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Reshaping Global Value Technology, Climate, Trade – Global Value Chains under Pressure

In Collaboration with A.T. Kearney

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Executive summary

Global value chains (GVCs) are the lifeblood of the world's economy, accounting for more than two-thirds of global trade. GVCs have been one of the primary driving forces behind an economic escalator that has delivered many of the past century's most extraordinary gains. Complex, multi-echelon GVCs have grown exponentially since the 1990s and, today, are an essential engine of global economic development and GDP growth. GVCs have helped some, albeit not all, countries and communities lacking strong infrastructure to participate in the global production and trade system. They are the integrating mechanisms that determine how many global and local businesses are configured and the crucial channels of access that allow them to succeed.

Yet, today, GVCs are undergoing profound changes, with sweeping implications for those who are dependent on them as pathways to economic success. Driving these changes is a "perfect storm" at the nexus of three mega-trends that are disrupting our global production system and reshaping the distribution of global value: emerging technologies; the environmental sustainability imperative emerging from the accelerating global climate emergency; and the reconfiguration of globalization. Individually and in combination, these three mega-trends have fundamental implications for how value is created and distributed along GVCs, and thus for how businesses define their strategies and nations advance sustainable development.

Facing up to these disruptions requires new approaches to ensure an orderly, inclusive and sustainable transition. These approaches will need to include new forms of business strategy and government policy and practice, supported by a new generation of public-private partnerships.

To secure their places in tomorrow's global economic system, developed and developing countries – as well as small and medium sized businesses (SMEs) and multinational corporations (MNCs) – urgently need to understand the risks and opportunities associated with the impending changes to GVCs, and the future shape of production as a driver of economic growth and development.

Recognizing this urgency, the World Economic Forum and the United Nations Development Programme (UNDP) have undertaken a joint effort to develop a better understanding of the ongoing transformations in production and GVCs from both a corporate and broader sustainable development perspective. In collaboration with A.T. Kearney, the partners developed a new Strategic Value Framework that helps stakeholders understand the likely impacts and implications of disruptions across GVCs, and thus what needs to be done to adapt to them, when and by whom.

Specifically, this Strategic Value Framework provides a methodology for quantifying the likely extent of GVC reconfiguration under different disruptive scenarios. It is an analytic resource that businesses and governments can use to both identify risks and seize opportunities by informing the design and execution of a new generation of strategies and policies.

Crucially, the Strategic Value Framework will help drive dialogue across the private and public sectors, thereby opening new opportunities for collaboration. The value of the framework will ultimately be measured by its effectiveness in generating actionable insights that help countries engage with business in upgrading their production base and aligning their strategies and practices to shape and secure their future share of global value.

Reshaping Global Value provides a challenging view of how today's GVCs are being transformed, and a compelling case for the need for public and private actors to come together to better understand the nature, pace and implications of the ongoing disruptions and take collaborative action accordingly. The key to understanding the scale of the forthcoming changes is appreciating their systemic features. To this end, the paper highlights the limits of predictive models given the inherent uncertainties, and the lack and uneven distribution of relevant data.

These constraints can be overcome by applying the methods of scenario analysis, data analytics, use case-driven assessments and, above all, dialogue. Towards that end, this paper:

- Offers a new Strategic Value Framework to test hypotheses and understand the implications of disruptive trends on GVCs.
- Identifies capabilities that can help businesses, governments and public-private partnerships to prepare for those disruptive trends, stay ahead of potential negative effects and continue to grow value.
- Makes a case for change and issues a call to action for businesses, governments and public-private partnerships to ensure an inclusive transition towards the future GVC landscape, including by rethinking their strategies and pathways to economic growth, and considering wholly new approaches to economic planning, policy-making, capacity development and business practices.

The Strategic Value Framework balances the granular analysis required to offer insights that are useful to specific sectors within countries, and the aggregated assessments necessary to also draw regional and global conclusions. The framework first profiles a current GVC in terms of three pillars:

- **Economic value pool** indicates where value is generated by industry and quantifies it in a value pool consisting of absolute revenues, relative profitability and net-retained profit across five stages of value creation – extraction, processing, forming, assembly and distribution.
- **Geographic concentration of supply** assesses the degree to which each stage in a GVC is supplied with production inputs from local, national, regional and global groupings of suppliers across the five stages of value creation.
- **Structural characteristics** consist of nine factors that are crucial to GVC competitiveness at each stage, while considering the main interdependencies between countries and sectors most relevant to value-chain participation: reliance on economy of scales; cost of labour; labour intensiveness; innovation intensiveness; supply concentration; demand concentration; competitive landscape; relative wages; and other indirect costs.

The Strategic Value Framework then provides a scenario tool to envision a range of impacts of the three disruptive mega-trends and identify important opportunities and challenges for relevant GVC stakeholders. These implications, in turn, may suggest new approaches, including strategies to develop capabilities that businesses, governments and public-private partnerships may require to upgrade their production base, improve their level of readiness for the future of production and participate in future GVCs. **Appendix A** contains a description of the GVC pillars, and the methodology behind the framework.

Reshaping Global Value also explores the effects resulting from the combination of the disruptive mega-trends, which have previously been studied mainly in isolation, and never considered in the aggregate as a “perfect storm”. The resulting insights point to an urgent need for action, not just by governments and businesses, but also through public-private partnerships involving a wider range of actors.

As disruptive mega-trends translate into shifting modus operandi in GVCs, relying solely on reactive responses brings a risk of significant loss of economic and social value. This report therefore builds on the Forum’s *Readiness for the Future of Production Report 2018* to recommend proactive development of specific capabilities. Thus, in addition to the relevant and widely accepted drivers of change presented in the previous study – technology and innovation, human capital, global trade and investment, and sustainable resources – this document proposes a set of critical GVC-specific capabilities.

For businesses these include “vertical disintermediation”, where operating models are shifted from functional alignment to cross-functional alignment around customers and channels; “demand alignment” to deepen the sources and use of data to tailor offerings to specific customers; and “ecosystem development” to amplify innovation through networks of collaboration, as compared to isolated internal R&D groups.

For governments, important capabilities include the promotion of innovation and technological upgrading; the establishment of broad-based quality education and lifelong learning systems; and the access of exporting industries to regional and global market channels. Governments need also to rethink regulatory approaches so that these send the right signals for all stakeholders to contribute to sustainable development and equitable societies.

Way forward

The Strategic Value Framework helps stakeholders, especially businesses and governments, to understand the implications of disruptions in production systems and identify the capabilities required to proactively drive new value creation. It is meant to inform the development of new business strategies and policies, and to encourage new public-private partnerships and strengthen cooperation. By implementing the Strategic Value Framework, the World Economic Forum and UNDP are driving in-depth industry sector-specific analysis and regional and country dialogues to support the transition to the future of production and new global value chains.

1. Global value chains and strategies for countries and businesses

- **GVCs play an important role in the development of businesses and national economies. More than two-thirds of world trade takes place within the framework of GVCs.**
- **Rapid expansion of GVCs created opportunities for many countries – particularly developing countries – to participate in global markets and drive their economic development.**
- **Businesses have benefitted from GVCs by reducing production costs and gaining access to new resources and technologies.**
- **The extent and nature of participation in GVCs varies, with benefits unevenly distributed between and within countries.**

GVCs encompass the cross-country, end-to-end processes by which goods are produced, consumed and dealt with at the end of their life cycles. Diverse entities coordinate activities across them, from raw material extraction through to processing, forming, assembly, distribution and either disposal, reuse or recycling. Industrial and business strategies have relied on and helped shape global networks of production that underpin GVCs.

Today, more than two-thirds of world trade occurs through GVCs,¹ although most GVC activity is in intermediate goods and embedded services rather than finished goods and thus not visible to consumers. Production of the iPhone, for instance, spans 200 suppliers residing in 43 different countries and six continents.² A single iPhone component, the A12 chip, is designed in California, fabricated in China or Taiwan and packaged and tested in the Philippines. This sort of geographical distribution is not limited to small, easily transportable components. The Airbus A380, the world's largest passenger aircraft, consists of 4 million individual parts produced by 1,500 companies from 30 countries around the world.³ Both the iPhone and the Airbus A380 illustrate the scope and complexity of today's GVCs, with borderless production systems hopping between developing and developed countries.

The ongoing advance of GVCs is abetted by forces that have remained broadly consistent since the end of the Second World War, when the members of the international community came together to open their markets.⁴ Governments that recognized the value and opportunities associated with GVC participation developed strategic policy frameworks that favoured cross-border collaboration. The rise of multi-echelon, globalized GVCs (which Professor Richard Baldwin described as “a trade-investment-services-IP nexus”) significantly accelerated from the 1990s onwards. Important factors included the globalization of trade, international investment and development of infrastructure.

Major enablers included enterprise-level resource planning systems to integrate geographically dispersed production, cross-border flows of intellectual property, managerial techniques and the widening of marketing know-how.⁵

Businesses have benefitted from the expansion of GVCs through lower production costs, greater availability of resources and access to technology. Companies with a global reach can coordinate complex supply chains across borders to enhance efficiency and profits. New production strategies influence the development of GVCs through investment decisions and intra-firm trade.

For developing countries, rapid GVC expansion opened unprecedented opportunities to participate in global markets. Before the rise of GVCs, countries had to build a deep and wide production base in order to compete.⁶ With the rise of GVCs, countries often entered foreign markets at lower costs and heightened pace by specializing in certain parts and tasks, joining regional or global supply chains.

According to the World Bank, participation in GVCs is associated with higher productivity gains and economic growth. A 1% increase in GVC participation is estimated to increase per capita income by more than 1%, about twice the effect of participation in conventional trade. As a result, the poverty reduction impact of GVC participation is greater.⁷

The expansion of GVCs has correspondingly provided an increasing role for developing countries in global production and trade. The share of these countries' exports in total merchandise trade almost doubled over the three decades from 1990 onwards, increasing from 24% in 1990 to 45% in 2018.⁸ More than half of developing countries' exports take place within the context of GVCs.⁹

Emerging economies have particularly benefitted from the offshoring of labour-intensive stages of manufacturing, heightened international mobility of technology and favourable national and multilateral economic reforms.¹⁰ As a result, emerging economies' share of global value-added trade has steadily increased from 20% in 1990 to 30% in 2000 to more than 40% today.¹¹

The extent and nature of GVC participation, however, varies across countries and sectors, and benefits are unevenly distributed among and within countries, particularly the least developed countries (LDCs)

The importance of GVCs to countries' industrial and development strategies, as well as to the growth and production strategies of business, underlines the need to understand the drivers of GVC disruption and strengthen the ability of stakeholders to adapt to these changes. The next chapter of this paper highlights three of the major disruptions, or mega-trends, affecting GVCs.

2. Mega-trends disrupting production systems

- A “perfect storm” of economic, social and environmental dynamics is reshaping production systems and global value distribution. Projections indicate a maximum potential value loss across end-to-end value chains of -40% at the lower bound and +70% at the upper bound, across a range of possible scenario outcomes.
- Emerging technologies are reducing the importance of economies of scale, facilitating the location of production closer to consumers, and enhancing transparency between producers and consumers.
- Widespread environmental degradation and a climate crisis profoundly affect GVCs through increasing risks to supply, impacts on resources availability, and actions to address climate change.
- Trade tensions and resulting policy uncertainty are further disrupting GVCs.
- A global development challenge over the coming decade is to mitigate these risks while securing equitable access to a new era of economic opportunities.

Today, several economic, environmental and social phenomena are contributing to a “perfect storm” that is disrupting global production systems and reshaping global value distribution. While multiple analyses have previously identified and discussed individual disruptors and their implications, none has explored the possible quantum shift that could arise from the interplay of mega-trends.

This paper aims to address this gap by describing the superposition of three of the mega-trends driving change – emerging technologies, environmental sustainability, and a reconfiguration of globalization. Individually and in combination, these mega-trends carry fundamental implications for how value is created and distributed along GVCs, and thus how businesses define their strategies and nations advance sustainable development.

Emerging technologies

Throughout history, technological innovations have shaped world commerce. A new wave of innovations in digital technologies is fundamentally changing production systems and trade, and has the potential to significantly accelerate global integration.¹² While advancing technologies create tremendous opportunities for countries and businesses, they also raise challenges ranging from data privacy to shifts in market power to income inequality.

Production technologies

The convergence of additive manufacturing (3D printing), artificial intelligence (AI), robotics and the internet of things (IoT) is dramatically altering the global production landscape for goods of all types, while bringing producers, consumers and the supply chain together in unprecedented ways.¹³

For example, in additive manufacturing, customization and complexity are no longer limiting cost factors. The rapidly growing list of compatible materials has greatly expanded the potential for additive manufacturing to disrupt different fields, from agriculture and biology to design and manufacturing.¹⁴ This technology has already eliminated the need for a large amount of highly skilled labour and the associated surges in manufacturing costs. For example, a fuel nozzle produced by General Electric now consists of a better-performing single part, versus the 20 finely machined and carefully assembled parts required to fabricate an earlier version.

Blending AI, robotics and IoT with additive manufacturing creates entirely new possibilities for who makes what, and where. Specifically, manufacturers will no longer have to rely on multiple stakeholders scattered across geographies. These technologies will enable them to bring much or all of their production back to their home bases and switch to just-in-time models.¹⁵ As a result, businesses could benefit from major reductions in shipping and inventory costs; near elimination of lead time; a lower risk of intellectual property theft; increased cooperation between stakeholders; faster response to changing market dynamics; and more efficient logistical flows.¹⁶

Box 1: Emerging technologies driving GVC reconfigurations in footwear manufacturing

New technologies will increasingly allow large industry players to reshore part of their production processes. Adidas, for example, is starting to meet consumers’ customization demands with 3D-printed sneakers. This technology requires skills not widely available in low-cost labour countries, where sneakers are currently produced. Local capabilities and available resources in the United States, in combination with high domestic demand for these premium products, resulted in US-based production, drastically changing existing sneaker value chains.

Further reading: “How Adidas Plans to Bring 3D Printing to the Masses”.

Digital platforms

Digital platforms will further disrupt the traditional GVC rules of interpersonal and cross-entity engagement, collaboration and competition. Most fundamentally, platforms make physical distances less relevant to the flow of information and services. One need only be online to participate. Over the past decade, the number of online users has more than doubled, and cross-border bandwidth increased by a factor of 148.¹⁷ Digital platforms will enable a much more diverse range of stakeholders to engage in both B2B and B2C transactions.

Enterprise blockchains could be another major disruptor. Klaus Schwab describes the blockchain “distributed ledger” as a programmable, cryptographically secure protocol in which a network of computers collectively verifies a transaction before it can be recorded and approved.¹⁸ The capacity to encode smart contracts into blocks could reduce the need for contracting and clearing-house services, while also preventing accidental or intentional entry of transactions that violate contract terms. No supply chain entity owns the blockchain data, nor can any entity alter any part of the immutable blockchain record or access blockchain data that others cannot. Thus, blockchain can effectively eliminate mistrust as a concern in value-chain interactions.

Digital platforms also reduce the importance of economies of scale, providing both small and large players ready access to research, development, marketing, sales and distribution.¹⁹ This creates lower barriers to entry for smaller players such as SMEs and can provide them immediate proximity to millions of customers.

Consumer expectations

Technology is also disrupting GVCs on the demand side. Increased access to mobile networks and data provides greater transparency between producers and consumers. Willingly or not, consumers now reveal many of their preferences and passions to brands through their online activity.

The new global pacesetters of value-chain design, companies such as Amazon and Alibaba, are helping to reset consumer expectations towards wider choice, higher speed and superior service. As a result, many consumers are becoming more engaged in the way products are being produced, which in turn creates unprecedented pressures for all suppliers to meet these evolving consumer expectations.²⁰ This is a fundamental shift, taking a completely different turn from Henry Ford’s Model T philosophy that customers can have a car painted any colour they want “so long as it is black”.

As technologies bring more customers and suppliers in direct contact, GVCs will see increased disintermediation – the cutting out of “middlemen” from the linear and rigid supply chains of the past in which distributors, wholesalers or other intermediaries often controlled the route to markets. Matchmaking platforms such as Amazon, Alibaba and Google, with the scale to grow markets, are replacing linear value chains with a connect-the-dots logic in which instances of demand are rapidly matched to the best-fit supply. Open communication and frictionless point-of-sale demand data are moving many GVCs away from batch replenishment towards continuous replenishment.

The imperative of environmental sustainability

From pollution and solid waste to water scarcity, desertification and deforestation, the need to address the underlying drivers of environmental degradation is increasingly recognized by stakeholders in government, civil society and business.

The greatest single threat to sustainable development is the global climate emergency.²¹ The United Nations Intergovernmental Panel on Climate Change found that only a 12-year window remains to prevent a 2°C rise in average global temperature, an event that would bring catastrophic and irreversible consequences.²²

Risks to supply

The World Economic Forum’s *Global Risk Report* identifies extreme weather events, natural disasters and the failure of climate change mitigation and adaptation as among the top five risks the world has faced since 2018.²³ Extreme events and natural disasters are exacerbated by climate change, which increases their frequency and intensity.

Some GVC players are changing their sourcing strategies to safeguard against supply disruptions. The automotive sector is a prime example, with its multi-sourcing of critical electronics components and paint. This has fuelled rising value-chain complexity as the number of nodes supplying each buying step in the chain explodes. An unintended consequence of this complexity, which removes the much-needed transparency to trace back components through to their origin, is illustrated by the Fukushima disaster in 2011. The automotive industry suffered shortages in its supply of specialist sensors as well as paint, because multiple suppliers relied on the same supplier further upstream. Indeed, 60% of global demand for some essential sensors was met by Hitachi Automotive in Japan. In the case of the paints, the disruptions resulting from the nuclear incident prevented original equipment manufacturers (OEMs) from producing colours with certain pigments.

Internalizing environmental impacts

As the effects of global climate change become more apparent, extreme weather events become more frequent and society becomes more conscious of the associated risks, governments will increasingly induce businesses and other actors to internalize the environmental impact of their activities.

Possible actions range from clean-air taxes in cities pushing up costs for diesel-based road transport, to carbon-trading schemes for factories, to recycling and improved utilization of assets with a high environmental footprint. As a result, the costs of long-distance and multi-echelon linear supply chains will increase relative to the cost of production, resulting in shorter chains and sources of supply moving closer to demand.

Complicating matters further, governments often fail to take synchronized action to encourage sustainability. National governments have varying regulatory requirements, making it more challenging for GVC stakeholders to comply than would be the case under more coherent international regulations. What makes the need for international cooperation on climate action even more pressing is the magnitude and urgency of the efforts required to reverse climate warming.

Climate change, GVCs and natural resources

Climate change also disrupts value chains by changing the endowments of economies and the efficiency with which factors of production can be deployed, including natural resources.²⁴

As one of the sectors most vulnerable to climate change, agriculture illustrates the complexity of the problem. The agricultural sector finds itself squeezed between the imperative to feed a growing global population and the shrinking availability of water and cultivatable land, both of which are aggravated by climate change. Adding arable land frequently comes at the expense of valuable natural habitats, particularly ecologically essential rainforests.²⁵ Expanding agricultural cultivation also increases the strain on freshwater supplies, as agriculture already accounts for 70% of “blue” water consumption (water from lakes, rivers, groundwater and glaciers).²⁶

Intensification of agricultural production is one way to resolve the dilemma. However, this response is also reaching its limits, as evidenced by the rise in resistances to modern agrochemicals and intensifying problems with soil compaction and soil erosion.²⁷ The solution may lie in sustainable intensification, which brings together the best agronomic practices to optimize production relative to inputs, including both land and water, while minimizing negative impacts and externalities, such as pollution or deforestation.²⁸

However, not all countries have the conditions required to leap from traditional to sustainable intensification. Beyond the challenge of knowledge transfer lies the issue of financing the investments needed to make production sustainable. Notably, in Brazil – where agriculture dangerously infringes on rainforests – there are limited structured credit systems in place for leapfrogging to sustainable intensification.

As countries take climate action, certain sectors are more at risk of disruption than others. This is the case for energy-intensive goods (such as aluminium, chemicals or pulp and paper) and conventional fuels. The emergence of new value chains with greener production and consumption systems, coupled with new technologies, also creates new opportunities for actors along the value chain. For instance, the push for renewable energy technologies is lowering the world’s demand for fossil fuels. However, it is also increasing demand for precious metals such as lithium and cobalt and thus facilitating the integration of countries rich in metals endowments into GVCs. As they establish new GVCs to meet demand for renewable energy, companies will have to cope with the scarcity of natural resources and the environmental consequences of their exploitation in production and across GVCs.

The imperative of circular economies

The risks associated with ecological crises and constraints may be managed by transitioning from the linear “produce, consume, then destroy” model towards a circular model. This will advance through higher use of local assets (for example, car sharing enabled by e-platforms), increased reconditioning and reuse of end-of-lifetime products (for example, 95% of the textiles that are currently landfilled could be recycled), and more recycling of waste components from each stage in the value chain. Zara, for instance, has partnered with the Massachusetts Institute of Technology to find new or more feasible ways to recycle textile fibres.²⁹

Consumer awareness

Consumer attitudes will likely become more important as the next generation dedicated to conscious consumption will represent the majority of consumers by 2030, and as the demand for sustainable production and value-chain transparency becomes increasingly prominent beyond Europe and North America. Some changes are already visible: Vegetarianism and veganism are on the rise, and large food manufacturers are self-imposing sustainability targets. Danone, for example, is aiming to transform its value chains into 100% regenerative agriculture, while McDonald’s aims to produce deforestation-free beef by 2030.

Box 2: Businesses take climate action

After the Paris Agreement of 2016, some global companies announced their intention to align emissions with the target of the United Nations Climate Change Conference (COP21) of 2015. One such producer, the Kellogg Company, is starting to set policies and develop initiatives with its suppliers on climate and water issues. In this collaborative approach, suppliers are requested to continuously measure their impacts and keep investing in future opportunities. This collaboration aims at long-term relationships and strict requirements for new potential suppliers, changing the GVC dynamics of the sector.

Further reading: “[Find Out More about COP21](#)”.

Globalization reconfigured

Globalization has resulted from the increasing cross-border flow of ideas, people, capital and goods, weaving relations of interdependence between countries. Those flows continued on the course of globalization across much of the latter half of the 20th century and has accelerated since the 1990s. Today, however, new dynamics of globalization are substantially reconfiguring GVCs and the global production system.

Slowing international trade

Since the great recession of 2009, trade has lost steam. While it continues to increase in absolute terms, the intensity of exchanges has fallen. Intermediate imports as a share of world GDP have dropped from 19% in 2008 to 17% today. Foreign direct investment (FDI) as a share of GDP fell from 3.5% before the great recession to just 1.3% in 2018.³⁰

Demand and supply gravitate to the South

Progress in poverty reduction and global demographic trends are creating huge opportunities for business expansion in developing economies, most notably in China and economic hubs across Asia. The growing and increasingly urbanized middle class within India, Indonesia, Thailand, Malaysia and the Philippines – coupled with policies to support domestic demand – have made these countries more significant contributors to the global economic map.³¹ Recent studies show that developing countries excluding China are projected to represent 35% of global consumption by 2030, while emerging markets overall will represent nearly 60% of global demand for manufactured goods in 2025.³² In parallel to shifts in global demand, the distribution of production nodes has widened and “fragmentation in dynamic regions and sectors have matured”,³³ with many developing countries, led by China, moving to produce finished products closer to the consumer.

These shifts in demand and supply reduce trade intensity, which is at the core of GVCs’ expansion. These trends do not imply that globalization is over, but they do point to underlying transformations in production and trade, with trade in services, digital technologies, and data flows acquiring much greater importance.³⁴

Policy uncertainty and rising trade tensions

Open markets and global trade have facilitated the remarkable growth of GVCs. Important events such as economic reforms in India and China and the consolidation of the European Single Market accelerated the expansion of GVCs in the 1990s and 2000s.

Nothing of equivalent influence has been seen since then. Rather, the great recession took a long-lasting toll on growth and spread hardship in developed and developing countries alike. Concern at the unequal sharing of benefits of globalization between and within countries has caused some to question the basic principles underpinning open markets and international cooperation.

One area in which this trend is evident is in trade policy, which may have significant implications for the future of GVCs. Analysis by the WTO and other international organizations shows a sharp rise in the application of restrictive measures by G20 countries in the past two years. Trade affected by such measures is now three-and-a-half-times the average since 2012, when these monitoring reports started.³⁵ This points to an escalation in trade tensions and an increasing risk of destabilizing effects to world trade and production, as policy decisions risk rolling back previous trade agreements.

GVCs are highly dependent on global sourcing and on the foreign investment decisions of global firms. As a result, current trade tensions are likely to have significant ongoing and undesirable consequences for many stakeholders, especially given the risk of overspill into other domains such as investment and data flows. By eroding investor confidence, trade tensions are likely to affect global economic growth.

Policy uncertainty and escalating trade tensions are compounding the effects of structural changes in GVCs discussed above. The shortening of supply chains to enhance proximity to consumers is resulting in stronger regional patterns of GVCs, which also align with concerns about rising trade tensions or broader geopolitical dynamics affecting investment and other domains of international cooperation. Manufacturing business may decide more frequently, for example, to relocate their main production facilities. Big tech’s China exodus was a case in point.

The *Financial Times* reported that, although trade rules were not the only factor, concerns over trade barriers were “accelerating the cost-push migration of capacity to South-East Asia that was already under way”. Similarly, according to the OECD, the share of foreign inputs in cross-border supply chains sourced from within the same region (measured in value-added terms) has risen in the three great nodes of GVCs: North America, Europe and Asia.³⁶

Box 3: Policy uncertainty and the shrinking of GVCs

In February 2019, the Japanese car manufacturer Nissan announced it would close its UK-based factory for the flagship model X-Trail and move production to Japan. Management provided several business reasons for the change, but the uncertainty around the UK’s relationship with the EU was clearly a factor. This decision potentially disrupts a complete value chain, as earlier stages along the chain will also be affected by the shift.

Further reading: “[Brexit Blamed for Nissan Pulling Manufacture of X-Trail from UK](#)”.

Towards shared prosperity or a growing divide?

The cumulative impact of the above mega-trends will vary across GVCs, countries, industrial sectors, companies and workers. As such, the development challenge will be to mitigate risks while securing equitable access between and within countries in a new era of economic opportunities. Developing countries are often heavily weighted towards the upstream stages of GVCs, where profit margins tend to be lower than in the downstream GVC segments closer to the customer. In addition, players contributing raw materials and low-skilled labour to GVCs are often highly susceptible to being undercut on price. Upstream competition can be fierce, putting continued pressure on those GVC segments to reduce costs and adapt to market conditions (e.g. ready-made textiles and apparel). On the other hand, technology makes localization of both production and consumption more feasible, while wage differentials will become less of a determining factor in choosing production locations.

Emerging technologies often demand precision, while consumers insist on ever higher quality standards and product customization. This makes it harder for low-skilled workers to compete. High-skilled workers will be able to fill newly created, well-paying jobs, while manual production workers could be displaced or relegated to lower-paying jobs, accelerating the growing inequality between the groups. Agricultural labourers, for example, are progressively being displaced by AI-enabled robots.³⁷

Technological advances can also exacerbate inequalities due to uneven access to internet connections. More than 4 billion people still have no access to the internet, 90% of whom are in developing countries.

Evidence suggests that job losses from automation will be distributed unevenly, with women being more vulnerable than men, as women dominate the labour force in some of the sectors most at risk, such as garment manufacturing and business processing outsourcing.³⁸

Such trends are likely to close a traditional path of participation in GVCs for developing countries and will make it even harder for LDCs to realize higher incomes and sustained inclusive growth.

An important question, therefore, is how business, governments and consumers can work together to respond to these changes in ways that contribute to shared prosperity? In the next section we introduce the Strategic Value Framework, which is intended to help stakeholders reach an answer to this question, among others.

3. A path towards next-generation global value chains

- In this chapter, a Strategic Value Framework is introduced to help GVC stakeholders understand the implications of the three mega-trends described in Chapter 2. The framework describes GVCs through a set of indicators and considers the likely impact of different future scenarios.
- Three use cases, covering product GVCs across both developing and developed countries, showcase how the framework can be used to inform dialogue and decisions.

To help stakeholders shape their own paths and maximize value in the next generation of GVCs, this chapter presents a Strategic Value Framework to quantify the likely extent of GVC reconfiguration under different disruptive scenarios. It can be used as a tool for both business and government to measure risks and identify opportunities and, in doing so, inform the design and execution of a new generation of strategies and policies.

Stakeholders can engage in a structured dialogue about major questions related to the impact of mega-trends on GVCs and their future configuration. Important questions include:

- What are the implications of the three mega-trends, individually or in combination, for the GVC?
- How might those implications affect different stages of value creation (e.g. extraction vs. distribution)?
- Which GVC participants and stakeholders are most at risk from pending disruptions?

Answering these questions is a crucial first step in pinpointing where interventions are urgently required and how stakeholders can take concerted action. However, the conversation must progress to explore deeper, multifaceted questions depending on the industry and national reality. Table 1 presents a set of illustrative questions that could be used to further support this process.

Structure of the framework

The framework consists of three main components:

- A description of the GVC across three pillars – economic value pool, geographic concentration and structural characteristics – and five stages along the value chain: extraction, processing, forming, assembly and distribution. Although the end-of-life stage is becoming more and more critical, it was not considered due to lack of data.
- Scenarios stemming from the likely evolution of three mega-trends.
- A methodology for projecting the impact of mega-trends on each parameter of the GVC over a specific time frame.

An online version of the [framework's dashboard](#) is available to enable users to further explore all potential implications of the mega-trends on GVCs, across multiple future scenarios. This section describes the dashboard and Appendix A provides a detailed description of the framework's components.

As illustrated (**Figures 1 and 2**), the dashboard has the flexibility to indicate a GVC in its current state, and in a customizable “scenario” setting.

- **Today's state:** The centre of each slider bar coincides with the neutral position, implying “no change” compared to today's situation. As such, the dashboard describes the structure of the GVC today using a set of indicators under three pillars: economic value pool, geographic distribution and structural characteristics. (See Appendix A for a description of each indicator.)
- **Scenario state:** The severity of the disruption under each mega-trend can be altered by moving the toggle along the slider bar. Toggling the slider bar to the highest and lowest positions enables the user to see the maximum conceivable effects of the mega-trends over a three-year time frame. (The definition of the scenario extremes used in the framework is presented in Appendix A.) To work against different time frames, the user can change the intensity of each mega-trend.

Table 1: Suggested list of questions to address during GVC deep-dives using the Strategic Value Framework (not comprehensive)

Topics	Businesses	Governments	Public-private partnerships
<i>Risks and opportunities</i>	<ul style="list-style-type: none"> – What are the top three risks and opportunities for my business? – As a business, why is it critical to remain profitable in the face of these disruptions? – How does the readiness of my business compare to other businesses? 	<ul style="list-style-type: none"> – What are the top three risks and opportunities for my country? – As a country, why is it critical to remain a relevant player in the future value chains? 	<ul style="list-style-type: none"> – How and what policies need to be developed to support the private sector in facing these disruptions? – How can businesses support governments facing these disruptions in a mutually beneficial manner? – What GVC participants and external stakeholders are needed to unlock value creation and build resilience?
<i>Partnerships, alliances and platforms</i>	<ul style="list-style-type: none"> – What can we learn from other businesses' success stories? – How should our business model develop to mitigate risks and unlock opportunities represented by the mega-trends? 	<ul style="list-style-type: none"> – As a country, what is needed to ensure we remain interesting to foreign investments? – How can we ensure that the national workforce remains competitive from a skills and monetary perspective? 	<ul style="list-style-type: none"> – Which partnerships, alliances or platforms can we draw on to facilitate this change process? – How should the GVC be reshaped to face the disruptions while promoting sustainable development?
<i>Skills and capabilities</i>	<ul style="list-style-type: none"> – How can my business have the right skills and capabilities to continuously adapt to external disruptions? 	<ul style="list-style-type: none"> – How can we provide sustainable and quality employment opportunities that foster socioeconomic developments across the national territory? 	<ul style="list-style-type: none"> – Which capabilities will be most critical to successfully adapting a GVC to new and emerging realities?
<i>Technology</i>	<ul style="list-style-type: none"> – How can we exploit the latest technological developments to mitigate the risks and unlock the opportunities associated with the other mega-trends (e.g. ensuring ecological sustainability)? 	<ul style="list-style-type: none"> – How can we support and encourage value-adding technological developments? 	<ul style="list-style-type: none"> – How can the private and public sectors cooperate to adapt to the rapidly changing landscapes and needs associated with tech-related disruptions?
<i>Data</i>	<ul style="list-style-type: none"> – How is data currently flowing through the value chain? – How will changes in data regulations affect our performance? 	<ul style="list-style-type: none"> – What policies and regulations need to be developed to support the flow of data while protecting consumers from data misuse? 	<ul style="list-style-type: none"> – How can the private and public sectors cooperate to adapt to the rapidly changing landscapes and needs associated with data-related disruptions?

Figure 1: Strategic Value Framework dashboard, highlighting how the future prevalence of mega-trends can affect different stages of the GVC. In this figure, the toggle bars for all three mega-trends are in the centre, therefore indicating the status as “today”

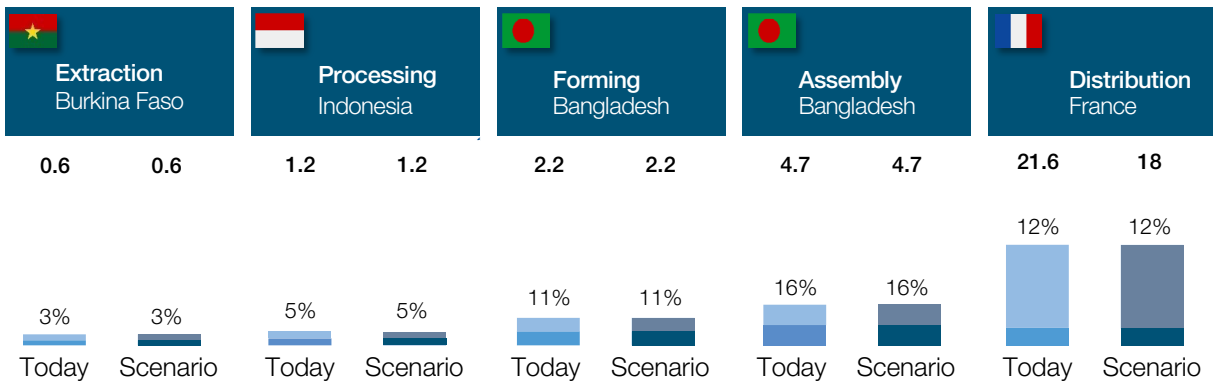
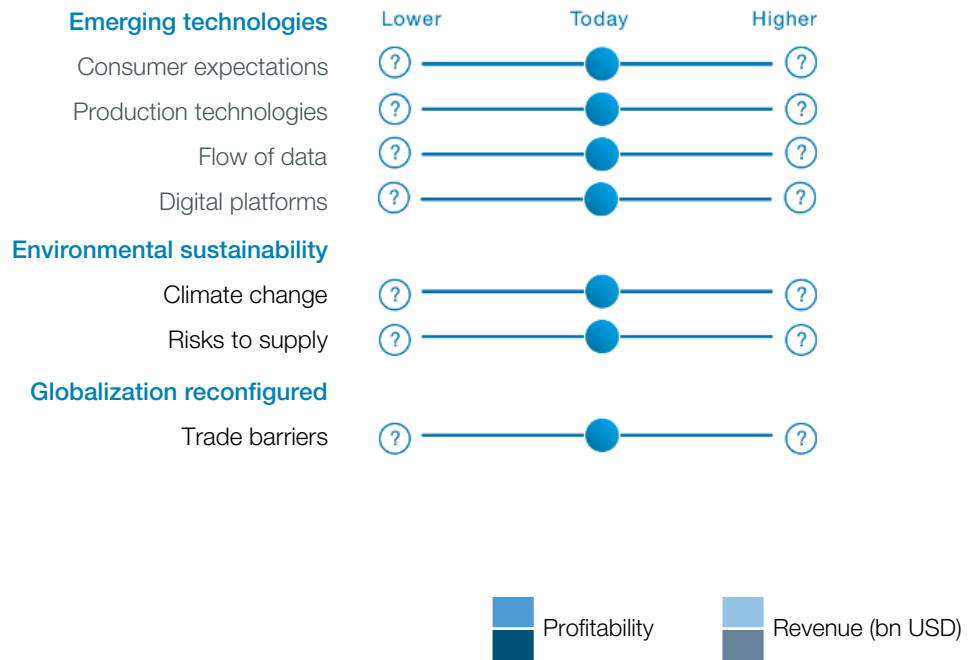
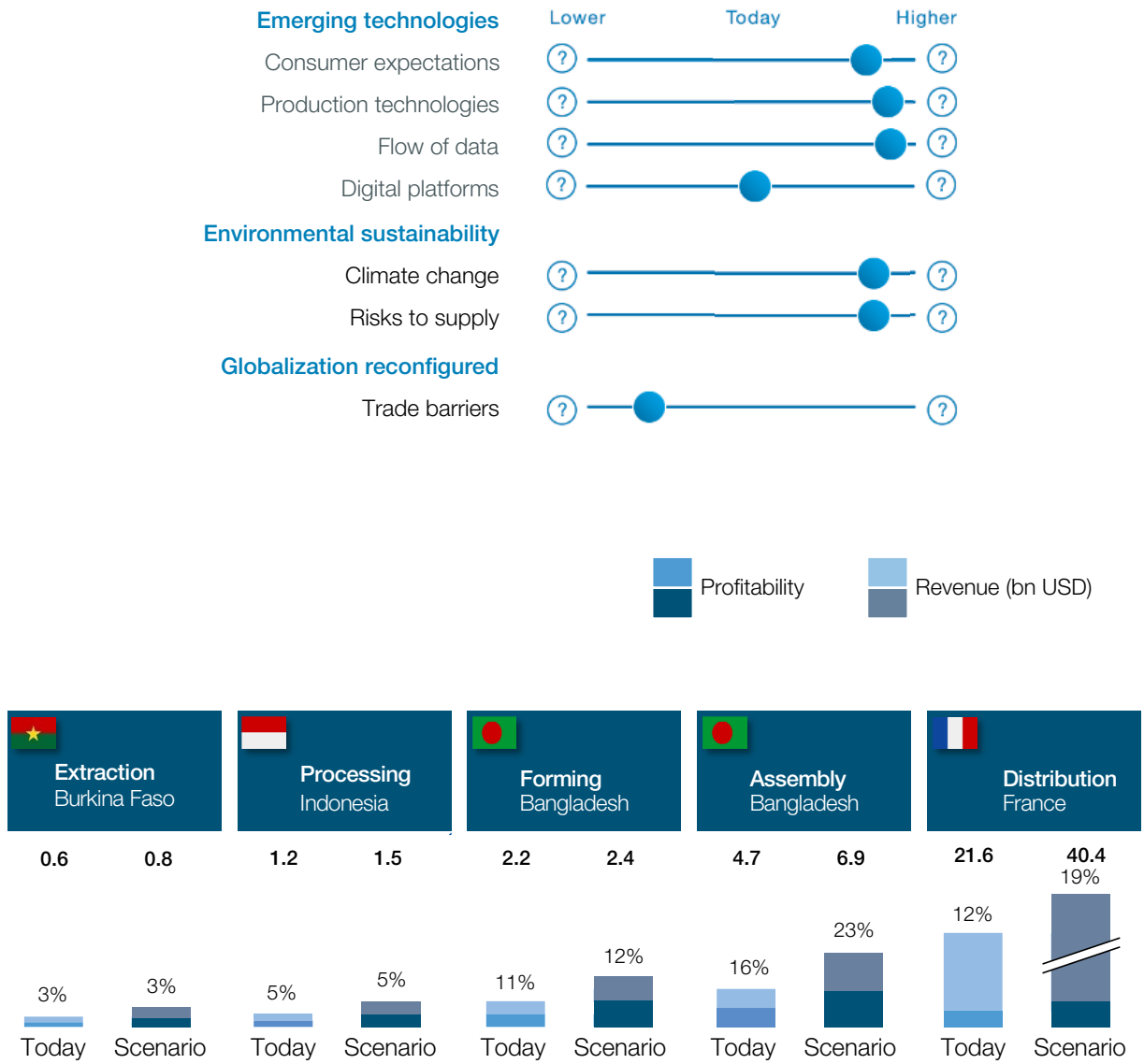


Figure 2: Illustrative example of how the Strategic Value Framework dashboard can be used to explore different scenarios

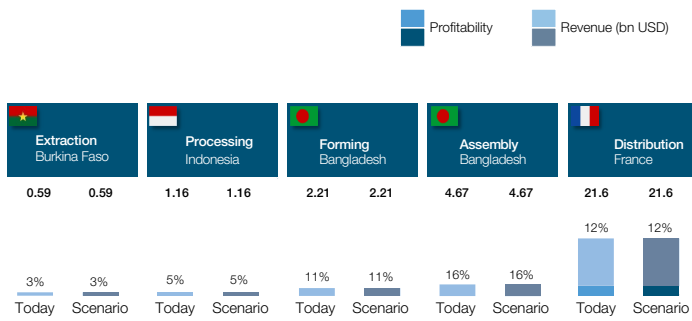


Global value chain pillars

The Strategic Value Framework describes GVCs through a set of indicators along three pillars:

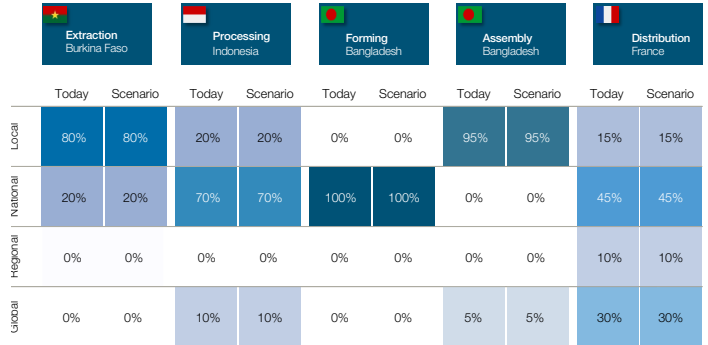
- **Economic value pool** indicates where value is created across the five stages of the GVC – extraction, processing, forming, assembly and distribution. This pillar is quantified by absolute revenues, relative profitability and net profits, as shown (**Figure 3**). Examining economic value may reveal significant differences in the distribution of value across the GVC. It can also help stakeholders to identify economic opportunities and/or risks at specific points within a GVC, as a result of the disruptions discussed above.

Figure 3: Economic value pool indicates revenues and profit margins across the GVC



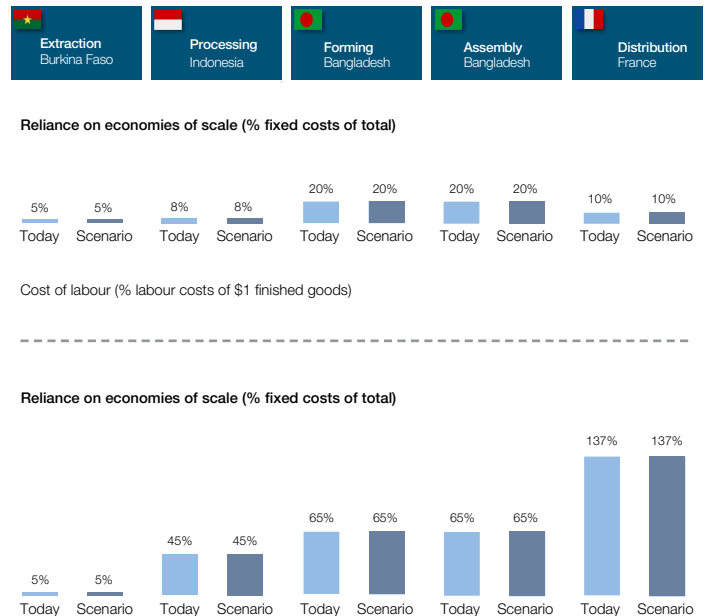
- **Geographic concentration** profiles the concentration of supply at each stage of a GVC across geographic scope, from local, national and regional through to global levels of sourcing (**Figure 4**). This analysis provides insights into the geographic footprint of each set of supplied materials across the GVC. In combination with the other pillars, examining geographic concentration can help stakeholders visualize the level of globalization versus localization of supply and demand, the importance of cross-border agreements, and the relevance of specific sectors to national and local economies.

Figure 4: Geographic concentration shows the distribution of local, national, regional and global players across the GVC



- **Structural characteristics** consist of nine indicators that contribute to the competitiveness of each stage along the GVC, considering the interdependencies between countries and sectors (**Figure 5**). A full list and definition of the selected indicators can be found in Appendix A.

Figure 5: Structural characteristics to determine the competitiveness of companies and countries across the GVC



The framework in practice

Some of the consistent insights across the three use cases and scenarios include:

- Labour cost intensiveness in upstream value-chain stages is declining relative to the importance of tailoring supply to customer needs in downstream stages, leading to a consistent increase of value-add in GVC stages close to the end consumer.
- Innovation, including the need for a talented and specialist labour pool, is becoming the most critical determinant to gain value across value chains, and is overtaking the relative importance of economies of scale in production.
- The ability of production nodes to generate incremental value across all value-chain stages will increasingly depend on innovation, connection to customer value and a wider view across the end-to-end GVC.

Three use cases (Figure 6) were developed to illustrate how the framework can be applied.

All three cases are examples of GVCs involving both developing and developed countries across different continents. They respectively represent end products ranging from low-price/moderate-margin (T-shirts; Figure 7), through moderate-price/high-margin (smartphones; Figure 8) to high-price/low-margin (automobiles; Figure 9).

Note that these use-case figures are estimates at the time of writing, based on the best available information and susceptible to change as mega-trends unfold.

The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations or UNDP concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

Figure 6: Overview of the three use cases prepared for this paper

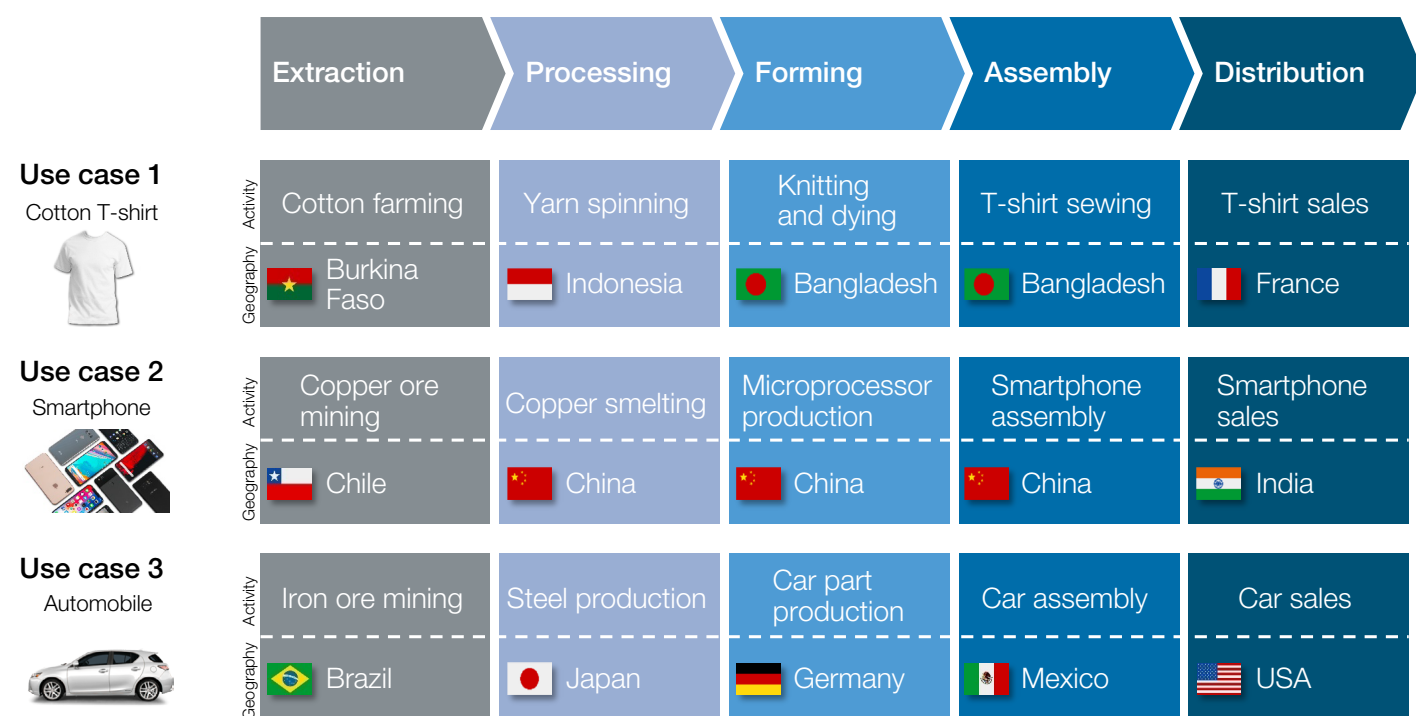


Figure 7: Visualization of the GVC for cotton T-shirts

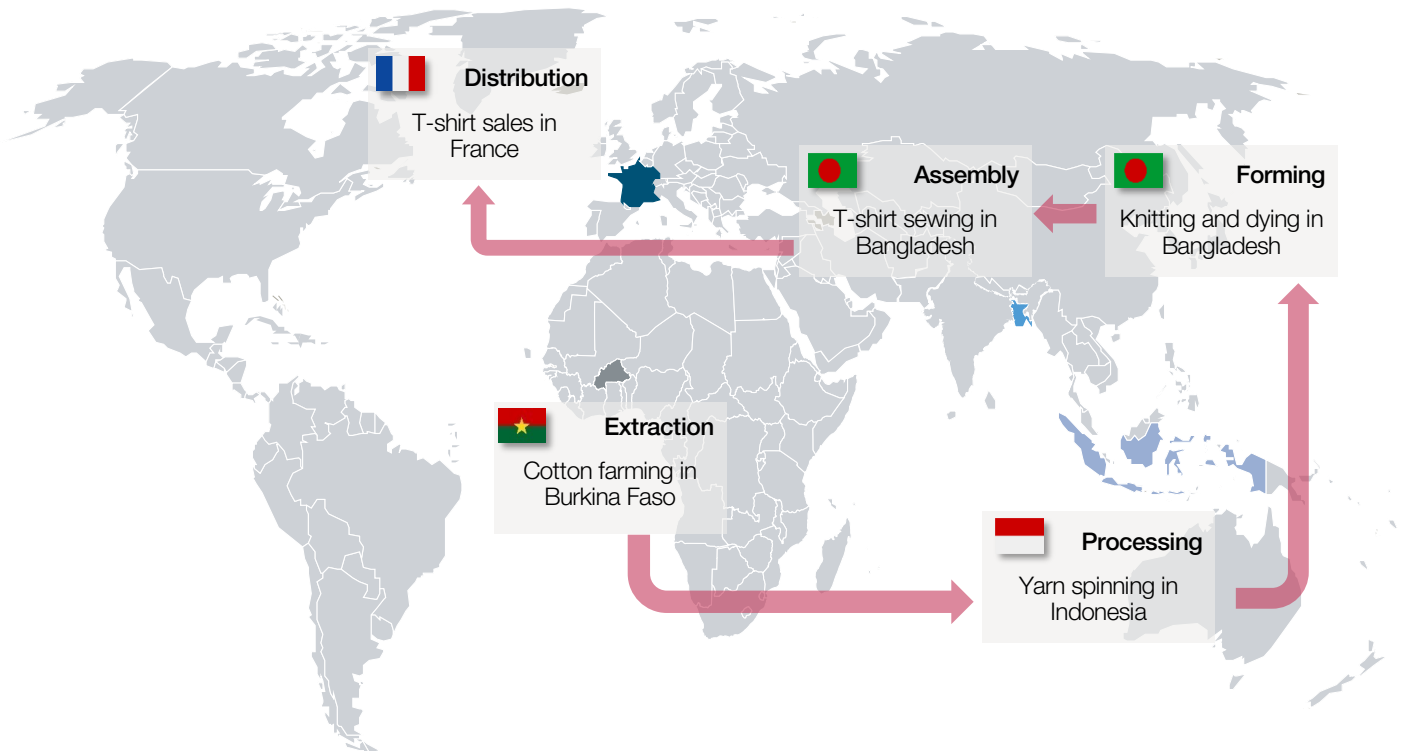


Figure 8: Visualization of the GVC for smartphones

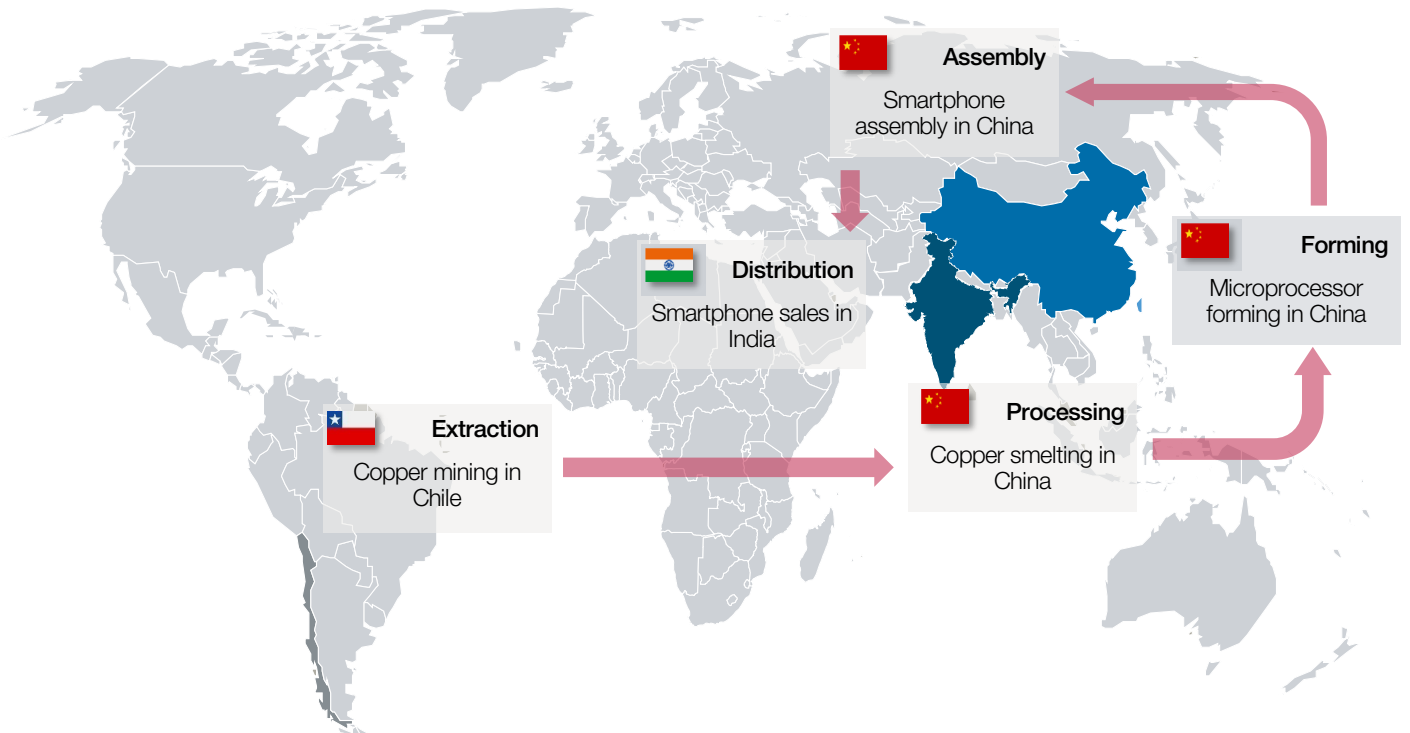
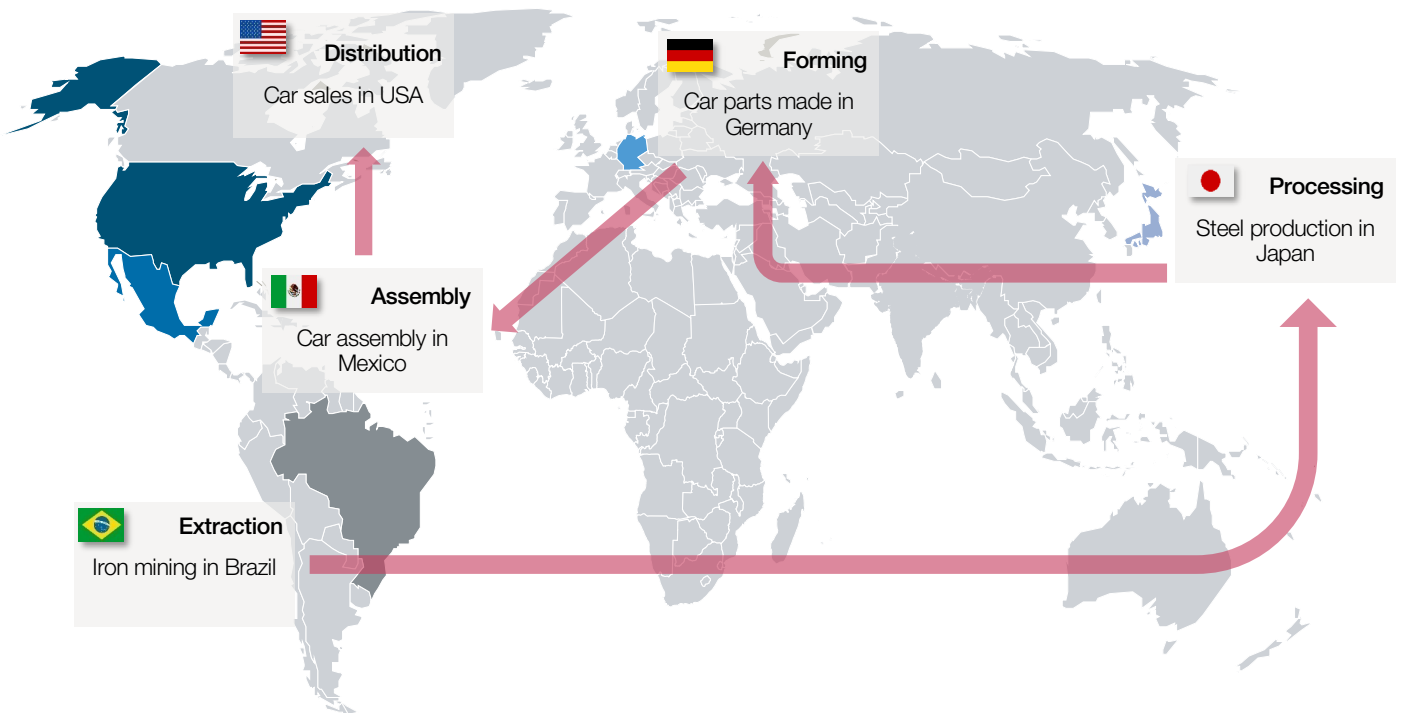


Figure 9: Visualization of the GVC for automobiles

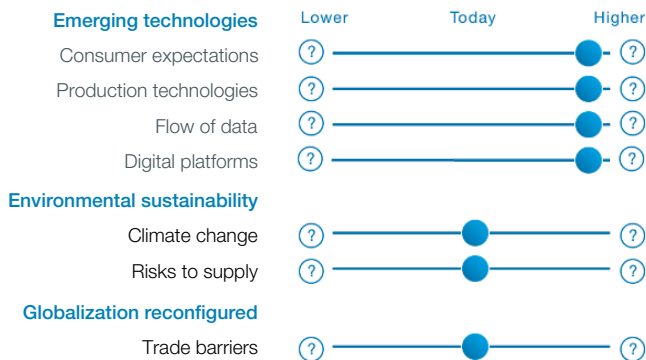


Use case 1: From Burkina Faso’s cotton fields to the French high street

This section explores the likely quantitative impact of mega-trends on the cotton T-shirt case. A dynamic view of the full set of results for all three use cases can be viewed at the [web reader interface](#).

This use case was constructed using three scenarios, moving one mega-trend to the extreme while keeping the other two constant.

Figure 10: Scenario settings for the extreme reference case for emerging technologies



Scenario 1 – Emerging technologies

In 2007, raw cotton accounted for more than 70% of Burkina Faso’s export revenues, with a value of \$528 million. A decade later, raw cotton’s export value has decreased by approximately 65%, to \$181 million. The contribution of raw cotton to Burkina’s export balance fell below 10% in 2017.

Previously, biotechnological advances contributed to Burkina Faso becoming one of Africa’s largest raw cotton exporters. However, as merely an extractor of raw materials, the country was not able to establish a strong foothold within the GVC and make itself indispensable.

As shown by the framework, the potential onset of disruptive mega-trends could leave farmers in a race against time. While a more intense application of emerging technologies might drive up revenues of the full cotton apparel GVC significantly, the increase will be steepest for distributors and retailers, further widening disparities on the distribution of benefits along stages in the value chain (**Figure 11**). The scenario points to a reconfiguring in the structural characteristics that underpin the GVC such as the relative reliance on economies of scale, cost of labour and other indirect costs along the chain. For instance, reliance on economies of scale at the assembly stage falls by 66% whereas the cost of labour falls by 73% at the distribution stage (**Figure 12**).

Figure 11: Revenue (in \$ billions) at different stages of the GVC both for current and future states

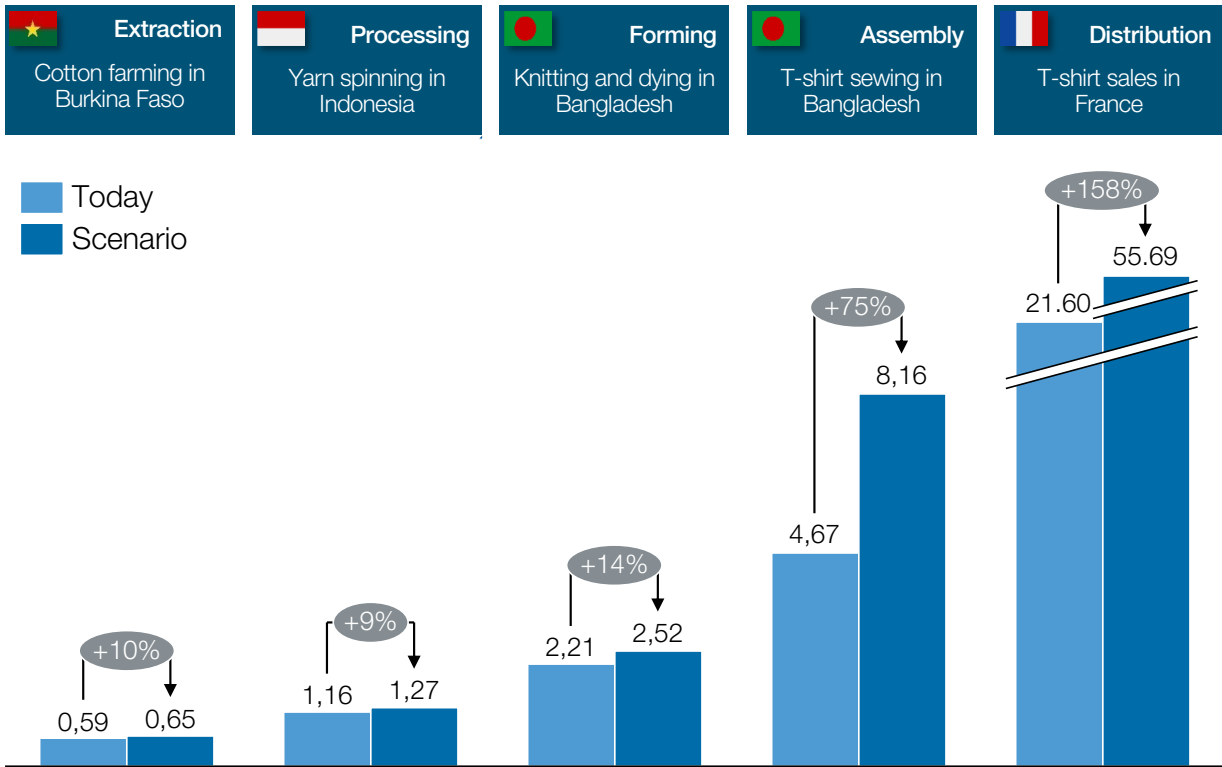
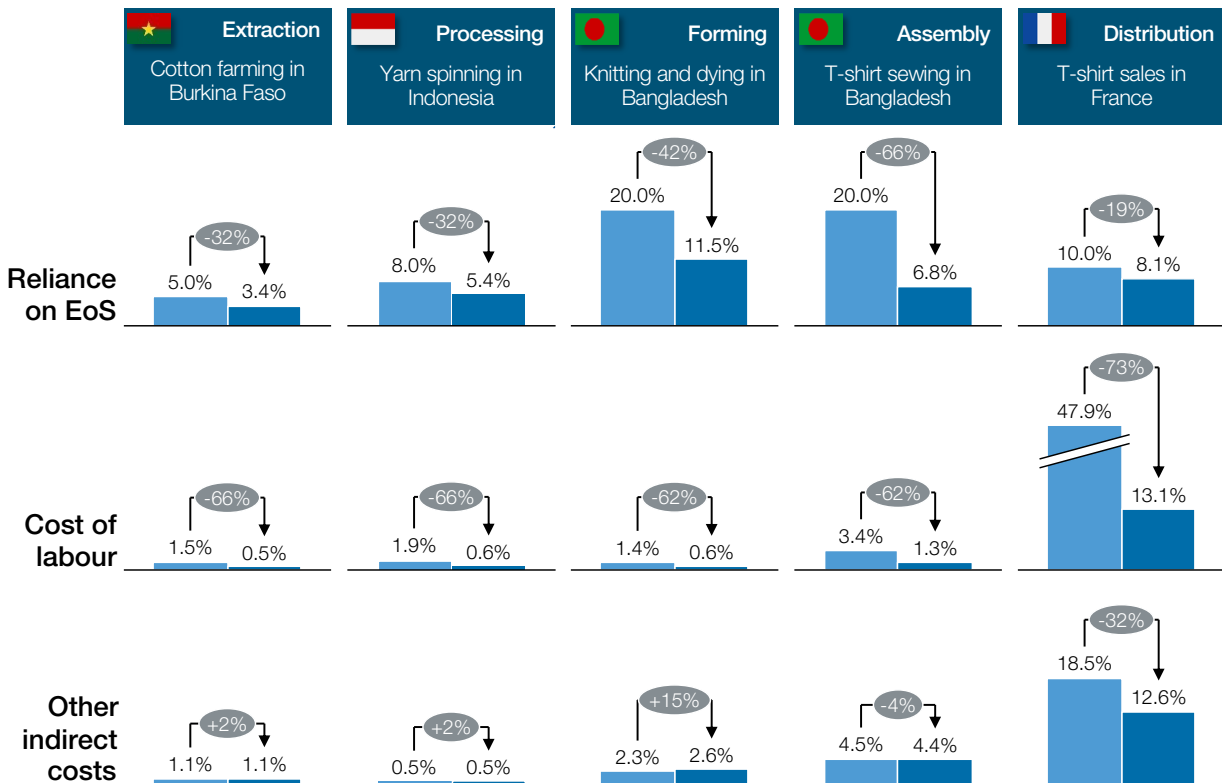


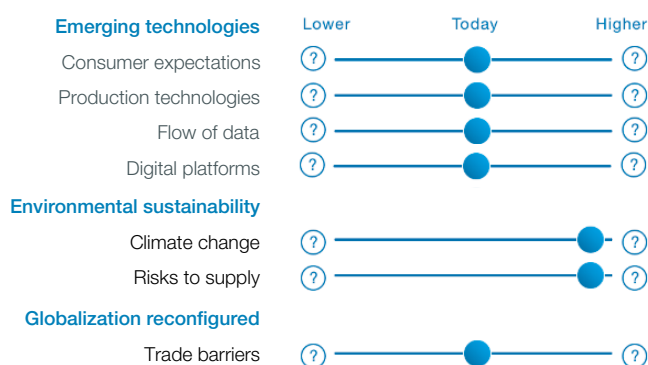
Figure 12: Overview of several structural indicators and the scenario impact



The framework allows stakeholders to assess the impact of these changes across stages of the value chain and countries. For instance, the relative importance of the cost of labour falls at all stages of the value chain but especially so in distribution. What capabilities would determine the competitive edge in these stages of the value chain in the future? Businesses and governments can identify what existing or new competencies are most crucial to finding viable paths for upgrading production and diversifying exports.

Scenario 2 – Environmental sustainability

Figure 13: Scenario settings for the extreme reference case for environmental sustainability



In this scenario (**Figure 13**), risks to supply resulting from water shortages in Burkina Faso put a significant strain on the revenues and profitability of Burkina Faso’s cotton producers. The framework indicates an increase in labour intensiveness – according to the number of FTEs per \$100,000 of finished goods – and a significant reduction in demand concentration, as demand shifts to more “convenient” exporters (**Figure 14**).

In the scenario, regulations and policies adopted as a response to environmental concerns are leading to lower profit margins through increased reporting burdens and more onerous process requirements across the GVC, while revenues remain relatively stable (**Figure 15**).

In parallel, the distribution stage of the GVC experiences declining profit margins and a strong shift in geographic concentration. Conscious consumers, environmental policies promoting local production, and the increased relative importance of other costs, such as transport compared to labour in the total cost equation, drive a shift from regional and global towards national and local suppliers (**Figure 16**).

These kinds of insights can trigger further discussions among stakeholders. What steps should be taken to adapt to more stringent environmental regulations? How can a local T-shirt distributor prepare to capitalize on the increased demand expected to materialize due to the increasing importance of proximity markets?

Various GVC stakeholders may also consider how their response to disruptions may contribute to commitments to tackle climate change or eradicate poverty. For example, how might French T-shirt distributors help cotton farmers in Burkina Faso reduce the impact of climate change, increase revenues and establish a secure place in the supply chain?

Ecological stresses heighten the need for a greater focus on circular economies. As an example, the recovery of polyvinyl alcohol (PVA) from the dying process can be reused in solar panels powering cotton farms.

Figure 14: Effect of extreme environmental sustainability scenario on labour intensiveness and demand concentration

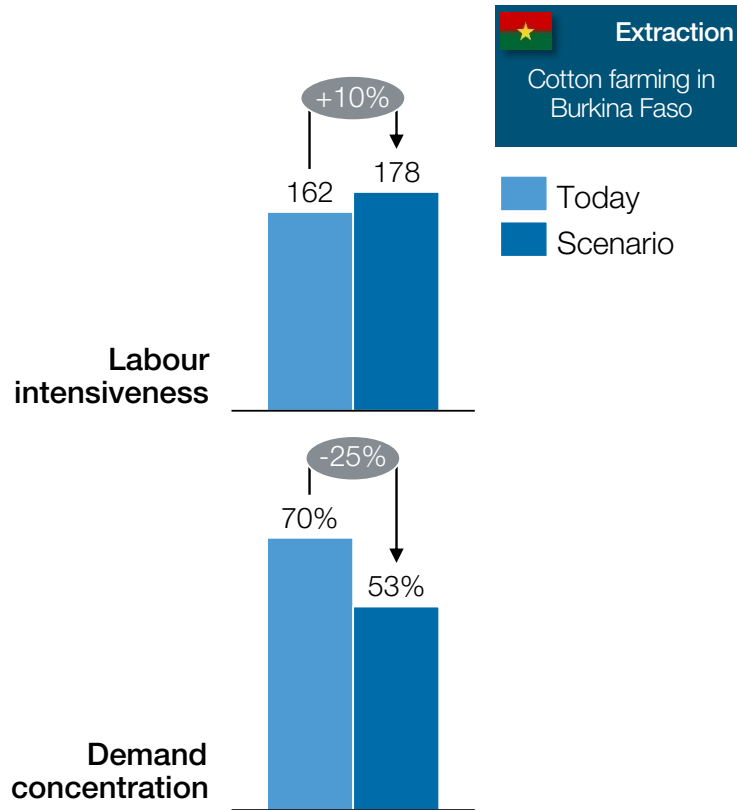


Figure 15: Effect of extreme environmental sustainability scenario on profit margins

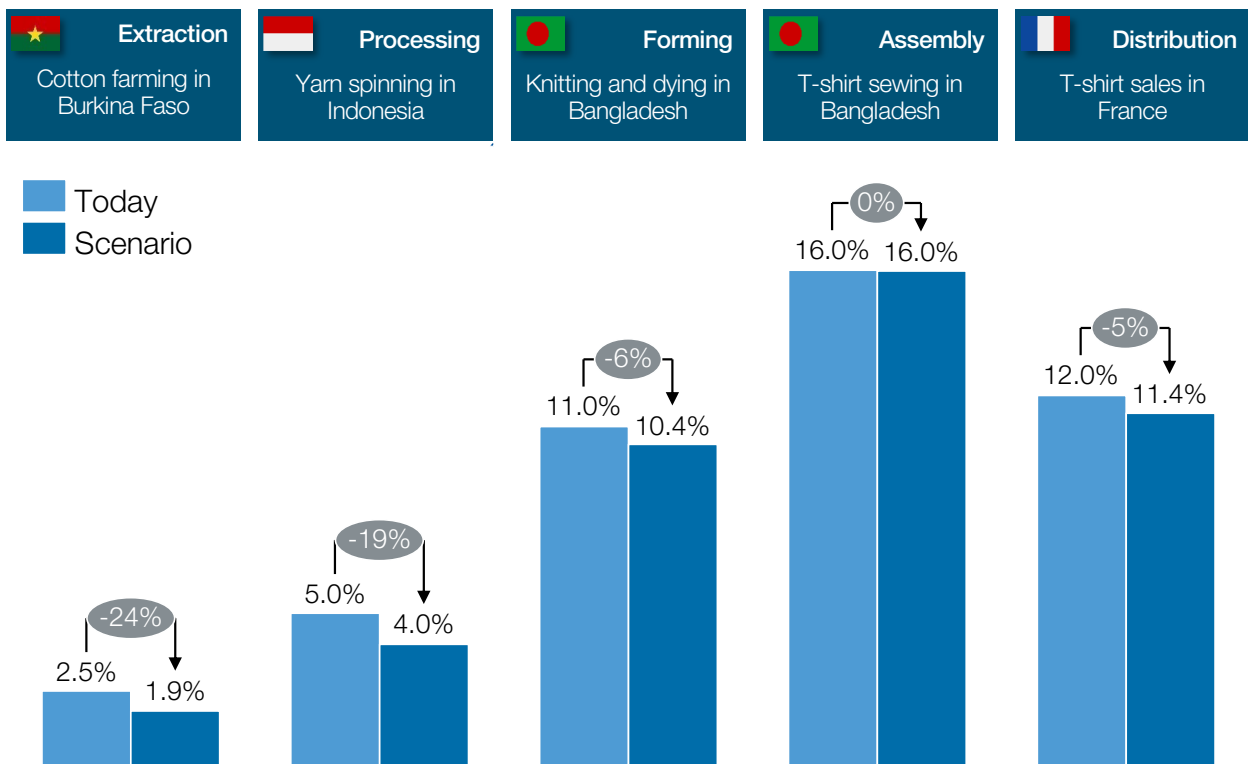
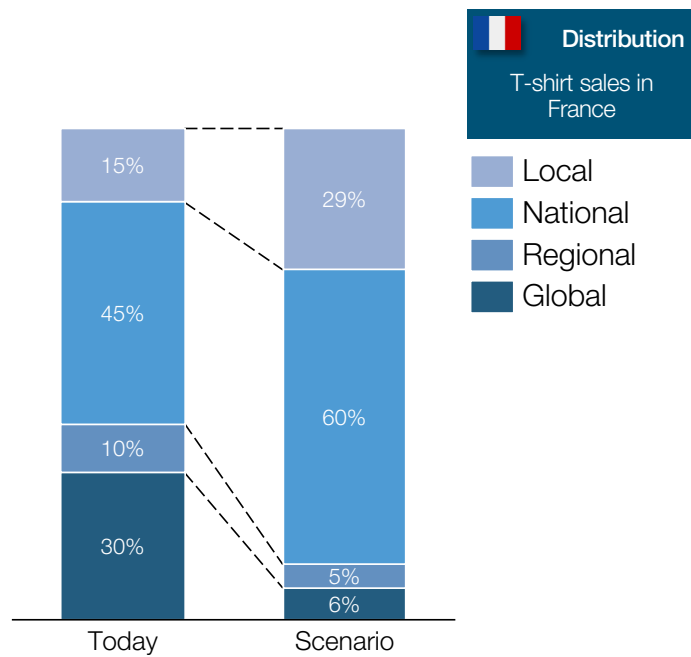
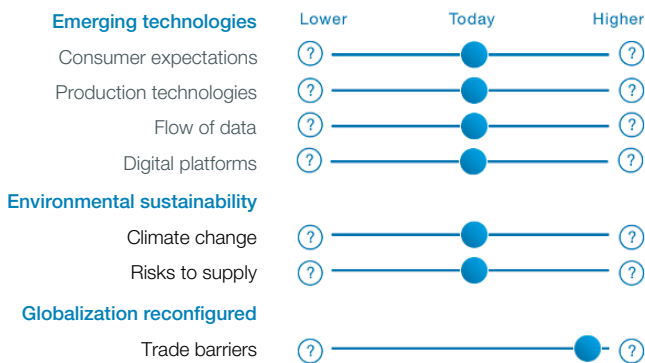


Figure 16: Effect of extreme environmental sustainability scenario on geographic concentration of suppliers



Scenario 3 – Globalization reconfigured

Figure 17: Scenario settings for the extreme reference case for globalization reconfigured



This scenario (Figure 17) anticipates increasingly protectionist trade policies and the resulting impacts on GVCs. Consequences include a significant reduction in the number of players across all stages of the value chain, falling revenues and lower profitability. This might even compel some stakeholders to leave the market altogether or merge with their competition.

The resulting geographic shifts (Figure 18) could also prompt companies to look for diversification opportunities across markets and suppliers, to better align with new trade configurations.

Insights from the use cases

The application of the same extreme scenarios to the three use cases reveals some similarities, but also disparities of impact and value chain reconfigurations.

In the extreme scenario, where adoption of emerging technologies accelerates, the framework shows the potential for increasing revenues and profits along the entire value chain in all three use cases, but with a stronger impact at the final stages of the value chain, closer to the end consumer. The magnitude of the effect, however, varies across different GVCs. While revenues increase by 126% for the cotton T-shirt value chain, smartphone value chain revenues increase by 66%, reflecting the fact that the latter industry is already a major playground for new technologies (Figure 19). Another broad GVC impact in this scenario is a structural shift towards shorter supply chains, with the increasing importance of national players.

An extreme scenario of environmental sustainability, Scenario 2, forces greater internalization of environmental costs and higher supply risks. Revenues and profits remain fairly stable across the three use cases, except at the extraction stage, where revenues, and especially profits, fall. Again, the magnitude of impacts varies in different parts of each GVC. The extraction stage in the smartphone and automobile value chains sees a cost increase of 58%, as compared to 26% for the cotton T-shirt value chain. This points to the difference in the environmental impact of mining compared to cotton production (Figure 20).

An extreme globalization reconfigured scenario, Scenario 3, shows protectionism resulting in negative repercussions along the entire value chains for all three use cases. Revenues and profit margins fall, as do the number of global players in the GVCs. The impact on revenue is larger on the smartphone GVC than on the other two. This is due in part to the greater involvement of China along various stages of the value chain, and thus a greater exposure to higher tariffs (Figure 21).

Figure 18: Scenario impact on geographic concentration of supplying companies

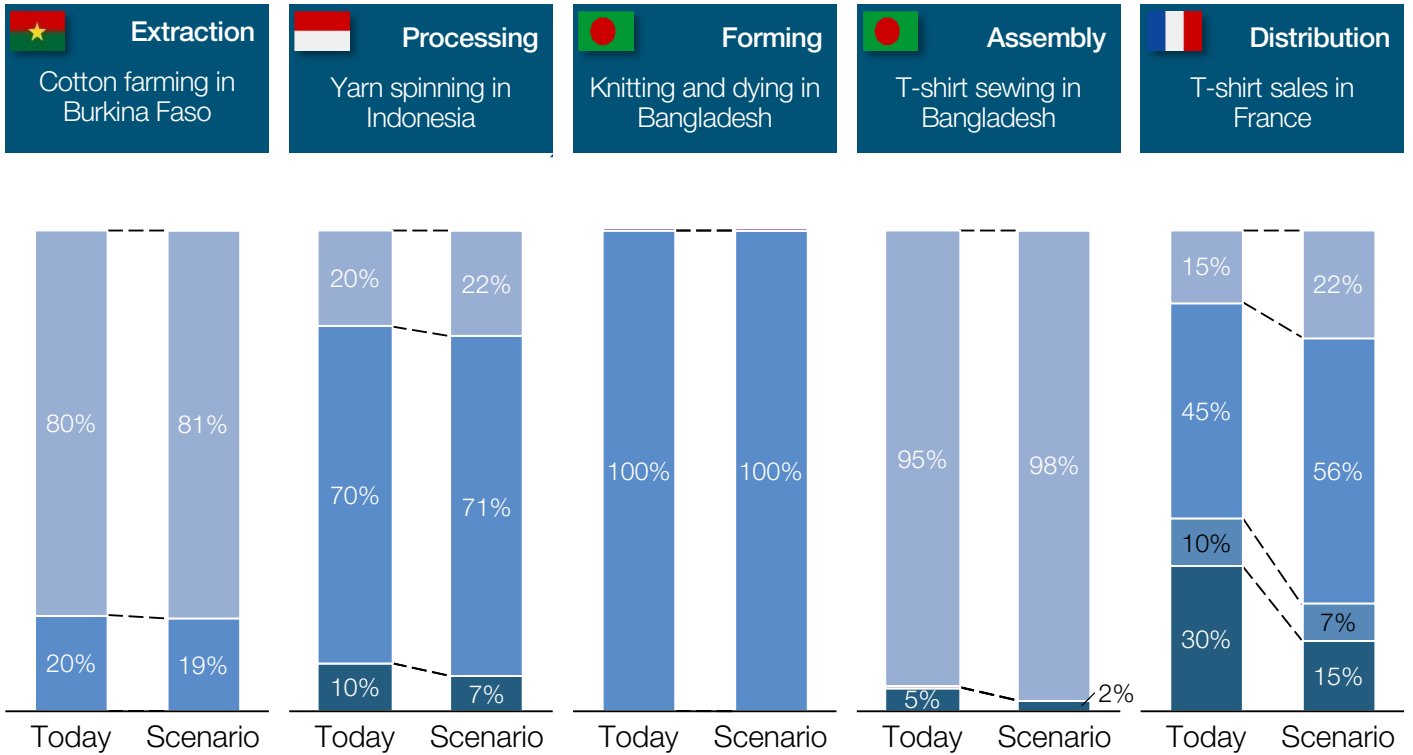


Figure 19: Impact of emerging technologies (Scenario 1) on total revenues (in \$ billions) of different GVCs

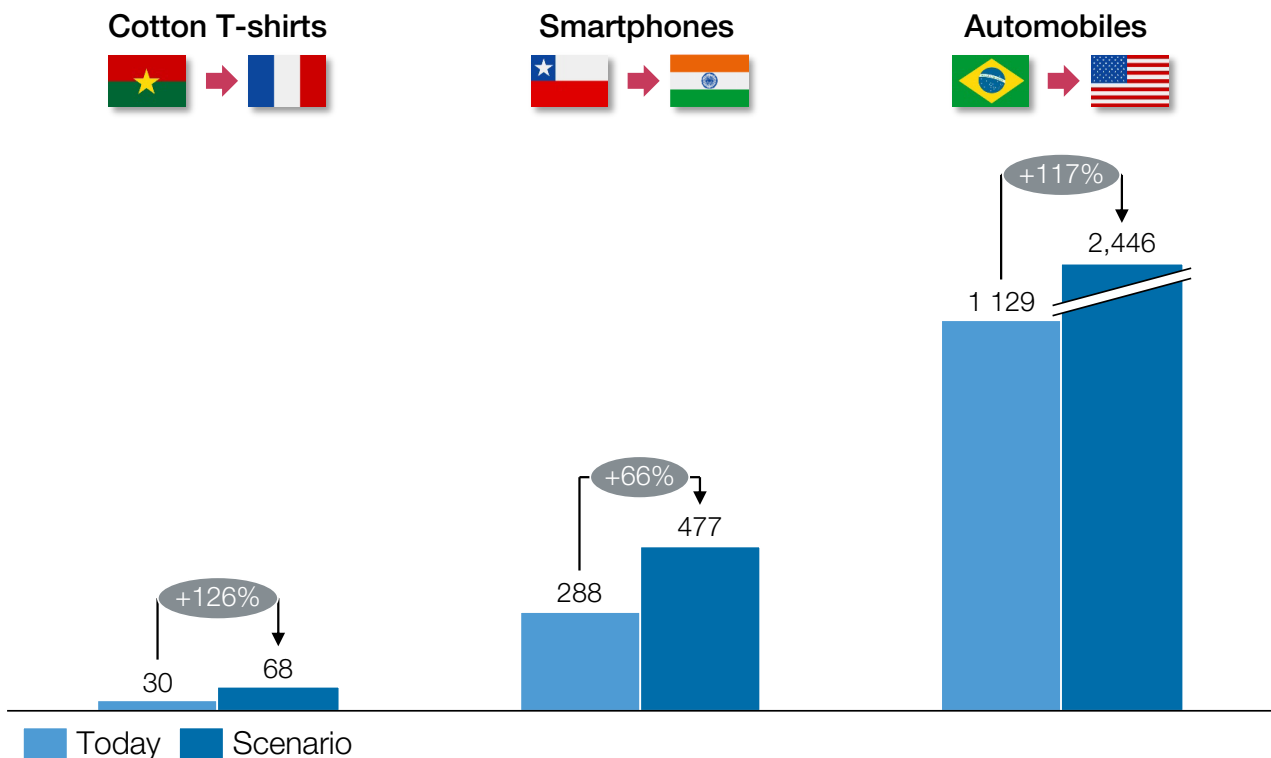


Figure 20: Impact of environmental sustainability (Scenario 2) on other indirect costs (as % of total costs) across different GVCs

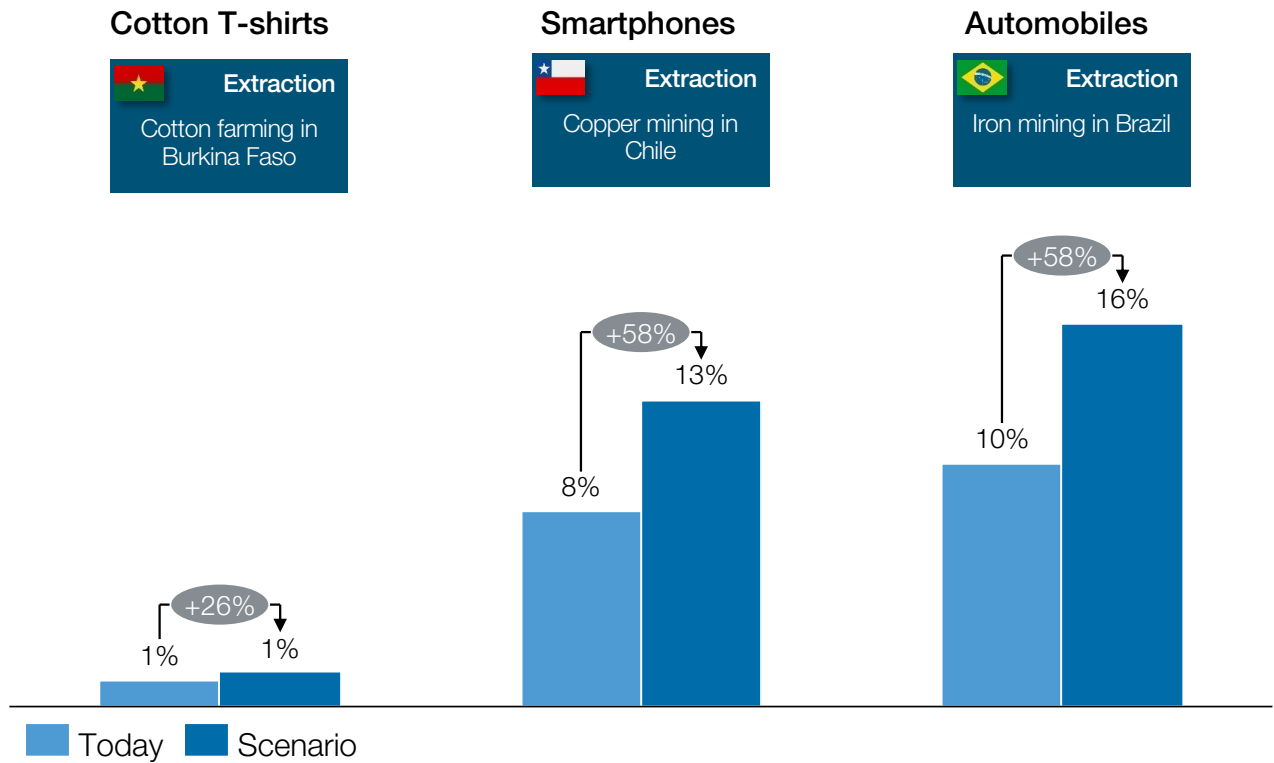
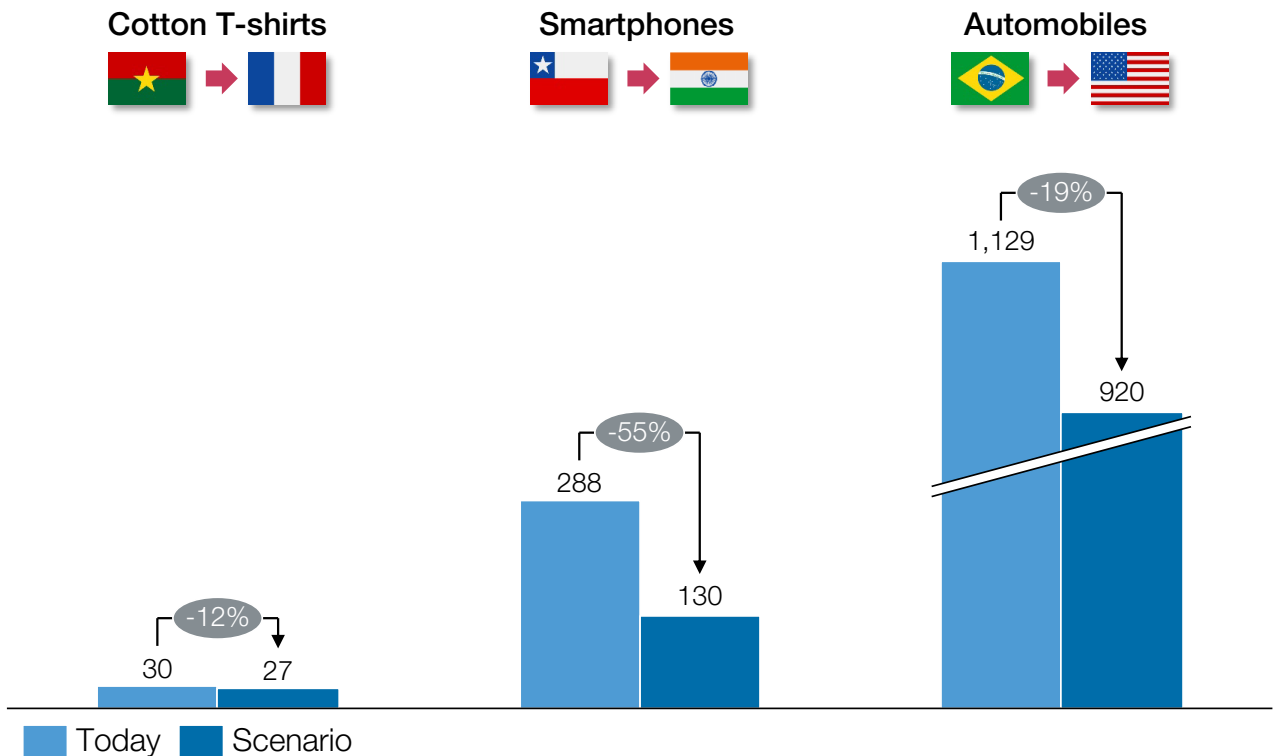


Figure 21: The impact of the globalization reconfigured on total revenues (in \$ billions) of different GVCs



4. Way forward

- Ongoing transformations in GVCs highlight the greater voice of customers, the growing importance of economies of skills and shifts in production away from costs.
- To stay ahead, business and government leaders need to rapidly and proactively develop new capabilities to mitigate disruptions and capitalize on new opportunities.
- Individually and through public-private partnerships, businesses and governments can work to understand and respond to disruptions with new strategies to expand social and economic value.
- The Strategic Value Framework aims to inform constructive dialogue within collaborative platforms, such as those provided by the World Economic Forum and UNDP, at the global, country and regional levels.

Predicting the future almost always leads to folly, as does presuming that nothing will change. As a pragmatic middle ground, however, we can observe important changes, gain a sense of the likely scope of those changes and gauge their relevance to a given set of activities. Heightened awareness, in turn, enables leaders to prepare for a range of future scenarios. This is the essence of how we see users getting the most from the Strategic Value Framework and plotting a path forward towards the future of GVCs.

While the exact outcome cannot be reliably predicted, the probable extent of change can. Stakeholders must avoid a reactive response and, instead, act now. One path is to proactively build public-private partnerships to enable the right level of analysis, foresight, trust and cooperation. Value-chain participants who instead rely on reactive responses will risk a significant loss in share of economic and social value. Similarly, mere tinkering around the edges of outmoded business models and value-chain concepts may provide no bulwark against the tides of change.

To stay ahead of the disruption certain to be wrought by the mega-trends described in this report, leaders in business and government need to rapidly and proactively develop the new capabilities their companies and citizens will need to capitalize on new opportunities. The best course is to be a disruptor, rather than the disrupted.

Key imperatives

In addition to the implications outlined in Section 3, three consistent imperatives were derived across all likely GVC scenarios in the Strategic Value Framework. Each deserves the attention of GVC stakeholders:

- **Demand-side – from factor costs to customer voice:** On the demand-side, proximity to the customer’s voice is overtaking factor costs as the main determinant of economic value for most participants in the value chain. GVCs must be tailored to deepen the sources and use of demand data, and to rapidly tailor offerings to customers’ personal preferences and priorities. Vertical disintermediation will help to connect sources of production with the customer and will serve to shorten value chains. Conversion of operating models from functional, isolated models towards cross-functional customer/channel alignments will also help GVC participants better adapt to the needs of the customer and patterns of demand.
- **Supply-side – from economies of scale to “economies of skills”:** On the supply-side, the competitive advantages derived from economies of scale in production are diminishing relative to “economies of skills”. This makes innovation in education and training a crucial path forward. Both must emphasize the capacity to engage in creative thinking, particularly in specialist fields, as well as becoming more agile in ways of working. This contrasts with the traditional emphasis on imparting accepted knowledge and sticking to what one knows. In parallel, to make GVCs more adaptive, private and public stakeholders must pursue more open innovation through networks of research, product development, marketing and process development, rather than innovating via isolated internal groups. Finally, businesses and governments must collaborate to seed more transformative technologies – even before they are proven – and more actively cultivate and nurture technologies that demonstrate the highest potential.

“

We see our front-line employees as the true owners of the process and value creators. Guided by our mission of alleviating pain, restoring health and extending life, we invest to ensure all employees have a full view of the end-to-end value chain.

”

Francois Monory, Vice-President of Global Operations for Medtronic’s Cardiac and Vascular Group (CVG)

- **The role of production – from cost centre to product centre:** A third and highly interrelated imperative will be transforming the traditional role of production away from the “cost centre” towards what might be called a “product centre”, with the focus shifting away from lowest factor costs towards hearing and adapting to customer needs with the help of digital technologies and new marketing channels. Where production was traditionally decoupled from product development, in the future of GVCs, production will enable open innovation and be a full partner in the promotion of new ideas and building differentiated customer value.

These imperatives, in conjunction with the mega-trends described in Section 2 and the future of GVCs envisioned in Section 3, offer a starting point, from which business and government make decisions and act on them. Below are suggested paths forward for businesses, governments and public-private collaborations. All the suggested paths forward build upon the findings of the *Readiness for the Future of Production Report 2018*, published by the World Economic Forum in collaboration with A.T. Kearney, in which six essential capabilities – technology and innovation, human capital, global trade and investment, institutional framework, sustainable resource, demand environment – were identified to accelerate the transition to the future of production and enable sustainable development. These are revisited in the context of GVCs.

A – Paths forward for businesses

Business leaders must craft strategies and set priorities for capability development based on characteristics of their GVCs, and in response to likely disruptive trends. The Strategic Value Framework presented in Section 3 can help leaders reach decisions. However, most business leaders will find certain common areas that require immediate and sustained attention.

For example, technology and innovation will be central to meeting the growing imperative to use customer voice to define and shape value. Vertical disintermediation (e.g. shortening the value chain for customer proximity) entails integrating upstream, downstream and to adjacencies; delayering demand signals; and aligning operating models away from closed activity nodes towards more nimble and collaborative responses to nuanced customer needs.

The workforce, in turn, will play a pivotal role in unlocking the power of new technologies to meet evolving customer demands. Leaders across multiple industries often recognize that their employees may not currently possess the right skill set for future GVCs. An important first step

for businesses will be embracing their role as developers of the vital skill sets graduates still typically lack even after completing their higher education degrees.

Innovation will become more important in developing “economies of skills”. For example, if mounting pollution causes governments to institute increasingly stringent regulations, small-scale businesses may lack the necessary infrastructure to fully comply. Their survival will then depend on increased agility in innovating and developing sustainability solutions. Open innovation can speed the pace of adaptation via the network effect – which pools ideas, resources and talent – thus amplifying individual contributions while consolidating efforts into value-adding solutions.

Examples of some imperatives for building more open innovation might include innovation through networks, rethinking talent and training and investing beyond the incremental in research and development with a philosophy of “think big, start small, learn fast”.

Consumers and governments are increasingly challenging companies to recognize their responsibility to contribute to environmental and social well-being. This sustainability pull becomes increasingly urgent as the mega-trends loom over GVCs. From an environmental perspective, businesses need to exploit their scale and capabilities to mitigate and, wherever possible, reverse the current climate crisis. With this in mind, businesses should develop business plans with more ambitious sustainability targets and invest in circular economies.

Production needs to be at the forefront of change, closely guided by the customer's voice. Technologies associated with the Fourth Industrial Revolution are creating a strong base to make this happen. However, technologies will only be as powerful as the vision guiding their application. While it is widely recognized that automation provides efficiency gains in production, few companies appear to have embraced the full potential of new technologies to transform GVCs. Production seems a logical place to initiate such expansive thinking.

Reorienting the role of production from cost centre to product centre requires action across the entire organization, from the manufacturing floor through to C-suite executives. To start this evolution, business leaders should work towards building product ownership within the factory walls, bringing the customer's voice to the factory floor, investing in agile production technologies and replacing fixed production capacities with flexible parameters.

B – Paths forward for governments

Governments must also prepare for the major disruptions in Section 2 and promote sustainable development and inclusive growth.

On the supply side, particularly in countries situated between the extraction and assembly stages of GVCs, it will be critical to understand the potential implications of disruptions on where value is created and by how much. Governments should take the lead in identifying opportunities to redeploy and grow competencies and resources to match the needs of future GVCs.

More broadly, governments could consider how to best support technological upgrades and innovation through a mix of horizontal and sector-specific policies, including investments in leapfrog technologies and rewarding success through experimentation.

With production becoming more localized and cross-border trade facing potential declines, governments will need to adapt infrastructure, strengthen strategic connections and derive connections between local players.

To help business get closer to the voice of the customer, policy-makers can also champion new channels and improved access to markets, through regional integration initiatives and access to market-making platforms.

In light of the growing importance of “economies of skills” governments must ensure broad-based access to quality education and the establishment of lifelong learning systems, with a focus on developing the right competencies for emerging technologies and systems.

Governments also need to rethink the signals or incentives provided to businesses and other actors, through a variety of tools including taxation, subsidies and regulations in different domains, to align actions with sustainable development. More specifically, regulatory approaches will need to adapt ever more quickly to the changing circumstances created by new technologies. This may range from updating perspectives on anti-trust laws to data and customer privacy protection.

C – Paths forward for public-private partnerships

GVCs are shaped by many actors, often with different levels of access to varying sources of information and resources. Collaboration by business and government is critical to ensure a coherent and end-to-end view of what is required to maximize value for all participants.

Collaboration is crucial for two primary reasons. First, in the face of uncertainty about the exact implications of the three mega-trends, public-private partnerships will yield the most exhaustive set of information and tools to proactively seize opportunities to advance sustainable development. Increased sharing of information and strategies are critical to overcoming the inertia that would otherwise hinder decisive action in the face of uncertainty. Second, cooperation between a broad range of GVC actors will facilitate flexibility in responding to the highly complex ongoing disruptions.

Businesses and governments need to work together to help preserve and create value as GVCs are disrupted by the ongoing “perfect storm”, which results from the combination of mega-trends presented in this paper. The exploration of future scenarios and the identification of the capabilities required to successfully reconfigure value chains should be a collaborative effort, bringing together all actors in society. There is an urgent need for new platforms to facilitate dialogue and help incubate these collaborative efforts. Such platforms should help manage difficult trade-offs and align the disparate interests of governments, businesses and consumers, while addressing global challenges such as inequality and climate change.

The World Economic Forum and UNDP are in a unique position to provide such platforms and support stakeholders at country, regional and global level, to help navigate disruptions while ensuring sustained and shared growth. The Forum offers access to bleeding-edge innovations and connects the most senior levels in business, government, academia and civil society. Using its [18 existing platforms for shaping the future](#) – such as the Future of Advanced Manufacturing and Production, the Future of Mobility and the Future of Food Security – will enable the Forum to carry out in-depth analysis of specific value chains and help strengthen public-private and international cooperation. The UNDP, with programmes in 170 countries and territories, can facilitate national and regional dialogue with a wide range of stakeholders to assess the implications of disruptions in GVCs on sustainable development and drive action and impact locally. Jointly, both organizations will work with stakeholders to support the transition to the future of production and GVCs.

Appendix A

Appendix A describes the parameters and sources of information used in the Strategic Value Framework, including a technical description of the methodology for each scenario setting.

The data used represents the best available sources at the time of writing. Some data may be revised or updated by the sources after publication.

Global value chain pillars

Economic value pool

The economic value pool indicates where and how much value is generated across the five stages of the GVC. This pillar is quantified by absolute revenues, relative profitability and net profits. All three mega-trends will have an impact on both revenues and margins, but the nature of the impact differs per trend, per stage in the value chain and per value chain.

Revenue

Total revenues generated in one specific stage of the GVC in a particular country: e.g. total revenues from the cotton-farming market in Burkina Faso.

Unit of measure: \$ billion in the country of focus

Source: industry reports combined with interviews with industry experts, financial statements of the top three players per industry and country

Profit margin

The average percentage profit margin across a sample of companies in a certain stage and country of the GVC.

Unit of measure: % of revenues across the industry in the country of focus

Source: industry reports combined with interviews with industry experts, financial statements of a sample of the top players per industry and country

Geographical concentration

This pillar represents the concentration of supply across geographic scope at each stage of a GVC, from local, national, regional through to global levels of sourcing. This analysis provides insights into the geographic footprint and spread of supply for each stage of the GVC.

Local

Local suppliers are defined as companies with a mainly local footprint: e.g. one copper mine in northern Chile.

Unit of measure: % of total suppliers in the industry in a particular geographical area in the country of focus

Source: Statista: market share data for specific industries, 2019; Economist Intelligence Unit (EIU) country reports, 2019

National

National suppliers are defined as companies with a footprint in one country: e.g. multiple copper mines in Chile.

Unit of measure: % of total suppliers in the industry in the country of focus

Source: Statista: market share data for specific industries, 2019; Economist Intelligence Unit (EIU) country reports, 2019

Regional

Regional suppliers are defined as companies with a footprint in one cross-country region: e.g. multiple copper mines in South America.

Unit of measure: % of total suppliers in the industry for the countries of focus

Source: Statista: market share data for specific industries, 2019; Economist Intelligence Unit (EIU) country reports, 2019

Global

Global suppliers are defined as companies with a footprint across the globe: e.g. copper mines in Chile, USA, China and Australia.

Unit of measure: % of total suppliers in the industry for the country of focus

Source: Statista: market share data for specific industries, 2019; Economist Intelligence Unit (EIU) country reports, 2019

Structural indicators

This pillar includes nine indicators to assess competitiveness at each stage along the GVC, represented by key performance indicators that can be compared across countries and value chains. They take into consideration interdependencies between countries and sectors that are relevant to value-chain participation. All values are aggregated averages for the country in which the respective stage is taking place.

Reliance on economies of scale

Defined as the percentage of fixed costs relative to the total costs of a representative sample of companies within a sector. Represents the reliance of business and sectors on a fixed asset base and corresponding fixed costs, which leads to lower marginal costs at higher volumes and thus a high dependency of competitiveness on attracting incremental volumes.

Unit of measure: % fixed costs of total costs at country level

Source: Euromonitor industry reports, 2019; Financial statements of the top five companies in the industry; Emis company reviews, 2019

Cost of labour

Defined as labour costs relative to total revenues of a representative sample of companies within a sector. Represents the reliance of business and sectors on number and salaries of workers to the total value-added of the product.

Unit of measure: labour cost as % of revenues at country level

Source: Euromonitor industry reports, 2019; Financial statements of the top five companies in the industry, A.T. Kearney intellectual capital

Other indirect costs

Defined as indirect costs excluding labour (e.g. energy, rent, services etc.) relative to total revenues of a representative sample of companies within a sector. Represents the reliance of business and sectors on costs other than labour to the total value-added of the product.

Unit of measure: other indirect costs as % of revenues at country level

Source: Financial statements of the top five companies in the industry, Bloomberg analyst reports on market leaders

Labour intensiveness

Defined as the number of people that are needed to generate \$100,000 in revenues for a sample of companies within the sector. Represents the reliance of business and sectors on the number of workers to the total value-add.

Unit of measure: number of FTEs per \$100,000 revenues at country level

Source: Statista: employment information per country and industry; OECD employment by activity data, 2019

Innovation intensiveness

Defined as total annualized research and development costs relative to revenues of a representative sample of companies within a sector. Represents the reliance on product and process innovation to drive long-term value relative to current total value-add.

Unit of measure: R&D cost as % of revenues at country level

Source: Financial statements of top five companies in the industry; Bloomberg market reports, 2019

Supply concentration

Defined as the value percentage that companies import from the top three supplying countries. For example, Peru, Chile and Mongolia are the top three copper ore suppliers to copper smelters in China. Supply concentration can be used to determine dependencies on upstream players in the value chain.

Unit of measure: % of import value of all relevant companies in the country of focus from the top three supplying countries

Source: Observatory of Economic Complexity, 2019

Demand concentration

Defined as the value percentage that is exported to the top three countries that import from a certain country-specific industry. For example, Indonesia, Malaysia and Viet Nam are the top three refined copper importers from Chinese copper smelters. Demand concentration determines dependence on other players downstream in the value chain.

Unit of measure: % of export value of all relevant companies in the country to the top three importing countries

Source: Observatory of Economic Complexity, 2019

Competitive landscape

Defined as the number of companies active in one stage and country of the GVC. Represents, on a relative scale, how competitive a sector is within a country.

Unit of measure: number of companies in one stage and country of the GVC

Source: OECD Structural Statistics on Industry and Services database, 2019

Relative wages

Defined as the relative industry wages of one stage of the GVC compared to the national average wage. Represents how well paid the sector is relative to other important sectors in the country (i.e. according to the corresponding countries' national average).

Unit of measure: sector wage as % of national average wage

Source: International Labour Organization wage database by country, US Bureau of Labor Statistics by industry

Scenario settings

In the scenario settings, estimated future impacts of the three mega-trends can be altered by moving the slider bar. The centre of each slider bar coincides with the neutral position, implying “no change”.

Every extreme on the slider bar has a specific interpretation, corresponding with a predefined impact on each of the above discussed parameters across the GVC pillars, over a maximum time frame of three years. Moving the slider bar to different positions enables the user to see the estimated effects of the mega-trends as per the predetermined scenario setting. The scenarios can be changed to adapt to different time frames as per the user’s needs.

The first part of this section defines the interpretation of both extremes for the different mega-trends. The second part explains how the different values on the slider bar are modelled into the Strategic Value Framework.

Definition and interpretation of the extremes per mega-trend

Emerging technologies

The scenario projects the new technologies mega-trend using four elements: customer expectations, new production technologies, flow of data and tech-enabled platforms. Every element has a unique impact on the GVC parameters across the three pillars: value pool, geographical concentration and structural indicators.

Customer expectations. The higher extreme is defined as more tailored and personalized products, with faster lead times and a higher degree of services provided. The lower extreme means a shift in the opposite direction, where standardization and long lead times are the more prevalent way of doing business.

New production technologies. The higher extreme points to a more agile way of working, with the introduction of technologies able to make small-batch (personalized) production profitable. The lower extreme is described as a more traditional approach focused on large batches and no innovative technology improvements.

Flow of data. The higher extreme assumes a scenario in which there is a frictionless flow, with open access to data across the value chain and relevant tools to analyse the available data to generate efficiencies. On the other side of the spectrum, the lower extreme would mean companies are not opening up their data nor using advanced tools to generate useful insights from it.

Tech-enabled platforms. The higher extreme expects an easy connection of demand and supply on these platforms, combined with easier access to knowledge at lower marginal costs. The lower extreme, instead, would entail a complete lack of tech-enabled platforms and, thus, very limited synchronization between demand and supply.

Environmental sustainability

The scenario setting concerning the environmental sustainability mega-trend takes into account two elements: climate change and risk to supply across the three GVC pillars.

Climate change. The higher extreme in the scenario setting captures a higher relative focus on climate action, where negative externalities related to climate impact increase overall costs: e.g. more stringent quality checks or controlled environments. Nevertheless, these costs are priced into final products, with potential to increase total value in certain GVC stages. The lower extreme disregards this focus, assuming climate change will stabilize and perceptions of climate change may take an opposite course.

Risk to supply. The higher extreme models a higher risk to supply due to depletion of resources, potential natural disasters and other threats to the supply of raw materials. For example, to mitigate risk of supply, companies could explore alternative suppliers from different countries, which would result in higher costs, and reduce sales volumes in the original supplying countries. In contrast, the lower extreme assumes there will be no to little risk to supply raw materials.

Globalization reconfigured

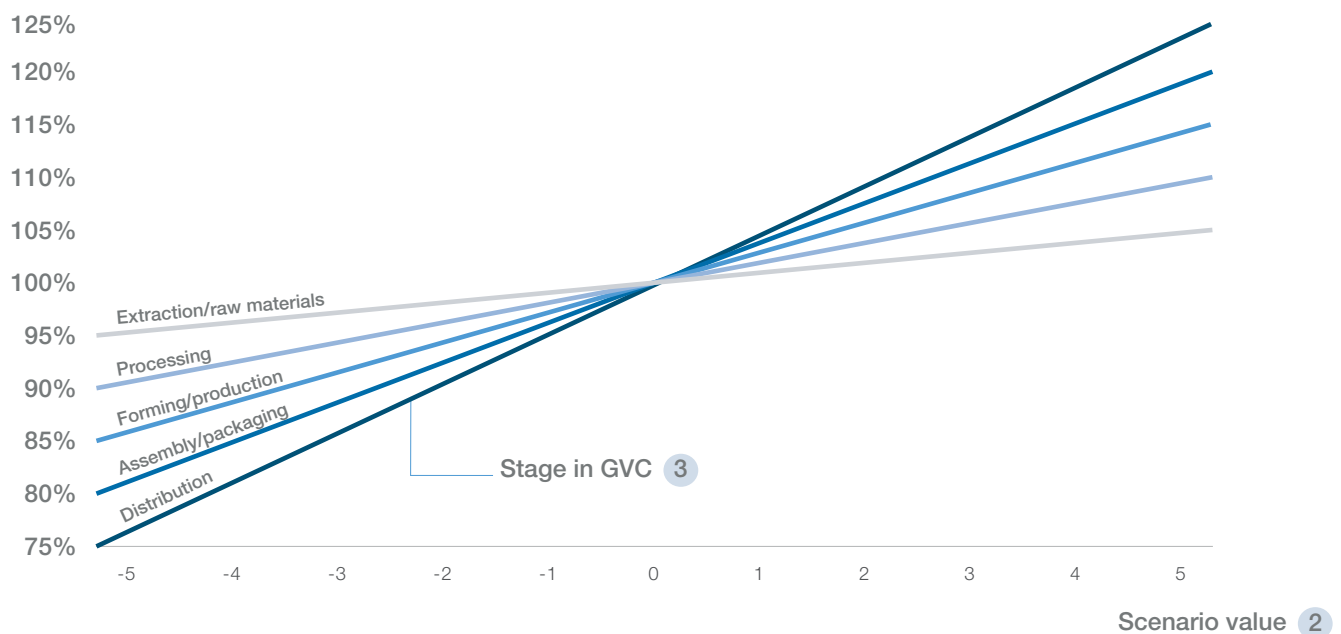
“Globalization reconfigured” is defined by one element: *trade barriers*. The higher extreme foresees higher tariffs, regulatory barriers to trade and more international trade disputes across countries and regions. The lower extreme assumes more market opening, and reduction of tariffs and other barriers to trade.

Methodology of the model

The scenario setting methodology applies several hundred hypothetical translation curves per mega-trend (**Figure A1**), to quantify the hypothesized scenario, defining the impact for a single starting parameter (1) with respect to the different discretized scenario values of the slider bars between -5 and +5 (2) in a certain stage of the GVC (3).

Figure A1: Visualization of different translation curves for every stage of the GVC for one specific mega-trend

Impact on parameter 1

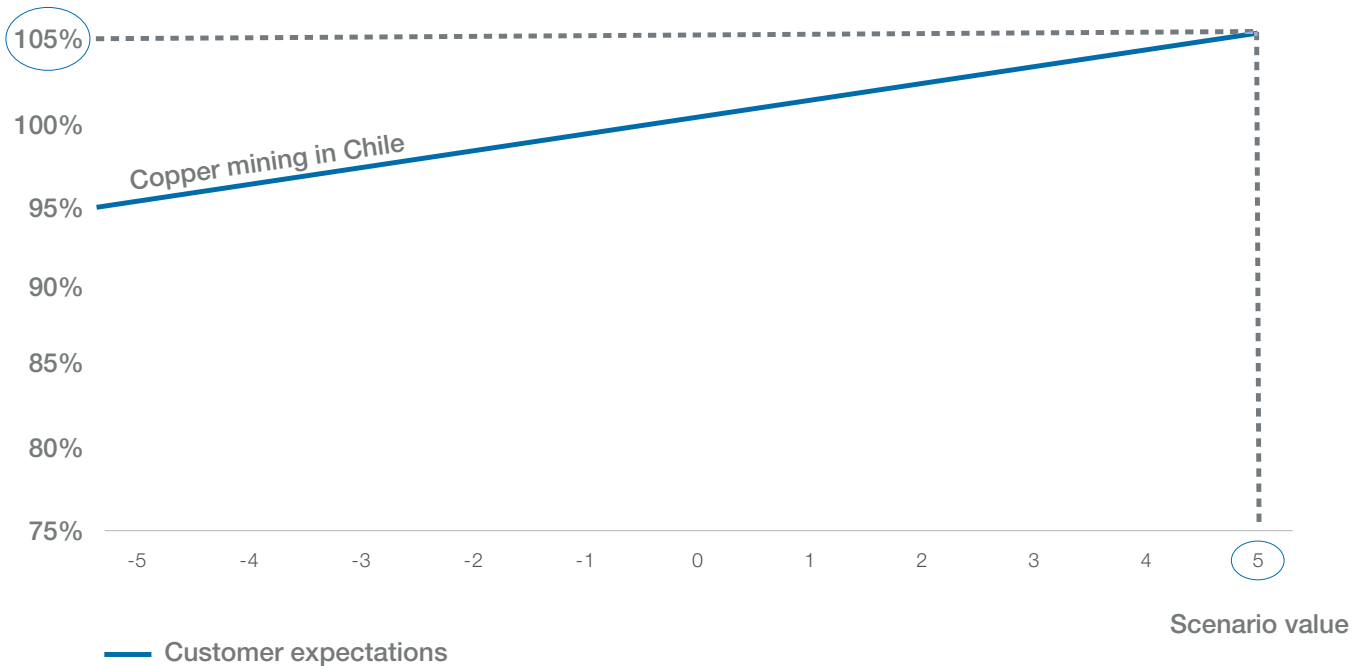


The projected effect and logic of each hypothetical translation curve is determined by using available research and intellectual capital, which is then stress-tested and validated across multiple overlaid scenarios with input from industry experts.

The following example (**Figure A2**) can help to clarify the translation curves to a greater extent. It takes the impact of customer expectations and its effect on revenues in the extraction stage of the smartphone GVC. In the case at the higher extreme of customer expectation, it is projected that copper mining revenues will increase by 5% due to the flow-through effect of increased specialization required to serve more discerning customers. Accordingly, the higher extreme is allocated with a 105% impact on current revenues. A linear curve is assumed between both extremes, resulting in a 5% reduction of revenues if the above scenario turns to the lower extreme.

Figure A2: Example of a translation curve showing how revenues for copper mining in Chile are affected by a scenario value of 5 for customer expectations

Impact on revenue



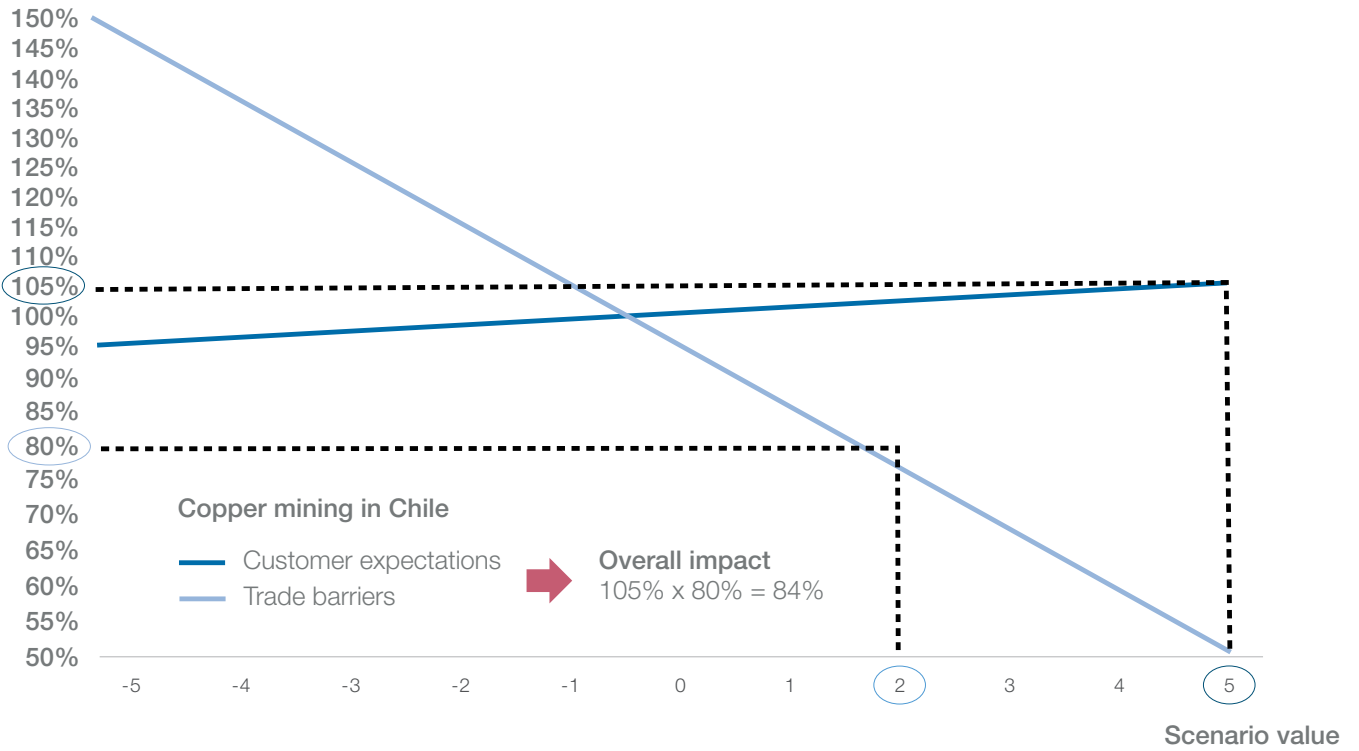
Similar translation curves are developed for all scenario settings of each mega-trend and each parameter of the GVCs across the three pillars.

The impact of multiple mega-trends is then multiplied and overlaid for each parameter of the scenario setting across the GVC pillars. Taking the previous example, next to customer expectations, the impact of trade barriers on revenues in the extraction stage of the smartphone GVC is estimated. The hypothetical scenario involves the following: Customer expectations leap, which results in the higher extreme, and trade barriers rise modestly, resulting in a value of +2 on the slider bar. The increased customer expectations would increase revenues by 105%, while the increased trade barriers are expected to decrease revenues by 20%. The combined effect multiplies both values to arrive at a combined impact of a 16% fall in revenues in the smartphone GVC’s extraction stage in the value chain’s future state compared to the current state.

Once all curves have been developed, the combined effects across all parameters and mega-trends for a single GVC are stress-tested and validated by industry experts to ensure the resulting multivariable analysis approaches the most likely outcome, and translation tables are edited where needed.

Figure A3: Example of a translation curve: how revenues for copper mining in Chile are affected by both rising customer expectations (value of 5) and trade barriers (value of 2)

Impact on revenue



Acknowledgements

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