CHAPTER 1

Benchmarking productivity: The Global Competitiveness Index

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The World Economic Forum has been assessing the competitiveness of nations for three decades since it first published the predecessor of the Global Competitiveness Report (GCR), the Competitiveness Scorecard, in 1979. Our research studies the factors enabling national economies to achieve sustained economic growth and long-term prosperity. It provides businesses and policy-makers with a benchmarking tool to enable an objective assessment of the relative strengths and weaknesses of their national economy and to make informed comparisons between countries. The outcomes can also help identify best practice cases in specific areas.

In 2008 the World Economic Forum has published the Ukraine Competitiveness Report in partnership with the Foundation for Effective Governance. The report analyzes the country's competitive strengths and weaknesses and assessed the competitiveness of Ukraine's regions. With this second edition of the Ukraine Competitiveness Report, the Foundation continues this work using the methodology developed by the World Economic Forum. In this chapter, we present the main features of the Global Competitiveness Index, the benchmarking tool used by the Forum to assess the competitiveness of nations.[1] This tool is used in this Report to draw the competitive landscape of both, Ukraine as well as its regions.

1.1 The 12 pillars of competitiveness

With continuous progress in theoretical and empirical economic research, the methodology used by the World Economic Forum to assess national competitiveness has inevitably evolved over time. The latest step in this evolution is the Global Competitiveness Index (GCI), which has been developed in cooperation with Professor Xavier Sala-i-Martin from Columbia University and first introduced in 2004. Since then the GCI has been the World Economic Forum's main vehicle for assessing competitiveness.

The GCI is designed to assess the potential of countries to grow over the medium to longer term, taking into account the present level of development, based on the understanding that competitiveness is *the set of institutions, policies and factors that determine the level of productivity of a country.*

The GCI encapsulates the latest thinking on competitiveness and captures the complexity of the economic growth process by taking into account a weighted average of many different components, each of which reflects one aspect of the complex reality of competitiveness. The components are grouped into 12 different categories, called the 12 pillars of competitiveness and described below.[2] The detailed structure of the GCI is presented in Annex A of this chapter.

1st pillar: Institutions
The set of public institutions forms the framework within which individuals, firms and governments interact to generate income and wealth in the economy, and therefore has a strong bearing on competitiveness

and growth.[3] The quality of the institutional environment plays a central role in the ways in which societies distribute the benefits and bear the costs of development strategies and policies. It also has a bearing on investment decisions and on the organization of production. Owners of land, capital, financial assets and intellectual property are unwilling to invest in the improvement and upkeep of their property, and foreign investors are unlikely to engage in a country if their property rights are not protected.[4]

Equally crucial are the government attitude toward markets and freedoms and the efficiency of its operations: over-regulation, excessive bureaucracy and red tape,[5] corruption, dishonesty in dealing with public contracts, lack of transparency and trustworthiness, or the political dependence of the judiciary system impose significant economic costs on businesses.

Private institutions are also important in the process of creation of wealth. Accounting and reporting standards for preventing fraud and mismanagement and for maintaining investor and consumer confidence are also important ingredients in the process of creation of wealth. High ethical standards and transparency increase the level of trust and thereby lower the cost of transactions.

2nd pillar: Infrastructure

High-quality infrastructure is critical to ensure the efficient functioning of the economy. It is also an important factor determining the location of economic activity and the kinds of activities or sectors that can develop in an economy. Well-developed transport infrastructure also reduces the effect of distance between regions, thereby truly integrating the domestic market and connecting it to other markets. It also facilitates the movement of workers around the country to the most suitable jobs. Economies also depend on electricity supplies that are free of interruptions and shortages to ensure that businesses and factories can work unimpeded, while a reliable and extensive telecommunications network allows for a rapid and free flow of information. As such infrastructure is an important driver of competitiveness and has a significant impact on economic growth.[6]

3rd pillar: Macroeconomic stability

Although macroeconomic stability alone can not increase the productivity of a nation, macroeconomic disaray seriously harms the economy.[7] Firms can not make informed decisions in presence of price instability, the financial sector can not function if the government runs huge deficits, and the government can not provide services efficiently if it has to make enormous interest payments on its past debts. In sum, the economy cannot grow unless the macroeconomic environment is stable and favorable.

4th pillar: Health and primary education

A healthy and educated workforce is vital to a country's competitiveness and productivity. Poor health leads to significant costs to business, as sick workers are often absent or less productive. Investment in the provision of health services is critical for clear economic, as well as moral, considerations.[8] This pillar also takes into account the quantity and the quality of basic education. Learning basic skills increases the productivity of each individual worker. By contrast, a workforce with little formal education can carry out only basic manual work and finds it much more difficult to adapt to more sophisticated production processes and techniques

5th pillar: Higher education and training

Quality higher education and training is crucial for economies that want to move up the value chain beyond simple production processes and products.[9] In particular, today's globalizing economy requires economies to nurture pools of well-educated workers who are able to adapt rapidly to their changing environment. To capture this concept this pillar measures secondary and tertiary enrollment rates as well as the quality of education. The extent of staff training and the availability of vocational training is also taken into consideration, as it ensures a constant upgrading of workers' skills to meet the changing needs of the production system.

6th pillar: Goods market efficiency

Efficient goods markets allow countries to produce the right mix of products and services given supply-and-demand conditions, and ensure that these goods can be most effectively traded. Healthy market competition, both domestic and foreign, is important in driving market efficiency and thus business productivity. Such competition ensures that the most efficient firms, producing goods demanded by the market are those that survive. To ensure the best possible environment for the exchange of goods there must be a minimum of impediments to business activity through unnecessarily distortionary government intervention, restrictive and discriminatory rules on foreign ownership or foreign direct investment. The pillar also looks at demand conditions which force companies to be more innovative and more customer-oriented, thereby fostering healthy competition

7th pillar: Labor market efficiency

The efficiency and flexibility of the labor market are critical for ensuring that workers are allocated, or easily re-allocated, to their most efficient use in the economy and provided with incentives to give their best effort in their jobs. Labour market flexibility also implies that businesses can adjust wages independently to a large extent and that their relationships with employees are smooth. Efficiency of labour markets calls for equity in the work environment between women and men, qualified management, and the ability to retain talent in the country.

8th pillar: Financial market sophistication

An efficient financial sector allocates the resources saved by a nation's citizens, or those invested from abroad, to its most productive uses. It channels resources to the entrepreneurial or investment projects with the highest expected rates of return, rather than to the politically

connected, which calls for a thorough assessment of risks. In addition, a well-functioning financial market makes different products and services available to businesses and entrepreneurs according to their financing needs, from such sources as loans, security exchanges, or venture capital.

9th pillar: Technological readiness

This pillar measures the readiness of an economy to adopt and use – but not necessarily develop – new technologies to enhance the productivity of its industries.[10] In today's interconnected world the ability to adopt and use new technologies has become an important competitive advantage of firms. In particular, information and communication technologies (ICT) have evolved into the "general purpose technology" of our time,[11] given the critical spillovers to the other economic sectors and their role as efficient infrastructure for commercial transactions.

10th pillar: Market size

The size of the market affects productivity because large markets allow firms to exploit economies of scale. Traditionally the markets available to firms have been constrained by a nation's borders. In the era of globalization international markets have become a substitute for domestic markets, especially for small countries. This is why both, domestic and foreign markets are taken into account when constructing the 10th pillar of economic competitiveness, market size. By including both domestic and foreign markets in the measure of market size, it also avoids discriminating against geographic areas such as the European Union that are broken into many countries, but have one common market.[12]

11th pillar: Business sophistication

Business sophistication concerns the quality of a country's overall business networks, as well as the sophistication of the operations and strategies of individual firms. This is conducive to higher efficiency in the production of goods and services, leading to increased productivity and enhancing a nation's competitiveness.[13] When companies and suppliers are interconnected in geographically proximate groups (clusters), efficiency is heightened, leading to greater opportunities for innovation and to reduced barriers to entry for new firms. Individual firms' operations and strategies – branding, marketing, the presence of a value chain, and the production of unique and sophisticated products – all lead to sophisticated and modern business processes, as they spill over to other companies.

12th pillar: Innovation

The last pillar of competitiveness is technological innovation. In the long run efficiency gains can be achieved and standards of living expanded only through technological innovation. Innovation is particularly important for more advanced economies. These tend to operate at the technology frontier, so that the possibilities of integrating and adapting exogenous technologies, as captured in the 9th pillar of technological readiness, are

limited.[14] Firms in these countries must design and develop cutting-edge products and processes to maintain a competitive edge. This requires an environment that is conducive to innovative activity, supported by both the public and the private sectors. In particular, this entails sufficient investment in research and development, especially by the business sector; high-quality scientific research institutions; collaboration in research between universities and industry; and the protection of intellectual property.

The interrelation of the 12 pillars

Although the 12 pillars of competitiveness are discussed separately, this should not obscure the fact that they are interdependent: not only they are related to each other, but they tend to reinforce each other. For example, businesses will not innovate at a large scale (12th pillar) if institutions (1st pillar) that protect intellectual property rights are not in place or when the labour force is poorly educated and trained (5th pillar). Although the actual construction of the Index will involve the aggregation of the 12 pillars into a single index, measures are reported for the 12 pillars separately, thereby offering an analysis of the competitive strengths and weaknesses of countries. By highlighting and prioritizing areas for improvement and strengths to build upon this analysis provides a basis for policy formulation.
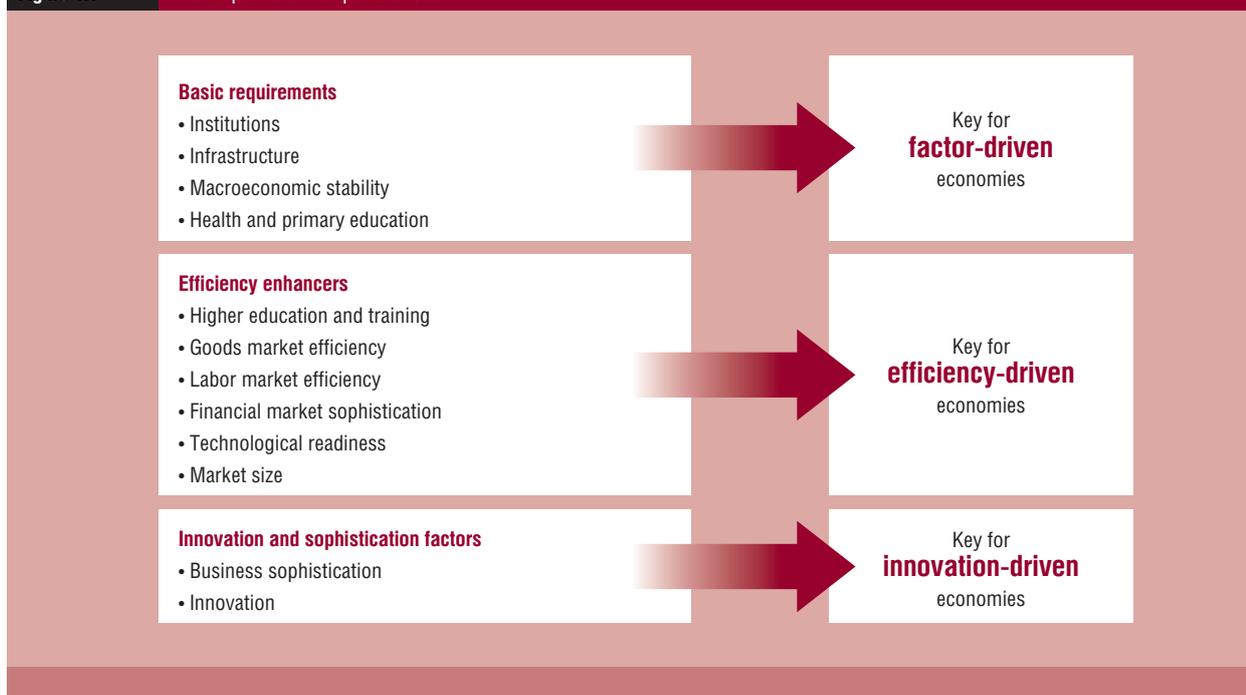
1.2 Competitiveness and the stages of economic development

It is clear that different pillars affect different countries differently. The best way for Chad to improve its competitiveness is not the same as the best way for the United States. This is because Chad and the United States are in different stages of development: as countries move along the development path, wages tend to increase and, in order to sustain this higher income, labor productivity must improve.[15]

According to the GCI, in the first stage, the economy is factor-driven and countries compete based on their factor endowments, primarily unskilled labor and natural resources. Companies compete on the basis of price and sell basic products or commodities with their low productivity reflected in low wages. Maintaining competitiveness at this stage of development hinges primarily on well-functioning public and private institutions (pillar 1), well-developed infrastructure (pillar 2), a stable macroeconomic framework (pillar 3), and a healthy and literate workforce (pillar 4).

As wages rise with advancing development, countries move into the efficiency-driven stage of development, when they must begin to develop more efficient production processes and increase product quality. At this point, competitiveness is increasingly driven by higher education and training (pillar 5), efficient goods markets (pillar 6), well-functioning labor markets (pillar 7), sophisticated financial markets (pillar 8), a large domestic or foreign market (pillar 10), and the ability to

Figure 1.1 The 12 pillars of competitiveness

Basic requirements
- Institutions
- Infrastructure
- Macroeconomic stability
- Health and primary education

Key for **factor-driven** economies

Efficiency enhancers
- Higher education and training
- Goods market efficiency
- Labor market efficiency
- Financial market sophistication
- Technological readiness
- Market size

Key for **efficiency-driven** economies

Innovation and sophistication factors
- Business sophistication
- Innovation

Key for **innovation-driven** economies

harness the benefits of existing technologies (pillar 9).

Finally, as countries move into the innovation-driven stage, they are able to sustain higher wages and the associated standard of living only if their businesses are able to compete with new and unique products. At this stage, companies must compete through innovation (pillar 12), producing new and different goods using the most sophisticated production processes (pillar 11).

The concept of stages of development is integrated into the GCI by attributing higher relative weights to those pillars that are relatively more relevant for a country given its particular stage of development. That is, although all 12 pillars matter to a certain extent for all countries, the importance of each one depends on a country's particular stage of development. To take this into account the pillars are organized into three subindexes, each critical to a particular stage of development. The basic requirements subindex groups those pillars most critical for countries in the factor-driven stage. The efficiency enhancers subindex includes those pillars critical for countries in the efficiency-driven stage, while the innovation and sophistication factors subindex includes the pillars critical to countries in the innovation-driven stage. The three subindexes are shown in Figure 1.1. The specific weights we attribute to each subindex in each stage of development are shown in Table 1.1.

Countries are allocated to stages of development

based on two criteria. The first criterion is the level of GDP per capita at market exchange rates. This widely available measure is used as a proxy for wages, as internationally comparable data for the latter are not available for all countries covered. The precise thresholds are shown in Table 1.2.

A second criterion measures the extent to which countries are factor driven. We proxy this by the share of exports of primary goods in total exports (goods and services) and assume that countries that export more than 70 percent of primary products are to a large extent factor driven.[16]

Countries falling in between two of the three stages are considered to be "in transition." For these countries, the weights change smoothly as a country develops, reflecting the smooth transition from one stage of devel-

Table 1.2 Income thresholds for establishing stages of development

Stage of Development	GDP per capita (US$)
Stage 1: Factor-driven	< 2,000
Transition from stage 1 to stage 2	2,000 -3,000
Stage 2: Efficiency-driven	3,000-9,000
Transition from stage 2 to stage 3	9,000-17,000
Stage 3: Innovation-driven	> 17,000

Table 1.1 Weights of the three main groups of pillars at each stage of development

Subindex	Factor-driven stage (%)	Efficiency-driven stage (%)	Innovation-driven stage (%)
Basic requirements	60%	40%	20%
Efficiency enhancers	35%	50%	50%
Innovation and sophistication factors	5%	10%	30%

Table 1.3	Classification of selected countries into stages of development		
Stage	**Comparator countries**	**Other countries in this stage**	**Important areas for competitiveness**
Stage 1 (factor-driven)	India	Egypt, Kyrgyz Republic, Moldova, Philipines, Tajikistan	Basic requirements (critical) and efficiency enhancers (very important)
Transition from 1 to 2	China, Azerbaijan, Kazakhstan	Armenia, Venezuela	Basic requirements (critical) and efficiency enhancers (increasingly important)
Stage 2 (efficiency-driven)	Argentina, Brazil, Colombia, Mexico, Romania, **Ukraine**	Bosnia and Herzegovina, Bulgaria, Peru, Serbia, South Africa, Thailand, Tunisia, Uruguay	Basic requirements (very important) and efficiency enhancers (critical)
Transition from 2 to 3	Chile, Estonia, Lithuania, Poland, Turkey Russian Federation	Hungary, Latvia, Slovak Republic, Taiwan, China	Same as above, but innovation factors become increasingly important
Stage 3 (innovation-driven)	United States	Czech Republic, France, Germany Ireland, Spain, Sweden, Israel, Japan, Republic of Korea,	All three areas important: basic requirements efficiency enhancers and innovation factors

opment to another. By introducing this type of transition between stages into the model – that is, by placing increasingly more weight on those areas that are becoming more important for the country's competitiveness as the country develops – the index can gradually "penalize" those countries that are not preparing for the next stage. The classification of countries into stages of development is shown in Table 1.3.

1.3 The Global Competitiveness Index Data

So far we have been talking about the Global Competitiveness Index which is the analytical framework we use to conduct our assessment of competitiveness. The necessary complement to this framework is the data feeding into it.[17]

Two types of data enter the GCI. Out of the 110 variables – or indicators – composing the index, about one third are hard data. Hard data provide an objective measure of a quantity, such as gross domestic product, cost of mobile telephone call, number of personal computers, and so on. Such data are typically obtained from international organizations (e.g., the World Bank, various United Nations' organizations, the International Telecommunication Union), complemented, if necessary, by national sources. The remaining indicators are soft data. These data come from the Executive Opinion Survey (the Survey) carried out annually by the World Economic Forum.

The aim of the Survey is to capture the qualitative dimension of specific aspects of competitiveness and to provide comparable data on issues for which there are no existing hard data indicators. This highly specialized survey is conducted annually by the Forum in all countries covered by the GCI – 134 as of 2008. Business leaders are asked to assess specific aspects of the business environment in the country in which they operate. For each question, respondents are asked to give their opinion about the situation in their country of

residence, compared with a global norm. To conduct the Survey in each country, the Forum relies on a network of 150 Partner Institutes. Typically, the Partner Institutes are recognized economics departments of national universities, independent research institutes, or business organizations. In Ukraine the Centre for Social and Economic Research (CASE) is the Forum's Partner Institute.

To ensure that the sample is selected consistently around the world, a detailed set of guidelines has been developed by the Forum for the Partner Institutes to target top management business executives, with a particular focus on surveying the most sizeable employers. In addition to relying on Partner Institutes to collect surveys in their respective countries, the Forum's member and partner companies are also invited to participate in the Survey. Sample sizes vary according to the size of the economy. In 2008 a record total of 12,297 responses were collected, up from 11,406 in 2007. This represents an average of 91 responses per country. For Ukraine specifically, the sample consisted of 116 firms in 2008 and 84 companies in 2007.

Once the data is entered, it is subjected to a rigorous quality control process. Following a careful verification of the Survey dataset, individual responses to each question are then aggregated at the country level and combined with results of the previous year following a weighted moving average approach. The weighting scheme is composed of two overlapping elements: on one hand, we give each response an equal weight by placing more weight on the larger of the two samples of responses; at the same time, we apply a discount factor to the previous year's results thereby placing more weight on the most recent responses.

The final country scores thus obtained are used in the computation of the GCI and other benchmarking tools developed by the World Economic Forum. For more information about the Survey's process and methodology refer to Browne et al. 2008.

1.4 Conclusions

This chapter has presented the Global Competitiveness Index which serves as the main vehicle for assessing Ukraine's competitiveness in this Report. The GCI captures what government and business leaders have known for a long time. Competitiveness is a complex phenomenon and the overall level of competitiveness of a nation can be improved only through a wide array of reforms in different areas. The GCI also highlights the fact that the priorities are different for different countries, depending on their level of development.

The GCI is constructed by combining hard data with perception data gathered through the Executive Opinion Survey. As a result, the relative scores of the various sub-categories of the GCI provide useful information as to what the priorities for reform should be, both from the cold reality of the hard data and from the point of view of the business community that is currently operating in the country.

The GCI is an instrument that can be used to identify the competitive strengths of a country as well as the barriers to its economic progress. It can also be used to establish comparisons with neighboring countries and the relative position in the overall rankings a particular country holds. In this context, the particular strength of the World Economic Forum's competitiveness work is that it provides a platform for dialogue among government, business, and civil society that can serve as a catalyst for productivity-raising reforms, with the aim of improving living standards.

Notes

1   This chapter draws extensively on Sala-i-Martin et al. 2008 and Browne et al. 2008. The reader interested in learning more about the topics discussed in this chapter is strongly encouraged to consult these two references.

2   For a more detailed description of each pillar and expanded references, see Sala-i-Martin et al. 2008.

3   See Acemoglu, Johnson and Robinson 2001, 2002; Rodrik, Subramanian, and Trebi 2002; and Sala-i-Martin and Subramanian 2003.

4   See de Soto 2000.

5   See de Soto and Abbot 1990; Shleifer and Vishney 1997; and Zingales 1998.

6   See Gramlich 1994; Aschauer 1989; Canning, Fay and Perotti 1994; and Easterly 2002.

7   See Fischer 1993.

8   See Sachs 2001.

9   See Schultz 1961; Becker 1993; Lucas 1988; and Kremer 1993.

10 See Aghion and Howitt 1992 and Barro and Sala-i-Martin 2003 for a technical exposition of technology-based growth theories.

11 A general purpose technology (GPT), according to Trajtenberg 2005, is the one which in any given period gives a particular contribution to overall economy's growth thanks to its ability to transform the methods of production in a wide array of industries. Examples of GPT have been the invention of the steam engine and the electric dynamo.

12 See for instance Alesina, Spolaore and Wacziarg 2005; Frenkel and Romer 1999; Rodrik and Rodriguez 1999; and Sachs and Warner 1995.

13 See Porter 1990. A recent study at the London School of Economics has shown that differences in the quality of management among first explain variations in their productivity, see Bloom and van Reenen 2007.

14 See Romer 1990; Aghion and Howitt 1992; and Grossman and Helpman 1991.

15 Probably the most famous theory of stages of development was developed by the American historian W.W. Rostow in the 1960s (see Rostow 1960). Here we adapt Michael Porter's theory of stages (see Porter 1990). Please see Chapter 1.1 of The Global Competitiveness Report 2007–2008 for a complete description of how we have adapted Michael Porter's theory for the present application.

16 In order to capture the resource intensity of the economy, we use as a proxy the exports of mineral products as a share of overall exports according to the sector classification developed by the International Trade Centre in their Trade Performance Index. In addition to crude oil and gas, this category also contains all metal ores and other minerals as well as petroleum products, liquefied gas, coal, and precious stones. Further information on these data can be found at the following site: http://www.intracen.org/menus/countries.htm.

All countries that export more than 70 percent of mineral products are considered to be to some extent factor-driven. The stage of development for these countries is adjusted downward smoothly depending on the exact primary export share. The higher the minerals export share, the stronger the adjustment and the closer the country will move to stage 1. For example, a country that exports 95 percent of mineral exports and that, based on the income criteria, would be in stage 3, will be in transition between stage 1 and 2. The income and primary exports criteria are weighted identically. Stages of development are dictated uniquely by income for countries that export less than 70 percent minerals. Countries that export only primary products would automatically fall into the factor-driven stage (stage 1).

17 Think of the GCI as the recipe for a dish and of the data as the ingredients used to prepare that dish.

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Appendix A: Structure of the Global Competitiveness Index 2008–2009

This appendix details the structure of the Global Competitiveness Index (GCI) introduced in Chapter 1, and provides notes on its computation. Appendix B provides detailed information on all of the indicators comprising the index.

The numbering of the variables matches the numbering of the Data Tables found in the World Economic Forum's Global Competitiveness Report 2008-2009 and which present countries' scores and ranks on each indicator composing the GCI. The number preceding the period indicates to which pillar the variable belongs (e.g., variable 1.01 belongs to the 1st pillar, variable 12.04 belongs to the 12th pillar).

The hard data indicators used in the GCI are normalized on a 1-to-7 scale in order to align them with the Executive Opinion Survey's results.[a] The Technical Notes and Sources at the end of this Report provide detailed information on all the hard data indicators. Those variables that are followed by the symbol 1/2 enter the GCI in two different places. In order to avoid double counting, we give them a half-weight in each place by dividing their value by 2 when computing the aggregate score for the two categories in which they appear. [b]

The percentage next to each category represents this category's weight within its immediate parent category. The computation of the GCI is based on successive aggregations of scores, from the variable level (e.g., the lowest level) all the way up to the overall GCI score (e.g., the highest level), using the weights reported below. For example, the score a country achieves in the 9th pillar accounts for 17 percent of this country's score in the Efficiency enhancers subindex. Similarly, the score achieved on the subpillar Networks and supporting industries accounts for 50 percent of the score of the 11th pillar. Reported percentages are rounded to the nearest integer, but exact figures are used in the calculation of the GCI.

Unlike for the lower levels of aggregation, the weight put on each of the three subindexes (Basic requirements, Efficiency enhancers, and Innovation factors) is not fixed. It depends on each country's stage of development, as discussed in the text.[c] For instance, in the case of Ukraine, which is in the second stage of development, the score in the Basic requirements subindex accounts for 40 percent of its overall GCI score, while it represents just 20 percent of the overall GCI score of Denmark, a country in the third stage of development.

Basic requirements

Weight (%) within immediate parent category

1st pillar: Institutions 25%

A. Public institutions 75%

1. Property rights 20%
    - 1.01 Property rights
    - 1.02 Intellectual property protection 1/2
2. Ethics and corruption 20%
    - 1.03 Diversion of public funds
    - 1.04 Public trust of politicians
3. Undue influence 20%
    - 1.05 Judicial independence
    - 1.06 Favoritism in decisions of government officials
4. Government inefficiency 20%
    - 1.07 Wastefulness of government spending
    - 1.08 Burden of government regulation
    - 1.09 Efficiency of legal framework
    - 1.10 Transparency of government policymaking
5. Security 20%
    - 1.11 Business costs of terrorism
    - 1.12 Business costs of crime and violence
    - 1.13 Organized crime
    - 1.14 Reliability of police services

B. Private institutions 25%

1. Corporate ethics 50%
    - 1.15 Ethical behavior of firms
2. Accountability 50%
    - 1.16 Strength of auditing and reporting standards
    - 1.17 Efficiency of corporate boards
    - 1.18 Protection of minority shareholders' interests

2nd pillar: Infrastructure 25%

A. General infrastructure 50%
    - 2.01 Quality of overall infrastructure

B. Specific infrastructure 50%
    - 2.02 Quality of roads
    - 2.03 Quality of railroad infrastructure
    - 2.04 Quality of port infrastructure
    - 2.05 Quality of air transport infrastructure
    - 2.06 Available seat kilometers (hard data)
    - 2.07 Quality of electricity supply
    - 2.08 Telephone lines (hard data)

3rd pillar: Macroeconomic stability 25%
    - 3.01 Government surplus/deficit (hard data)
    - 3.02 National savings rate (hard data)
    - 3.03 Inflation (hard data) [d]
    - 3.04 Interest rate spread (hard data)
    - 3.05 Government debt (hard data)

4th pillar: Health and primary education 25%

A. Health 50%
    - 4.01 Business impact of malaria [e]
    - 4.02 Malaria incidence (hard data)[e]
    - 4.03 Business impact of tuberculosis[e]
    - 4.04 Tuberculosis incidence (hard data) [e]
    - 4.05 Business impact of HIV/AIDS[e]
    - 4.06 HIV prevalence (hard data)
    - 4.07 Infant mortality (hard data)
    - 4.08 Life expectancy (hard data)

B. Primary education 50%
    - 4.09 Quality of primary education
    - 4.10 Primary enrollment (hard data)
    - 4.11 Education expenditure (hard data)1/2

Efficiency enhancers

5th pillar: Higher education and training..........................17%

A. Quantity of education...33%

    5.01   Secondary enrollment (hard data)
    5.02   Tertiary enrollment (hard data)
    4.11   Education expenditure (hard data) [1/2]

B. Quality of education..33%

    5.03   Quality of the educational system
    5.04   Quality of math and science education
    5.05   Quality of management schools
    5.06   Internet access in schools

C. On-the-job training...33%

    5.07   Local availability of specialized research and training services
    5.08   Extent of staff training

6th pillar: Goods market efficiency.........................17%

A. Competition 67%

    1. Domestic competition..77% [f]

    6.01   Intensity of local competition
    6.02   Extent of market dominance
    6.03   Effectiveness of anti-monopoly policy
    6.04   Extent and effect of taxation[1/2]
    6.05   Total tax rate (hard data)[1/2]
    6.06   Number of procedures required to start a business (hard data)[g]
    6.07   Time required to start a business (hard data)[g]
    6.08   Agricultural policy costs

    2. Foreign competition..23% [f]

    6.09   Prevalence of trade barriers
    6.10   Trade-weighted tariff rate (hard data)
    6.11   Prevalence of foreign ownership
    6.12   Business impact of rules on FDI
    6.13   Burden of customs procedures
    10.04   Imports as a percentage of GDP (hard data)

B. Quality of demand conditions.................................33%

    6.14   Degree of customer orientation
    6.15   Buyer sophistication

7th pillar: Labor market efficiency.........................17%

A. Flexibility...50%

    7.01   Cooperation in labor-employer relations
    7.02   Flexibility of wage determination
    7.03   Non-wage labor costs (hard data)
    7.04   Rigidity of employment (hard data)
    7.05   Hiring and firing practices
    6.04   Extent and effect of taxation[1/2]
    6.05   Total tax rate (hard data)[1/2]
    7.06   Firing costs (hard data)

B. Efficient use of talent...50%

    7.07   Pay and productivity
    7.08   Reliance on professional management[1/2]
    7.09   Brain drain
    7.10   Female participation in labor force (hard data)

8th pillar: Financial market sophistication.................17%

A. Efficiency...50%

    8.01   Financial market sophistication
    8.02   Financing through local equity market
    8.03   Ease of access to loans
    8.04   Venture capital availability
    8.05   Restriction on capital flows
    8.06   Strength of investor protection (hard data)

B. Trustworthiness and confidence.............................50%

    8.07   Soundness of banks
    8.08   Regulation of securities exchanges
    8.09   Legal rights index (hard data)

9th pillar: Technological readiness.........................17%

    9.01   Availability of latest technologies
    9.02   Firm-level technology absorption
    9.03   Laws relating to ICT
    9.04   FDI and technology transfer
    9.05   Mobile telephone subscribers (hard data)
    9.06   Internet users (hard data)
    9.07   Personal computers (hard data)
    9.08   Broadband Internet subscribers (hard data)

10th pillar: Market size...17%

A. Domestic market size...75%

    10.01   Domestic market size index (hard data) [h]

B. Foreign market size..25%

    10.02   Foreign market size index (hard data)[i]

Innovation and sophistication factors

11th pillar: Business sophistication 50%

A. Networks and supporting industries.......................50%

    11.01   Local supplier quantity
    11.02   Local supplier quality
    11.03   State of cluster development

B. Sophistication of firms' operations and strategy.......50%

    11.04   Nature of competitive advantage
    11.05   Value chain breadth
    11.06   Control of international distribution
    11.07   Production process sophistication
    11.08   Extent of marketing
    11.09   Willingness to delegate authority
    7.08   Reliance on professional management[1/2]

12th pillar: Innovation...50%

    12.01   Capacity for innovation
    12.02   Quality of scientific research institutions
    12.03   Company spending on R&D
    12.04   University-industry research collaboration
    12.05   Government procurement of advanced technology products
    12.06   Availability of scientists and engineers
    12.07   Utility patents (hard data)
    1.02   Intellectual property protection[1/2]

Appendix A: Structure of the Global Competitiveness Index 2008–2009

Notes

a. The standard formula for converting hard data is the following:

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

The sample minimum and sample maximum are, respectively, the lowest and highest country scores in the sample of countries covered by the GCI. In some instances, adjustments were made to account for extreme outliers. For those hard data variables for which a higher value indicates a worse outcome (e.g., disease incidence, government debt), we rely on a normalization formula that, in addition to converting the series to a 1-to-7 scale, reverses it, so that 1 and 7 still corresponds to the worst and best possible outcomes, respectively:

$$-6 \times \frac{\text{(country score - sample minimum)}}{\text{(sample maximum - sample minimum)}} + 7$$

b. For those groups of variables that contain one or several half-weight variables, country scores are computed as follows:

$$\frac{\text{(sum of scores on full weight variables)} + \frac{1}{2} \times \text{(sum of scores on half weight variables)}}{\text{(count of full weight variables)} + \frac{1}{2} \times \text{(count of half weight variables)}}$$

c. As described in the chapter, the weights are the following:

Weights	Factor-driven stage (%)	Efficiency-driven stage (%)	Innovation-driven stage (%))
Basic requirements	60	40	20
Efficiency enhancers	35	50	50
Innovation factors	5	10	30

Ukraine is in the second stage of development, that is, the Efficiency-driven stage.

d. In order to capture the idea that both high inflation and deflation are detrimental, inflation enters the model in a U-shaped manner as follows: for values of inflation between 0.5 and 2.9 percent, a country receives the highest possible score of 7. Outside this range, scores decrease linearly as they move away from these values.

e. The impact of malaria, tuberculosis, and HIV/AIDS on competitiveness depends not only on their respective incidence rates, but also on how costly they are for business. Therefore, in order to estimate the impact of each of the three diseases, we combine its incidence rate with the Survey question on its perceived cost to businesses. To combine these data we first take the ratio of each country's disease incidence rate relative to the highest incidence rate in the whole sample. The inverse of this ratio is then multiplied by each country's score on the related Survey question. This product is then normalized to a 1-to-7 scale. Note that countries with zero reported incidence receive a 7, regardless their scores on the related Survey question.

f. The Competition subpillar is the weighted average of two components: Domestic competition and Foreign competition. In both components the included variables provide an indication of the extent to which competition is distorted. The relative importance of these distortions depends on the relative size of domestic versus foreign competition markets. This interaction between the domestic market and the foreign market is captured by the way we determine the weights of the two components. Domestic competition is the sum of consumption (C), investment (I), government spending (G), and exports (X), while foreign competition is equal to imports (M). Thus we assign a weight of (C+I+G+X)/(C+I+G+X+M) to Domestic competition and a weight of M/(C+I+G+X+M) to Foreign competition.
For Ukraine, the calculation yields a weight of 0.77 for the Domestic competition component and of 0.23 for the Foreign competition component.

g. Variables 6.06 and 6.07 combine to form one single variable.

h. The size of the domestic market is constructed by taking the natural log of the sum of the gross domestic product valued at PPP plus the total value (PPP estimates) of imports of goods and services, minus the total value (PPP estimates) of exports of goods and services. Data are then normalized on a 1-to-7 scale. PPP estimates of imports and exports are obtained by taking the product of exports as a percentage of GDP and GDP valued at PPP. The underlying data are reported in the Data Tables section.

i. The size of the foreign market is estimated as the natural log of the total value (PPP estimates) of exports of goods and services, normalized on a 1-to-7 scale. PPP estimates of exports are obtained by taking the product of exports as a percentage of GDP and GDP valued at PPP. The underlying data are reported in the Data Tables.