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Ranking of Countries – The WEF, IMD, Fraser and Heritage Indices

Wolfgang Ochel and Oliver Röhn*

Introduction

For more than 25 years ranking the competitiveness (and economic growth prospects) of countries and their underlying factors has been on the agenda. The interest in ranking has to do with the globalisation of economies. The business community uses rankings as a tool to determine investment plans and to assess locations for new operations. Governments interested in attracting enterprises find information to benchmark their policies against those of other countries. Academics use rankings for cross country analyses.

Rankings well-known to business leaders and policy makers are prepared by the World Economic Forum (WEF), IMD – the International Institute for Management Development –, the Fraser Institute and the Heritage Foundation. They are published annually.[1] Whereas the focus of the first two rankings is on the competitiveness of countries (and obstacles to growth), the last two assess what they consider to be the main factor of economic growth (and prosperity): the degree to which economies are free.

In the following we will present the rankings of the above mentioned organisations. Although the rankings cover many more countries, our main focus will be on the OECD members. We will discuss their general approach and their results, and investigate whether the rankings are related to the future economic performance of these countries. Furthermore, we will have a closer look at the methodology of the rankings: the selection of the determinants of competitiveness, the quality of the data, their standardisation and the weighting procedure when aggregating the variables into composite indicators.

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[1] Our choice of rankings and indicators is rather selective. We do not include important indices prepared by BERI, the Bertelsmann Stiftung, International Country Risk Guide (ICRG), World Bank Doing Business, etc. We also do not refer to indices used primarily in academic research on the determinants of economic performance, such as the Gastil's political rights index (Freedom House index), the World Bank's governance indicators (Kaufmann et al. 1999) and the Hall and Jones (1999) index.

Overview of the indices

Since 1979, the World Economic Forum (WEF) has annually published the World Competitiveness Report. The objective of the report is to assess the comparative strengths and weaknesses of national economies in terms of competitiveness and prospects for growth. The Global Competitiveness Report 2005–2006 presents three index rankings: the Growth Competitiveness Index (GCI), developed by Jeffrey Sachs, the Business Competitiveness Index (BCI), developed by Michael Porter, and the Global Competitiveness Index (Global-CI), developed by Xavier Sala-i-Martin. The GCI we are focusing on tries to measure national competitiveness. The strengths and weaknesses of national economies influence economic growth in a country. The main growth factors are technology, the state of a country's public institutions and the quality of the macroeconomic environment. The role of technology in the growth process differs for countries depending on their stage of development. For "core economies" technological innovation is critical for growth. "Non-core economies" can grow by adopting technologies developed abroad. 21 OECD countries are considered to be "core innovators" with at least 15 patents per million inhabitants in 2003. The GCI is calculated on the basis of 35 sub-indices. The weighting procedure is relatively sophisticated (see Box 1).

Since 1989 the International Institute for Management Development (IMD) has assessed the competitiveness of 51 nations (and 9 regions). The concept of competitiveness is quite similar to that of WEF. IMD distinguishes four main competitiveness factors: economic performance, government efficiency, business efficiency, and infrastructure. Each of these four factors is broken down into five subfactors (see Box 2). The ranking of IMD is based on 241 competitiveness criteria. The subfactors do not necessarily include the same number of criteria. Whereas each subfactor has the same weight in the aggregation process, the 241 criteria are weighted differently (IMD 2005).

The Fraser Institute has been publishing its Economic Freedom of the World index (EFW index) since 10 years. The main objective of the EWF index is not to assess the competitiveness of nations but to measure the differences in the consistency of institutions and policies with economic freedom. The four cornerstones of economic freedom are personal

Box 1

WEF Growth Competitiveness Index (GCI)

Objective: Gauge the ability of countries to attain sustained economic growth.

The GCI 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 35 sub-indices, a combination of "survey data (S)" and "hard data (H)". The survey data are from WEF's Executive Opinion Survey. The role of technology in the growth process differs for countries depending on their stage of development. For "core economies" technological innovation is critical for growth. "Non-core economies" can grow by adopting technologies developed abroad. "Core economies" are countries with more than 15 US utility patents registered per million inhabitants.

The weights for core (C) and non-core (N-C) countries differ (weights are given in parentheses):

Component indexes	Sub-indices	Data
Technology (C: 1/2; N-C: 1/3)	Innovation (C: 1/2; N-C: 1/8)	4 S and 2 H (S: 1/4; H: 3/4)
	Technology transfer (C: 0; N-C: 3/8)	2 S
	Information and communication technology (C: 1/2; N-C: 1/2)	5 S and 5 H (S: 1/3; H: 2/3)
Public institutions (C: 1/4; N-C: 1/3)	Contracts and law (C: 1/2; N-C: 1/2)	4 S
	Corruption (C: 1/2; N-C: 1/2)	3 S
Macroeconomic environment (C: 1/4; N-C: 1/3)	Macroeconomic stability (C: 1/2; N-C: 1/2)	2 S and 6 H (S: 2/7; H: 5/7)
	Country credit ranking (C: 1/4; N-C: 1/4)	1 H
	Government spending (C: 1/4; N-C: 1/4)	1 S

Sub-indices = Unweighted average of data if weights are not given.
The weights are based on regression analysis results (McArthur and Sachs 2001).

Source: World Economic Forum (2005).

Box 2

IMD World Competitiveness Yearbook (WCY)

Objective: Assessment of the competitiveness of 51 nations and 9 regions. Ranking the ability of nations to create and maintain an environment that sustains the competitiveness of enterprises and promotes economic growth.

The WCY divides national environment into four main competitiveness factors. Each of these four factors has been broken down into five sub-factors:

Economic performance	*Government efficiency*	*Business efficiency*	*Infrastructure*
Domestic economy	Public finance	Productivity	Basic infrastructure
International trade	Fiscal policy	Labour market	Technological infrastructure
International investment	Institutional framework	Finance	Scientific infrastructure
Employment	Business legislation	Management practices	Health and environment
Prices	Societal framework	Attitudes and values	Education

The WCY is based on 241 competitiveness criteria: 128 hard data and 113 survey data. The survey data are drawn from the IMD Annual Executive Opinion Survey.

The sub-factors do not necessarily include the same number of criteria. Each sub-factor, independently of the number of criteria it contains, has the same weight in the aggregation procedure that is 5 percent (20 x 5 = 100). Within each subgroup survey data receive a weight of 0.5 and hard data of 1.0.

Source: IMD (2005).

Box 3

Fraser Institute: Economic Freedom of the World (EFW index)

Objective: The measurement of differences in the consistency of institutions and policies with economic freedom. Key ingredients of economic freedom are personal choice, freedom of exchange, freedom to enter and compete in markets and protection of private property.

The EFW index measures the degree of economic freedom present in five major areas:
- Size of government: Expenditures, taxes and public enterprises,
- Legal structure and security of property rights,
- Access to sound money,
- Freedom to trade internationally,
- Regulation of credit, labour and business.

Within the five major areas, 21 components are incorporated into the index but many of those components are themselves made up of several sub-components. The index uses 38 distinct pieces of data. Nearly half of them are survey data supplied by WEF and IMD surveys. Each component is placed on a scale from 0 to 10.

The component ratings within each area are averaged to derive ratings for each of the five areas (regression estimates were used to adjust the area ratings for the countries without survey data). In turn, the summary rating is the average of the five area ratings.

Source: Fraser Institute (2005).

choice rather than collective choice, exchange coordinated by markets rather than allocation via the political process, freedom to enter and compete in markets, and protection of persons and their property from aggression by others. These four cornerstones require governments to do some things but refrain from doing others. According to the Fraser Institute, governments can promote or reduce economic freedom in five major areas: size of government, the legal system, access to sound money, freedom to trade and regulations of credit, labour and business (see Box 3). These areas are subdivided by components and subcomponents with a total of 38 criteria. The aggregation of subcomponents and components is carried out by using unweighted averages (Fraser Institute 2005).

The Index of Economic Freedom of the Heritage Foundation pursues the same objectives as the EFW index. A list of 50 independent factors is divided into 10 broad factors of economic freedom (see Box 4). The 50 independent variables which determine the 10 broad factors are weighted by the experts of the Heritage Foundation. The overall score is determined by weighting the 10 factors equally (Heritage Foundation 2005).

Box 4

Heritage Foundation Index of Economic Freedom

Objective: Systematic, empirical measurement of economic freedom. Economic freedom is defined as the freedom of people to work, produce, consume and invest in the ways they feel are most productive.

The Index is not designed to measure how much each determinant of economic freedom adds to economic growth, although it is acknowledged that economic freedom promotes economic growth.

The 2005 Index of Economic Freedom measures 155 countries against a list of 50 independent variables divided into ten broad factors of economic freedom:
- Trade policy,
- Fiscal burden of government,
- Government intervention in the economy,
- Monetary policy,
- Capital flows and foreign investment,
- Banking and finance,
- Wages and prices,
- Property rights,
- Regulation and
- Informal market activity.

The 50 independent variables are analyzed to determine for each of the 10 factors a score on a scale running from 1 to 5. A score of 1 signifies high economic freedom, while a score of five indicates low economic freedom. All 10 factors are considered to be equally important to the level of economic freedom. Thus, to determine a country's overall score, the factors are weighted equally.

Source: Heritage Foundation (2005).

Comparing the ranking results

Table 1 presents the results of the four rankings for OECD countries (but omits the rankings of the other countries). With respect to the average ranking the United States, Switzerland, Denmark, Iceland and Australia are the top five countries. However, none of these five countries is a top performer in all four rankings. The middle group consists of Sweden, the Netherlands, Germany, Japan, Spain, etc. The countries with the lowest ranking are Slovakia, Greece, Poland, Mexico and Turkey.

In order to check how similar the four rankings are, a rank correlation (Spearman index) is employed. Table 2 shows that the mean correlation coefficients

Table 1

Ranking results

Rank	WEF GCI 2006[a]	score	IMD 2005[b]	score	Fraser 2003[c]	score	Heritage 2005[d]	score	Average ranking[e]	
1	FIN	5.94	USA	100.0	NZL	8.20	LUX	1.63	USA	3.8
2	USA	5.81	ICE	85.3	CHE	8.20	IRL	1.70	CHE	5.5
3	SWE	5.65	CAN	82.6	USA	8.20	NZL	1.70	DNK	6.0
4	DNK	5.65	FIN	82.6	GBR	8.10	GBR	1.75	ICE	6.0
5	ICE	5.48	DNK	82.5	CAN	8.00	DNK	1.76	AUS	7.2
6	CHE	5.46	CHE	82.5	IRL	7.90	ICE	1.76	FIN	7.3
7	NOR	5.40	AUS	82.0	AUS	7.80	AUS	1.79	NZL	7.8
8	AUS	5.21	LUX	80.3	LUX	7.80	CHE	1.85	CAN	8.0
9	NLD	5.21	IRL	77.8	AUT	7.70	USA	1.85	LUX	8.8
10	JPN	5.18	NLD	77.4	DNK	7.70	SWE	1.89	GBR	8.8
11	GBR	5.11	SWE	76.3	ICE	7.70	FIN	1.90	IRL	9.0
12	CAN	5.10	NOR	76.2	NLD	7.70	CAN	1.91	SWE	10.5
13	DEU	5.10	NZL	75.5	FIN	7.60	NLD	1.95	NLD	11.0
14	NZL	5.09	AUT	74.3	DEU	7.50	DEU	2.00	AUT	13.5
15	KOR	5.07	JPN	68.7	BEL	7.40	AUT	2.09	NOR	13.5
16	AUT	4.95	GBR	68.5	HUN	7.40	BEL	2.13	DEU	14.5
17	PRT	4.91	DEU	67.8	NOR	7.30	ITA	2.28	JPN	17.0
18	LUX	4.90	BEL	67.5	SWE	7.30	NOR	2.33	BEL	17.8
19	IRL	4.86	KOR	64.2	JPN	7.20	ESP	2.34	ESP	20.5
20	ESP	4.80	FRA	64.2	ESP	7.20	CZE	2.36	HUN	20.8
21	FRA	4.78	CZE	60.1	PRT	7.10	HUN	2.40	KOR	20.8
22	BEL	4.63	HUN	59.9	KOR	7.00	SVK	2.43	PRT	21.5
23	CZE	4.42	ESP	59.4	FRA	6.90	PRT	2.44	CZE	22.0
24	HUN	4.38	SVK	58.6	GRC	6.90	JPN	2.46	FRA	22.5
25	SVK	4.31	PRT	52.4	CZE	6.80	POL	2.54	ITA	24.5
26	GRC	4.26	TUR	51.3	ITA	6.60	FRA	2.63	SVK	24.5
27	ITA	4.21	GRC	50.3	SVK	6.60	KOR	2.63	GRC	26.3
28	POL	4.00	ITA	45.8	MEX	6.50	GRC	2.80	POL	28.0
29	MEX	3.92	MEX	41.5	POL	6.10	MEX	2.89	MEX	28.8
30	TUR	3.68	POL	39.0	TUR	5.90	TUR	3.46	TUR	29.0

[a] Range of scores from 1 to 7 (best). – [b] Scores between 0 and 100 (best). – [c] Scores between 0 and 10 (best). – [d] Scores range from 1 (best) to 5. – [e] Average of the four ranking positions.

Sources: World Economic Forum (2005); IMD – International Institute for Management Development (2005); Fraser Institute (2005); Heritage Foundation (2005).

of the four rankings vary between 0.73 (WEF) and 0.82 (IMD). The highest correlations are found between WEF and IMD (0.87) and between Fraser and Heritage (0.87). These results reflect the fact that the WEF index and the IMD index focus on competitiveness and economic growth whereas the main objective of Fraser and Heritage is to assess the economic freedom of countries. Therefore, WEF and IMD, on the one hand, and Fraser and Heritage, on the other hand, use similar variables for their rankings. The lowest correlations are found between Heritage and WEF (0.63) and between Fraser and WEF (0.68).

Table 2

Spearman correlation coefficients of the rankings

	WEF	IMD	Fraser	Heritage	Mean
WEF	1	0.87	0.68	0.63	0.73
IMD	0.87	1	0.83	0.78	0.82
Fraser	0.68	0.83	1	0.87	0.79
Heritage	0.63	0.78	0.87	1	0.76

Source: CESifo calculations based on Table 1.

In addition to rank correlations, the extent to which individual countries change their position when different indices are used demonstrates how similar the rankings are. Table 3 shows the deviation between the highest and the lowest position of the four rankings for individual countries. Whereas the deviation is very low for Australia and Mexico and rather low for several other countries it is high for Luxembourg, Ireland, Sweden, Japan and New Zealand. The high deviations are the result of different rankings of

Table 3

Greatest deviation of rankings[a)]

AUS	1	DNK	6	ITA	11
MEX	1	FRA	6	NOR	11
DEU	4	CHE	6	FIN	12
GRC	4	AUT	7	KOR	12
NDL	4	BEL	7	GBR	12
ESP	4	HUN	8	NZL	13
TUR	4	PRT	8	JPN	14
CZE	5	USA	8	SWE	15
POL	5	CAN	9	IRL	17
SVK	5	ICE	9	LUX	18

[a)] Deviation between the highest and the lowest position of the four rankings.

Source: CESifo calculations based on Table 1.

WEF on the one side and Fraser and Heritage on the other side. Whereas WEF attributes a relatively high degree of competitiveness to Sweden (rank 3) and Japan (rank 10), their economic freedom is considered to be low: rank 18 (Fraser) and rank 24 (Heritage), respectively. The opposite is true for the other three countries: they receive low rankings with regard to competitiveness and high rankings with regard to economic freedom (Table 1).

The indices and subsequent growth: Some simple correlations

One reason why composite indices have received a great deal of attention recently might be borne by the expectation that they can help explain differences in future economic performance. Politicians and the business community are especially interested in future growth prospects. Both the WEF and IMD indices try to measure the competitiveness of nations. Competitiveness seems closely related to the growth prospects of a country, and WEF explicitly states that it analyzes "the extent to which individual national economies have the structures, institutions and policies in place for economic growth over the medium term, roughly a perspective of five years" (McArthur and Sachs 2001, 28).

Figures 1 and 2 depict some simple correlations between the index values in 2001 and the average per capita growth rate over the period 2000–04. In both cases there appears to be no systematic relationship between the index values and subsequent growth. While there is a slight positive, although not significant, correlation between the WEF index and the average growth rate, the correlation is even negative in the case of the IMD index.[2]

In contrast to IMD and WEF, Heritage and Fraser try to assess the economic freedom of countries. While the competitiveness of nations might impact economic growth in the shorter run, the effect that economic freedom exerts on a country's economic performance is likely to be only in the longer run.

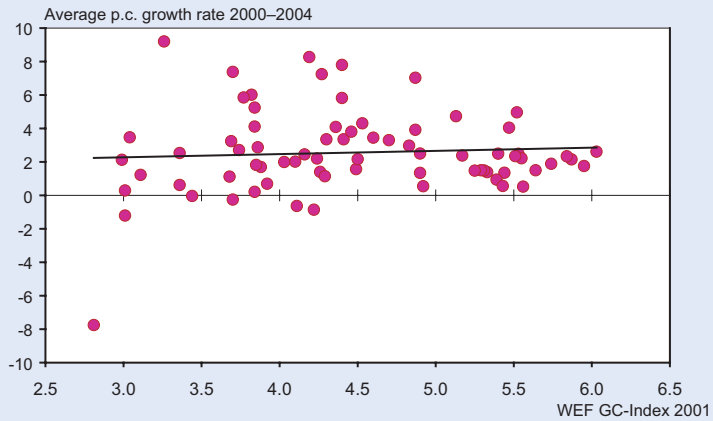
Figure 3 plots the country values of the Fraser index in 1980 and the average per capita growth rate over the period 1980–2004. Although there appears to be a lot of unexplained variation in cross country per capita growth rates, the relationship is clearly positive (and significant). In the case of the Heritage index we are restricted to a period of about ten years as the index only dates back to 1995. As is apparent from Figure 4 there does not seem to be a clear connection between the index and subsequent growth.[3] However, a period of about ten years might not be

[2] One might object to our choice of the growth period under study as it is likely to be influenced by the burst of the New Economy bubble and therefore may not be representative. We are, however, restricted to this period since the version of WEF's Growth Competitiveness Index discussed in this article was not introduced until 2001.

[3] The correlation is slightly positive (yet insignificant), which is unintuitive for the case of the Heritage index since *higher* index values represent *lower* economic freedom.

Figure 1

RELATIONSHIP BETWEEN WEF GC-INDEX AND GROWTH

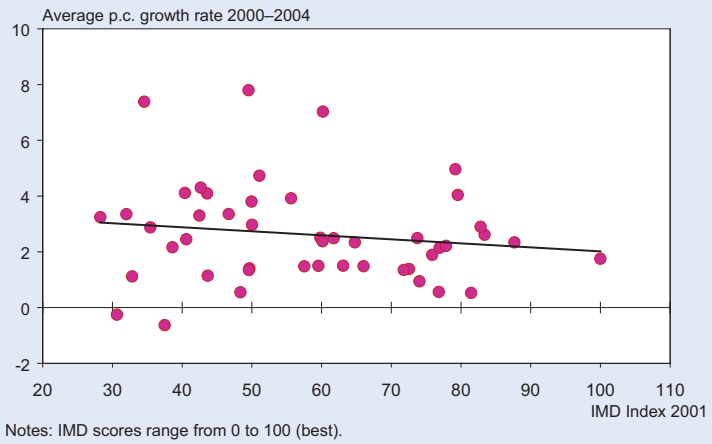


Notes: GCI scores range from 1 to 7 (best).

Source: CESifo.

Figure 2

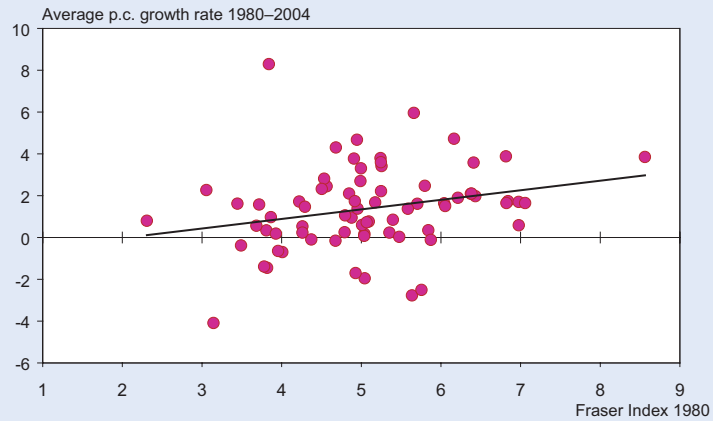
RELATIONSHIP BETWEEN IMD INDEX AND GROWTH



Notes: IMD scores range from 0 to 100 (best).
Source: CESifo.

Figure 3

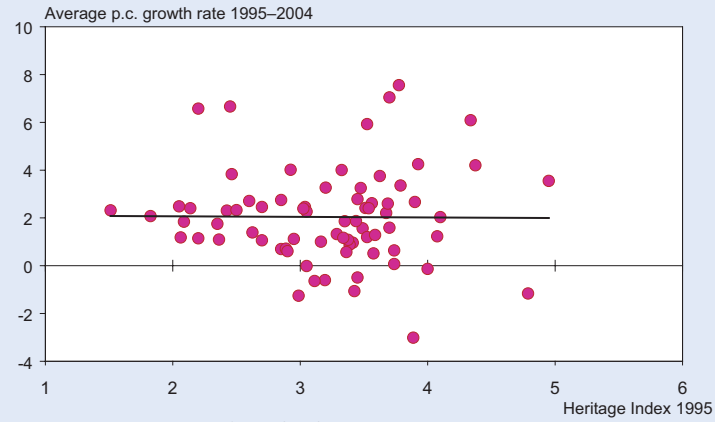
RELATIONSHIP BETWEEN FRASER INDEX AND GROWTH



Notes: Fraser scores range from 0 to 10 (best).
Source: CESifo.

Figure 4

RELATIONSHIP BETWEEN HERITAGE INDEX AND GROWTH



Notes: Heritage scores range from 1 (best) to 5.
Source: CESifo.

enough to uncover the effects of economic freedom on growth.

Clearly, the simple correlations reported in this section should not be mistaken as a robust statistical analysis of the predictive ability of the indices for future growth. Still, the weak correlations – with the exception of the Fraser index – suggest a rather limited use of these indices to assess future growth prospects. In the following sections we turn to investigate the crucial steps in constructing these composite indices.

Selected variables

The quality of our four indexes depends among other things on the selection of variables. The choice of the variables should be based on the theoretical and empirical relevance of the phenomenon being measured and on their measurability.

The focus of the WEF index is on competitiveness and economic growth. Drawing on the economic growth literature and research at the Centre for International Development at Harvard University, McArthur and Sachs (2001) tested the links of more than a dozen sub-indices with GDP per capita growth between 1992 and 2000 for a sample of 75 economies. They created indices for three broad factors that proved to be linked to economic growth: technology, public institutions and macroeconomic environment. Technology is subdivided into the sub-indices innovation (overall level of innovation, company R&D spending relative to international peers, private sector R&D collaboration with local universities, gross tertiary enrolment

rate, etc.), technology transfer (direct investment as a source of new technology and technology-in-trade), and information and communication technology (Internet access in schools, number of mobile telephone users, Internet users per capita, etc.). The public institutions index consists of economies' average score on questions concerning neutrality in government procurement, judicial independence, clear delineation and respect for property rights, corruption etc. The macroeconomic environment index measures the overall stability of a country's macro economy, the short-term outlook of private agents and the share of government expenditures as a percentage of GDP (see Box 1).

Although the WEF GCI includes important growth factors, it is not at all comprehensive. The empirical literature on the determinants of economic growth points to additional factors such as geography, human resources, health, religion, social capital and infrastructure (Durlauf et al. 2004, App. 2). With special reference to OECD countries, Bassanini et al. (2001) have demonstrated that government revenues as percentage of GDP, high government transfers as opposed to government investment, high direct taxes, etc., are (negatively) associated with growth and should not be omitted when ranking the growth prospects of countries. Furthermore public institutions have been captured by WEF in a very general way, whereas concrete product market regulations, labour market institutions and regulations of entrepreneurial activities have not been included (Nicoletti and Scarpetta 2003). And finally indicators for market efficiency, competitive policy and trade openness have been neglected (Ahn and Hemmings 2000; OECD 2003).

The exclusion of the above-mentioned growth factors may be because WEF produces a business competitiveness index in addition to the GCI. The BCI refers to the microeconomic foundations of competitiveness and includes some of the growth factors omitted by the GCI. Another reason for the exclusion of some growth factors may have been their low impact on economic growth shown by the test undertaken by McArthur and Sachs. Unfortunately the test results are not published (McArthur and Sachs 2001). Anyhow, the omission of growth factors should have contributed to the low explanatory power of the GCI for economic growth.

Whereas WEF's GCI omits important growth factors, IMD has included a rather comprehensive set of growth factors in constructing its WCY index. Starting from four dimensions that shape a country's competitiveness environment (attractiveness vs. aggressiveness; proximity vs. globality; assets vs. processes and individual risk taking vs. social cohesiveness) four competitiveness factors with twenty subfactors (see Box 2) are deduced (Garelli 2001). The IMD index is a business school product. The knowledge of many business leaders has been used in order to select the main determinants of competitiveness and growth. The index is meant to be a guide for firms' locational decisions. The 241 indicators facilitate detailed descriptions of the countries. However, the IMD approach has two disadvantages. Performance indicators and impact factors are mixed although they cannot be influenced by policy to the same extent (Heinemann et al. 2004, 18–22). And even more critical: No theoretical or econometric approach is used in order to identify the most important growth factors. Their choice seems to be carried out quite subjectively (Drews 2005, 201–212).

The WEF and IMD assume that the growth process follows the same rules and is based on the same growth factors in all countries. The only exception is the distinction between "core" and "non-core" countries made by WEF. This distinction implies that additional factors are used in order to characterize the transfer of technology in "non core" countries. Apart from this exception both approaches assume linearity in the growth process for all countries. This assumption is, however, not very realistic. Durlauf and Johnson (1995) have shown that there are groups of countries with different structural characteristics and initial conditions which determine the growth process in a different way. By using classification and regression tree methods, they subdivide 96 countries into four "convergence clubs" with nonlinear growth processes. The OECD countries belong mainly to two different groups. Subsequent research has reinforced Durlauf and Johnson's findings of multiple "convergence clubs", although the discussion on growth convergence is continuing (for an overview see Durlauf et al. 2004, 89–96; Hemmer and Lorenz 2004, chapter 7). Not taking into consideration nonlinearities in the growth process and not selecting different indicators for each "convergence club" is a weakness of the IMD index and to a lesser extent of the WEF index.

The main objective of the Fraser index and of the Heritage index is not to assess the growth prospects of countries but to measure economic freedom. The meaning of economic freedom was discussed at sev-

eral conferences at the Fraser Institute and inspired by liberal and institutionalist thinking. By taking institutions into consideration, a fundamental precondition for a favourable long-term economic performance is addressed. There was agreement that the four key ingredients of economic freedom mentioned above should be the guideline for governmental activities. Governments should be of limited size, should establish a legal structure that provides for the even-handed enforcement of contracts, the security of property rights, etc., and should facilitate access to sound money. In addition, the freedom to international trade should be guaranteed, credit and labour markets should be regulated appropriately and the entry into business activities not restricted. The Fraser index selects 21 components in 5 major areas (see Box 3). It reflects the essence of a free private market and represents an "ideal" state in which a limited government guarantees some fundamental prerequisites for this market. Focusing on economic freedom the Fraser index does not include growth factors common to the WEF and IMD indexes. It therefore seems obvious that it cannot explain economic growth adequately at least in the shorter to medium run.

The Heritage Foundation Index defines economic freedom in a way similar to the Fraser Institute. Economic freedom is understood as the absence of government coercion or constraint on the production, distribution, or consumption of goods and services beyond the extent necessary for citizens to protect and maintain liberty itself (Beach and Miles 2005). Ten areas are identified with a total of 50 independent variables that grade each country's level of economic freedom (see Box 4). Many of them are institutional factors like the top marginal income tax rate, restrictions on foreign ownership of business, minimum wage laws, legally granted and protected private property, labour regulations, etc. Explanations are given as to why these variables are chosen and how they are related to economic freedom. Although the explanations are not unconvincing, the choice of variables is somehow subjective.

Data

The indices are calculated on the basis of hard data and survey data. The WEF uses 14 hard data and 21 survey data, IMD 128 hard data and 113 survey data, Fraser 19 hard data and 19 survey data, whereas in the case of the Heritage Foundation hard data prevail. Hard data are taken from statistics of international organisations. While their use is unproblematic the use of survey data is not. Survey data are generated by the WEF's and IMD's executive opinion surveys and are also used by Fraser.

The WEF Executive Opinion Survey captures the perceptions of executives on obstacles to growth in more than 100 countries. The survey is carried out among business executives and entrepreneurs with some international activity in enterprises ranging from smaller companies of 50 employees to very large multinationals. The sample of firms covers a variety of industries and is composed of a cross-section of domestic private-sector firms, foreign owned firms and firms with government participation. In 2004 more than 2,100 executives from 30 OECD member countries took part in the survey with 226 from Turkey (greatest sample) and 20 from Sweden (minimum sample; WEF 2004, 199–208). IMD surveys executives in top and middle management representing a cross-section of the business community in each country or region. The participants are nationals with international experience or expatriates. In 2005 IMD surveyed 4000 executives from 60 economies (Rosselet-McCauley 2005).

The surveys provide qualitative information on concepts that are difficult to measure. They capture the perceptions of executives on the environment in which they work. The executives express their views on the issues that they believe are the cause of constraining economic growth in their country. Compared to hard data, survey data are more recent and sometimes closer to reality. However, the survey data also have their shortcomings.

One precondition for good survey results is a high quality questionnaire. The questions should be clear, be based on appropriate concepts to capture the different subjects and should not be similar. These preconditions are not always fulfilled. For instance the question about a country's level of "technological readiness" (WEF: question 3.01) is ambiguous. Which technology is meant? And what does "world leaders" mean, who serves as a benchmark? What does it mean "to be aggressive in absorbing new technology"? (WEF: 3.02). And which institutions are included when assessing the quality of scientific research institutions (WEF: 3.05; Lall 2001, 1518)? Furthermore, the questions are not always based on clear concepts. Just to give one example: in order to assess the impact of the wage bargaining system on

wages, the coordination of wage bargaining must also be taken into consideration, not only centralization, as in the survey. (WEF: 9.19). And finally there are quite a lot of repetitive questions that do not add meaningful new information.

The other precondition for good survey results is high quality responses. In order to meet this requirement, the participants of the survey should be selected carefully and the sample should be representative. Furthermore, the respondents should use the same benchmarks when comparing their countries with other countries. These conditions are also not always fulfilled. There is no doubt that the business executives of the panels are experts and have an excellent knowledge of the economic environment of their countries. However, they do not represent all stakeholders that influence competitiveness and economic growth, such as union leaders, politicians and scientists. Beyond that, executives will have difficulties employing the same standard in assessing institutional and policy arrangements to take into account the relative position of a country in relation to other countries. These difficulties are exemplified by the assessment of hiring and firing practices in different countries. With scores ranging from one to seven, Germany with a score of 2.2 occupies place 102 among 104 countries, just ahead of France (place 103), but behind Portugal, Spain, Greece and Turkey (WEF 2004, 599). At the same time, the OECD (2004, 117, column 13) considers Germany's hiring and firing regulations to be less restrictive than those of the countries just mentioned. The difference in the ranking may be due to the assessment being based on different conceptual approaches. But one cannot exclude the possibility that German executives approached the task of assessing Germany's labour market flexibility in a more "pessimistic" frame of mind than their foreign counterparts with respect to their own countries. The WEF could make the assessment standard more comparable between the countries involved by engaging the executives in an organised exchange of views.

Although the perceptions of executives provide important information when ranking growth prospects of countries, the quality of the surveys raises some doubts on the reliability of these rankings.

Standardization

Variables underlying a composite indicator usually come in a variety of different statistical units. In order to aggregate variables into a composite indicator the variables need to be normalised or standardised to a common scale. The most commonly used normalisation methods are simple (often linear) transformations of the underlying data that do not influence the ranking of countries within an individual indicator. The choice of the standardisation or normalization method can, however, impact country rankings when the individual indicators are aggregated into a composite indicator (see Freudenberg 2003 and Matthes and Schröder 2004 for examples). The basic intuition being that relative distances between country values within the original indicator are influenced by the transformation method.

Heritage's Index of Economic Freedom uses the *score classes method* (also *categorical scaling method*) to assign a country a score between 1 and 5 for each of its 10 factors. A score of 1 signifies an economic environment or set of policies that are most conducive to economic freedom, and a score of 5 represents the least favourable environment for economic freedom (Heritage 2005). In general, this method assigns each variable a score depending on whether its value is below or above a certain threshold. For instance, a country receives a score of 1 in the trade policy factor if the weighted average tariff rate is equal to or below 4 percent, a score of 2 if the weighted average tariff rate is between 4 percent and 9 percent and so forth. Additionally, however, Heritage uses expert assessments to determine the final score and assigns a country an additional point if there are substantial non-tariff barriers or ample evidence for corruption within the customs authorities.

Fraser's EFW index and the GCI of WEF employ both the *score classes method* and *continuous scaling methods* based on linear interpolations to normalize the underlying indicators to lie within a scale of 0–10 (EFW) and 1–7 (GCI). In contrast to the score classes method, continuous scaling methods transform the underlying indicator values into a continuous, uniform scale that retains the relative distances between the original values (Matthes and Schröder 2004). The basic equation for this class of standardisation methods is $X = (I-a) / b$, where "I" is the original value of the indicator and "a" and "b" are constants to be chosen. Both Fraser and the WEF use the distance from the best and worst performer ("Min-Max" method) to transform the original indicators into a range between 0 and 1. According to

this approach, "a" is the minimum indicator value I_{min} and "b" is equal to the distance between the highest and lowest indicator value ($I_{max} - I_{min}$).[4] In a second step, EFW and GCI linearly transform these values to lie within a range of 0 and 10 and 1 and 7, respectively.

IMD also employs a continuous scaling method to transform all original indicators into a common scale. Yet they use a slightly different linear interpolation method. All original indicator values are transformed into a standardised distribution with mean 0 and standard deviation of 1. It follows that "a" is equal to the mean of an indicator and "b" is equal to the standard deviation of the indicator values. This procedure again assures a common scale for all indicators and, thus, renders aggregation into a composite indicator possible. The resulting composite indicator is additionally transformed according to the "Min-Max" method described above to take values between 0 and 100. This last step is done for illustrative purposes only and does not influence the final ranking.

The *score classes method* provides a reasonable approach to quantify information that would otherwise not be measurable. An example could be expert assessments about the legal framework of a country or the security of property rights. Yet, the method exerts several weaknesses if the underlying indicators represent hard or quantifiable data. Heritage's index and in parts Fraser's index rely on this approach to rescale hard data. First, the score classes method discards valuable information regarding the relative differences of indicator values. On the one hand relatively large differences in the underlying indicator can result in the same score, marginal differences on the other hand can lead to discrete jumps in the score classes. To illustrate this point, consider two countries that impose an average tariff rate of 4.1 percent and 8.9 percent, respectively. Both countries would receive a score of 2 in Heritage's trade policy factor. In contrast, a third country with a slightly higher tariff rate of 9.1 percent than the second country, would receive a score of 3. A second problem arises with regard to the definition of the decisive thresholds. In principle, these thresholds could be theoretically justified. If such a justification is lacking, however, the classification becomes arbitrary. This limitation is not confined to hard data but also applies if the underlying indicator represents soft data. In the case of Heritage and Fraser these theoretical considerations are not evident and hence the thresholds seem at least questionable. The allegation of subjectivity is further aggravated in the case of Heritage by the inclusion of expert assessments to determine the final score.

Proportional continuous scaling methods based on linear interpolations avoid distortions due to discrete jumps and preserve the information about relative distances in the original indicator values at the same time. These approaches are, however, problematic if even distributions, where most of the country values are centred around the mean indicator value, are combined with uneven distributions with extreme indicator values into a composite indicator (Matthes and Schröder 2004). The intuition is simple. The presence of countries with extreme indicator values results in a large denominator "b" and small standardized variables if "I" is small. Therefore, differences in the middle part of the distribution of the original indicator are compressed. This in turn implies that important yet relatively small differences within the original indicator values are obscured by continuous scaling methods based on linear interpolations in the presence of extreme outliers. Thus, when aggregating even and uneven distributions, differences in the latter are implicitly down weighted and not properly reflected in the composite indicator. This problem is more pronounced in the "Min-Max" method used by Fraser and WEF than in the "standard deviation from the mean" method employed by IMD.

The outlier problem can of course be avoided if extreme values are completely neglected. This approach is chosen in part in the Growth Competitiveness Index of WEF. A more sophisticated method is proposed by Matthes and Schröder (2004). They suggest a two-step procedure, where the first step involves a linear transformation similar to the "standard deviation from the mean" method described above. In the second step, however, they employ a logistic function. The advantage of the logistic transformation is that extreme values are forced into a given range (e.g. 0–100) and the "compression effect" of the first step is mitigated. Further, this approach allows the flexibility – by appropriate choice of a constant – to account for different degrees of "uneveness" in the underlying distribution. A related approach is employed in the Bertelsmann Index (Hafemann and van Suntum 2004; Kladroba 2005).

[4] If lower values of an indicator are better, the nominator of the basic equation changes to $I_{max} - I$.

Weighting

After the variables have been normalized they are typically aggregated into a composite index in the following form:

$$CI = \Sigma\, w_i\, x_i,$$

where "x_i" is a normalised variable, "w_i" is a weight attached to "x_i", and $\Sigma\, w_i = 1$.[5] Usually the weighting approach proceeds in two stages. First, the underlying indicators are organized into "thematic" sub-groups and weights are assigned to the variables within a sub-group to derive a sub-index. Second, the sub-indices are weighted to build a composite indicator. The weighting approach is crucial, since the overall index and hence the country ranking is in general heavily influenced by the weighting scheme. This is the more pronounced, the more polarised the country profiles with regard to the underlying indicators, i.e. the more a country is characterized by extreme (both high and low) indicator values (Freudenberg 2003).

The weights assigned to each component reflect their relative importance in the composite index. Hence, the weights should ideally be based on an underlying theoretical framework. The lack of clear theoretical guidance in the weight selection process induces many authors of composite indices to assign equal weights to each component. In fact, this is the approach chosen by IMD, Fraser and Heritage. In the first step, the universe of basic indicators are grouped into 20 (IMD), 10 (Heritage) and 5 (Fraser) sub-indices. In the second step all sub-indicators are assigned equal weights in the composite index. The two-step procedure assures that subindices with a greater number of underlying indicators are not automatically overestimated. Common weighting implies, however, that all subindices are of equal importance, which seems questionable with the indices at hand. Further, equal weighting together with the linear aggregation rule specified in the equation above presumes that all indicators are perfect substitutes. A decrease of one point in one indicator or sub-index can be fully compensated by an increase of one point in any other sub-index. Finally, a further problem of equal weights arises in the presence of highly correlated components of a composite indicator. High correlation between sub-components might indicate that the two indicators are measuring the same underlying concept. Thus, if two correlated indicators or sub-indices are included in a composite index the unique dimension they represent is double counted, biasing the index towards that dimension.

The use of statistical techniques can avoid equal or arbitrarily chosen weights even in the absence of a clear theoretical framework. Statistical methods exploit common dependencies among the underlying indicators and, thus, let the data endogenously determine the weights. If the target variable is sufficiently specified and measurable the weights can be based on regression analysis. The GCI of the WEF employs regression analysis with the average growth rate as the dependent variable to establish the weights of its three subcomponents as well as the weights within these subcomponents. Their cross sectional analysis also reveals that the weights of the components should differ between the core and non-core countries. Even though simple cross sectional regression analysis is more objective and superior to equal or subjective weighting schemes, the method also has certain limitations.[6] First, simple correlations between the dependent and the independent variable cannot establish causality. Further, even if there might be a cause and effect relationship, the direction of causality is unknown without further analysis. The issue seems especially important in the case of the GCI, since the components of the index are regressed on past growth instead of future growth to establish the weights. Moreover, some of the included variables, in particular indicators based on survey data, seem likely to be influenced by the growth performance instead of being its cause. Second, cross country analysis cannot account for the specific characteristics of individual countries. This problem becomes more pronounced as the sample of included countries increases and the more heterogeneous the countries under study are. The GCI partly corrects for this issue by allowing the weights to differ between developed and developing countries. In principle, both the problem of causality and country heterogeneity can be more adequately addressed using panel data. However, long-time series are usually scarce, especially for the wide range of indicators employed and countries analysed.

[5] We focus on linear aggregation rules since all indices discussed here follow this simple rule. Linear aggregation implies that all indicators are *mutually preferentially independent,* i.e. the trade-off ratio between two variables given by the weights is independent of the values of all other variables. This might be an undesirable feature. For a detailed discussion see e.g. Munda and Nardo (2003). For other aggregation rules see e.g. Giovanni et al. (2005).

[6] It should be stated that the authors of the GCI acknowledge some of these limitations, see e.g. WEF (2001, chapter 1.1).

Principle Component (PCA) or Factor Analysis (FA) offer an alternative way to statistically establish weights. These methods are applicable even in the absence of a well specified and measurable target variable. They are especially appealing in the presence of highly correlated indicators or subcomponents. Both methods are designed to reduce the dimensionality of the underlying set of indicators into a smaller set of uncorrelated components or factors preserving the maximum amount of information contained in the variables. The weight each variable receives in a common factor is derived from the correlation matrix and therefore reflects the common dependencies among indicators. Factor analytical techniques are for example employed in the construction of the OECD Product Market Regulation Indices (Nicoletti et al. 2000).[7] It should be noted, however, that PCA and FA are not exempt from subjectivity. Different factor analytical methods lead to different weights as well as the different rotation methods used to increase the interpretability of the factors. Moreover, there is no unique rule as to how many factors should be retained.

Apart from theoretical and empirical considerations weights can also reflect the quality of the data. For example lesser weight could be given to variables that suffer most from missing values. Higher weight could also be assigned to indicators from reliable sources (e.g. international organizations). This procedure might of course penalize developing countries whose data is in most cases not as readily available as that of more developed countries. The WEF incorporates this idea into its GCI by assigning lower weight to indicators based on survey data.[8]

Conclusions

With the on-going integration of global markets, country rankings become more interesting to the business community and governments. WEF, IMD, the Fraser Institute and the Heritage Foundation have prepared the most well-known rankings. They focus on the competitiveness or the economic freedom of countries.

The ranking results for the OECD countries are quite similar for WEF and IMD on the one hand and for Fraser and Heritage on the other hand, although there are differences between them. The simple correlations we have identified suggest that none of the indices is able to explain a large share of the variation in cross country growth rates and the correlations are rather weak – with the exception of Fraser's index – at least for the time periods under study.

The selection of variables and their weighting are the crucial steps in building composite indicators. The choice of growth factors (especially in the case of the WEF GCI) is not at all comprehensive and is usually not scrutinized by econometric tests. Nonlinear relationships are left unexplored. Especially for IMD, Fraser and Heritage the weighting procedures are rudimentary as they lack a theoretical or statistical foundation. Apart from the selection and weighting of variables the heavy dependence on survey data seems problematic in particular owing to their questionable reliability. Further, the standardisation methods used are likely to yield additional distortions and are not checked for robustness.

Although the rankings provide much useful information on individual countries their methodology is in general rudimentary and calls for further improvement.

Abbreviations

AUS	Australia	IRL	Ireland
AUT	Austria	ITA	Italy
BEL	Belgium	JPN	Japan
CAN	Canada	KOR	Korea
CHE	Switzerland	LUX	Luxembourg
CZE	Czech Republic	MEX	Mexico
DEU	Germany	NLD	Netherlands
DNK	Denmark	NOR	Norway
ESP	Spain	NZL	New Zealand
FIN	Finland	POL	Poland
FRA	France	PRT	Portugal
GBR	United Kingdom	SVK	Slovak Republic
GRC	Greece	SWE	Sweden
HUN	Hungary	TUR	Turkey
ICE	Iceland	USA	United States

[7] Both Heritage (Roll 2004) and Fraser (Fraser 2005, ch.1 footnote 4) claim to have checked the robustness of their weighting methodology by means of PCA and FA. They state that the results do not contradict their assumption of equal weights.
[8] A more extensive overview of existing weighting procedures is provided by Giovanni et al. (2005).

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