PART 2

Navigating the Complex World of Standards and Using Them Effectively

Standards are essential for the functioning of markets and institutions. They come in many forms and serve many different purposes. Most standards are voluntary, developed by stakeholders who perceive a market or societal need for them. Standards can become mandatory, however, when they are enshrined in laws or agreed upon in legally binding contracts. They may differ in their geographic reach, varying, for instance, according to whether they have been developed at the national or international level. Depending on their function, standards establish consistent measurement, ensure compatibility, and enhance quality.

To build an understanding of how best to use standards for development, chapter 2 provides a clear definition of standards and distinguishes their various types, forms, and functions. It explains the rationale for standards in diffusing knowledge and information, enhancing coordination, encouraging competition, and addressing externalities. The chapter also discusses how various stakeholders—in the private sector, civil society, and government—contribute to the development of standards. Understanding the motivations of these stakeholders can help in assessing the opportunities, challenges, and trade-offs involved in the development and adoption of standards and in identifying instances in which too few or too many standards are likely to emerge.

A key question of this Report is: How should low- and middle-income countries use standards for development? Chapter 2 offers guidance on the different ways that both voluntary and mandatory standards can serve as tools of public policy, highlighting how standards differ from regulations and how they complement other instruments such as market-based policies. It also presents a conceptual framework showing how low- and middle-income countries can move toward higher standards for quality, adapting international standards to local capacity when necessary, while gradually raising the ambition of their standards and their ability to meet those standards.

Both the implementation of voluntary standards and the enforcement of mandatory standards rely on a broader system of public and private institutions and policies. This system, known as quality infrastructure, includes metrology, conformity assessment (testing, inspection, and certification), accreditation, and standardization itself. A country's quality infrastructure functions across various policy areas, from accrediting universities in education to inspecting hospitals in health care. Chapter 3 explains how countries can increase their ability to comply with standards by developing effective quality infrastructure. It discusses how to strengthen institutions, sequence reforms, and allocate roles between the government and the private sector.

Spotlight 2 discusses the important role of international standards development organizations in promoting international coordination in developing standards, noting that low- and middle-income countries tend to be underrepresented in these organizations. Spotlight 3 focuses on national standards bodies and builds on a novel survey conducted by the International Organization for Standardization (ISO) and the World Bank. The spotlight emphasizes differences and similarities between low- and middle-income countries and high-income countries, such as the varying roles played by governments in these countries with respect to standards.

2 Using Standards as a Catalyst for Development

Main messages

- Standards are more important for low- and middle-income countries today than when high-income countries were at similar levels of development, especially because of increased technological sophistication and the pressures and opportunities of globalization.
- Standards are ineffective when they are not implemented. Therefore, countries need to adopt a balanced approach that aligns their ambition for higher standards with their capacity to comply with them.
- Aligning with international standards enables market access and learning, but low- and middle-income countries may not always find such alignment feasible. Countries should first *adapt* international standards as needed, then *align* with them over time, and eventually *author* them. This path is not necessarily linear and may differ by country and by sector.
- Low- and middle-income countries may face a *vicious circle of low quality* created by low demand for quality among domestic markets and society, weak institutions and low quality of production, and low compliance capacity. Standards can help break this circle.
- This Report considers a wide range of different types of standards, both voluntary and mandatory ones. It focuses on three types of standards based on their core function: *measurement standards*, *compatibility standards*, and *quality standards*.
- Most standards are *voluntary* and emerge because of private incentives to address market or societal needs or both. Sometimes, governments need to help convene development of voluntary standards.
- Standards may become *mandatory* if enshrined in law. Mandatory standards are particularly useful when uniform compliance is needed to meet a given target or when they simplify compliance and enforcement.
- Policy benefits from using the full spectrum of standards include using voluntary standards to drive innovation, leveraging them to support regulation, and applying mandatory standards in high-risk areas.

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Introduction

This chapter first clearly defines the nature and different aspects of standards. It then builds on basic economic principles to explain the rationale behind standards and how to differentiate them from regulation. It also develops a conceptual framework to help policy makers understand how to use voluntary and mandatory standards, leveraging the strengths of each type of standard as catalysts for development. This chapter should be read alongside chapter 3, which focuses on how to build a country's public and private system for implementing and enforcing standards (that is, the country's quality infrastructure).

Understanding standards

Definition and typology of standards in the Report

Important standards surround us, defining the precise dimensions and tolerances of screw threads, the weight of a kilogram, how to build a fire-resistant wall, the minimum age for legal work, and how digital devices communicate with cell towers and one another, among many other things. Standards enable trade in goods and services, improve education and health care, help protect the environment, and support knowledge sharing.

Aiming to capture the different ways standards matter for development, this Report adopts a broad definition. It defines standards as *codified solutions meant for common and repeated use that are recognized by multiple stakeholders*.[1] This definition of standards centers on four key elements:

- *Codification.* Standards systematically document rules or specifications. Therefore, traditions or rules of thumb are not considered standards.[2]
- *Need.* Standards should be developed and implemented only when there is a clear need for them, such as addressing market failures or agreeing on, as the International Organization for Standardization (ISO) puts it, "the best way of doing something." Standards provide a *solution* to such a need, and the solution can vary depending on the context. They are *normative* documents, as they provide not only information, but also specifications that are preferable over alternatives.
- *Common and repeated use.* Standards are designed for wide and repeated application, ensuring consistency or uniformity. For example, a manufacturer may use standards for its inputs to ensure that its suppliers consistently deliver the same level of quality.
- *Recognition.* Codified solutions become standards when other entities recognize them. Such recognition can occur either because entities consider the process used for developing a standard to be legitimate or because they accept a standard's authoritative status, whether voluntarily or not (for example, to access a market or to comply with a regulation). Although organizations may develop standards for their internal processes (such as the size of the hamburger bun in a fast-food chain), these internal standards are not the focus of this Report.

The Report's definition of standards broadly aligns with existing definitions but adapts them to accommodate the wide scope of the Report's analysis. In particular, the definition used by ISO and the International Electrotechnical Commission (IEC) characterizes standards as documents established by *consensus*, a principle that reflects the governance model of these organizations.[3] Although this is an important principle at ISO and the IEC and among their member bodies, many other standards of high relevance to low- and middle-income countries, especially those promulgated by industry associations, governments, or private initiatives, are not based on consensus.[4]

It is helpful to distinguish among the various types of standards discussed in the Report that fall under the broad definition just presented. Table 2.1 presents a typology. Importantly, compliance with standards may be either voluntary or mandatory. Although many are voluntary, standards become mandatory when enshrined into law. Voluntary standards can also be legally binding when they are included in contractual obligations. The Report highlights that both voluntary and mandatory standards play a critical role for development, and that policy makers must clearly distinguish between them, because they serve different functions and pose distinct policy challenges.

The Report's use of the terms *voluntary standards* and *mandatory standards* departs slightly from common usage in the standards community and in organizations such as the World Trade Organization (WTO). In that expert context, *standards* are understood as voluntary instruments, whereas once their requirements are made legally binding, they are referred to as *technical regulations*.[5] The distinction between these two terms underscores that not all technical regulations are based on, or make reference to, recognized standards, contrary to good international practice.

This Report nonetheless adopts the terminology of *voluntary* and *mandatory standards* for two reasons. First, it provides greater clarity for nonspecialist audiences. Second, it reflects the fact that standards are applied in many domains beyond trade policy—such as education, construction, and public administration—in which the term *technical regulation* is rarely used. Throughout the Report, *mandatory standard* may therefore be read as broadly synonymous with *technical regulation*, particularly in contexts relating to trade.

Table 2.1 Typology of standards

DIMENSIONS	OPTIONS
Legal status	• Voluntary • Mandatory
Stakeholders involved in standards development	• Government • Private sector • Civil society, academia, and professional associations • International organizations • Mixed
Exclusiveness	• Open • Proprietary
Geographic level	• International • Regional • National • Subnational • Organization
Target	• People • Processes • Organizations and systems • Products and services
Core function	• Measurement • Compatibility • Quality (for example, performance, safety)

Sources: WDR 2025 team, based on de Vries 1998; OECD and ITC 2024.

Note: The list of options included in the table is not exhaustive.

Standards can also be classified according to the types of stakeholders involved in developing them (for example, government, private sector, or civil society). Standards developed by the government are often referred to as *public standards*, whereas *private standards* are developed by private or multistakeholder entities and are typically voluntary.

Standards may be developed in consensus in formal standards development organizations or evolve as de facto standards. When developed in consensus, standards, particularly international standards, typically result from the pooling of knowledge from leading experts in agreement on what they consider "the best way of doing things."[6] In contrast, de facto standards are typically put in place by a single firm with market power. The Microsoft Word file format is an example of a standard developed by a single company, and so without formal consensus. On the other hand, the PDF file was a de facto standard, a proprietary technology developed by Adobe, which became a formal international standard, having been adopted by consensus at ISO (in the ISO 32000 series of standards).

A further distinction can be made between open and proprietary standards. *Open standards* are publicly accessible, and anyone can use them. Standards developed in consensus tend to be open but may still be behind a paywall. In contrast, *proprietary standards* are typically controlled by a company or consortium and may be protected by intellectual property rights such as patents or copyrights. Their use may require licensing agreements or fees or be accompanied by technical restrictions, giving the holder of the rights to them control over implementation and potentially limiting competition or interoperability. De facto standards are often proprietary (refer to the discussion in chapter 4 on standards for a better economy).

Standards can also be classified by their geographic scope (international, regional, national, or subnational) and by what they standardize (that is, their target). Standards may pertain to people (such as skills standards), processes (such as methods for testing products), organizations and systems (such as quality management systems), or products and services (such as standards for material strength).[7]

This Report focuses on three types of standards based on their core function: measurement, compatibility, and quality standards.[8]

- *Measurement standards* are agreed-upon methods for ensuring consistency, accuracy, and reliability in measurement. They are crucial across various fields for providing a common understanding of weights and measures or a common metric for assessing quality or progress, reducing errors, and enhancing consumer confidence in products and services. Measurement standards enable accurate comparisons of measurements across different locations and times, thus supporting global trade and technological advancement. Disability-adjusted life years and quality-adjusted life years are examples of measurement standards in health care.

- *Compatibility standards* are agreed-upon specifications that ensure interoperability and compatibility among different systems, devices, or components. They enable products or services to work together seamlessly even if developed by different manufacturers. Standard gauge for rails in railway systems and standardized freight containers are both examples of compatibility standards. Compatibility standards also help reduce product variety. For example, in the 1920s the US government pushed manufacturers to move to "standard sizes," which helped enable mass production (refer to chapter 1).

- *Quality standards* specify properties a product, service, system, or process needs to have to achieve a defined level or state of quality (for example, performance, safety, reliability, sustainability).[9] If measurement standards define a ruler, quality standards define a marker on the ruler. Examples of quality standards include standards for product safety, caps on fuel emissions, quality management systems, and professional skill qualifications. Quality standards are often an important prerequisite for a product to be sold in the market and for schools, hospitals, and businesses to operate.

In addition to these three core functions, further types of standards can be distinguished. For instance, some standards serve primarily to establish common terminology or definitions.[10]

Types of problems standards address

Standards can play a crucial role in improving coordination and facilitating the efficient functioning of markets by addressing failures in coordination and market failures related to imperfect information, externalities, or market power. Depending on the nature of the policy challenge and the incentives of the stakeholders involved, voluntary standards may offer a more effective solution, or mandatory standards may, as table 2.2 illustrates. Policy makers must balance the complementary strengths of these two types of standards, drawing on voluntary standards when market demand

Table 2.2 How standards may reduce transaction costs and address market failures

		TYPE OF STANDARD USUALLY APPLICABLE		
ROLE OF STANDARDS	PURPOSE	VOLUNTARY OR MANDATORY	MAIN FUNCTION	OUTCOMES
Diffusing information	Offer codified good practices	Mostly voluntary	Quality	• Knowledge transfer • Quality upgrading • Productivity
Addressing coordination failures	Provide common specifications	Voluntary and mandatory	Compatibility, measurement	• Economies of scale • Compatibility • Lower transaction costs • Variety reduction
Promoting competition	Provide common specifications	Voluntary and mandatory	Quality, compatibility	• Lower switching costs • Transparent information • Competition
Reducing information asymmetries	Provide transparent, reliable, or consistent information	Mostly mandatory	Quality, compatibility, measurement	• Lower search and transaction costs • Higher trust and consumer protection
Addressing negative externalities	Define thresholds, processes, or technologies to reduce harm to others	Mostly mandatory	Quality	• Environmental protection • Social sustainability • Economic fairness

Source: WDR 2025 team.

Note: Whereas this table illustrates typical patterns, real-world standards often serve multiple purposes simultaneously, for instance, blending measurement, compatibility, and quality functions.

drives innovation and adoption and enforcing mandatory standards when public interests like health, safety, or environmental protection require enforceable rules. Quality, compatibility, and measurement standards all play a role, but certain types tend to be more effective for specific problems, for example, compatibility standards for network effects.

Diffusing information. Quality standards embody information about good practices, especially when these standards are developed through consensus by leading experts. Quality standards are usually best kept voluntary. For example, an organization can follow the guidance and requirements in ISO 9001 to learn how to set up a quality management system that ensures consistent product quality, tracks defects, and incorporates customer feedback.[11] Standards help organizations avoid having to "reinvent the wheel." Like a recipe, standards codify good practices, allowing the transfer of knowledge. As a result, standards significantly enhance quality and boost productivity. Low- and middle-income countries can benefit from the knowledge transfer that standards allow by adopting international standards or participating in expert discussions as international standards are developed.

Addressing coordination failures. Standards help address coordination failures. The US National Institute of Standards and Technology (NIST) calibrates a standard for time measurement using atomic clocks that time-stamp hundreds of billions of financial transactions every day, and the institute's internet time service receives more than 40 billion hits daily to synchronize clocks on computers and network devices. From the rise of mass production to the development of global value chains and increased reliance on the internet, standards have become essential foundations of the economy. By offering common specifications, they enable economies of scale; support network industries like railways, telecommunications, and the digital economy; and increase market sizes (for example, through regional economic integration such as that which characterizes the European Union). Shared specifications also help reduce the variety of products and components available, which can significantly boost efficiency, as when automotive manufacturers standardize parts like bolts or battery sizes across models, facilitating bulk purchasing, streamlining assembly, and making maintenance easier. Standardization of this kind can occur through market forces via voluntary standards or through government regulation. Compatibility standards also promote wider dissemination and ease of use of technology, allowing users to switch among compatible products. Additionally, product standardization is essential for enabling worker specialization within firms, leading to higher productivity and growth.[12]

Promoting competition. Standards can also promote fair competition by lowering barriers to market entry.[13] For instance, compatibility standards in telecommunications or payments allow users on one network to connect with users on another, encouraging competition among service providers.[14] By sharing information, standards help businesses compete by enabling consumers to make better-informed decisions. They can also create a level playing field. For example, safety standards that underpin conformity marks let smaller manufacturers compete by ensuring they meet the same safety requirements as established brands.[15] Likewise, bioequivalence standards allow generic drug manufacturers to compete with brand-name medicines, offering consumers confidence that generics are equally effective.[16] However, standards can also act as a barrier to entry, which is one of the risks discussed in the next subsection.

Reducing information asymmetries. Standards can convey vital information that helps build trust between people and organizations. When paired with credible certification (discussed in chapter 3), standards help fill information gaps by signaling product quality or specifications.[17] For example, standards enable a buyer of gold to trust that the weight and purity of the gold match the seller's claims.[18] This boost in trustworthiness can reduce the costs associated with managing economic transactions in firms, bureaucracies, and broader economic systems, which is why both voluntary and mandatory standards can be effective, depending on the situation. For instance, with standards, a firm does not need to spend time and resources verifying quality and specifications with each purchase.[19] Reducing such costs, often referred to as *transaction costs,* allows organizations to thrive and countries to develop.[20]

Addressing negative externalities. Standards are crucial for addressing negative externalities, a significant market failure. Negative externalities happen when an economic actor does not bear the full costs of its actions, passing some of those costs on to others. Standards—usually mandatory ones—set rules, thresholds, or procedures to help prevent or lessen harm caused by negative externalities. For example, to cut air pollution, emissions standards limit the amount of harmful chemicals that factories can release into the environment. Standards for lending and capital adequacy establish minimum requirements financial institutions must meet in order to extend credit, reducing the risk of financial instability from excessive lending. Standards also support the enforcement of these rules, thresholds, or procedures. For instance, the World Health Organization (WHO) offers air pollution guidelines that countries can use when creating their own national standards. Regarding greenhouse gases, ISO 14064 provides guidance for measuring, monitoring, and reporting emissions and removals, helping entities mitigate their environmental impact.

Risks of standardization

Although standardization can be helpful, it can also create risks depending on the way standards are designed and used. Developing and implementing standards with requirements that are unrealistically high can be a case of "the best being the enemy of the good," especially if the standards increase costs for adoption and enforcement. Standards can also be exclusionary, particularly for small firms that lack the financial resources needed for their implementation and for certification that they have been met.

Mandatory standards, which as noted earlier are also called "technical regulations" in some domains, can be used as barriers to trade. As chapter 4 shows, the share of global trade subject to nontariff measures such as mandatory standards rose from about 15 percent in the 1990s to nearly 90 percent in the 2020s.[21] High-income countries have historically relied more on such measures and often imposed stricter ones, but low- and middle-income countries are now applying them almost as extensively. Beyond their impact on international trade flows, mandatory standards and other nontariff measures also influence competition among domestic firms.

Dominant firms may promote their own technological standards to increase their own market power. For most of the twentieth century, this did not present a major obstacle to competition, thanks to the open and collaborative processes used to establish most standards, whether in national or international forums. However, this started to change during the Third Industrial Revolution (driven by information technology, or IT) and has continued into—or even worsened in—the ongoing Fourth Industrial Revolution, in which digital, physical, and biological systems come together. The network effects inherent in these new technologies create a winner-takes-all environment, encouraging the use of standard essential patents or other forms of intellectual property protections to earn rents.

Standards can lock firms and countries in a suboptimal equilibrium if they prevent adjustments in a rapidly changing environment. For example, the QWERTY keyboard is a well-known example of technological lock-in. Originally designed to prevent typebars on a typewriter from jamming, it remains the standard layout for computer keyboards today, although other designs may be more efficient. Similarly, the persistence of the Imperial measurement system illustrates the strong path dependency of standards that become deeply embedded in institutions, infrastructure, and everyday practices, making change costly.

Who develops standards and why

Because standards serve multiple purposes, stakeholders have various reasons to develop them. The demand for voluntary standards typically arises from practical market needs. Custom screw threads were acceptable when made in small quantities, but mass production of goods with screws naturally created the necessity for standard screw threads as a practical way to simplify processes. Constant train derailments in the late nineteenth century highlighted the need for mandatory standards ensuring consistent quality in steel rails (refer to box 1.2 in chapter 1).

The different motivations of stakeholders influence how and with whom they collaborate to develop standards. In network industries like IT, a small group of technology companies often has a strong commercial incentive to develop voluntary standards that address specific issues, such as communications and exchange protocols. In sectors undergoing rapid technological change, the speed of standards development becomes more important than wide stakeholder participation. As a result, firms frequently form private consortia for developing standards rather than relying on formal international standards development organizations like ISO or the IEC. This is one reason why many standards development organizations around the world are specific to particular sectors.

In some contexts, a standard may require the involvement of many different stakeholders, as in the case of international standards. ISO and IEC commitment to inclusive stakeholder engagement and consensus is based on the understanding that, for a standard to be applicable internationally, its development process must be accessible to a diverse group of stakeholders. For this and other reasons, the WTO has established six principles for international standards development, among them openness and consensus.[22] However, the goal of inclusivity often results in longer development times for standards and a risk that the purpose of a standard may become diluted as a result of the many participants involved (refer to spotlight 4 for details). Meanwhile, broad and balanced stakeholder involvement in international standardization remains a goal, as the representation of low- and middle-income countries and smaller firms is often inadequate.

Stakeholders' private incentives for participating in developing international or national standards vary. They may want to influence the process to shape markets in favor of their own technologies or to guide future regulations related to a particular standard. However, their incentives to participate in the development of a particular standard can be weak if the standard is not essential to their area of work, leading to a free-rider problem. For example, while a shared standard for data exchange may benefit an entire industry, no individual firm may be willing to invest its own time and resources to help develop it.

Unlike industrial standards, the development of which has only commercial incentives, *voluntary sustainability standards* evolve from a mix of commercial incentives and broader societal objectives. Such voluntary sustainability standards are often sector specific and developed outside established national or international standards development organizations by a group of industry players, though often with contributions from nongovernmental organizations, government institutions, and academics. For example, Unilever and the World Wide Fund for Nature (WWF) founded the Marine Stewardship Council (MSC) to address concerns about overfishing and lack of sustainability standards in global fisheries. With sustainability regulation often providing only a floor for performance, voluntary sustainability standards offer a way for better-performing firms to differentiate themselves and appeal to a segment of customers willing to pay a premium to cover firms' adherence to a higher standard. These commercially driven standards increase the risk of multiple standards' coexisting (that is, fragmentation), which in turn contributes to the "spaghetti bowl" effect discussed in chapter 4.

Then there are standards that no individual stakeholder may have a strong commercial incentive to develop, such as those addressing negative externalities to protect the public's health and safety. In such areas, governments, international organizations, or nongovernmental organizations often must take a leading role. Examples include food safety standards developed under the umbrella of the Codex Alimentarius, published by the Food and Agriculture Organization of the United Nations (FAO) and WHO; labor standards developed by the International Labour Organization (ILO); and health standards maintained by WHO. The international reach of such standards means that stakeholders need to be significantly involved to ensure the standards' legitimacy and adoption.

Determining the right number of standards

Is there an optimal number of standards, and when do oversupply (fragmentation) or undersupply (lack) of standards become issues? The preceding discussion provides some insights into these questions. In technology-focused sectors like IT, network externalities create winner-takes-all incentives that favor the rapid development of standards. The need for speed explains why consortia or individual firms create most IT standards. However, fragmentation becomes a major concern when multiple standards coexist because the network effects of using a single standard do not materialize. For example, Blu-ray and HD DVD standards coexisted early on until Blu-ray gained enough market share to become the dominant video format. Companies use private standards for sustainability, on the other hand, to differentiate their products and often go beyond what existing sustainability regulations require. The resulting fragmentation can create problems if consumers struggle to recognize a sustainability label among the many different ones. Meanwhile, a growing number of voluntary sustainability standards relate to business-to-business relationships, with little risk of confusing consumers.

Standards created by international standards development organizations such as ISO, the IEC, and the International Telecommunication Union (ITU) usually do not suffer from fragmentation because only one standard is developed for a specific need. Fragmentation becomes an issue when national standards differ from international standards or when there are multiple conformity marks. For example, the CE (Conformité Européenne) mark in the European Union, the CCC (China Compulsory Certificate) mark in China, the FCC (Federal Communications Commission) mark in the United States, and the ISI mark (standards mark of the Bureau of Indian Standards) in India are typically mandatory for electronic products. A product with a CE mark cannot be sold in China unless it also meets CCC requirements, which adds cost and delays in time to market. This happens because conformity marks are based on different technical standards and different procedures for assessing conformity, such as testing procedures, factory audits, documentation, and follow-up inspections.

Although fragmentation caused by an oversupply of standards is a problem, so is a lack of standards, especially in areas concerning safety. Private stakeholders may lack incentives to develop standards, making it necessary for governments or international organizations to intervene. Consumer groups can also play a role in demanding standards.[23] For example, in the nineteenth century, workers most at risk of death from boiler explosions demanded safety standards for boilers.[24] Today, consumer groups push for food or automobile safety, but concerted efforts of this type require collective action and time. Similarly, after a disaster, demand for safety standards often increases, such as calls for stricter building codes after an earthquake or for stronger fire codes following a particularly deadly fire.

Although this Report emphasizes the benefits a country can reap from transitioning to more ambitious standards, political economy dynamics may obstruct progress in this area. In some cases, the absence of stringent mandatory standards does not reflect a lack of compliance capacity but rather the vested interests of powerful actors who benefit from regulatory gaps. Likewise, weak enforcement may not stem from institutional shortcomings alone: It can be a deliberate feature in systems marked by rent seeking and corruption. It should also be recognized that underdeveloped quality infrastructure systems pose significant challenges in many low- and middle-income countries (refer to chapter 3). A country's quality infrastructure system directly influences its capacity to use or adopt standards and to verify compliance with them, so many low- and middle-income countries cannot transition to more stringent standards, even if they recognize the significant benefits such standards could provide.

How to use standards for development

Standards as a public policy tool

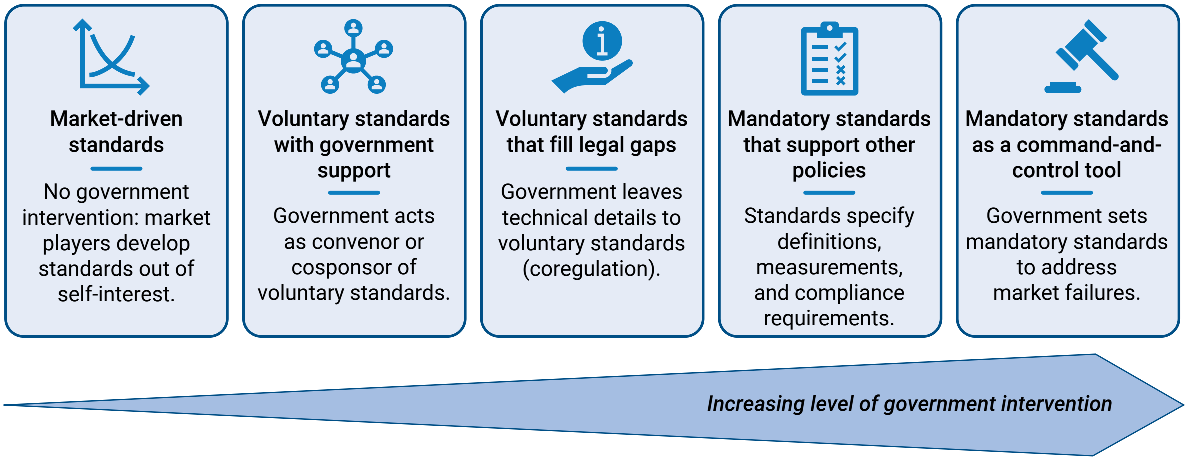
When and how should governments use standards as policy tools? The answer to this question is complex, because public policy aims to achieve various objectives: from promoting economic development, to protecting the population's health and safety, to advancing national security, to safeguarding the environment. Standards are not the only tool for achieving such objectives. Safer products, for instance, can result from tort and insurance premiums driven by costly payouts in the case of accidents. Carbon emissions can be limited using a price-based approach in which emissions are taxed. Population health can be enhanced through awareness campaigns about health risks.

If standards are the policy tool of choice, however, there are multiple ways to use them. This Report highlights that policy makers should leverage the strengths of both voluntary and mandatory standards; this subsection explains the key differences. On one end, governments might leave policy issues to voluntary standards if market demand drives their development and adoption. Government intervention may be necessary only to coordinate stakeholders or support the uptake of voluntary standards. On the other end, governments can require that products and services meet specific thresholds or design standards, such as emissions limits for vehicles or safety standards for electrical appliances. A combined approach might involve setting legal requirements in broad terms and allowing market players to use voluntary standards to address gaps. For example, the European Union's General Product Safety Regulation mainly requires that products be safe—and leaves many technical details to voluntary standards. Such an approach can be an effective and flexible form of coregulation with the private sector in which the government delegates some regulatory functions to voluntary standards.[25] Importantly, even if standards are not the primary tool for addressing a policy issue, they can still serve a supporting role. For instance, carbon pricing relies on clearly defining what emissions are covered, how they are measured, and how to verify them. Standards are crucial in these areas.

Five main ways to use standards as a policy tool

Figure 2.1 summarizes the five chief ways standards can be used as a policy tool: market-driven

Figure 2.1 There is a spectrum of ways to use standards as tools for public policy



Source: WDR 2025 team.

standards, voluntary standards with government support, voluntary standards that fill legal gaps, mandatory standards that support other policies, and mandatory standards as a command-and-control tool.

Market-driven standards

Governments may choose not to intervene in the market at all—and instead leave room for market-driven voluntary standards. The fact that most standards are voluntary and widely implemented demonstrates the power of private incentives and self-interest. Any supplier must meet the standards of firms, whether domestic or foreign, to which it sells its commodities, goods, or services. For example, a light bulb manufacturer needs to ensure it complies with the size standards of the sockets in which it expects its light bulbs to be used, showing how compatibility standards can create strong incentives across the supply chain. In many cases, there is no need for the government to be involved in voluntary standards. In fact, government involvement can be counterproductive if political or regulatory considerations influence technical specifications.

Voluntary standards with government support

Although voluntary standards can be beneficial, stakeholders may not participate in their development or be willing to pay for them. Private organizations may lack the ability to coordinate and agree on a common standard, leading to too many varieties of the same product and limiting the potential for mass production. In such cases, the government may step in to help develop industry standards, like the US government's standardization efforts in the 1920s (refer to box 1.3 in chapter 1). Developing standards requires attending many technical meetings, a cost not all firms can afford. It also involves overhead costs for coordinating stakeholders, sharing information, and distributing standards. In many high-income countries, national standards bodies fund standards development by selling standards to users and requesting a fee for participation in standards development. Such a revenue model not only sustains the process but also provides a market signal: The more often a standard is purchased and used, the greater the likelihood that it meets a real industry or societal need. Similarly, many international standards development organizations like ISO rely on sales of standards to support their operations. However, in many low- and middle-income countries, the revenue from selling standards rarely covers the full costs of standards development. Whereas in high-income countries, national standards bodies on average generate 38 percent of their income from the sales of standards, sales make up only 2 percent of revenue of such bodies in low-income countries and 6 percent in lower-middle-income countries.[26] This is because national standards bodies in low- and middle-income countries are often government organizations with less of an orientation to and focus on sales. The government may therefore need to step in, not by specifying the content of a voluntary standard, but by encouraging its development. Similarly, governments might also want to encourage certain groups of stakeholders to use standards. For example, small and medium enterprises might need extra support for implementing standards because they lack the information or capacity to do so, even though it would be beneficial to them, for instance, in regard to international market access or quality upgrading.

Voluntary standards that fill legal gaps

Laws are often not very specific, because otherwise they could become outdated quickly or overly complex. In such cases, voluntary standards serve as important tools for filling technical gaps in legal provisions or for guiding compliance with laws. For example, governments may find it impractical to specify the thickness of cable insulation in a law promoting electrical safety. What if a new insulation material is discovered that provides the same insulation at half the thickness? Accordingly, it is good regulatory practice to leave such technical details to voluntary standards. Governments can issue these standards, or they may ask standards development organizations to develop them. If a voluntary standard relating to a particular regulation already exists when the regulation is codified, the government can simply reference that standard in the regulation (refer to chapter 8). This approach saves time and relies on standards already familiar to industry. A similar approach applies in public procurement, in which firms can bid in tenders (public offers), but the government may require compliance with certain standards, serving as a powerful way to promote standards.

Mandatory standards that support other policies

Standards can support policy instruments by providing definitions and specifying measurements, verification, and requirements for compliance. For example, if a government offers financial incentives for energy-efficient appliances, it may rely on a standard to define which appliances qualify as energy efficient, how energy efficiency is measured, and how compliance is verified through testing or certification. Similarly, an emissions-trading system allows the market to allocate carbon credits but may require that measurement and verification of emissions follow specified standards.

Mandatory standards as a command-and-control tool

Governments must decide when to impose specific requirements on firms' technological choices through mandatory measures or when to use incentives.[27] Examples of mandatory standards (*command-and-control tools*) include requiring machines to have emergency stop buttons or banning harmful chemicals in food. These policies define what is legal and illegal through licensing, bans, restrictions, and price controls. *Incentive-based instruments*, on the other hand, use price incentives such as government procurement, subsidies, and tax cuts, without directly controlling specifications, quantities, or allocations. In practice, the boundary between command-and-control and incentive-based instruments is often blurred; policies may combine aspects of both, showing the potential of the two approaches for complementarity. For instance, tradable emissions standards set limits on emissions intensity but allow firms to exceed the limits by purchasing emissions credits from firms whose emissions are below the limits.[28]

Guidelines for when to use mandatory standards instead of incentive-based instruments

There are two general guidelines for determining when mandatory standards make better sense than measures that depend on incentives. Mandatory standards are preferable when uniform compliance is needed or when they make it easier to achieve and enforce compliance.

Using mandatory standards to achieve uniform compliance

Incentive-based instruments are generally perceived as more cost-effective than command-and-control regulations because they provide ongoing motivation for innovation and efficient improvements in performance. For example, a carbon tax encourages emitters of carbon-based pollutants to cut emissions in the least costly ways, enabling companies with lower abatement costs to take more action. Although such incentive-based tools can be more efficient than mandatory measures, they also come with a higher risk of not reaching their goals. For instance, offering hospitals financial incentives to lower infection rates might prove ineffective if the hospitals' revenue mainly depends on other factors, such as the number of patients, the length of their stays, and their doctor-to-patient ratios. In such cases, enforcing basic hygiene and sanitation standards in hospitals, like handwashing stations and sterilization procedures, can be more effective. For more details on these challenges, refer to chapter 3.

Mandatory standards ensure compliance with a threshold and are therefore more suitable when not meeting the threshold causes substantial or irreversible damage.[29] For example, it might be safer and more cost-effective to require specifications for the minimum strength of construction materials than to risk the substantial costs of noncompliance, such as a collapsing bridge. Requiring safety standards at nuclear power plants may also be a wiser strategy than imposing fines after a safety-related incident occurs. Conducting the cost-benefit analyses required for making such decisions is complicated. As discussed in chapter 8, the analyses involve making important value judgments, including how to price nonmonetary damages (such as loss of life or health deterioration), how to value the future compared with the present (such as today's environmental investments for future generations), and how to define the boundaries of a system under analysis (such as indirect costs and benefits for people in other countries or other species).

Mandatory standards are especially useful when uniform compliance is needed: for example, to ensure that all teachers meet a certain minimum qualification, that levels of pesticide residue in foods do not exceed levels considered safe, or that all electrical equipment is safe for consumers. Uniform compliance might be required when the risk of harm is high (as in the case of safety standards), when the benefits of compliance depend on universal adoption (as in the case of hygiene protocols), or when fairness and credibility are at stake (as in education). However, at the same time, uniform compliance can also limit the government's ability to account for differences in the ability to comply, because some individuals may find it easier than others to meet a particular standard.

Using mandatory standards when they make achieving and enforcing compliance easier

Both incentive-based instruments (such as taxes and subsidies) and mandatory standards require monitoring and enforcement. However, incentive-based instruments usually need accurate measurement of performance metrics, which can be difficult when capacity for such measurement is low. For instance, taxes are based on actual income, incentives for school performance depend on measuring student achievement, and pollution taxes rely on continuous monitoring of emissions. High-capacity environments may have effective tools for the types of measurements needed in instances like these, but in many low- and middle-income countries, limited data collection and institutional capacity hinder reliable measurement of performance.

In such settings, mandatory standards tend to be more practical, especially when compliance can be verified through observable features, documentation, or routine inspections. For example, instead of trying to assess teacher effectiveness based on changes in the results of student learning, a government might require teachers to hold a teaching certificate. Instead of taxing emissions that are difficult to track, a regulation might mandate that factories install and operate scrubbers known to reduce pollution.

Similarly, relying on a litigation-based approach to regulation, in which harm is addressed after the fact through lawsuits and liability claims, requires a well-functioning legal system, which many low- and middle-income countries may lack. Fostering compliance via insurance systems works only if insurance markets are mature enough to function properly. In such cases, mandatory standards may be easier to enforce than an approach based on litigation or incentives. Meanwhile, as this Report discusses in detail, the implementation and enforcement of standards also requires the availability of compliance infrastructure like testing laboratories (refer to chapter 3).

Mandatory standards typically provide clearer, more specific instructions than incentive-based tools, which can limit flexibility but offer practical guidance, especially in situations in which capacity is low. For example, small and medium enterprises often do not know about opportunities to save energy or the technologies needed to implement them. Requiring the use of equipment that meets higher energy efficiency standards can guide their actions more effectively. Additionally, mandatory standards have as one benefit that providers are either compliant or not, which simplifies monitoring and enforcement and helps clarify standards. For instance, consumers can easily determine whether a product has passed a safety test or whether their accountant is certified and qualified.

When one size may not fit all

Countries generally benefit from adopting common international standards because such standards are widely recognized as best practice and trusted. For example, consider a low- or middle-income country that wants to import solar lamps for rural electrification. Lamp importers in the country may lack the technical expertise to draft detailed technical requirements in their purchasing documents. These importers can simply request that the imported lamps meet the international standard for such lamps without needing in-depth knowledge of the technical specifications. Additionally, higher demand for lamps that comply with the international standard will drive down the price, because the standard ensures the lamps can be mass produced. Conversely, if importers specify that lamps be produced to a different standard, it could increase both the production costs and the prices.

There is no single answer to the question "Does one size fit all?". Whether to choose "one size" or not entails a set of trade-offs that vary by context. One key trade-off is that between diversity and uniformity. Diversity can foster innovation, accommodate local practices and traditions, and enhance relevance and legitimacy. Uniformity, by contrast, can enable economies of scale, reduce complexity through the reduction of varieties, and enable greater efficiency. Another trade-off is between the stringency of standards and the ability to meet or enforce them. Higher standards are desirable for quality but depend on local capacities.

This tension between ambition and capacity is at the heart of the conceptual framework presented in this Report. Importantly, the extent to which one size should fit all depends on the type of standard considered (that is, whether it is a measurement, compatibility, or quality standard).

Compatibility standards benefit the most from a one-size-fits-all approach because any deviation from the standard can cause incompatibility. For example, credit cards issued by one bank that do not adhere to common standards for data formats and security protocols may not work at another bank's automatic teller machines. At the same time, there is no guarantee that the prevailing standard is the most effective one, especially when switching imposes significant costs. Moreover, the universal adoption of a standard may also raise market power when only one or a few unique producers provide the products for which the standard is used or any component needed to meet it.

Measurement standards also benefit from a one-size-fits-all approach, because their goal is comparability. However, some standards regimes pre-date globalization and have instead served as the foundation for economies and societies, making such standards socially, economically, and politically costly to change. As a result, these regimes may coexist if switching to a common standard is too costly. As discussed in chapter 1, despite the benefits of universally adopting the metric system, several countries still use both the metric and Imperial systems, leading to significant transaction costs. In addition, there is often no agreement on the ideal standards for benchmarking and measuring policy outcomes like achievements in the areas of education, health, or poverty reduction (refer to box 2.1).

Box 2.1 Standards for measuring poverty: A trade-off between uniformity and local relevance

A core challenge in measuring poverty lies in balancing uniformity and diversity. Uniform standards facilitate international comparability, enabling global monitoring, target setting, and resource allocation. In contrast, diversity allows national poverty measures to be adapted to local economic conditions, institutional capacities, and policy needs, enhancing their relevance and accuracy.

Countries follow different standards for measuring and setting national poverty lines, reflecting context-specific decisions based on a country's typical living conditions, consumption behavior, and policy priorities.[a] For example, countries adopt either consumption- or income-based measures of poverty depending on their own specific contexts. Low-income countries often prefer to use consumption data because of the prevalence of informality, in-kind transactions, and subsistence production. In contrast, middle- and high-income countries typically rely on income data, leveraging administrative systems and formal labor markets.[b]

Instruments used in surveys intended to measure poverty are adapted to local contexts, resulting in variation in definitions, item coverage, and methods for collecting data. Even in

(Box continues next page)

Box 2.1 Standards for measuring poverty: A trade-off between uniformity and local relevance *(continued)*

regard to consumption, the structure of questionnaires, recall periods, treatment of domestic production, and imputation methods differ across countries.[c] These differences ensure accuracy within each country but complicate global comparability.

To allow global comparisons, the World Bank introduced an international poverty line in the *World Development Report 1990: Poverty*.[d] Originally known as "one-dollar-a-day," it is currently set at US$3 per day per capita in 2021 purchasing power parities.[e] This benchmark is converted to local currencies using purchasing power parities to account for cross-country differences in price levels. The international poverty line serves as a common threshold for identifying extreme poverty across countries and over time, enabling benchmarking of performance and tracking of global goals.[f]

Yet although the international poverty line is set at the same level globally, global comparability remains imperfect. As mentioned, countries differ in whether they collect income or consumption data to measure poverty, and even within those categories, they differ in how they define and gather data. These discrepancies are essential for local relevance but introduce inconsistencies across countries. For instance, household income in one country may include certain income components that are not included in household income in another country. Consumption data may vary in regard to recall periods, whether durables are included, and the treatment of homegrown food.

To address these challenges, the World Bank is actively working to harmonize income and expenditure data across countries. Its efforts aim to align definitions, improve survey instruments, and promote methodological consistency, particularly for surveys of household expenditure, which underpin poverty estimates in many low- and middle-income countries.

Source: WDR 2025 team.

a. Allen (2017); Decerf (2023); Mahrt et al. (2022); Ravallion (1998, 2016).
b. Carletto et al. (2022).
c. Deaton and Zaidi (2002); Giambastiani et al. (2022).
d. World Bank (1990).
e. Filmer et al. (2025).
f. Jolliffe and Prydz (2021).

The need to adapt standards to local contexts is perhaps strongest in regard to quality standards. Countries or regions may face very different costs of complying with an international standard, with the differences driven by variations in production capacity, citizens' preferences, and enforcement capacity. But perhaps most important, quality standards for many different products and services must align with purchasing power, which is quite limited in low-income countries. Quality standards and purchasing power generally evolve together, with the latter influencing the former.

The extent to which an international standard should be adopted as is versus adapted to a local context is just one of many trade-offs involved in setting standards. Achieving scale can reduce diversity. For example, having uniform learning standards across a country decreases variation in teaching methods, leaving teachers less room to account for individual learning needs. Having subject matter experts lead the development of standards may bring in expertise but also increases the risk of capture. Trade-offs vary depending on the areas in which standards are applied, a country's level of development, and societal preferences.

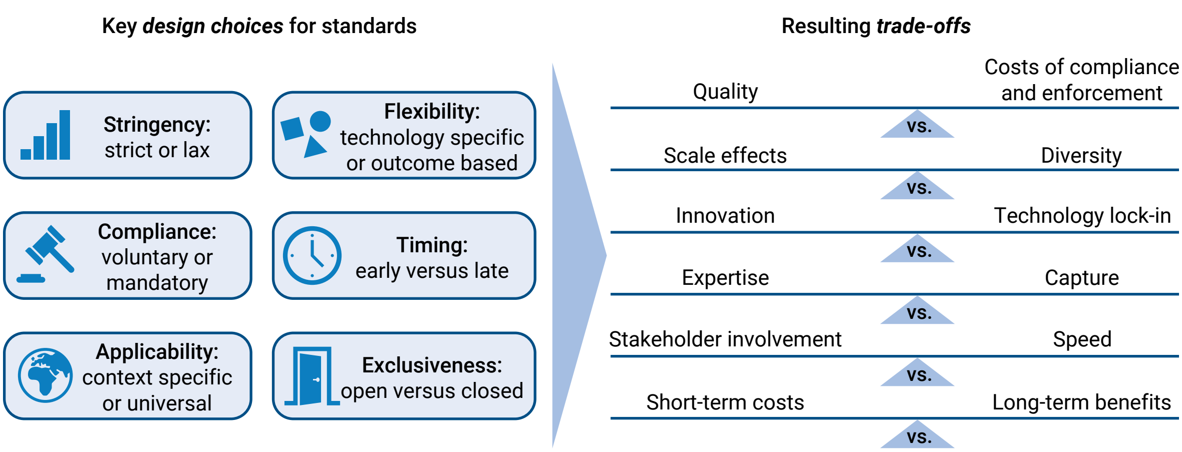
Figure 2.2 illustrates the choices that influence key trade-offs in designing standards. Analysis of ISO administrative data provides some empirical support for the existence of a trade-off between stakeholder involvement and the speed of standards development. Each additional participating country in standards development, regardless of the country's level of development, adds only three days to the process of publishing a standard. If the secretariat for the ISO technical committee in charge of the products that the standard regulates is based in a high-income country, the publication process can be three to four months shorter (refer to spotlight 2 for details).

The costs and benefits of setting standards may be realized over different time horizons and possibly even across generations, with compliance costs incurred immediately and benefits realized in the longer term, as in the case of reductions in emissions of greenhouse gases and the impacts of climate change (refer to chapter 6). In addition, standards modify the incentives faced by consumers and providers. Standards that demand higher quality provide incentives for producers to invest in better inputs and processes that allow them to make higher-quality products at lower prices and in turn induce consumers to demand higher quality; stricter standards require development of better technology for monitoring and enforcement, implying possibly significant investment costs but also making it easier to enforce standards in the future. These dynamics highlight the fundamental way in which standards are at the heart of the development process.[30]

A framework for transitioning toward higher quality standards

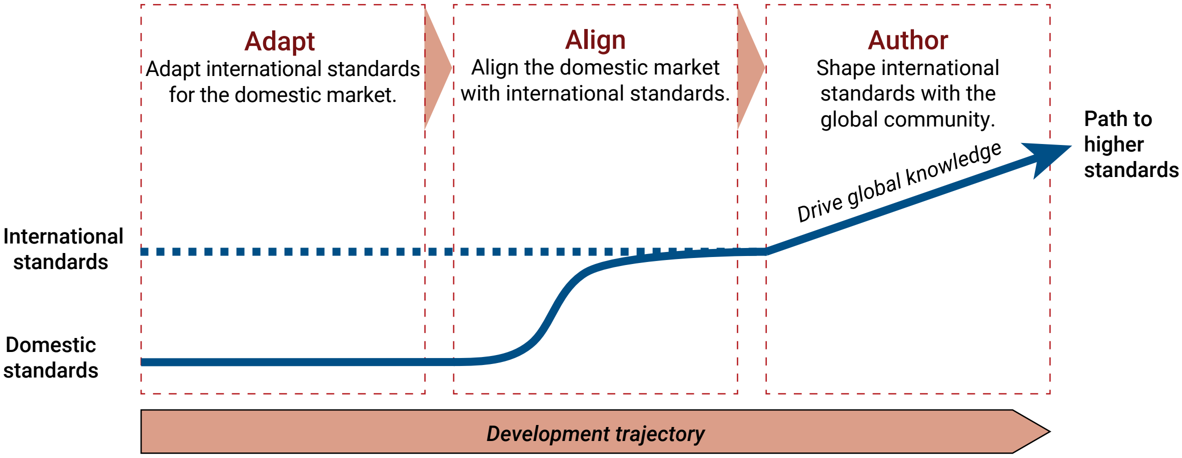
Development at the country level is about transitioning toward higher-quality goods, services, institutions, infrastructure, and quality of life, among other things. As this Report shows,

Figure 2.2 Important choices for designing standards, and the resulting trade-offs



Source: WDR 2025 team.

Figure 2.3 From adapting standards to aligning and then authoring them



Source: WDR 2025 team.

standards play a catalytic role in this journey. Figure 2.3 depicts the evolution of standards setting over the different phases of a country's development. Importantly, this trajectory may not progress uniformly across a country, which may be at several different points with respect to changes in the development of standards at the same time.

Adaptation. At low levels of development, countries may need to *adapt* international standards to local conditions, including lower capacity to meet the standards, especially when it comes to mandatory standards. Adaptation is often not an option, however, when it comes to accessing the international market. International buyers generally require products to meet international standards for safety, quality, and compatibility, and if a product does not meet these standards, it will not be accepted abroad. Therefore, the key decision regarding voluntary standards is whether or not to *adopt* them. Data from a survey of 116 ISO members, conducted jointly by the World Bank and ISO in 2025, show that ISO members adopt as is more than 90 percent of ISO standards they consider; they adapt the rest, mainly on account of differences in climate (refer to spotlight 3 for details).

When establishing mandatory standards for domestic markets, however, countries can adapt international standards. Countries therefore need to implement a dual regime in which they follow international standards for international market access but adapt standards for the domestic market to local conditions.

In the latter case, the degree of *adaptation* (that is, deviation from an international standard) should align with the country's compliance capacity with respect to the corresponding standard. Adaptation carries inherent risks, however, because domestic standards that are less strict than the corresponding international one might become the long-term norm or local industries could influence the standards-setting process, resulting in overly lenient standards. Deviation from international standards should therefore always be considered a second-best option, to be pursued only if compliance capacity cannot be increased.

Wider use of "tiered standards" can help countries avoid situations in which adaptation of international standards leads to fragmentation. This is because tiered standards provide a framework that accommodates different levels of compliance capacity or stringency while maintaining overall compatibility with international standards. (Chapter 8 provides details on tiered standards.) Sometimes, adaptations in low- and middle-income countries may also result in standards that are more stringent than comparable international ones: for example, stricter standards on electrical safety to account for frequent power outages in a country or requirements for enriched food products to fight malnutrition where it is a particular problem.

Countries mainly find they need to adapt the stringency of international standards if they intend to use them for domestic regulation. Because the uptake of voluntary standards is optional, adaptation of their strictness may be less urgent. Still, when countries adopt an international standard as a national standard, it is important that they consult with domestic stakeholders to identify any need for adaptation to local contexts. Adaptations of this kind may be less about stringency and more about local practices and terminologies (that is, they may involve "horizontal" rather than "vertical" differences). For example, Ethiopia developed a national standard for beehives to account for the widespread use of traditional beehives, which differ from the frame beehives common in other parts of the world.

Alignment. As countries increase their compliance capacity, they should strive to *align* standards for the domestic market with international standards. This is beneficial because international standards reflect good international practices in an area that countries can learn from. Alignment with international standards is also encouraged under the WTO's Agreement on Technical Barriers to Trade to ensure that achieving legitimate public objectives like health, safety, or environmental protection does not unnecessarily disrupt trade. Moreover, aligning domestic standards with international standards ensures that firms do not need to produce one variant of a product for the domestic market and another for the export market. In other areas like education or governance, standards need to be more sensitive to context, but with a clear pathway for improvement, which often means harmonizing them with international standards.

Authoring. As countries develop, they should become more involved in *authoring* international standards, either the development of new ones or the revision of existing standards based on their experience and needs. Active participation in the process of developing international standards is important even if a country has limited technical expertise in whatever areas the standards govern. It allows the country to share its challenges and priorities, thereby influencing what the standard covers. Additionally, international standards development organizations serve as learning environments and help countries gain a deeper understanding of the subject matter discussed during standards development through interactions with participants from other nations and stakeholders. Of course, a country's level of participation will depend on the country's expertise in the sector and stakeholder interest.[31]

The journey of standards—from adoption to authoring—is not linear or uniform across sectors. Countries can move between the choices of adaptation, alignment, or authoring in different areas of society at varying speeds. For example, Ethiopia is authoring standards for teff, a local grain, while adapting standards in other areas. India is taking up leadership in development of international standards for low-voltage electrification while adapting standards for fuel efficiency. The journey embodies complex interplay among scientific and technological advancements, cultural traditions, social acceptance, economic pragmatism, business interests, and political ambition and power. Understanding the processes involved is crucial for policy makers, businesses, and civil society as they navigate the increasingly complex global landscape of standards.

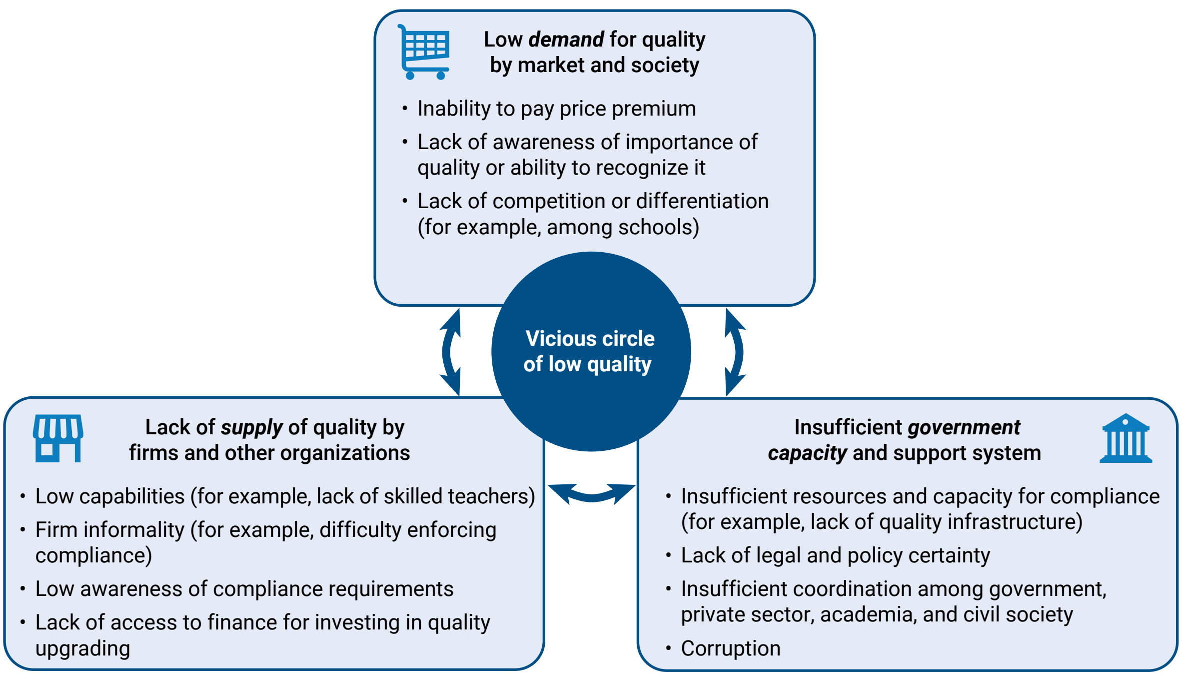
Using standards to break the vicious circle of low quality in low- and middle-income countries

Low quality of products and services in low- and middle-income countries often results from a multidimensional vicious circle of supply and demand factors and limited government capacity, as illustrated in figure 2.4. Standards can help break the circle.

Although this Report stresses that standards are more important for low- and middle-income countries today than when high-income countries were at similar levels of development, especially as a result of increased technological sophistication and the pressures and opportunities of globalization, they are no panacea. In other words, one cannot expect the quality of production to increase just by raising standards. Sometimes, higher standards are set *after* broader socioeconomic improvements happen, whereas at other times, they are established *before* such improvements occur. Both patterns have occurred in the East Asian "miracles" of China, Japan, and the Republic of Korea, featured in spotlight 1. These countries' strategic and sustained use of standards contributed to their explosive growth and demonstrates that breaking the vicious cycle of low quality is possible.

Addressing quality bottlenecks. Because high quality often comes at a higher price, societal and market demand should determine the level of quality of a country's products and services. Even when higher quality proves more cost-effective in the long term, as in, for example, the cases of energy-efficient light bulbs or appliances that last longer and reduce energy bills, the higher up-front costs required to ensure higher quality can be prohibitive for large segments of the population in low- and middle-income countries. Aside from their

Figure 2.4 Low- and middle-income countries are often trapped in a vicious circle involving low quality



Source: WDR 2025 team.

ability to pay, people may not demand goods and services of higher quality if they lack awareness of the importance of quality or the ability to recognize it.[32] Moreover, consumers may be hesitant to pay a price premium if they cannot trust the quality of goods and services: for example, if there is no reliable testing and certification that would provide trustworthy market signals to consumers.[33] This matters, as studies have shown that when the market demands and rewards quality (for example, when firms export), producers do upgrade quality.[34] But if consumers cannot discern quality, typically because of incomplete information, producers do not have an incentive to upgrade.[35]

Societies and domestic markets also may not demand quality because of limited competition or lack of product differentiation within such markets. For example, if there is only one school or hospital in a district, it may not have an incentive to improve quality. An active civil society, including media, consumer associations, and professional bodies, is crucial for increasing demand for quality but is often missing in low- and middle-income countries.

On the supply side—notably among firms, but also in other organizations—low capabilities constitute a main quality bottleneck. For example, firms in low- and middle-income countries may lack internal production controls or the necessary skills to meet higher quality standards, resulting in quality bottlenecks. The high levels of informality among firms in low- and middle-income countries make these deficiencies worse and create challenges when these countries attempt to impose sanctions for violations of mandatory standards or trace noncompliant products. In principle, external finance can help make these trade-offs easier to navigate, but it is usually limited. Although development is a complex issue, low-quality production is one of its most significant challenges.[36] Firms in low- and middle-income countries produce lower-quality products, whether measured by the unit value of exports,[37] by the use of advanced technologies,[38] or by the quality of firm management.[39] This quality differential leads to significant productivity differences between countries[40] and sectors.

In addition, governments in low- and middle-income countries often lack the financial and human resources needed to enforce compliance with standards or provide incentives to increase quality; the problem is compounded by insufficient infrastructure for enforcing standards such as testing laboratories. At the same time, low- and middle-income countries frequently have underdeveloped legal frameworks and judicial systems, involving things such as weaknesses in private law jurisprudence, as evidenced in insufficient laws regarding product liability or contracts. Policy unpredictability further weakens compliance in these countries because organizations and people may adopt a "wait and see" approach before increasing their compliance. Meanwhile, coordination among government institutions is often a challenge, especially because enforcement of mandatory standards typically requires collaboration among multiple government bodies at various administrative levels, as well as the private sector and civil society, which often has deeper pools of expertise.

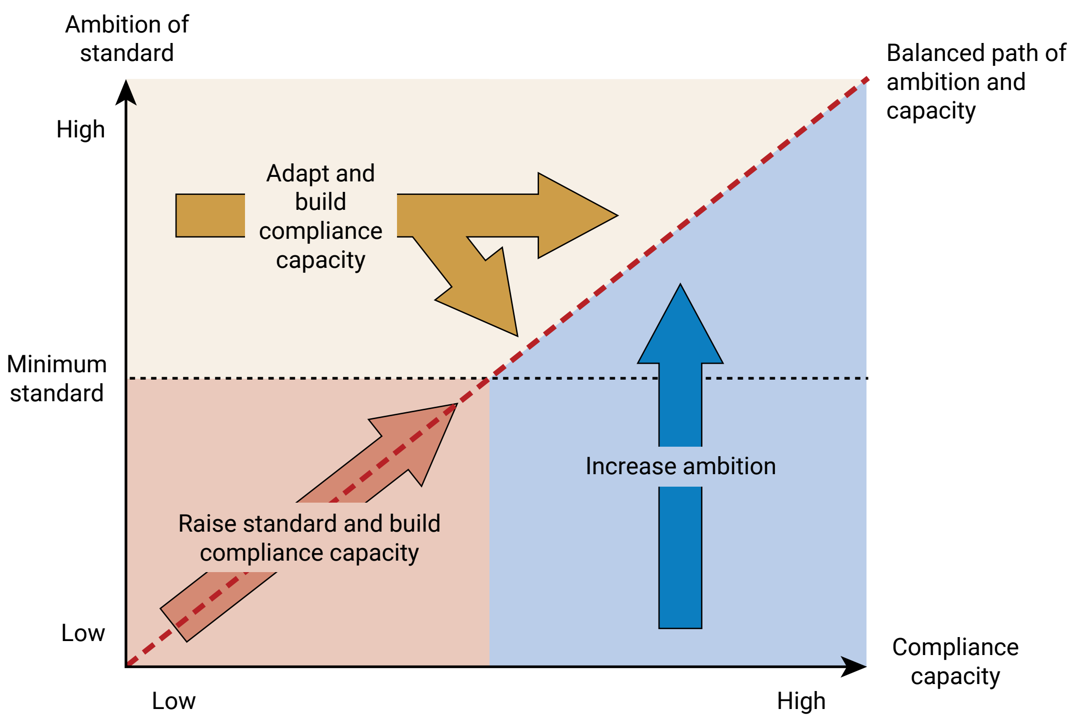
Standards are not the only tool for breaking circles of low quality, but they can be especially important in low- and middle-income countries. For instance, standards in trade help firms access the global market, which is crucial for firms in low- and middle-income countries that face limited domestic demand and low willingness to pay for high-quality products. International standards are a key source for the diffusion of technologies and knowledge, which is even more vital in countries with limited technical expertise. The absence of standards in health and education, for example, tends to be especially harmful to the poorest segments of a country's population, making these gaps even more costly in contexts of extreme poverty and vulnerability. Likewise, transaction costs and the extent of market failures may be particularly high in low- and middle-income countries.[41] In addition, weaker state capacity limits these countries' ability to design and enforce effective policies and worsens the impact of market failures and transaction costs in hindering the development process.[42]

Balancing the ambition of standards with the capacity for compliance

Compliance capacity refers to the ability of stakeholders to meet voluntary standards and those used for regulation, the quality infrastructure required to verify compliance (such as the availability of laboratories), and the government's enforcement capability. Standards are pointless without implementation. For this reason, countries need to balance the ambition of their quality standards—their stringency and the range of areas they cover—with the capacity of individuals and firms in the country to meet them. These components are interrelated. If standards are too weak, society may fall short in areas such as education, health, food safety, and environmental protection. But if standards are too ambitious, products and services may become too expensive and unaffordable to most consumers (as a result of high prices) and unprofitable to most producers (as a result of high compliance costs). In addition, setting high mandatory standards without adequate government capacity to ensure compliance may lead to uneven enforcement, possibly inviting corruption.

Figure 2.5 shows the challenges inherent in balancing ambition and compliance capacity. The red diagonal dashed line indicates the highest standard achievable for a given level of compliance capacity. A country setting a standard on the red dashed line sets the standard at the level of its compliance capacity, resulting in no

Figure 2.5 Matching the ambition of standards with compliance capacity



Source: WDR 2025 team.

compliance gap.[43] Three scenarios in particular can arise:

1. *Raise standard and build compliance capacity (rust-colored area at bottom left of figure 2.5).* In this area of the figure, a country has yet to meet the minimum standard in a given domain (such as food safety or labor standards). Filling the gap between actual performance and full compliance with the standard requires a combination of increasing the standard to the minimum and building compliance capacity (a move to the top-right corner of the rust-colored area). Building compliance capacity is not straightforward and will likely involve building capacity among stakeholders and investing in compliance infrastructure such as laboratories (refer to chapter 3).
2. *Adapt and build compliance capacity (tan-colored area at top of figure 2.5).* High standards and low compliance lead to uneven enforcement, weakening the very trust that standards are supposed to foster. Depending on the specific circumstances, countries may need either to invest in compliance capacity to meet the high standards or to adapt standards to the local context, or even better, to pursue a mix of the two.

For most low- and middle-income countries, compliance capacity is the binding constraint; the tan- and rust-colored areas are the relevant ones. A third scenario may be more relevant for high-income countries:

3. *Increase ambition for standards (blue area in figure 2.5).* Countries with high compliance capacity and low ambition are not fully exploiting their potential. Because it rarely makes sense to reduce compliance capacity, countries should increase the ambition of their standards, especially if the minimum standard has not yet been met.

Once countries have achieved their relative maximum on the dashed ambition-capacity line, ideally they move along the line by incrementally increasing compliance capacity and ambition. Which one they pursue first—capacity or ambition—will depend on the sector and context.[44] Countries should set standards based on national priorities and their ability to comply with them and then gradually raise their ambitions as their capacity increases. Doing so will ensure that countries will be able to comply with their standard, regardless of their income levels. This can be referred to as a *maturity-model approach* with incremental gains over a period of time.

Setting standards without the capacity to enforce them (the tan-colored area at the top of figure 2.5) is not without consequences. In some cases, setting standards "too high" can be viewed as *aspirational* and may induce market participants to change their behaviors to meet the standard. For example, China's ratification of the Montreal Protocol on Substances That Deplete the Ozone Layer is viewed as instrumental in spurring a series of innovations that allowed the country to develop and adopt cleaner production technologies in a widespread manner.[45] In such a case, the existence of a compliance gap or the fact that the existing reality falls short of the standard can be seen as a catalyst for development. At the same time, setting standards without the ability to guarantee uniform compliance may not only defeat the purpose of the standard but also create uncertainty about what compliance behavior is actually mandatory, potentially leading to arbitrary enforcement in a subset of market participants and paving the way for corruption.[46] In such a case, the compliance gap can become a substantial impediment to development.

The chapters and spotlights in part 3 of this Report present empirical evidence supporting the framework in figure 2.5. They show that, except in the case of environmental standards, countries follow the framework when regulating areas as diverse as health care and procurement. Most standards are set following a gradual increase along the dashed line in both countries' ambition and their compliance capacity, resulting in no compliance gap. For the case of environmental standards, in contrast, some countries set standards that are too high relative to their compliance capacities, and as a result, they also have large compliance gaps. This is akin to *isomorphic mimicry*,[47] in which countries set high standards, perhaps on account of external pressure, without expecting these standards to be enforced. This results in a U-shaped relationship between formal standards and development, with lower-income countries setting higher standards (while not enforcing them) than middle-income countries.

Authoring international standards

International standards are developed in various forums, including formal standards development organizations such as ISO, the IEC, and the ITU, as well as intergovernmental organizations like Codex Alimentarius (for food standards) and the ILO (for labor standards). Low- and middle-income countries need to be involved in different arenas to author international standards, and each comes with different governance models and power structures.

At ISO, member countries can send experts to working groups developing standards and delegates to the technical committees of the working groups (refer to spotlight 2 for details). However, because working group and committee meetings cost both time and money and require technical expertise, many low- and middle-income countries often participate only in the committees that are most relevant to their interests. For example, low- and middle-income countries rich in minerals generally participate in ISO committees related to mining to ensure that their national producers can comply with standards these committees develop.

Whereas before the COVID-19 pandemic, ISO held meetings in person in one of the participating countries, now most ISO meetings happen virtually.[48] However, because technical committee meetings are conducted in English, countries, particularly those whose native language is not English, may find it hard to participate if their delegates are not fluent in English. As a result, low- and middle-income countries often find themselves "standard takers" rather than "standard makers." High-income countries, as well as large emerging markets, in contrast, participate in many more technical committees and do so more actively, thereby establishing a greater presence in the process of developing standards. Importing countries also try to influence standards to protect their local producers.

Research shows that consensus-based decision-making is best for resolving these competing interests and encouraging adoption of standards, although it can also produce conflict and delay.[49] Although this is not a constraint in regard to mature technologies, it can be in regard to sectors in which technological change is rapid; in such sectors, the process of setting standards might shift to industry associations or individual firms.

Specific countries (or specific firms) can sometimes take a leadership role in authoring standards within specific sectors. This is often seen in regard to emerging technologies such as electric vehicles, the Internet of Things, and successive generations of telecommunications technologies (such as 5G). In some instances, a country may first develop a standard at the country level and then propose it to international partners for adoption as an international standard. Only countries with technological expertise, state capacity, political will, and concentrated production capabilities in specific goods or services tend to be influential in developing international standards.

There are apprehensions that development of standards in emerging technologies is becoming a battleground for geopolitical competition, reflecting the adage attributed to Werner von Siemens, "Who owns the standards, owns the market." Developing standards is not only about creating technical specifications; standards are an assertion of geopolitical influence and an attempt to set the terms of engagement, for example, for the digital age. As major powers jostle to shape the global rules of the game, they perceive shaping international standards to those developed by their own national firms as important for establishing market dominance. But authoring standards is not limited to global superpowers. Smaller nations and even nonstate actors can play crucial roles in developing standards, particularly in emerging fields for which the rules are still being written. Estonia's standards for digital governance and the Linux Foundation's open-source software protocols demonstrate how focused efforts can have outsized impacts on global norms. Understanding the journey from adoption to authoring becomes crucial as countries navigate an increasingly complex world.

Notes

1. Refer also to de Vries (1998).
2. Similarly, languages are not considered a standard in this Report, even though they may be codified.
3. The ISO and IEC definition of a standard is a "document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines, or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context" (ISO and IEC 2021, 2). Similarly, the Technical Barriers to Trade Agreement of the World Trade Organization (WTO) defines a standard as a "document approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for products or related processes and production methods, with which compliance is not mandatory" (WTO 2014, 58).
4. This Report's definition also omits the element in the ISO and IEC definition that describes standards as aiming to achieve an "optimum degree of order in a given context" (ISO and IEC 2021, 2). This phrase expresses an aspirational goal rather than a defining characteristic, and it is inherently subjective.
5. Refer to WTO (2014).
6. Refer to Standards (portal), International Organization for Standardization, https://www.iso.org/standards.html.
7. In a related way, standards can be categorized based on whether they focus on inputs, processes, or outcomes. Depending on the part of the value chain under consideration, the same standard may be classified as either an input or an outcome. For example, skills standards for teachers would be outcome standards at the level of the teacher, but input standards in the case of student learning.
8. David (1987).
9. Refer to de Vries (1998).
10. de Vries (1998).
11. ISO standards for management systems help improve the performance of organizations by specifying repeatable steps that organizational leaders may consciously implement to achieve their goals and objectives. The standards may also be used to create an organizational culture that reflexively engages in a continuous cycle of self-evaluation, correction, and enhancement in operations and processes through heightened employee awareness and management leadership and commitment. ISO 9001, for example, is a globally recognized standard for quality management (ISO 2015). It helps organizations of all sizes and sectors improve their performance, meet customer expectations, and demonstrate their commitment to quality. In 2023 alone, 837,978 certificates were issued attesting to ISO 9001 compliance in 1,250,243 sites around the world. This illustrates the level of importance and use of ISO's flagship standard.
12. Bassi et al. (2024); Holmes and Stevens (2014).
13. Nyman and Begazo (2025).
14. Arabéhéty et al. (2016); Beck and de la Torre (2007); Crémer et al. (2023).
15. Takhar (2020).
16. Lynch (2025).
17. Verhoogen (2023).
18. Refer also to Akerlof (1970).
19. Clougherty and Grajek (2014).
20. North (1990).
21. WDR 2025 team calculations, using data from TRAINS [Trade Analysis and Information System] (portal), United Nations Trade and Development, https://trainsonline.unctad.org/home; WITS: World Integrated Trade Solution (database), World Bank, Washington, DC, http://wits.worldbank.org/WITS/. Refer to chapter 4.
22. The WTO's Technical Barriers to Trade Committee agreed upon the six principles of voluntary standards development—transparency, openness, impartiality and consensus, effectiveness and relevance, coherence, and the need to consider the concerns of low- and middle-income countries—in 2000. Refer to Principles for the Development of

International Standards, Guides, and Recommendations (dashboard), World Trade Organization, https://www.wto.org/english/tratop_e/tbt_e/principles_standards_tbt_e.htm.
23. To give rise to the voices of consumers in development of international standards, ISO has established a dedicated committee on consumer policy. The committee advises the ISO Council by, for example, consolidating and presenting the viewpoints of consumers on matters relevant to ISO's current and potential work in the areas of standardization and conformity assessment. Refer to ISO/COPOLCO: Committee on Consumer Policy, International Organization for Standardization (dashboard), https://www.iso.org/committee/55000.html.
24. Fressoz (2025).
25. OECD (2020).
26. Data are based on a survey conducted jointly by the World Bank and ISO among ISO members in 2025. The survey sample includes 116 national standards bodies: 13 in low-income countries, 28 in lower-middle-income countries, 34 in upper-middle-income countries, and 41 in high-income countries. Revenues from the sale of standards include revenues from subscriptions.
27. Ambec (2025); Antweiler (2013); Goulder and Parry (2008); Sterner and Coria (2012).
28. Fischer (2019).
29. Weitzman (1974).
30. de Vries and Verhagen (2016).
31. Spotlight 3 documents how low- and middle-income countries participate in ISO.
32. Cajal-Grossi et al. (2025).
33. Akerlof (1970).
34. Alfaro-Ureña et al. (2022); Atkin et al. (2017); Bold et al. (2022).
35. Chen et al. (2022).
36. Aghion and Howitt (2005); Hausmann et al. (2007); Hummels and Klenow (2005); Sutton and Trefler (2016). This Report defines quality broadly as a multidimensional concept that varies by context—goods, services, labor, or institutions—but has an impact on performance, safety, reliability, or customer satisfaction. More important, these attributes increase consumers' willingness to pay and often result in higher prices or market shares.
37. Hallak and Schott (2011).
38. Comin and Mestieri Ferrer (2018).
39. Bloom and Van Reenen (2007).
40. Acemoglu and Zilibotti (2001).
41. Refer to Dixit (2003) on transaction costs and Stiglitz (2010) on market failures, for example.
42. Estache and Wren-Lewis (2009); Laffont (2005).
43. In practice, this need not be a straight line.
44. The slope of the "balanced path" line also differs by sector. In some sectors, a small increase in compliance capacity can allow a country to pursue much more ambitious standards, whereas in others, even a slight increase in ambition would require substantial investments in compliance capacity.
45. Zhao (2005).
46. Botero et al. (2004); Djankov et al. (2002).
47. "Isomorphic mimicry" refers to the practice by which organizations adopt the outward forms, structures, and practices of best-practice institutions without actually developing the underlying capabilities that make those institutions effective (refer to Andrews et al. 2017).
48. In 2024, ISO held 4,959 virtual technical meetings, 2,062 hybrid meetings, and 836 in-person meetings.
49. Farrell and Simcoe (2012); Simcoe (2012).

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