

# Drivers of Long-Run Prosperity: Laying the Foundations for an Updated Global Competitiveness Index

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The World Economic Forum has been measuring the drivers of competitiveness for over three decades. Since its creation in 1979 by Professor Klaus Schwab, the index has evolved continuously to capture the changing needs of countries as well as the evolving nature of competitiveness. Since 2005 the main tool for benchmarking competitiveness has been the Global Competitiveness Index (GCI), produced in collaboration with Professor Xavier Sala-i-Martin of Columbia University.<sup>1</sup>

The GCI represented the latest thinking on national competitiveness at the time of its introduction. However, in the last 10 years economic thinking has evolved and recent events have brought to light new elements that affect competitiveness, once again calling for a review. For example, the recent global financial crisis highlighted new channels through which a country's competitiveness can be affected by global financial fragilities; furthermore, the speed and modes of technological change have redefined how economists think about the innovation process. Recently the role of information technologies in how production is structured has changed and new consumption models, such as the "sharing economy," are emerging. In addition, new indicators have become available that can provide better measurements of established concepts.

To capture these developments, the World Economic Forum has embarked on a two-year process of reviewing and modernizing the index.<sup>2</sup> While most of the factors that were believed to determine competitiveness 10 years ago are still believed to do so today, to remain at the cutting edge the GCI methodology needs to be brought up to date with new elements and improved measurements. By doing so, the updated GCI will provide policymakers, businesses, and civil society with a better assessment of countries' economic performance.

This chapter therefore has two purposes. First, it restates the importance of those long-established drivers of productivity captured by the current GCI, providing an extensive literature review. Second, it introduces relevant new concepts that modernize our thinking on specific elements—mainly in the domains of innovation, education, and finance, the main components that will distinguish the updated GCI from the current version presented in Chapter 1.1 of this *Report*.

## WHAT COMPETITIVENESS IS AND WHY IT MATTERS

Our conceptual definition of competitiveness remains unchanged. We continue to define *competitiveness* as *the set of institutions, policies, and factors that*

<sup>1</sup> Sala-i-Martin and Artadi 2004.

<sup>2</sup> The authors would like to thank a number of experts for their contribution to this chapter; they are listed in Appendix B.

determine the level of productivity of a country. We focus on productivity because growth models suggest that, in the long run, productivity is the most fundamental factor explaining the level of prosperity of a country and hence its citizens.

Since Adam Smith's work (1776), economists have identified, theoretically and empirically, dozens of possible factors—both within and outside firms—affecting the level and growth rates of productivity and prosperity across countries. These range from the institutional framework discussed by Smith, which allows for division of labor and exchange, to the most recent studies on connectivity as a source of business innovation. They include factors such as macroeconomic stability, corruption (or the absence of it), security, education (both basic and advanced), the health of the labor force, regulation, financial development, the efficient use of talent, the right incentives for firms to invest in research and development (R&D), market size, the participation of women in the workforce, and the use of modern production and distribution techniques.

Each proposed factor rests on solid theoretical grounds and is backed by empirical evidence. Because the development process is complex and economic theories are open ended, any effort to identify one single factor that matters above all others is misguided. Indeed, all of these factors could be in place at the same time.

Academic research since the 1950s has formalized several of these ideas in mathematical terms.<sup>3</sup> It has provided empirical evidence that capital accumulation is not sufficient to explain differences in countries' prosperity, and total factor productivity (TFP) is the main long-run engine of growth, living standards, and prosperity. The term *productivity* is widely used as shorthand for TFP.

To reflect the complexity of the economic development process, the GCI embraces a wide array of determinants of a country's productivity at both the macro- and microeconomic levels. Most of the suggested drivers of productivity are linked to one another, which makes any attempt to measure competitiveness more challenging. For the sake of clarity, simplicity, and intellectual organization, we divide the potential factors affecting competitiveness that we have identified into 12 categories that will translate into the 12 pillars of the updated GCI. This categorization is intended to provide guidance for policymakers in the form of a tool that gives information on the competitive strengths and weaknesses of their respective economies.

The 12 sections below offer a conceptual discussion to restate or update the relevance of each productivity

factor in light of the current state of academic research. At the time of publication of this *Report*, the update of the GCI is still a work in progress, so what we present here is our current thinking on those factors that drive competitiveness; we expect to refine our approach in the coming year through a series of consultations with academics, practitioners, and policymakers. Despite improvements in measurements, some areas still suffer from a scarcity of reliable data that cover the large sample size of the GCI, so that the elements presented in each section may not necessarily be implemented in the final, updated GCI. In an attempt to stimulate discussion on relevant indicators to capture the concepts outlined above, we present potential indicators for each of the drivers of competitiveness that we have identified to date in Appendix A to this chapter.

## INSTITUTIONS

A country's institutional environment has long been considered a determining factor of competitiveness, and will remain largely unchanged in the updated GCI. In the context of the current GCI, *institutions* are defined by two characteristics that reflect core features put forward by economic literature.<sup>4</sup> First, institutions set formal, legally binding constraints—such as rules, laws, and constitutions—along with their associated enforcement mechanisms.<sup>5</sup> Second, institutions include informal constraints such as norms of behavior, conventions, and self-imposed codes of conduct such as business ethics, and can be thought to include norms of corporate governance as well. By shaping the ways in which individuals organize themselves and their economic transactions, institutions form the backbone of societies.<sup>6</sup> The differences among institutions explain many of the underlying reasons for the differences in technology and in physical and human capital between countries, which

3 Since Solow's seminal 1956 paper "A Contribution to the Theory of Economic Growth," a large empirical literature based on aggregate production functions (Barro 1991) attributes differences among countries' income to the accumulation of physical capital, human capital, and productivity.

4 Our definition is loosely based on the work of North 1994. Hall and Jones 1998, for instance, follow a narrower definition and refer to institutions as social infrastructure that avoids diversion, which can be undertaken either by private agents (thievery, squatting, and mafia protection) or by public agents—that is, the government itself (e.g., expropriation, confiscatory taxes, and corruption).

5 The idea of an individual submitting either explicitly or implicitly to the authority of a ruler in exchange for protection of their remaining rights has been discussed in the concept of social contract, most prominently put forward by Thomas Hobbes (*Leviathan*, 1651), John Locke (*Second Treatise of Government*, 1689), and Jean-Jacques Rousseau (*Du contrat social*, 1762).

6 Adam Smith, in his *Wealth of Nations* (1776), was among the first to put forward the importance of institutions: "Commerce and manufactures can seldom flourish long in any state which does not enjoy a regular administration of justice, in which the people do not feel themselves secure in the possession of their property, in which the faith of contracts is not supported by law, and in which the authority of the state is not supposed to be regularly employed in enforcing the payment of debts from all those who are able to pay. Commerce and manufactures, in short, can seldom flourish in any state in which there is not a certain degree of confidence in the justice of government" (Book V, Chapter 3 "Of Public Debts," paragraph 7).

in turn explain a large part of cross-country differences in income.<sup>7</sup>

Ample empirical evidence has shown the importance of institutions for productivity,<sup>8</sup> suggesting that their fundamental role consists in setting the right incentives and lowering uncertainty so that citizens can be confident in engaging in economic activities.<sup>9</sup> Economic agents will invest only if they believe that they will reap expected benefits and returns on their work or investment without needing to spend excessive amounts of time and money protecting their property and monitoring the fulfillment of others' contractual obligations.<sup>10</sup> This depends, informally, on adequate levels of trust in society;<sup>11</sup> it also depends, formally, on the existence of institutions capable of ensuring a basic level of security and enforcing property rights. This in turn relies on the institutions' political set-up and power structure, characterized by (1) the incidence of transparency, (2) efficiency of the public sector, and (3) the existence of checks and balances.

Economic literature has documented the importance of enforceable property rights for the economy<sup>12</sup>—that is, the right of control over an asset and the returns it may generate provides incentives to invest (in physical or human capital or technology), create, innovate, trade, and maintain. If physical or financial property cannot be acquired and sold with confidence that the authorities will endorse the transaction over the long run, economic growth will be undermined. An absence of property rights also drives people out of formal markets into the informal sector. De Soto suggests that no nation can have a strong market economy without adequate participation in a framework that enforces legal ownership of property and records economic activity, because they are the prerequisites to obtaining credit, selling properties, and seeking legal remedies to conflicts in court.<sup>13</sup> Ensuring the protection of property rights is therefore a key role of the state.

Another fundamental role of the state is guaranteeing the security of its citizens, which is a minimal requirement for incentivizing economic activity. Violence, racketeering, organized crime, and terrorism all constitute substantial disincentives to private investment and economic transactions. Empirical research provides evidence that homicides, robbery, extortion, and kidnapping can crowd out investment;<sup>14</sup> and organized crime can generate misallocation of capital and labor and act as a barrier to enter a market.<sup>15</sup>

Although the two roles of the state provide a *raison d'être* for formal constraints, their implementation depends on the quality of institutions. Research shows that three characteristics of institutions determine

7 See Acemoglu 2009 for an exhaustive discussion on institutions and the fundamental causes of economic growth. According to Acemoglu, potential fundamental causes of economic growth may be (1) luck, leading to divergent paths among societies with identical opportunities, preferences, and market structures; (2) geographic differences that affect the environment in which individuals live and that influence the productivity of agriculture, the availability of natural resources, certain constraints on individual behavior, and even individual attitudes; (3) institutional differences that affect the laws and regulations under which individuals and firms function and thus shape the incentives they have for accumulation, investment, and trade; and (4) cultural differences that determine individuals' values, preferences, and beliefs.

8 For example, North and Thomas 1973 discuss a system of property rights as the key to growth. Hall and Jones 1998 find that differences in capital accumulation and productivity, and therefore output per worker, are driven by differences in institutions and government policies. Acemoglu et al. 2001 show that institutions are robustly related to present-day differences in per-capita incomes. Rodrik et al. 2002 find that property rights are more important than either geography or trade in determining income levels around the world.

9 North explains, "[t]he major role of institutions in a society is to reduce uncertainty by establishing a stable (but not necessarily efficient) structure to human interaction. The overall stability of an institutional framework makes complex exchange possible across both time and space" (North 1990, p. 6).

10 The notion of investment here is intended in a broad sense. It includes investments in capital but also comprises investments in time, energy, work, ideas, and education.

11 Trust within society reduces transaction costs of economic activities. Franke and Nadler 2008 define a nation's ethical attitude as people's "cognitive, affective, and behavioural predispositions to react to issues and activities involving social standards for what is morally proper and virtuous" and show that it significantly predicts economic performance.

12 For example, Acemoglu et al. 2001 focus on the expropriation risk that current and potential investors face. Examples from literature in support of these ideas include Banerjee and Iyer 2005, who analyze the colonial land revenue institutions set up by the British in India and show that differences in historical property rights institutions lead to sustained differences in economic outcomes; De Soto 2000, who shows that owners of land, corporate shares, and even intellectual property are unwilling to invest in the improvement and upkeep of their property if their rights as owners are insecure; Acemoglu et al. 2005, who discuss the detrimental effects on growth in the Middle Ages and early Modern Period from the lack of property rights for landowners, merchants, and proto-industrialists on growth in the Middle Ages and early Modern Period; and Knack and Keefer 1995, who show that security of property rights affects the efficiency with which inputs are allocated by inhibiting activities (rent-seeking, theft, arbitrary confiscation, and/or excessive taxation) that reduce individual incentives.

13 De Soto's influential book *The Other Path: The Invisible Revolution in the Third World* (1990) has significantly impacted economic development policies and led to the creation of the World Bank Doing Business framework.

14 See, for example, Detotto and Otranto 2010; Detotto and Pulina 2013.

15 For example, Pinotti 2014 explores the various channels through which organized crime stifles growth. Mafia rackets lead to misallocation of capital and labor by forcing firms to purchase overpriced inputs or hire individuals based on their connections to the organization; they may prevent new entrepreneurs from entering the market; and their influence on politicians and public officials can divert public investments and interfere with the selection of public officials.

their quality. The first is an absence of corruption and undue influence. Broadly understood as the misuse of public power for private gain, corruption interferes with the allocation of resources to their most efficient uses and undermines growth in five main ways: (1) it diminishes incentives to invest, because economic agents view corruption as a species of tax; (2) it leads to a misallocation of human capital, because talent is incentivized to engage in rent-seeking activities rather than productive work;<sup>16</sup> (3) it results in loss of tax revenue; (4) it pushes inappropriate public spending, because government officials are tempted to allocate expenditures less on the basis of promoting public welfare than on the opportunity they provide for extorting bribes;<sup>17</sup> and (5) it lowers the quality of infrastructure and public services through the misallocation of public procurement contracts.<sup>18</sup>

The second determinant of institutional quality is efficiency in the public sector, which has two aspects: efficient administrative services and a stable policy environment. Administrative efficiency implies a lack of unnecessary red tape in business processes such as the collection of taxes, compliance with regulations, obtaining permits, and the judicial system; there is empirical evidence that burdensome bureaucracy decreases investments and firms' efficiency.<sup>19</sup> Policy stability may affect productivity by reducing uncertainty about the future and consequently expanding the time horizon of society's preferences; this may lead to better resource allocation, including more R&D investments and hence faster technological progress.<sup>20</sup>

Finally, quality institutions are endogenous—that is, the rules governing human interactions are the result of choices made by those in power, selected on the basis of the rules they set. Separation of powers, and

especially the independence of the judiciary,<sup>21</sup> has long been recognized as pivotal to preventing those in power from arrogating absolute power or shaping economic institutions to benefit themselves at the expense of the rest of the society.<sup>22</sup> Branches of governance represented by the separate powers should be able to hold each other reciprocally accountable for the discharge of the powers apportioned to them by law.<sup>23</sup> It is the extent to which this actually happens in practice—not merely that it is provided for in principle in a country's constitution—that matters.<sup>24</sup>

In addition to the quality of public institutions, corporate ethics and governance standards determine incentives for companies, investors, and society to engage in economic activities. Strong corporate governance standards contribute to productivity in two ways. First, they enable shareholders to exert control over firms, and shareholder value in turn is maximized by raising the firm's productivity. Second, by aligning incentives of firms' managers and owners, they limit risks to investors, incentivizing higher levels of investment and reducing costs of capital for the firm. Key to corporate governance is the transparent access of shareholders to timely and accurate information, accountability of management to strong and independent corporate boards, and auditor independence.<sup>25</sup> In addition to formal standards, informal behavioral norms also play a crucial role in the way businesses are run. High ethical standards among business leaders can contribute to building trust, thereby reducing the cost of capital and compliance.

## INFRASTRUCTURE AND CONNECTIVITY

Throughout history, better-connected villages and cities have been more prosperous. From the ancient cities of Mesopotamia to the Phoenician and Greek harbors around the Mediterranean, from the Roman paved roads to the Silk Road that connected China to Europe, and from the railroad systems built in Europe and North America in the 19th century to the interstate highway system of the 1950s in the United States and to the current global Internet network, human progress has been associated with the infrastructures that facilitate the exchange of products and ideas.

16 See also the discussion on health for the relationship between human capital and economic growth.

17 Shleifer and Vishny 1993 show that the structure of government institutions and of the political process are important determinants of the level of corruption and that the illegality of corruption makes it much more distortionary and costly than taxation. Mauro 1997 presents evidence that corruption distorts public expenditures away from growth-promoting areas such as education and health toward other types of projects.

18 Tanzi and Davoodi 1997 find that corruption diverts public funds to areas where bribes are easiest to collect and toward low-productivity projects—for example, new construction rather than maintenance of existing infrastructure—resulting in rising public investment but lower social welfare and reduced impact on productivity.

19 Ayal and Karras 1996 construct a measure of bureaucracy for OECD countries and show that higher levels of bureaucracy are negatively related to economic growth. Loayza et al. 2005 conclude that a heavier regulatory burden—particularly in product and labor markets—reduces growth and induces informality.

20 Aisen and Veiga 2013. Also, Alesina et al. 1996 show that growth is significantly lower in countries where the propensity of a government to collapse is high. Jong-A-Pin 2009 uses a measure of multidimensional instability of the political regime to show that it has a robust and significant negative effect on economic growth.

21 Notably revived from Roman institutional set-up and developed by Montesquieu in *The Spirits of Law* (1748), the system of checks and balances is most famously represented in the US constitution.

22 Acemoglu et al. 2005.

23 Henisz 2000; Chong and Calderón 2000; Dollar and Kraay 2002; World Bank 2005.

24 Feld and Voigt 2003 show that, for a sample of 66 countries between 1980 and 1998, the factually ascertainable degree of judicial independence positively influenced GDP growth, but no such impact was found when looking only at the legal foundations of judicial independence. Their findings show the importance of de facto versus de jure on economic growth (only first one is significant).

25 Kroszner 2004.

The concepts captured in the infrastructure and connectivity category of the updated GCI are essentially similar to those captured in the first version of the GCI. The only novelty is that, in addition to assessing the quality of the transport infrastructure, the pillar also measures the quality of domestic and international transport networks. Well-developed physical and digital infrastructures affect productivity directly by connecting economic agents, reducing transaction costs, easing the effects of distance and time, facilitating the flow of information, and facilitating integration of markets into global value chains. Information and communication technologies (ICTs) are becoming increasingly important: there is a growing empirical literature on how ICTs facilitate innovation and impact firm and country productivity by giving decision makers more complete information.<sup>26</sup>

Indirectly, physical and digital infrastructures impact productivity by enabling and improving access to basic services such as sanitation, education, and healthcare, and therefore contributing to a healthier and more skilled workforce.<sup>27</sup> Transport and—increasingly—digital infrastructures enable deeper social interaction, which contributes to creativity and innovation and, in turn, to productivity.

These links are well established empirically,<sup>28</sup> providing substantial evidence of the importance for productivity of both the quantity and quality of surface and air transport, energy, ICTs, and connectivity.

## MACROECONOMIC ENVIRONMENT

A stable macroeconomic environment does not drive economic growth, but it is a necessary condition to promote productivity.<sup>29</sup> Uncertainty about the future economic outlook, associated with volatile inflation and

doubts about the sustainability of public finances or recessions caused by financial crises, can dramatically reduce investments. Fischer (1993) defines a stable macroeconomic framework as being characterized by low and predictable inflation and sustainable fiscal policy,<sup>30</sup> and shows that both these factors increase capital accumulation and productivity growth. Recent financial crises have brought to light additional factors affecting the stability of the economic environment: the composition of public finance, its dynamic interaction with the financial sector, and the detrimental effect of recessions resulting from financial meltdown.

The first ingredient for a stable macroeconomic environment is low inflation. In principle it is volatility of prices that affects productivity rather than high levels of inflation per se, but empirical research has found that in practice high levels of inflation are by nature volatile.<sup>31</sup> When inflation is high, future prices are less certain so returns are less predictable and long-term projects become riskier, reducing the willingness of firms and investors to invest. Deflation or near-zero inflation also has negative effects on the economy: it increases the real value of debt; it may also generate unemployment, because wages remain artificially above market level; it discourages investment by increasing real interest rates; and it can lead to a self-reinforcing cycle of consumers holding back spending in expectation of further price decreases. For these reasons, most central banks target moderate and stable inflation.

The second component of macroeconomic stability is the avoidance of uncertainty about public finances.<sup>32</sup> Such uncertainty may cause potential investors to hold back from committing to new projects,<sup>33</sup> or to prefer short-term projects to longer-term ones that would have higher returns and more impact on productivity growth.<sup>34</sup> The need to deal with high public debt may also diminish a government's effective political independence, including its flexibility to pursue policies that would promote productivity-enhancing investments.<sup>35</sup> If governments increase taxes to service the debt, this can introduce market distortions that affect productivity.<sup>36</sup>

26 Among others, see Franklin et al. 2009 on the impact of ICT use on firm performance in 13 EU economies; UNCTAD 2008 about ICT impact on Thailand's manufacturing sector productivity; Brynjolfsson et al. 2011 on the impact of data on firm performance.

27 As highlighted by Calderón and Servén 2014, additional indirect effects accrue through changes in the usage of other production factors as a result of complementarities with infrastructures and positive externalities.

28 For example, Aschauer 1989 finds a large effect of public infrastructure on productivity in the United States and links the decline in productivity observed in the 1970s to the lack of infrastructure investment, though this was probably an overestimate resulting from methodological and data issues. Subsequent empirical research has typically found the impact to be smaller yet positive in most cases. A meta-analysis by Straub 2008 finds a significant positive effect of various infrastructure measures on productivity in two-thirds of cases. On separate but related issues, see also Canning and Pedroni 2008; Pritchett 2000; and Tanzi and Davoodi 1997; also see Keefer and Knack 2007 about the importance of governance, corruption and clientelism for public expenditure and consequential better quality of infrastructures.

29 In the context of the GCI, macroeconomic stability is assessed by its impacts on productivity rather than with respect to fiscal and monetary policies that affect economic growth by supporting aggregate demand.

30 Fischer 1993 also mentions appropriate interest rates, appropriate and predictable real exchange rates, and a viable balance of payments. However, we believe that interest and exchange rates are partially captured by the financial development pillar and partially endogenous to fiscal policy.

31 The empirical evidence finds a nonlinear relationship between growth and inflation; see Fischer 1993; Little et al. 1993; Omay and Öznur Kan 2010; Ibarra and Trupkin 2011; Seleteng et al. 2013. Inflation is positively related with growth up to certain threshold, and then it becomes significantly negative after this level.

32 Uncertainty can either be due to the policy measures that will need to be implemented to achieve budget balance, or to a high likelihood of default.

33 Pindyck and Solimano 1993.

34 Fosu 1996; Servén 1997.

35 Elmendorf and Mankiw 1999.

36 Krugman 1988; Sachs 1989.

On the other hand, if governments borrow to service the debt, they need to offer higher interest rates to compensate for perceived higher risk, which can crowd out private investment.

In addition, some studies suggest that the *composition* of debt may matter: Gros (2011) argues that public debt owed to foreigners is much riskier than domestic public debt, because governments cannot tax non-citizens. Debt owed in foreign currency also exposes a country to the risk that depreciating exchange rates will add to the debt burden.<sup>37</sup> Higher interest rate spreads on foreign currency debt amplify the crowding out effect.<sup>38</sup>

With respect to foreign currency exposure, private debt can also have destabilizing effects on the economy: countries whose firms hold a large amount of foreign currency-denominated debt may run the risk of a crisis since sudden stops and currency volatility can produce a chain of private-sector defaults.<sup>39</sup>

When countries with high levels of public debt run budget deficits, this fuels perceptions of instability by indicating that unsustainable debt levels will be reached at a faster rate.<sup>40</sup> The recent financial crisis has highlighted that concerns about the unsustainability of public debt can be self-reinforcing:<sup>41</sup> high public debt forces up interest rates, making it more difficult for governments to service the debt, which adds to concerns about the debt's unsustainability.

The second lesson from the recent recession is that financial crises, although originating in the financial sector, can have macroeconomic effects, generating an unstable economic outlook. Recessions associated with financial crises can harm long-term productivity through a phenomenon called *hysteresis*, which may explain why the global economy failed to return to previous levels of growth after the crisis.<sup>42</sup> Financial crises cause banks to restrict credit, reducing investment and increasing unemployment.<sup>43</sup> Before credit lines can be re-established some firms go bankrupt, losing intangible assets, while unemployed workers lose skills.

37 Hausmann et al. 2013 point out that this is because developing countries cannot borrow abroad in their own currency and sometimes cannot borrow long-term domestically. This phenomenon is referred to as "original sin" by Eichengreen et al. 2003.

38 Du and Schreger 2013.

39 Aghion et al. 2004 suggest that if domestic prices do not adjust fully to exchange rate changes, a currency depreciation driven by a rapid capital outflow (a "sudden stop") increases the debt burden of such firms, reducing their profits and in turn their ability to invest; in the worst cases they go bankrupt.

40 Fischer 1993.

41 This is a case of "multiple equilibria," in which the self-reinforcing cycle could also go in the other direction: if the markets expect that the government can pay, risk premium will be low and hence there will be no default (Gros 2012).

42 The concept of hysteresis was originally discussed by Blanchard and Summers 1986.

43 Franz 1990.

## HEALTH

Health will remain as important in the updated GCI as it is in the current GCI. The availability of new indicators could lead to improvements in the measurement of the health status of the population, especially with respect to non-communicable diseases.

According to the World Health Organization's definition, *health* is a *state of complete physical, mental, and social well-being, not merely the absence of disease or infirmity*.<sup>44</sup>

It is commonly understood that higher income typically leads to better health, for example by enabling a country to afford better nutrition, sanitation, and healthcare services. A substantial body of research now points to causality also flowing in the other direction: better health leads to higher income by improving productivity.<sup>45</sup> A healthy workforce forms the backbone of economic activity.

Better health directly affects productivity in two main ways. First, healthy workers have the physical and mental energy to perform better.<sup>46</sup> Second, they are less likely to take time off work as a result of illness (either because of their own illness or to take care of a sick family member). In that sense, productivity can be affected by the health not only of the current workforce but also that of the population as a whole.

We intend to capture the impact on productivity of two broad categories: non-communicable diseases and communicable diseases. Communicable diseases such as HIV, malaria, and tuberculosis drag down productivity because infected workers are weaker and tend to be more often absent from work than healthy workers.<sup>47</sup> However, the global disease burden is shifting from communicable to non-communicable diseases such as cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes.<sup>48</sup> These are of growing concern because they reduce the quality and quantity of the labor force and therefore negatively impact productivity.<sup>49</sup>

In addition to the two direct channels described above, there are three main indirect ways in which better health translates into greater productivity, with effects becoming apparent only in the medium to long run. First, healthy children tend to attend school more

44 This definition is based on the preamble to the World Health Organization's Constitution. See WHO 1946.

45 See, for instance, Bloom and Canning 2000, 2008; Cole and Neumayer 2006; Tompa 2002; UNIDO 2007; WHO 2001.

46 For the arguments on how a healthy workforce impacts productivity, see, for instance: Bloom and Canning 2008; WHO 2001.

47 For instance, on the link between productivity and HIV, see ILO 2010 and UNAIDS 2015; for the link between productivity and tuberculosis, see Laxminarayan et al. 2007; and for the link between productivity and malaria, see World Economic Forum and Harvard School of Public Health 2006 and WHO 2001.

48 Murray et al. 2012.

49 World Economic Forum and Harvard School of Public Health 2011; WHO 2014; Engelgau et al. 2011.

regularly, stay in school for longer, and develop higher levels of cognitive ability, thus improving the overall level of education of the future workforce. The importance of education for productivity is described further below.

Second, healthier individuals live longer, and individuals with longer life expectancies are likely to invest more in building their human capital through education because they can expect higher returns on their investment. And third, healthier individuals are likely to spend less on medical expenses, enabling them to save more. With a longer life expectancy, an individual may be motivated to save more for retirement. This will increase the amounts available to fund investments; investments that businesses are also more likely to make when they know they can rely on a healthy workforce.

## EDUCATION

*Education can be defined as the stock of skills, competencies, and other productivity-enhancing characteristics embedded in labor, or in other words the efficiency units of labor embedded in raw labor hours.*<sup>50</sup> In general, education—as a critical component of a country’s human capital—increases the efficiency of each individual worker and helps economies to move up the value chain beyond manual tasks or simple production processes. Since Schultz (1961), human capital has been considered the “most distinctive feature of the economic system,”<sup>51</sup> and further work has proven the impact of education on productivity growth empirically.<sup>52</sup>

Three channels have been suggested through which education affects a country’s productivity. First, it increases the collective ability of the workforce to carry out existing tasks more quickly. Second, secondary and tertiary education especially facilitate the transfer of knowledge about new information, products, and

technologies created by others.<sup>53</sup> Finally, by increasing creativity it boosts a country’s own capacity to create new knowledge, products, and technologies—as discussed further in the last two categories below.

Education concerns not only the quantity of schooling—the percentage of the population that completed primary, secondary, or tertiary education—but also, critically, its quality. Hanushek and Kimko (2000), for example, find that it is not merely years of schooling but the quality of schooling (which may be reflected in international examinations) that has a significant relationship with economic growth.<sup>54</sup>

Although traditional areas of education such as literacy and numeracy remain important drivers of productivity, the GCI needs to be updated to place greater emphasis on the delivery of education that meets 21st century demands such as knowledge diffusion and innovation. Current debates on the relationship between the quality of education and productivity center on softer skills such as the extent to which educational institutions equip their students with the ability to think critically and creatively, and how extensively and effectively these institutions foster and support students’ curiosity. This has two important implications for delivering education. First, research suggests that teaching creativity and curiosity involves complementing the focus on numeracy and literacy with concepts of intelligence in areas such as the arts, music, interpersonal relations, control of the body (as needed, for example, for dancing and theater), and intrapersonal knowledge.<sup>55</sup> Second, it requires a reassessment of our current methods of teaching: departing from the assumption that all children learn equally, it suggests the need for a tailor-made learning experience based on an individual analysis of the way a child absorbs knowledge, thereby allowing the teacher to properly assess a child’s progress.<sup>56</sup>

## PRODUCT AND SERVICE MARKET EFFICIENCY

When markets for goods and services function efficiently, each factor of production is allocated to its most productive use. That means businesses produce the goods and services most desired by customers and sell them for the lowest possible price. The efficiency of product markets can be reduced by lack of competition and distortionary fiscal policies and regulations. For the most part, aspects related to these topics are already

50 Acemoglu 2009, Chapter 3.

51 Schultz 1961, p. 1. Schultz explores the role of human capital to explain three findings that were seemingly perplexing at the time of writing: (1) there was a fall in share of the capital-income ratio despite it hitherto being believed that the share of capital should increase with economic growth; (2) income in the United States had increased at a higher rate than the combined amount of land, number of man-hours worked, and stock of reproducible capital used to produce the income; and (3) there was an unexplained large increase in real earnings per worker. Schultz concentrates on (1) health facilities and services, broadly conceived to include all expenditures that affect the life expectancy, strength, and stamina, vigor, and vitality of people; (2) on-the-job-training; (3) formally organized education; (4) study programs for adults that are not organized by firms; and (5) migration of individuals and families to adjust to changing job opportunities.

52 For example, according to Barro 2001, an additional year of secondary schooling for boys raises the economic growth rate by 0.44 percent per year. Barro and Lee 2010 find that, holding all else constant, output for the world economy would increase by around 2 percent for every additional year of schooling. Standards models have also been developed by Becker 1965, Mincer 1981, and Ben-Porath 1976. See Acemoglu 2009 for a detailed discussion.

53 This role of human capital in adapting to change and implementing new technologies was first suggested by Schultz 1964 and also pioneered by Nelson and Phelps 1966. On the link with secondary and tertiary education in particular, see Barro and Lee 2010.

54 Hanushek and Kimko 2000 find that scores on international examinations (indicators of the quality of schooling capital) matter more than years of attainment for subsequent economic growth. Labor force quality has a consistent, stable, and strong relationship with economic growth.

55 Gardner and Hatch 1989; Robinson 2001, 2009.

56 Lazear 1992.

captured in the current GCI. In the updated GCI, we plan to also include the effects of bankruptcy law on competition and market efficiency.

Industries where competition is more intense are more efficient and produce more innovation, thus improving productivity.<sup>57</sup> Competition-enhancing policies enable the market to select the best firms, thereby creating incentives for firms to reduce costs and for new, more efficient firms to enter the market.<sup>58</sup> The presence of dominant players in a market—for example, in oligopolies and monopolies—drives up prices but also, importantly, can decrease the level of innovation. Effective antitrust policies should avoid the creation of such dominant positions while preserving economies of scale and incentives for innovation, especially in resource-intensive and high-tech sectors.

In most cases,<sup>59</sup> opening a market to foreign competition forces the least-productive companies to exit the market and rewards the most productive;<sup>60</sup> removing domestic barriers to entry into and exit from markets can increase productivity through the “creative destruction” of less-productive firms.<sup>61</sup> When firms can easily enter and exit markets, resources can be reallocated to emerging sectors and capital reinvested in new technologies with higher productivity.

The legal and regulatory environment can directly impact the entry and exit of firms. An efficient framework for settling bankruptcy is necessary to ensure that investors can close a failing entrepreneurial experience and move on to new challenges. Barriers to entry

include licensing (especially of professional or public services), public monopolies, and administered prices.<sup>62</sup> There is evidence that reforms to market regulation policies in Organisation for Economic Co-operation and Development (OECD) countries intended to promote competition tend to also boost productivity.<sup>63</sup> These specific factors are not fully captured in the current GCI, but they will be reflected in the updated competitiveness index.

Beyond lack of competition and restrictive regulations, fiscal policies can also reduce the efficiency of product markets by distorting investment choices and artificially favoring sectors based on political selection.<sup>64</sup> Although there can be arguments for such interventions, in many cases they have negative effects on a country's overall productivity—for example, by subsidizing traditional but declining industries at the expense of new and more vibrant sectors.

It is well established that taxation in general affects productivity by reducing investment, because it effectively increases the cost of investment capital.<sup>65</sup> Specific tax structures can exacerbate the effect: for example, Fatica (2013) finds that the structure of tax incentives for capital investment in advanced economies has led to a significantly higher share of investment in machinery and equipment and a significantly lower share in ICTs.

## LABOR MARKET EFFICIENCY

Efficient labor markets match workers with the most suitable jobs for their skillset. Efficient labor markets also incentivize both employees and employers to act in ways that promote the productivity of human capital: workers to work as efficiently as possible and employers to provide the right incentives.

The first way in which efficient labor markets promote productivity—allocating a country's human resources to its most productive sectors—points to the importance of labor market flexibility. Employment protection policies, such as rules and regulations for firing workers, have been shown to lead to a decrease in employment, consumption, and productivity.<sup>66</sup> Flexible

57 Blundell et al. 1999 find that industries characterized by more intense competition produce more innovation and that firms with higher market share tend to have a more intense patent activity. For the sake of completeness, some economists have also pointed out that competition may discourage firms from entering the market by driving down post-entry rents (Dasgupta and Stiglitz 1980), or reduce innovation as dominant firms innovate more (Scherer 1967) since they can overcome financial market failures resorting to internal cash flows (Bhattacharya and Ritter 1985). Market competition can discourage investments in innovation by reducing the rents generated by successful innovation (Aghion and Howitt 1992).

58 Aghion and Schankerman 2004. The effect on productivity of market selection among firms has been confirmed by empirical studies such as Nickell 1996 and Buccirossi et al. 2011. Nickell 1996 finds that increased competition, measured as lower rents or a higher number of competitors, is associated with significantly higher TFP growth. Buccirossi et al. 2011 find that better competition policy fosters TFP growth, especially in countries that lag further behind the technological frontier and where the overall regulatory environment and the judicial system work better.

59 Although openness and international competition is beneficial in most cases, there might be cases for which the protection of the infant industry can increase welfare. Melitz 2005 provides a model for optimal infant industry protection and argues that the decision to protect the industry should depend on the industry's learning potential, the shape of the learning curve, and the degree of substitutability between domestic and foreign goods. In terms of methods of protection, he argues that quotas achieve a higher welfare than tariffs.

60 Melitz 2003. Moreover, trade reallocates market share toward more productive firms and reduces mark-ups, which implies increased competition; see Melitz and Ottaviano 2008.

61 Schumpeter 1942.

62 Blanchard and Giavazzi 2003.

63 Nicoletti and Scarpetta 2003.

64 We focus on the distortionary effect of taxes on productivity rather than their redistribution effect.

65 This finding stretches back to Jorgenson and Hall 1967. More recently, Vartia 2008 finds that corporate tax rates negatively affect TFP by reducing company profitability. Similarly, Arnold and Schwellnus 2008 find a negative effect of corporate taxation on both firm-level TFP and investment, especially in sectors with higher average profitability and in firms that lag more behind the technological frontier. An analysis of the link between taxation and private investment (the crowding-out effect) should also take into account the efficiency of public spending and preferences in public supply of good and services. However, such a discussion is beyond the scope of this work.

66 Hopenhayn and Rogerson 1993.



labor markets allow workers to shift from declining firms and enable companies and the economy as a whole to respond to external shocks.<sup>67</sup>

Greater labor market flexibility also increases the ability of a country to reallocate production to emerging segments and adapt the workforce to the new needs of high-tech sectors.<sup>68</sup> As technology advances, firms that fall behind the technological frontier have to reduce their workforce—and if firing costs are high, entrepreneurs will be more inclined to invest in sectors with a slower pace of technological change.<sup>69</sup> This implies that countries with more flexible labor market legislation would tend to specialize more in industries with a faster pace of technological change.

Flexibility works best when complemented by some form of unemployment insurance, because workers who benefit from unemployment insurance are more patient in their job searches and tend to look for riskier, more productive, and higher-wage jobs; employers also tend to create more of these good-quality jobs. Acemoglu and Shimer (2000) find that, while moderate levels of unemployment insurance benefits—such as those in the United States—may slightly increase the level and duration of unemployment, they could boost productivity overall by improving the quality of jobs. Recent research has also pointed to active labor market policies as a means to improve the matching between workers and vacant jobs and reduce long-term unemployment.<sup>70</sup> The importance of these policies is not captured in the current Index but will be taken into account in the updated GCI.

The second way in which efficient labor markets can stimulate productivity is by promoting the accumulation of human capital and the use of talent at its full potential. This means attracting and retaining the best talent in the country, increasing workers' efforts, and increasing employers' willingness to train employees. Performance-related pay is one policy with proven benefits for productivity.<sup>71</sup>

Beyond monetary rewards, dualities in labor markets—when some permanent employees enjoy strong labor protection, while others are on flexible temporary contracts—have been shown to reduce

productivity in two ways: by demotivating workers and by reducing firms' investments in training.<sup>72</sup>

## FINANCIAL MARKET EFFICIENCY

An efficient financial market is characterized by prices that reflect all available public information, a lack of bubbles, the capacity to manage risks through hedging, and the tendency to allocate savings to their most productive investment uses.<sup>73</sup> Such efficiency is achieved only when financial markets are both developed and stable.<sup>74</sup> Although these concepts are already defined in the current GCI, the measurement of some of their elements has improved and the 2008–09 financial crisis has reconfirmed the importance of achieving stability. Both these developments will be better reflected in the updated version of the Index.

*Financial development* is defined here as the depth of the intermediation system, including the availability and liquidity of credit, equity, debt, insurances, and other financial products. Given financial stability, financial development promotes productivity in four main ways.<sup>75</sup> First, developed financial markets enable risks to be pooled. This allows for investments in larger and riskier projects that tend to be more productive: without the capacity to pool risks, individual investors would prefer smaller and lower-risk but also lower-return projects.<sup>76</sup> It also makes it easier for individual investors to diversify, improving access to finance for small- and medium-sized enterprises (SMEs), which tend to be more risky than larger firms but also more dynamic and innovative, increasing a country's productivity.<sup>77</sup>

67 Mortensen and Pissarides 1994 were the first to provide a model to analyze the matching process between jobs and workers and to study the impact of labor market policies on adjusting to shocks.

68 Bassanini et al. 2009 found that firing restrictions affect the TFP of industries with a higher rate of job turnover more negatively.

69 Samaniego 2006.

70 See, for example, Pissarides 1992; Camfors 1994.

71 For example, Lazear 2000 finds that in one company, performance-related pay boosted average output per worker by about 44 percent, through both increasing the productivity of existing workers and attracting new and more qualified employees. Booth and Frank 1999 found that performance-related pay raised earnings in firms, in line with net productivity gains.

72 Boeri and Garibaldi 2007 show how the presence of such dualities negatively affects the productivity of labor. Dolado et al. 2012 show that duality leads employees to decrease their efforts and firms to reduce investments in training.

73 This characterization is based on Tobin's 1984 definition of financial efficiency. In more technical terms, these characteristics are (1) information arbitrage efficiency, (2) fundamental valuation efficiency, (3) full insurance efficiency, and (4) functional efficiency.

74 Omitted in the neoclassical growth model, the role of financial markets for economic growth was raised by Schumpeter 1911, Goldsmith 1969, and King and Levine 1993. The importance of this issue rests on the question of causality: is financial intermediation the result of economic growth, or does it also spur economic growth? Lucas 1988 argued that finance merely responds to changing demands from the "real sector." However, more recent evidence suggests that financial development precedes economic growth. For example, King and Levine 1993 show a strong relationship between the initial level of financial development and growth, and Rajan and Zingales 1998 show that industrial sectors that are relatively more capital intensive develop much more in countries where financial markets are already developed.

75 Levine 2005.

76 Acemoglu and Zilibotti 1997 show that, since large investment projects require a large amount of capital, in the absence of financial institutions that collect and allocate capital it would not be possible to finance such large projects because there could be no single investor with sufficient capital or willing to invest in such projects.

77 King and Levine 1993; Norden 2015.

Second, the development of financial markets improves the allocation of capital to entrepreneurs and investment opportunities by enabling investors to find information about investment opportunities that have the best chance of improving productivity.<sup>78</sup> Third, large financial intermediaries are more able than individual investors to develop long-run relationships with the firms to which they lend, and monitor those firms, incentivizing borrowers to invest the borrowed money productively.<sup>79</sup> And fourth, by providing an efficient payment system, the banking sector reduces the transaction costs associated with the exchange of goods and services, which generates productivity gains.<sup>80</sup>

Without sound financial institutions and stability, however, excessive financial development can lead to costly financial crises. Rousseau and Wachtel (2011) show that the financial crises neutralized the growth-enhancing effect of financial deepening that had taken place in previous periods. Financial sectors that grow “too large” relative to the rest of the economy appear to be associated with risks of financial instability, through promoting excessive risk taking and producing political capture.<sup>81</sup>

Given the possibly permanent effects that financial crises may have on the growth trajectory of an economy,<sup>82</sup> policymakers have started to consider preventive macro-prudential policies;<sup>83</sup> however, the debate on how such policies should balance the development and stability of financial sectors is still ongoing.<sup>84</sup> Therefore the updated GCI will focus on improving the measurement of the concepts of financial development and stability, but will not provide indications of what specific banking regulations would be optimal.

## TECHNOLOGICAL ADOPTION

In today’s globalized world, technology is increasingly essential for firms to compete and prosper. The technological adoption category assesses the agility

with which an economy adopts existing technologies. Compared with the current GCI, the updated pillar does not include measures of ICT use. This concept is now part of the infrastructure and connectivity pillar.<sup>85</sup>

Technology is understood as a broad concept covering not only products such as machinery, equipment, and material, but also processes and organization methods, all linked by the common factor of enhancing efficiency in production. In addition, technology adoption contributes to a conducive innovation ecosystem (see below).

The literature identifies two sources of technology adoption: local firms can invest to bring in technology from abroad or from other sectors or companies, and a country can exploit spillovers from the foreign direct investment (FDI) of international companies.

Turning first to investment by local firms, the wider the gap between foreign technology and the technology already available in the country—and the longer the gap between invention and adoption—the more difficult it is to import new technologies. Disparity in these barriers to technology adoption accounts for a large portion of income disparity across countries.<sup>86</sup>

Such barriers are not merely financial. Research shows that countries’ endowment in human capital, institutions, geographic distance, and openness to trade can affect the extent of these barriers,<sup>87</sup> requiring specific organizational adjustments, management skills, and time-consuming accumulation of technical knowledge. There is a role for investments in human capital to overcome these barriers, and for local and industry-level policies to promote technology adoption.

As for FDI, a large theoretical and empirical literature shows spillovers on growth in the recipient country through three channels: contagion effects, imitation, and movement of labor.<sup>88</sup> Contagion occurs through personal contacts between domestic and foreign firms; the transfer of knowledge is proportional to the presence of foreign investment in the industry and to the relative backwardness of the country.<sup>89</sup> Imitation happens when

78 Galetovic 1996; Blackburn and Hung 1998; Morales 2003.

79 Diamond 1984; Bencivenga and Smith 1991.

80 Greenwood and Smith 1997.

81 On the concept of “too large,” see Arcand et al. 2012. On risk taking, see Beck 2011. On political capture, see Johnson 2009.

82 The concept of hysteresis has been discussed in the context of the macroeconomic environment since, although financial crises are produced in the financial sector, when they take place they impact the stability of the economy at large.

83 Macro-prudential policies have been defined as the use of primarily prudential tools (i.e., caps on loan-to-value ratios, limits on credit growth and sheets restrictions, capital and reserve requirements and surcharges, and taxes) to limit systemic risk—the risk of disruptions to the provision of financial services that is caused by an impairment of all or parts of the financial system, and that can cause serious negative consequences for the real economy. For further discussion, see IMF 2013 and Claessens 2014.

84 The discussion about how to best implement regulation is therefore outside the scope of our analysis and we assume that the regulation is effective as long as financial markets are deep and stable.

85 In the current GCI, two ICT measures appear in both the infrastructure and technological readiness pillars and each occurrence is assigned half-weight. In an effort to streamline and simplify the framework, the updated GCI will not use half-weight indicators.

86 Parente and Prescott 1994; Barro and Sala-i-Martin 1997; Comin and Hobijn 2010.

87 See, for example, Comin and Hobijn 2004. See also the human capital, institutions, and openness sections for a more complete review of these factors. Since they are already taken into account in other pillars of the Index, they are not considered in this context.

88 The literature is divided between research focusing on spillovers from horizontal FDI (intra-industry, between foreign firms and their local competitors); and research studying spillovers from vertical FDI (inter-industry, among foreign firms and their local buyers and suppliers).

89 See Findlay 1978. Another type of contagion occurs in vertical FDI through the relationship between international firm and local suppliers (Rodriguez-Clare 1996).

domestic firms copy foreign production, starting at a lower level and gradually reducing the technological gap.<sup>90</sup> Finally, foreign firms may transfer know-how by training their local workers.<sup>91</sup>

Recent research has tested these theories empirically and found that, although FDI fosters growth in general, the net effect may depend on the conditions of the local economy. Such conditions include the availability of good suppliers, local human capital, financial development, the sector involved, and the capacity of international companies to work with local suppliers.<sup>92</sup>

## MARKET SIZE

Historically, the size of an economy has coincided with its domestic market. However, in a globalized world, a country's market may or may not coincide with its political borders. *Market size* is therefore defined as a combination of country size and foreign markets.

Economic research, in line with the current GCI, suggests two ways through which market size affects productivity: economies of scale in production and incentives for innovation.

In general, market size produces efficiency gains by allowing for specialization—an idea that remains as true today as when Adam Smith proposed it in 1776. Furthermore, large markets can take advantage of economies of scale in the production of goods and services. Public goods tend to have high fixed costs and low marginal costs, and consequently the per capita cost of services such as justice, defense, and infrastructure decreases in places where a greater number of taxpayers pay for them.<sup>93</sup> Similarly, firms may also attain increasing returns to scale that enable them to produce more output with proportionally less input by using larger and more efficient capital equipment.<sup>94</sup> As argued by Balassa (1967) and Kravis (1971) and modeled by Krugman (1979), economies of scale play a crucial role in explaining the postwar growth in trade, since

extending the market through trade allows exploitation of economies of scale in production.<sup>95</sup>

The second driver of productivity is perhaps even more important: larger markets create substantially bigger incentives for generating new ideas. Larger stocks of resources increase the likelihood of finding new ways to use those resources, and a single idea can make more profit when it is sold in larger markets.<sup>96</sup> On the same note, larger markets create positive externalities in the accumulation of human capital and transmission of knowledge because of increasing returns to scale embedded in technology or knowledge creation.<sup>97</sup>

## IDEAS ECOSYSTEM

The way economists and practitioners think about innovation has evolved considerably in the past decade. From coming up with new ideas, innovation is now seen as an “ecosystem” conducive to the generation of ideas and the “implementation” of these ideas in the form of new products, services, and processes in the marketplace. Some elements of the ecosystem promote competitiveness in their own right (education, the availability of finance, competition, technology) while supporting the innovation ecosystem. This section focuses only on aspects specific to innovation and leaves the discussion of the other relevant but more general factors to the previous sections. Building on the current GCI, which focused primarily on technological innovation, the new framework attempts to capture this broader notion of innovation.

We define *idea generation* as the capacity of a country to produce new inventions—solutions to specific technological or business problems—that change consumption patterns and models, whether this takes the form of addressing new needs or new ways to perform tasks. The generation of ideas is, however, just the first step toward innovation, which also requires bringing products, processes, or business models to market or concretely implementing them in the economy, as explored below. Opportunities and incentives to create new ideas translate into more innovation and hence higher productivity.<sup>98</sup> Although economic literature focuses more on system incentives to spur idea generation at the aggregate level, business literature

90 Glass and Saggi 1998.

91 Glass and Saggi 1999.

92 For example, Potter et al. 2003 find that buyer-supplier linkages are important for productivity spillovers. Borensztein et al. 1998 and Xu 2000 show that FDI affects a host country's technology and growth only in the presence of a sufficient stock of human capital, while Alfaro et al. 2004, Durham 2004, and Hermes and Lensink 2003 provide evidence that well-developed financial markets are necessary to gain significantly from FDI.

93 See Alesina et al. 2005b.

94 In other words, the cost of producing one additional unit of output diminishes when the total amount of production increases. Economies of scale are often productivity enhancing; however, for sake of completeness, it is sometimes possible to attain diseconomies of scale. This happens when the marginal cost of production is higher than the average cost, in which case there is a trade-off between the size of the economy and its efficiency.

95 Similarly, Matsuyama 1991 models industrialization by considering a manufacturing sector subject to increasing returns.

96 Romer 1996 uses US time series to show that techniques of mass production emerged in the United States in the first half of the 19th century. He chose the United States because the larger market and larger stocks of resources create substantially bigger incentives for discovering new ways to use the resources.

97 Jones 1999 shows that, because ideas are non-rivalrous and can be used for each unit simultaneously, the total production of new products (i.e., novels, computer games, and automobiles) is characterized by increasing returns once the fixed cost of creating the idea is taken into account. A similar concept is also presented by Lucas 1988 and Grossman and Helpman 1991.

98 See, for example, Romer 1990.

suggests that, since a relevant part of innovation happens or is implemented in firms, it is important to identify the factors that generate innovative companies and/or motivate them to innovate. Therefore both streams of literature need to be considered to provide a complete picture of the innovation environment.

Some models of endogenous growth focus only on the link between productivity and formal R&D,<sup>99</sup> highlighting the importance of legal environments (such as the patent system) and the effect on competition of the race for new ideas. In these models, factors that lead economies to employ more researchers and invest more capital resources in research will produce more new ideas, will be more competitive, and will grow faster.

However, recent studies show that non-R&D forms of innovation are also important: in types of innovations that do not require fixed costs (such as research costs) and/or that may allow for a “first mover advantage,” the inventors may be able to maintain a competitive advantage for a sufficient interval of time to have an incentive to innovate. For example, innovations in managerial and organizational techniques, personnel, accounting, work practices, finance, and branding can increase the efficiency with which a good or service is produced.<sup>100</sup> In this case, the benefits of innovating are not associated with selling the innovation, but instead are seen in the increase of profits through efficiency gains.

Ideas are by nature “non-rival” (that is, they can be “consumed” by several users at same time). Some ideas are also non-excludable—that is, the author cannot prevent others from using them, either because they cannot be protected by patent laws or because of their nature. For example, it would be impossible to prevent people from using the Pythagorean theorem, even if it were patented. Some ideas, on the other hand, are temporarily excludable: the authors can prevent others from using them. This can happen if the idea is patented or if the idea is hard to duplicate so the author has a first mover advantage while competitors figure out how to copy it. If ideas are non-excludable, inventors will not be able to reap the benefit of their inventions. In this case, only few ideas will be generated.<sup>101</sup>

As noted above, not all ideas are generated by scientific R&D; they can also result from other activities, when certain conditions align. Therefore, providing an

innovation-conducive environment can increase the likelihood that this kind of “softer” innovation takes place. The literature shows that ecosystems and networks encourage collaboration, connectivity, critical and creative thinking, diversity, and confrontation across different visions and angles;<sup>102</sup> these systems increase the likelihood that new ideas will be generated.<sup>103</sup>

In some cases the development of creativity and collaboration skills is related to educational opportunities, as discussed in the education section. For example Dyer et al. (2011) propose that—beyond technical inventions—the ultimate drivers of innovation are related to human capital factors such as curiosity and the capacity to observe, understand, and use ideas from different fields.<sup>104</sup>

## IDEAS IMPLEMENTATION

Although ideas are the engine of growth, they do not create economic benefits until they are incorporated into actual products, services, and processes that reach the marketplace. This helps to explain why national investments in R&D are not always strongly correlated with average incomes. Understanding the causes that result in a lack of implementation and commercialization of new ideas, whether patented or not, is at the core of economic research on innovation.

This focus on microeconomic drivers of growth—that is, on how dynamics in the business world affect the creation of new products or companies—is at the cutting edge of innovation research and has not yet generated many firm conclusions. However, in principle the link between company-level innovation and national productivity is straightforward. By bringing new products and services to market, companies foster productivity though the technology embedded in those new products and provide efficiency gains associated with their use.

The innovation process is a function of two aspects of a company. The first is its corporate culture: the extent to which it promotes the vision and capacity to manage

99 See, for example, Romer 1990; Barro and Sala-i-Martin 2004; Howitt and Aghion 1998; Dinopoulos and Thompson 1998.

100 See Comin and Mulani 2006.

101 The literature also suggests that there are externalities in R&D production that have three consequences: (1) since inventors (monopolists) cannot do perfect price discrimination, even with patent protection uniform pricing will generate some consumer surplus; (2) the introduction of new technologies makes old technologies obsolete and therefore harms the investors in these technologies; and (3) inventors earn private returns in goods production but not in knowledge production, and therefore they are incentivized to produce inventions only if they can market them.

102 Ridley 2010 argues that, in a historical perspective, prosperity relates to “how human beings bring together their brains and enable their ideas to combine and recombine, to meet and, indeed, to mate.”

103 For example, Coto-Millán et al. 2011 show theoretically that the chance of achieving scientific discoveries increases in the presence of collaborative relationships between universities, private companies, and public administration. McGregor and Chi 2002 show that collaborative problem solving involves the active exchange and interaction of ideas between two or more people and such interactive exchanges can result in the joint production of co-constructed ideas, some of which may be novel. Huang et al. 2010 show that collaboration is important for both R&D and non-R&D innovation but each type uses different networks: R&D product innovation involves sourcing information from clients, universities, and research institutions, while non-R&D innovation uses information from suppliers and competitors. Finally, Barahona and Pentland 2006 show that diffusion of ideas depends on time, communication channels, and a social structure to support it; idea generation is therefore fostered by stronger communication channels and intensity of human connections.

104 Dyer et al. 2011.

new technologies, develop new business models, and exploit old technologies in new ways.<sup>105</sup> Openness to new, unconventional, and disruptive ideas has a first-order impact on creative innovations that break new ground in knowledge creation.<sup>106</sup> Such openness is influenced by society's prevailing norms, such as the degree of risk aversion.<sup>107</sup>

The second aspect is business execution, some important elements of which are already captured in other pillars. For example, one of the effects of the availability of venture capital and other financial resources—as reflected in the financial development section—is to permit an organization to bear the costs of implementing new ideas and absorb failure.<sup>108</sup> Similarly, ideas may not be implemented because of a lack of human capital, an issue already addressed in the education pillar.<sup>109</sup>

The effectiveness of marketing influences the degree to which new ideas are implemented because marketing activities complement product innovation by making newly developed products seem appealing. The more a company is able to create product differentiation through strong branding, thereby reducing the sense that a firm's products are substitutable by those of its competitors, the more willing it will be to bear the risks associated with introducing innovative new products.<sup>110</sup>

Other, softer aspects that may prevent a firm from transforming an idea into a product are not yet fully assessed by the literature. For example, commercialization of ideas may be held back by inadequate internal processes and misalignment of different departments.<sup>111</sup>

## CONCLUSIONS

This chapter has reviewed the main drivers of competitiveness with the dual purpose of restating the long-established factors already captured in the current GCI and presenting the World Economic Forum's updated thinking in some areas, with special emphasis on innovation, education, and financial markets, in light of the most recent evidence and economic research. This conceptual discussion will serve as a basis for discussion leading to the updated version of the GCI,

which will be launched in the next edition of *The Global Competitiveness Report*.

Importantly, this effort represents work in progress and presents our current thinking on the concepts that underpin the GCI. The World Economic Forum will continue to update and deepen the understanding of those factors that have evolved in terms of their impact on competitiveness. In the coming year, these concepts will continue to be validated and appropriate measures identified to capture both the new and existing drivers of competitiveness.

This review, together with ongoing consultations with experts, is meant to provide a base for the modernization of the GCI methodology to reflect the latest developments in the economic thinking and the latest available indicators for their measurement.

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105 This idea is derived from the concept of disruptive innovation in Christensen 1997. According to Christensen, "disruptive" innovation is defined as "innovations that create new markets by discovering new categories of customers" while "sustaining" innovation simply improves existing products or processes.

106 Acemoglu et al. 2014.

107 According to Kihlstrom and Laffont 1979, less risk-averse individuals become entrepreneurs while more risk-averse individuals become their employees.

108 Ramsey et al. 2008.

109 Peansupap and Walker 2006.

110 Kaiser 2001.

111 McKinsey 2010.

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## Appendix A: Measurement of Key Concepts and Preliminary Index Structure

The links between productivity and each of the 12 categories explained in this chapter are translated into pillars of the updated GCI and measured through variables and proxies detailed in Table 1 below.

In general, the objective of this framework is to measure current outcomes at pillar level, which are inputs for competitiveness. Therefore we focus on measuring the current quality and quantity of each of the 12 pillars and on identifying bottlenecks and areas of strength. For example, in the infrastructure pillar we measure whether the current provision of transport, energy, and ICT infrastructures and connectivity meet the needs of a country's economy by combining quantitative and qualitative measures.

Although they are relevant for policymaking, we tend to exclude input measures—such as expenditures, investment regimes, and partnership models—for two reasons. First, mixing input and output measures risks double counting. Second, ample evidence shows that input measures, including monetary investment, are poor indicators of either quantity or quality of the dimension measured.

There are, of course, some limitations: as is often the case, data gaps force us to rely on proxy measures to capture certain concepts. For instance, in the case of ICT infrastructure, we use ICT uptake among the population to approximate uptake among businesses.

The structure presented here is preliminary, as some of the indicators have yet to be tested and calibrated.

**Table 1: Preliminary index structure**

Indicator	Indicator description (Question and answers if derived from EOS)	Comments	Existing/New*	Type <sup>†</sup>	Main source(s) (if available)
<b>1st pillar: Institutions</b>					
<b>A. Property rights</b>					
Property rights	In your country, to what extent are property rights, including financial assets, protected? [1 = not at all; 7 = to a great extent]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Intellectual property protection	In your country, to what extent is intellectual property protected? [1 = not at all; 7 = to a great extent]		Existing	EOS	World Economic Forum, Executive Opinion Survey
<b>B. Security</b>					
Business costs of crime and violence	In your country, to what extent does the incidence of crime and violence impose costs on businesses? [1 = to a great extent; 7 = not at all]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Homicide rate	Number of homicides per 100,000 population		New	Non-EOS	United Nations Office on Drugs and Crime
Business cost of organized crime	In your country, to what extent does organized crime (mafia-oriented racketeering, extortion) impose costs on businesses? [1 = to a great extent; 7 = not at all]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Index of terrorism incidence	Simple average of the number of terrorism-related casualties (injuries and fatalities) and the number of terrorist attacks, each normalized on a scale of 1 to 7		New	Non-EOS	World Economic Forum's calculations; National Consortium for the Study of Terrorism and Responses to Terrorism (START)

\* Existing: indicator included in the current GCI methodology; New: new indicator considered for inclusion in the updated GCI methodology.

<sup>†</sup> EOS = Executive Opinion Survey; Non-EOS = other sources.

**Table 1: Preliminary index structure** (*cont'd.*)

Indicator	Indicator description (Question and answers if derived from EOS)	Comments	Existing/New*	Type†	Main source(s) (if available)
<b>1st pillar: Institutions</b> ( <i>cont'd.</i> )					
<b>B. Security</b> ( <i>cont'd.</i> )					
Reliability of police services	In your country, to what extent can police services be relied upon to enforce law and order? [1 = not at all; 7 = to a great extent]		Existing	EOS	World Economic Forum, Executive Opinion Survey
<b>C. Undue influence and corruption</b>					
Irregular payments and bribes	Average score across the five components of the following Executive Opinion Survey question: In your country, how common is it for firms to make undocumented extra payments or bribes in connection with (1) imports and exports; (2) public utilities; (3) annual tax payments; (4) awarding of public contracts and licenses; (5) obtaining favorable judicial decisions? In each case, the answer ranges from 1 [very common] to 7 [never occurs]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Diversion of public funds	In your country, how common is illegal diversion of public funds to companies, individuals, or groups? [1 = very commonly occurs; 7 = never occurs]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Judicial independence	In your country, how independent is the judicial system from influences of the government, individuals, or companies? [1 = not independent at all; 7 = entirely independent]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Favoritism in decisions of government officials	In your country, to what extent do government officials show favoritism to well-connected firms and individuals when deciding upon policies and contracts? [1 = show favoritism to a great extent; 7 = do not show favoritism at all]		Existing	EOS	World Economic Forum, Executive Opinion Survey
<b>D. Checks and balances</b>					
Consistency of judicial system	In your country, to what extent can individuals, institutions (civil society), and businesses obtain justice through the judicial system in the face of arbitrary government decisions? [1 = not at all; 7 = to a great extent]		New	EOS	World Economic Forum, Executive Opinion Survey
World Press Freedom Index	The World Press Freedom Index aims to measure the freedom of information. It reflects the degree of freedom that journalists, news media, and Internet citizens enjoy in each country, and the efforts made by the authorities to respect and ensure respect for this freedom		New	Non-EOS	Reporters Without Borders
<b>E. Public-sector performance</b>					
Burden of government regulation	In your country, how burdensome is it for companies to comply with public administration's requirements (e.g., permits, regulations, reporting)? [1 = extremely burdensome; 7 = not burdensome at all]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Government Online Service Index	The Government Online Service Index assesses the quality of government's delivery of online services		New	Non-EOS	United Nations, <i>E-Government Development Database</i>
Efficiency of legal framework in settling disputes	In your country, how efficient are the legal and judicial systems for companies in settling disputes? [1 = extremely inefficient; 7 = extremely efficient]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Efficiency in provision of public goods and services.	In your country, how efficient is the government in providing public goods and services? [1 = extremely inefficient; 7 = extremely efficient]		New	EOS	World Economic Forum, Executive Opinion Survey
Effectiveness of law-making bodies	How effective is the legislative process in your country? [1 = not effective at all – it is deadlocked; 7 = extremely effective]		New	EOS	World Economic Forum, Executive Opinion Survey
Government ensuring policy stability	In your country, to what extent does the government ensure a stable policy environment for doing business? [1 = not at all; 7 = to a great extent]		New	EOS	World Economic Forum, Executive Opinion Survey

\* Existing: indicator included in the current GCI methodology; New: new indicator considered for inclusion in the updated GCI methodology.

† EOS = Executive Opinion Survey; Non-EOS = other sources.

Table 1: Preliminary index structure (cont'd.)

Indicator	Indicator description (Question and answers if derived from EOS)	Comments	Existing/New*	Type†	Main source(s) (if available)
<b>1st pillar: Institutions (cont'd.)</b>					
<b>F. Corporate ethics and governance</b>					
Ethical behavior of firms	In your country, how do you rate the corporate ethics of companies (ethical behavior in interactions with public officials, politicians, and other firms)? [1 = extremely poor—among the worst in the world; 7 = excellent—among the best in the world]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Strength of auditing and accounting standards	In your country, how strong are financial auditing and reporting standards? [1 = extremely weak; 7 = extremely strong]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Efficacy of corporate boards	In your country, to what extent is management accountable to investors and boards of directors? [1 = not at all; 7 = to a great extent]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Extent of conflict of interest regulation index	The extent of conflict of interest regulation index measures the protection of shareholders against directors' misuse of corporate assets for personal gain		New	Non-EOS	World Bank/IFC, The Doing Business project
Extent of shareholder governance index	The extent of shareholder governance index measures shareholders' rights in corporate governance by distinguishing three dimensions of good governance: shareholders' rights and role in major corporate decisions; governance safeguards protecting shareholders from undue board control and entrenchment; and corporate transparency on ownership stakes, compensation, audits, and financial prospects		New	Non-EOS	World Bank/IFC, The Doing Business project
<b>Pillar 2: Infrastructure and connectivity</b>					
<b>A. Transport infrastructure</b>					
Road quality index	The road quality index will combine different measures of quality and connectivity of the domestic road network		New	Non-EOS	World Economic Forum's calculations
Quality of roads	In your country, how do you assess the quality of the roads? [1 = extremely underdeveloped—among the worst in the world; 7 = extensive and efficient—among the best in the world]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Air Connectivity Index	Based on a gravity-like model, the Air Connectivity Index captures the full range of interactions among all network nodes, even when there is no direct flight connection between them		New	Non-EOS	Arvis, J. F. and B. Shepherd. 2011. <i>The Air Connectivity Index: Measuring Integration in the Global Air Transport Network</i> . June.
Quality of air transport infrastructure	In your country, how do you assess the quality of air transport? [1 = extremely underdeveloped – among the worst in the world; 7 = extensive and efficient – among the best in the world]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Liner Shipping Connectivity Index	The Liner Shipping Connectivity Index captures how well countries are connected to global shipping networks. It is based on five components of the maritime transport sector: number of ships, their container-carrying capacity, maximum vessel size, number of services, and number of companies that deploy container ships in a country's ports		New	Non-EOS	United Nations Conference on Trade and Development
Quality of port infrastructure	In your country, how do you assess the quality of seaports (for landlocked countries, assess access to seaports) [1 = extremely underdeveloped—among the worst in the world; 7 = extensive and efficient—among the best in the world]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Quality of railroad infrastructure	In your country, how would you assess the quality of the railroad system? [1 = extremely underdeveloped—among the worst in the world; 7 = extensive and efficient—among the best in the world]		Existing	EOS	World Economic Forum, Executive Opinion Survey

\* Existing: indicator included in the current GCI methodology; New: new indicator considered for inclusion in the updated GCI methodology.

† EOS = Executive Opinion Survey; Non-EOS = other sources.

Table 1: Preliminary index structure (cont'd.)

Indicator	Indicator description (Question and answers if derived from EOS)	Comments	Existing/New*	Type†	Main source(s) (if available)
<b>Pillar 2: Infrastructure and connectivity (cont'd.)</b>					
<b>B. Energy infrastructure</b>					
Electrification rate	Share of population with access to electricity		New	Non-EOS	World Bank/International Energy Agency
Quality of electricity supply	In your country, how reliable is the electricity supply (lack of interruptions and lack of voltage fluctuations)? [1 = extremely unreliable; 7 = extremely reliable]		Existing	EOS	World Economic Forum, Executive Opinion Survey
<b>C. ICT infrastructure</b>					
Mobile-cellular telephone subscriptions	Number of mobile-cellular telephone subscriptions per 100 population		Existing	Non-EOS	International Telecommunication Union
Fixed-broadband Internet subscriptions	Number of fixed-broadband Internet subscriptions per 100 population		Existing	Non-EOS	International Telecommunication Union
Wireless-broadband subscriptions	Number of wireless-broadband subscriptions per 100 population. This covers satellite broadband, terrestrial fixed wireless broadband, and active mobile-broadband subscriptions to the Internet		New	Non-EOS	International Telecommunication Union
Internet users	Percentage of individuals using the Internet		Existing	Non-EOS	International Telecommunication Union
<b>Pillar 3: Macroeconomic stability</b>					
Debt coverage ratio	General government gross debt as a percentage of government revenue		New	Non-EOS	World Economic Forum's calculations; International Monetary Fund, <i>World Economic Outlook</i>
Government budget balance	General government budget balance, calculated as general government revenue minus total expenditure, as a percentage of GDP		Existing	Non-EOS	International Monetary Fund, <i>World Economic Outlook</i>
Gross national savings	Public- and private-sector savings as a percentage of nominal GDP		Existing	Non-EOS	International Monetary Fund, <i>World Economic Outlook</i>
Inflation	Annual percent change in consumer price index		Existing	Non-EOS	International Monetary Fund, <i>World Economic Outlook</i>
Foreign debt	Gross external debt position (current US\$) or total external debt stocks (disbursed and outstanding debt, current US\$) as a percentage of GNI. The external debt position includes both public and private debt		New	Non-EOS	World Bank and International Monetary Fund, <i>Quarterly External Debt Statistics</i>
Hysteresis indicator	Variable that takes on a value of 1 whenever a financial crisis is ongoing; a value of 7 when there is no financial crisis; and a value between 1 and 7 when a country is recovering from a financial crisis: a value of 2.2 in the year after the end of the crisis, of 3.4 in the second year after the crisis, 4.6 in the third year, and 5.8 in the fourth year. In the fifth year after the end of the crisis, the recovery is deemed complete and the value is 7 (i.e., no crisis)	Proxy measure of the hysteresis phenomenon at play during and after a financial crisis that translates into deleveraging and de-skilling	New	Non-EOS	World Economic Forum's calculations; International Monetary Fund, <i>World Economic Outlook</i>
<b>Pillar 4: Health</b>					
Years of life lost (YLLs): Non-communicable diseases	YLLs are years lost due to premature mortality caused by non-communicable diseases, communicable diseases, and injuries. YLLs are calculated by subtracting the age at death from the longest possible life expectancy for a person at that age		New	Non-EOS	Institute for Health Metrics and Evaluation
YLLs: Communicable diseases			New	Non-EOS	Institute for Health Metrics and Evaluation
YLLs: Injuries			New	Non-EOS	Institute for Health Metrics and Evaluation

\* Existing: indicator included in the current GCI methodology; New: new indicator considered for inclusion in the updated GCI methodology.

† EOS = Executive Opinion Survey; Non-EOS = other sources.



Table 1: Preliminary index structure (cont'd.)

Indicator	Indicator description (Question and answers if derived from EOS)	Comments	Existing/New*	Type†	Main source(s) (if available)
<b>Pillar 4: Health (cont'd.)</b>					
Years lived with disability (YLDs): Non-communicable diseases	YLDs are years lived in less than ideal health due to a condition. YLDs are measured by taking, for each condition, the prevalence of that condition multiplied by the disability weight for that condition. Disability weights reflect the severity of different conditions and are developed through surveys of the general public		New	Non-EOS	Institute for Health Metrics and Evaluation
YLDs: Communicable diseases			New	Non-EOS	Institute for Health Metrics and Evaluation
YLDs: Injuries			New	Non-EOS	Institute for Health Metrics and Evaluation
Infant mortality	Number of infants dying before reaching one year of age per 1,000 live births in a given year	Proxy measure of the overall quality of the healthcare system	Existing	Non-EOS	World Bank, <i>World Development Indicators Database</i>
<b>Pillar 5: Education</b>					
<b>A. Skills of the current workforce</b>					
Primary attainment rate	<i>Educational attainment</i> is defined as the highest grade completed within the most advanced level attended in the education system of the country where the education was received. Cumulative attainment rate is the sum of the percentage of population aged 25 years and older that have the specified level of education	Proxy measures of the level of education of the current workforce	New	Non-EOS	United Nations Educational, Scientific and Cultural Organization (UNESCO)
Secondary attainment rate			New	Non-EOS	United Nations Educational, Scientific and Cultural Organization (UNESCO)
Tertiary attainment rate			New	Non-EOS	United Nations Educational, Scientific and Cultural Organization (UNESCO)
Extent of staff training	In your country, to what extent do companies invest in training and employee development? [1 = not at all; 7 = to a great extent]		Existing	EOS	World Economic Forum
<b>B. Skills of the future workforce</b>					
School life expectancy (SLE): Primary level	Number of years a person of school entrance age can expect to spend within the specified level of education	Proxy measures of the level of education of the future workforce	New	Non-EOS	United Nations Educational, Scientific and Cultural Organization (UNESCO)
SLE: Secondary level			New	Non-EOS	United Nations Educational, Scientific and Cultural Organization (UNESCO)
SLE: Tertiary level			New	Non-EOS	United Nations Educational, Scientific and Cultural Organization (UNESCO)
Quality of the education system	This indicator will capture the overall quality of the education system and the extent it teaches the relevant skills		New	EOS	World Economic Forum, Executive Opinion Survey
Quality of vocational training	In your country, how do you assess the quality of vocational training [1 = extremely poor—among the worst in the world; 7 = excellent—among the best in the world]		New	EOS	World Economic Forum, Executive Opinion Survey
Classroom connectivity	This indicator will capture the concept of a "flipped classroom"—that is, the idea that reverses the traditional educational arrangement by delivering instructional content, often online, outside of the classroom and moves activities, including those that may have traditionally been considered homework, into the classroom		New	EOS	World Economic Forum, Executive Opinion Survey
Encouragement to creativity	This indicator will measure the extent to which the education system encourages and forms the students' creativity		New	EOS	World Economic Forum, Executive Opinion Survey

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† EOS = Executive Opinion Survey; Non-EOS = other sources.

Table 1: Preliminary index structure (cont'd.)

Indicator	Indicator description (Question and answers if derived from EOS)	Comments	Existing/New*	Type†	Main source(s) (if available)
<b>Pillar 6: Goods market efficiency</b>					
<b>A. Domestic competition</b>					
Extent of market dominance	In your country, how do you characterize corporate activity? [1 = dominated by a few business groups; 7 = spread among many firms]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Effectiveness of anti-monopoly policy	In your country, how effective are anti-monopoly policies at ensuring fair competition? [1 = not effective at all; 7 = extremely effective]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Competition in professional services	<i>To be determined</i>		New	EOS	World Economic Forum, Executive Opinion Survey
Competition in public services	<i>To be determined</i>		New	EOS	World Economic Forum, Executive Opinion Survey
Cost required to start a business	Cost is recorded as a percentage of the economy's income per capita. It includes all official fees and fees for legal or professional services if such services are required by law		New	Non-EOS	World Bank/IFC, The Doing Business project
Time required to start a business	Number of days required to start a business	Proxy measures of the barriers to the free entry and exit of actors to and from the market	Existing	Non-EOS	World Bank/IFC, The Doing Business project
Bankruptcy proceedings costs	The average cost of bankruptcy proceedings. The cost of the proceedings is recorded as a percentage of the estate's value		New	Non-EOS	World Bank/IFC, The Doing Business project
Strength of insolvency framework index	The Strength of insolvency framework index evaluates the adequacy and integrity of the legal framework applicable to liquidation and reorganization proceedings. It is based on four other indexes: the Commencement of proceedings index, the Management of debtor's assets index, the Reorganization proceedings index, and the Creditor participation index		New	Non-EOS	World Bank/IFC, The Doing Business project
Total tax rate	This variable is a combination of profit tax (% of profits), labor tax and contribution (% of profits), and other taxes (% of profits)		Existing	Non-EOS	World Bank/IFC, The Doing Business project
Distortive effect of taxes and subsidies	In your country, to what extent do government subsidies distort competition? [1 = distort competition to a great extent; 7 = do not distort competition at all]		New	EOS	World Economic Forum, Executive Opinion Survey
<b>B. Foreign competition</b>					
Prevalence of non-tariff barriers	In your country, to what extent do non-tariff barriers (e.g., health and product standards, technical and labeling requirements, etc.) limit the ability of imported goods to compete in the domestic market? [1 = strongly limit; 7 = do not limit at all]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Trade tariffs	Trade-weighted average tariff rate. An <i>applied tariff</i> is a customs duty that is levied on imports of merchandise goods. This indicator is calculated as a weighted average of all the applied tariff rates, including preferential rates that a country applies to the rest of the world. The weights are the trade patterns of the importing country's reference group		Existing	Non-EOS	International Trade Centre
Complexity of tariffs index	The Complexity of tariffs index measures the complexity of a country's tariff regime based on three criteria: tariff dispersion, the prevalence of tariff peak and specific tariffs, and the number of distinct tariffs		New	Non-EOS	International Trade Centre
Burden of customs procedures	In your country, how efficient are customs procedures (related to the entry and exit of merchandise)? [1 = extremely inefficient; 7 = extremely efficient]		Existing	EOS	World Economic Forum, Executive Opinion Survey

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† EOS = Executive Opinion Survey; Non-EOS = other sources.

Table 1: Preliminary index structure (cont'd.)

Indicator	Indicator description (Question and answers if derived from EOS)	Comments	Existing/New*	Type†	Main source(s) (if available)
<b>Pillar 7: Labor market efficiency</b>					
<b>A. Flexibility and matching</b>					
Redundancy costs	This variable estimates the cost of advance notice requirements, severance payments, and penalties due when terminating a redundant worker, expressed in weekly wages		Existing	Non-EOS	World Bank/IFC, The Doing Business project
Hiring and firing practices	In your country, to what extent do regulations allow flexible hiring and firing of workers? [1 = not at all; 7 = to a great extent]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Cooperation in labor-employer relations	In your country, how do you characterize labor-employer relations? [1 = generally confrontational; 7 = generally cooperative]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Flexibility of wage determination	In your country, how are wages generally set? [1 = by a centralized bargaining process; 7 = by each individual company]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Ease of finding skilled employees	In your country, to what extent can companies find employees with the skills required to meet their needs? [1 = not at all; 7 = to a great extent]		New	EOS	World Economic Forum, Executive Opinion Survey
Ease of hiring foreign labor	In your country, how restrictive are regulations related to the hiring of foreign labor? [1 = highly restrictive; 7 = not restrictive at all]		New	EOS	World Economic Forum, Executive Opinion Survey
Active labor market policies	This index will measure the quality of active labor market policies		New	EOS	World Economic Forum, Executive Opinion Survey
<b>B. Use of talent and reward</b>					
Pay and productivity	In your country, to what extent is pay related to employee productivity? [1 = not at all; 7 = to a great extent]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Reliance on professional management	In your country, who holds senior management positions? [1 = usually relatives or friends without regard to merit; 7 = mostly professional managers chosen for merit and qualifications]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Female participation in labor force	This measure is the percentage of women aged 25–64 participating in the labor force	These indicators measure the incentives for and the actual participation of the population in the labor force	New	Non-EOS	International Labour Organization
Male participation in labor force	This measure is the percentage of men aged 25–64 participating in the labor force		New	Non-EOS	International Labour Organization
Salary tax wedge	This indicator reflects the tax wedge for an average country-specific industrial worker and is defined as the difference between the salary costs of a single "average worker" to his/her employer and the amount of net income (take-home pay) that the worker receives		New	Non-EOS	Egger, P. and N. Strecker. 2015. "A Tour of Income Tax in the World, 1980–2012." Mimeo.
<b>Pillar 8: Financial market efficiency</b>					
<b>A. Efficiency and depth</b>					
Availability of financial services	In your country, to what extent does the financial sector provide the products and services that meet the needs of businesses? [1 = not at all; 7 = to a great extent]	Measures of the depth of the banking sector in its capacity to provide credit to private sector, pooling risks, and selecting the most productive investments	Existing	EOS	World Economic Forum, Executive Opinion Survey
Domestic credit to private sector (% of GDP)	<i>Domestic credit to private sector</i> refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment		New	Non-EOS	The World Bank, <i>World Development Indicators Database</i>

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Table 1: Preliminary index structure (cont'd.)

Indicator	Indicator description (Question and answers if derived from EOS)	Comments	Existing/New*	Type†	Main source(s) (if available)
<b>Pillar 8: Financial market efficiency (cont'd.)</b>					
<b>A. Efficiency and depth (cont'd.)</b>					
Financing of SMEs	In your country, to what extent can small- and medium-sized enterprises (SMEs) access the finance they need for their business operations through the financial system? [1 = not at all; 7 = to a great extent]		New	EOS	World Economic Forum, Executive Opinion Survey
Venture capital availability	In your country, how easy is it for start-up entrepreneurs with innovative but risky projects to obtain equity funding? [1 = extremely difficult; 7 = extremely easy]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Bank overhead costs	Operating expenses of a bank as a share of the value of all assets held. Total assets include total earning assets, cash and due from banks, foreclosed real estate, fixed assets, goodwill, other intangibles, current tax assets, deferred tax assets, discontinued operations, and other assets	Proxy measure of the cost-efficiency of the banking sector in providing financial services	New	Non-EOS	World Bank, <i>Global Financial Development Database</i>
Depth of credit information index	The Depth of credit information index measures rules and practices affecting the coverage, scope, and accessibility of credit information available through either a public credit registry or a private credit bureau	Measure of the availability of credit information as a means to reduce asymmetries and improve capital allocation	New	Non-EOS	World Bank/IFC, The Doing Business project
Financing through the local equity market	In your country, to what extent can companies raise money by issuing shares and/or bonds on the capital market? [1 = not at all; 7 = to a great extent]	Measures of the size and liquidity of the equity market, to proxy the extent to which companies can leverage it to finance their operations	Existing	EOS	World Economic Forum, Executive Opinion Survey
Market capitalization of listed companies (% of GDP)	<i>Market capitalization</i> (also known as <i>market value</i> ) is the share price multiplied by the number of shares outstanding. Listed domestic companies are the domestically incorporated companies listed on the country's stock exchanges at the end of the year. Listed companies do not include investment companies, mutual funds, or other collective investment vehicles		New	Non-EOS	World Bank, <i>World Development Indicators Database</i>
Money supply (% of GDP)	Money and quasi money comprise the sum of currency outside banks; demand deposits other than those of the central government; and the time, savings, and foreign currency deposits of resident sectors other than the central government. This definition of <i>money supply</i> is frequently called <i>M2</i> ; it corresponds to lines 34 and 35 in the International Monetary Fund's (IMF) <i>International Financial Statistics</i> (IFS)	Proxy measure of the depth and breadth of services offered by the financial sector	New	Non-EOS	World Bank, <i>World Development Indicators Database</i>
<b>B. Stability</b>					
Soundness of banks	In your country, how do you assess the soundness of banks? [1 = extremely low—banks may require recapitalization; 7 = extremely high—banks are generally healthy with sound balance sheets]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Bank nonperforming loans	Bank nonperforming loans to total gross loans are the value of nonperforming loans divided by the total value of the loan portfolio		New	Non-EOS	World Bank, <i>World Development Indicators Database</i>
Bank Z-score	The Z-score compares the buffer of a country's banking system (capitalization and returns) with the volatility of those returns		New	Non-EOS	World Bank, <i>Global Financial Development Database</i>
Regulation of securities exchanges	In your country, to what extent do regulators ensure the stability of the financial market? [1 = not at all; 7 = to a great extent]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Stock price volatility	Stock price volatility is the average of the 360-day volatility of the national stock market index		New	Non-EOS	World Bank, <i>Global Financial Development Database</i>

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Table 1: Preliminary index structure (cont'd.)

Indicator	Indicator description (Question and answers if derived from EOS)	Comments	Existing/New*	Type†	Main source(s) (if available)
<b>Pillar 9: Technology adoption</b>					
Availability of latest technologies	In your country, to what extent are the latest technologies available? [1 = not at all; 7 = to a great extent]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Firm-level technology absorption	In your country, to what extent do businesses adopt new technology? [1 = not at all; 7 = adopt extensively]		Existing	EOS	World Economic Forum, Executive Opinion Survey
FDI and technology transfer	To what extent does foreign direct investment (FDI) bring new technology into your country? [1 = not at all; 7 = to a great extent]		Existing	EOS	World Economic Forum, Executive Opinion Survey
FDI stock	Cumulated value of greenfield investments, as a percentage of GDP		New	Non-EOS	Financial Times FDImarket
Local supplier quality	In your country, how do you assess the quality of local suppliers? [1 = extremely poor quality; 7 = extremely high quality]		Existing	EOS	World Economic Forum, Executive Opinion Survey
<b>Pillar 10: Market size</b>					
Domestic market size index	Sum of gross domestic product plus value of imports of goods and services, minus value of exports of goods and services, normalized on a 1–7 (best) scale		Existing	Non-EOS	International Monetary Fund, <i>World Economic Outlook</i>
Exports as a percentage of GDP	Exports of goods and services as a percentage of gross domestic product		Existing	Non-EOS	International Monetary Fund, <i>World Economic Outlook</i>
Potential market	<i>To be determined</i>		New	Non-EOS	
<b>Pillar 11: Innovation ecosystem</b>					
Quality of scientific research institutions	In your country, how do you assess the quality of scientific research institutions? [1 = extremely poor—among the worst in the world; 7 = extremely good—among the best in the world]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Number of researchers in R&D per capita	Researchers in R&D are professionals engaged in the conception or creation of new knowledge, products, processes, methods, or systems and in the management of the projects concerned. Postgraduate PhD students (ISCED97 level 6) engaged in R&D are included		New	Non-EOS	World Bank, <i>World Development Indicators Database</i>
Availability of scientists and engineers	In your country, to what extent are scientists and engineers available? [1 = not at all; 7 = widely available]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Number of scientific and technical journal articles per capita	<i>Scientific and technical journal articles</i> refer to the number of scientific and engineering articles published in the following fields: physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences		New	Non-EOS	World Bank, <i>World Development Indicators Database</i>
PCT patent applications	Number of applications filed under the Patent Cooperation Treaty (PCT) per million population		Existing	Non-EOS	Organisation for Economic Co-operation and Development (OECD)
Cooperation and Interaction	Average score across the four components of the following Executive Opinion Survey question: In your country, to what extent do people collaborate and share ideas (1) inside the company; (2) between domestic companies; (3) between domestic and international companies; and (4) between companies and universities/research institutions. In each case, the answer ranges from 1 [not at all] to 7 [to a great extent]		New	EOS	World Economic Forum, Executive Opinion Survey
Encouragement to idea generation	In your country, to what extent do companies encourage employees to generate new ideas? [1 = not at all; 7 = to a great extent]		New	EOS	World Economic Forum, Executive Opinion Survey
Diversity in patents applicants	<i>To be determined</i>		New	Non-EOS	
Diversity in company workforce	In your country, to what extent do companies seek diversity of the workforce (e.g. gender, ethnicity, social group, age, religion, culture, sexual orientation, disabilities)? [1 = not at all; 7 = to a great extent]		New	EOS	World Economic Forum, Executive Opinion Survey

\* Existing: indicator included in the current GCI methodology; New: new indicator considered for inclusion in the updated GCI methodology.

† EOS = Executive Opinion Survey; Non-EOS = other sources.

**Table 1: Preliminary index structure** (*cont'd.*)

Indicator	Indicator description (Question and answers if derived from EOS)	Comments	Existing/New*	Type†	Main source(s) (if available)
<b>Pillar 12: Innovation implementation</b>					
Capacity to commercialize new products	In your country, to what extent do companies turn ideas into commercially successful new products, services, or business models? [1 = not at all; 7 = to a great extent]		New	EOS	World Economic Forum, Executive Opinion Survey
Charges for the use of intellectual property	Charges for the use of intellectual property are payments and receipts between residents and nonresidents for the authorized use of proprietary rights and for the use, through licensing agreements, of produced originals or prototypes and related rights		New	Non-EOS	World Bank, <i>World Development Indicators Database</i>
Post-incubation performance	Availability and performance of incubators as a tool to support commercialization of new innovative business ideas		New	Non-EOS	UBI Global
Attitudes toward entrepreneurial risk	In your country, to what extent do people have an appetite for entrepreneurial risk? [1 = not at all; 7 = to a great extent]		New	EOS	World Economic Forum, Executive Opinion Survey
Companies embracing disruptive ideas	In your country, to what extent do companies embrace risky or disruptive business ideas? [1 = not at all; 7 = to a great extent]		New	EOS	World Economic Forum, Executive Opinion Survey
Willingness to delegate authority	In your country, to what extent does senior management delegate authority to subordinates? [1 = not at all; 7 = to a great extent]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Extent of marketing	In your country, how successful are companies in using marketing to differentiate their products and services? [1 = not successful at all; 7 = extremely successful]		Existing	EOS	World Economic Forum, Executive Opinion Survey
Buyer sophistication	In your country, on what basis do buyers make purchasing decisions? [1 = based solely on the lowest price; 7 = based on sophisticated performance attributes]		Existing	EOS	World Economic Forum, Executive Opinion Survey

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