvement to the 3rd rank to very high scores on the technology index. Although Taiwan enjoys a macroeconomic environment that is quite favorable relative to most other countries, considerable competitive disadvantages are perceived to exist with regard to Taiwan's public institutions.

Switzerland and Japan have also been able to improve their overall positions. In both cases, technology represents the key driver behind these improvements. In the case of Switzerland, the country's dramatic rise in the technology index by 18 positions mirrors a 7-percent increase in the number of utility patents Swiss firms have registered in the United States in 2001. Swiss public institutions are also perceived to have improved relative to other countries, whereas the country slips slightly in the macroeconomic dimension of national competitiveness (a more detailed discussion of Switzerland's competitiveness can be found in Chapter 2.3). Japan's companies are even more competitive in terms of innovation, putting the country in the 5th position on that subindex as well as the technology index. Not surprisingly, however, Japan's position on the macroeconomic environment index and, to a somewhat lesser extent, the public institutions index drops markedly, reflecting the massive problems the country continues to face in these areas. These problems pose a formidable challenge to policymakers. The good news is, however, that the country's innovative power has remained very strong, and once the macroeconomic situation improves and the governance problems are addressed efficiently, Japan should be able to recover and resume economic growth.

It is more difficult to trace France's decline in the overall GCI back to an individual subset of factors. France slips on all counts: in the area of technology by 11 positions to number 28, with regard to the quality of its public institutions to 29, and concerning the macroeconomic environment to 28. Tables 6, 7, and 8 allow a more detailed assessment of France's relative ranking in all these dimensions.

As far as emerging-market countries are concerned, India represents a particularly interesting case. As noted earlier, India's overall position on the GCI improves this year by 8 positions to 48. In terms of technology, India ranks 2nd among the non-core innovators for the technology transfer index, a position that mirrors the country's overall strong performance in terms of the prevalence of foreign technology licensing and a relatively high score in terms of foreign direct investment and technology. However, India's overall improvement also mirrors a relatively stronger macroeconomic environment, driven for example by its jump from the 33rd to the 9th position on government expenditure.

Countries that have been experiencing financial turmoil show considerably lower readings on the overall GCI, primarily reflecting a much more difficult macroeconomic environment. Argentina's relative credit rating falls from the 43rd to the 72nd position. Access to credit is reported to have become much more difficult, putting Argentina at the 76th rank of the entire sample of 80 countries. A substantial deterioration also concerns the country's public institutions, with a rock-bottom score for property rights protection. Relative to its previous year's position, Turkey slips even more, by 16 positions to 69 on the overall GCI. Turkey faces a similarly complex mix of serious challenges, especially pertaining to its macroeconomic environment and its public institutions.

Conclusions

In closing, we stress again that the GCI rankings are empirically based rankings, whose quality is as good as the available evidence from recent worldwide experience with growth. Because we cannot observe future growth, we must look backward in testing and developing the rankings. Of course, if the future is not like the recent past, the rankings will not be good indicators of future growth. We are not suggesting that a country can *necessarily* grow rapidly if it reorients its policy to score high on the criteria listed in the *Global Competitiveness Report*. Still less are we suggesting that countries can guarantee rapid growth by concentrating exclusively on the small subset of variables that make up the GCI. Nevertheless, in the public discussion about economic policy, it is helpful to know which variables have been most strongly correlated with recent growth rates. The various subindexes aggregate these variables and, put together in the overall GCI, can help identify specific impediments to growth. Together with other chapters of this *Report*, it is hoped that our analysis help design policies to remove such impediments.

Notes

1 We would like to thank Frederic Davier of the Laboratory of Applied Economics, Department of Economic and Social Sciences, University of Geneva, for assisting us in analyzing the hard and Survey data used to calculate the Growth Competitiveness Index. We also wish to thank Andrew M. Warner, J. E. Austin Associates, Arlington, VA, and the Center for International Development at Harvard University, Cambridge, MA, for his assistance in examining the performance of the Growth Competitiveness Index over time. Some parts of this paper follow an earlier draft provided by Andrew M. Warner.

2 Note that the inflation rankings are based on a normalization of the data that is based on the ranks rather than the actual inflation rates.

3 Employing the European Union's own criteria to measure the region's progress toward becoming "the most competitive and dynamic knowledge-based economy in the world by 2010, capable of sustainable economic growth, with more and better jobs and greater social cohesion," one comes to slightly different results. However, even using the European Union's own benchmarks puts France into the bottom half of the competitiveness rankings among the individual member states (World Economic Forum 2002).

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Appendix: Composition of the Growth Competitiveness Index

The Growth Competitiveness Index is composed of three component indexes: the technology index, the public institutions index, and the macroeconomic environment index. These indexes are calculated on the basis of both "hard data" and "Survey data."

The responses to the Executive Opinion Survey are what we refer to as *Survey data*, with responses ranging from 1 to 7 (see the chapter at the end of the *Report* for further information on the Executive Opinion Survey); the hard data were collected from various sources, described in the Technical Notes and Sources at the end of the *Report*. Virtually all of the data used in the calculation of the Growth Competitiveness Index can be found in the data tables section of the *Report*.

The standard formula for converting each hard data variable to the 1-to-7 scale is:

$$6 \times \frac{(\text{country value} - \text{sample minimum})}{(\text{sample maximum} - \text{sample minimum})} + 1$$

The sample minimum and sample maximum are the lowest and highest values of the overall sample, respectively. In some instances, adjustments were made to account for extreme outliers in the data.

Calculating the Growth Competitiveness Index

As explained in the chapter, the sample of countries is divided into two groups: the core innovators and the non-core innovators. Core innovators are countries with more than 15 US utility patents registered per million population in 2001; non-core innovators are all other countries.

For the core innovators, we place extra emphasis on the role of innovation and technology. The weightings for the core innovators are as follows:

Growth Competitiveness Index for core innovators = (1/2 technology index) + (1/4 public institutions index) + (1/4 macroeconomic environment index)

For the non-core innovators, we calculate the Growth Competitiveness Index values as a simple average of the three component indexes:

Growth Competitiveness Index for non-core innovators = (1/3 technology index) + (1/3 public institutions index) + (1/3 macroeconomic environment index)

Technology index components

The technology index is calculated for the core and non-core innovators as follows:

technology index for core innovators = (1/2 innovation subindex) + (1/2 information and communication technology subindex)

technology index for non-core innovators = (1/8 innovation subindex) + (3/8 technology transfer subindex) + (1/2 information and communication technology subindex)

Innovation subindex

innovation subindex = (1/4 Survey data) + (3/4 hard data)

Innovation Survey questions

- 3.01 What is your country's position in technology relative to world leaders'?
- 3.02 Does continuous innovation play a major role in generating revenue for your business?
- 3.07 How much do companies in your country spend on R&D relative to other countries?
- 3.09 What is the extent of business collaboration in R&D with local universities?

Innovation hard data

- 3.15 US utility patents granted per million population in 2001
- 3.18 Gross tertiary enrollment rate in 1998 or most recent available year

Technology transfer subindex

technology transfer subindex = unweighted average of two technology transfer Survey questions

- 3.04 Is foreign direct investment in your country an important source of new technology?
- 3.05 Is foreign technology licensing in your country a common means of acquiring new technology?

Appendix: Composition of the Growth Competitiveness Index *(cont'd.)*

Information and communication technology (ICT) subindex

information and communication technology subindex = (1/3 information and communication technology Survey data) + (2/3 information and communication technology hard data)

Information and communication technology Survey questions

4.02 How extensive is Internet access in schools?
4.03 Is there sufficient competition among ISPs in your country to ensure high quality, infrequent interruptions and low prices?
4.04 Is ICT an overall priority for the government?
4.05 Are government programs successful in promoting the use of ICT?
4.06 Are laws relating to ICT (electronic commerce, digital signatures, consumer protection) well developed and enforced?

Information and communication technology hard data

4.07 Cellular mobile subscribers per 100 inhabitants, 2001
4.08 Internet users per 10,000 inhabitants, 2001
4.09 Internet hosts per 10,000 inhabitants, 2001
4.10 Main telephone lines per 100 inhabitants, 2001
4.11 Personal computers per 100 inhabitants, 2001

Public institutions index components

public institutions index = (1/2 contracts and law subindex) + (1/2 corruption subindex)

Contracts and law subindex (Survey questions)

6.01 Is the judiciary in your country independent from political influences of members of government, citizens or firms?
6.03 Are financial assets and wealth clearly delineated and well protected by law?
6.09 Is your government neutral among bidders when deciding among public contracts?
6.15 Does organized crime impose significant costs on business?

Corruption subindex (Survey questions)

7.01 How commonly are bribes paid in connection with import and export permits?
7.02 How commonly are bribes paid when getting connected with public utilities?
7.03 How commonly are bribes paid in connection with annual tax payments?

Macroeconomic environment index components

macroeconomic environment index = 1/2 macroeconomic stability subindex + 1/4 country credit rating[1] in March 2002 + 1/4 government expenditure[2] in 2001

Macroeconomic stability subindex

macroeconomic stability subindex = (2/7 macroeconomic stability Survey data) + (5/7 macroeconomic stability hard data)

Macroeconomic stability Survey questions

2.01 Is your country's economy likely to be in a recession next year?
2.05 Has obtaining credit for your company become easier or more difficult over the past year?

Macroeconomic stability hard data

2.15 Government surplus/deficit in 2001
2.17 National savings rate in 2001
2.19 Inflation in 2001
2.21 Real exchange rate relative to the United States in 2001
2.28 Lending– borrowing interest rate spread in 2001

Institutional Investor country credit rating,[1] March 2002

Government expenditure[2] as a percentage of GDP, 2001

Notes

1 The *Institutional Investor* country credit ratings are taken from http: //www.iiplatinum.com/rr/countrycredit/ccr/2002.htm

2 This refers to variable 2.16 in the Data Tables in Part 4 of the *Report*.