WORLD TRADE ORGANIZATION

International Labour Office

INVESTING IN SKILLS FOR INCLUSIVE TRADE

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A joint study of the International Labour Office and the World Trade Organization

International Labour Office

World Trade Organization

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Foreword

This publication is a product of the joint research programme of the International Labour Office (ILO) and the World Trade Organization (WTO). It follows up on three prior joint publications by the ILO and WTO Secretariats. The first was a review of the literature on trade and employment, the second a report on the linkages between trade and informal employment, and the third an edited volume on making globalization socially sustainable. This fourth publication discusses the importance of skills development policies in helping workers and firms harness the benefits of trade.

Trade and technology have been key drivers of rising incomes and economic development in recent decades, improving the lives of many, and reducing poverty. For these positive effects to materialize, however, economies must adjust and this can mean important changes for both firms and workers. While trade and technology create new opportunities, they also put more pressure on the less competitive firms and sectors.

Skills have an important role in enabling firms to adapt to market demand and to competition, allowing them to raise productivity, to participate effectively in international trade and to adjust to import competition. Skills also have an important role in enabling workers to seize the best available opportunities, including those offered by trade and technology. In both developed and developing countries, the level of skills demanded by firms is increasing as a consequence of trade and technological change, but the types of skills required vary between countries, sectors and firms.

Building on previous findings by our two institutions, which shed light on the mechanisms through which globalization affects workers and on the measures that governments can take to make globalization more inclusive, this report focuses on the linkages between trade and skills and between trade and skills development policies. It brings together the findings of the literature, both theory and evidence, the lessons from the ILO's practical work on skills and trade under the Skills for Trade and Economic Diversification (STED) Programme, and its wider work on successful skills development systems. The report discusses how trade affects the demand for skills, and how skills development systems can help firms get the workers they need and help workers get productive and decent jobs. It stresses the importance of responsive skills development systems in making trade more inclusive.

The report aims to broaden the conversation on skills and trade, and to build closer links between the trade and skills policy communities. It shows the importance of collaboration between our two institutions and points to areas where future research may be useful. We hope readers will find in this work a timely contribution to the discussion about a very important challenge of today's world.

Guy Ryder
Director-General
International Labour Office

Roberto Azevêdo
Director-General
World Trade Organization

Authors

Marc Bacchetta
Counsellor, Economic Research and Statistics Division, World Trade Organization

Cornelius Gregg
Senior Technical Specialist, Skills and Employability, Employment Policy Department, International Labour Office

Stela Rubínová
Research Economist, Economic Research and Statistics Division, World Trade Organization

Bolormaa Tumurchudur Klok
Economic Officer, Skills and Employability, Employment Policy Department, International Labour Office

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Executive Summary

Skills development is key to more inclusive trade

Over recent decades, the global economy has experienced a profound transformation, mostly as a result of the joint forces of trade integration and technological progress, accompanied by important political changes. Increased trade integration has helped to drive economic growth in both high- and low-income economies, lifting millions out of poverty in emerging and developing countries. Since the global financial crisis of 2007–08, however, trade, productivity and income growth have decelerated. At the same time, trade is increasingly perceived as leaving too many individuals and communities behind.

Reaping the benefits from global trade and effective integration into global markets goes hand in hand with the adoption of new technologies, improved forms of work organization and productivity increases. Given the role of skills in trade, it is vital to put a strong emphasis on skills development. Human capital is one of the principal enablers of trade growth and economic diversification, and is also an important "buffer" facilitating the adjustment to more open trade. Appropriate skills development policies are key to helping firms expand their export activities; they are also key to helping workers who lose their jobs make a smooth and rapid transition to new jobs with equal or higher wages. These two effects reinforce each other. For trade to grow, it needs to be more inclusive; and more exports offer more employment opportunities.

Skills development policies constitute one among many policy instruments available to governments to make trade inclusive by enabling firms and workers to participate in trade, by lowering adjustment costs and by distributing more evenly the benefits of trade and technological progress. Other active labour market policies (ALMPs), such as job-search assistance or activation strategies, passive labour market policies such as unemployment insurance, and social policies, as well as complementary policies such as housing or credit market policies, can also be used to lower adjustment costs, while various instruments are available to redistribute the gains from trade or technology to those whose skills are less in demand because of those changes.

The level and composition of skills in a country affect its participation in trade

The level and dispersion of skills in a country's workforce influence its trade pattern and may also affect its export performance. The average skill level of workers, and the distribution of skill levels among workers in a country, contribute to determining its comparative advantage and export diversification, as do the areas of skills specialization and the quality of skills.

Countries with responsive skills development systems are more successful in putting skills to use in tradable activities, with corresponding impacts on trade. Skills development policies are therefore an important ingredient in strengthening and developing a country's overall comparative advantage, or that of specific internal regions, whether in existing activities or in higher-productivity activities, which in turn strengthens its position in the global economy.

Work by the ILO, under the Skills for Trade and Economic Diversification (STED) Programme, finds that businesses in developing countries face common challenges in terms of the capabilities that they can deploy so as to participate effectively in international trade. These important challenges consist in addressing common features of market demand in a globalized world, such as cost efficiency, quality, responsiveness and product differentiation, as well as common features in good management practices and work organization. Key general targets for skills improvement include core work skills, technical skills and management skills including human resource management.

The need for strong capabilities in these areas is not limited to developing countries. They are also needed where regions within a developed country have been affected negatively by an employment shock and are having difficulty in adjusting to the new conditions. In such situations, regions in developed countries often need to build comparative advantage in new high-productivity activities, and are likely to face many of the same constraints as their developing-country counterparts. The literature on local economic development in developed countries supports the need to develop comparative advantage in activities rooted initially in local strengths, and places a heavy emphasis on investment in skills as a basis for this.

Trade affects the demand for skills in several ways

There are four main mechanisms through which trade affects the relative demand for skills. First, trade raises the demand for products in which countries have a

comparative advantage. This increases the demand for factors used intensively in the production of those goods and services. In countries with a comparative advantage in skill-intensive sectors, trade thus increases the demand for skilled workers. Second, international trade leads to firm selection, whereby the least productive firms may be driven out of business and the most productive firms expand. More productive firms tend to employ relatively more skilled workers and have higher returns to skills, which translate into a higher relative demand for skills. Third, as the costs of offshoring fall, the least complex and locationally dependent stages of production that were still performed onshore in high-income economies relocate to low-income economies. These newly offshored tasks are nevertheless more complex compared to the already offshored stages, which increases the average complexity of tasks performed in both types of country and pushes upward the relative demand for skilled workers everywhere. Fourth, lower trade costs may induce skill-biased technological change – that is, a change in the production technology that favours high-skilled over low-skilled labour by increasing its relative productivity and, therefore, the relative demand for it – in both exporting and import-competing firms in both developed and developing countries. This also contributes to increased demand for skills.

Empirical evidence shows that trade induces skills upgrading in both developed and developing economies

In developed economies, recent trends suggest that trade and offshoring are associated with a decline in the employment share of medium-skilled workers. Import competition from low-wage countries also pushes firms to increase their product quality and/or investment in research and development, increasing their demand for high-skilled workers. Moreover, international trade alters the types of skills that are demanded. In particular, medium- and high-skill occupations that require social interaction, communication and non-routine abstract thinking experience the most significant increase in demand.

The available evidence from developing economies shows that trade affects employment composition through the adoption of new technologies. This comes about both by giving exporters incentives to invest in more productive technology and by making imports of technology-intensive capital goods cheaper. New technologies are complementary with high-skilled labour and often replace low-skilled labour, leading to skills upgrading.

Trade affects the wage distribution by increasing the returns to skills

In both developed and developing countries, trade-induced increases in the skill premium (the ratio of the wage of high-skilled workers to the wage of low-skilled workers) have contributed to wage inequality where skills supply has not been responsive. Furthermore, in some developed economies the decrease in the relative demand for jobs that require routine and non-abstract tasks has led to polarization of the wage distribution, whereby employment in middle-paid jobs has decreased relative to that in high- and low-paid jobs. This tendency towards greater wage inequality results from the presence of labour market frictions and from unresponsive skills supply systems. It is also important to stress that while trade plays a role in wage inequality, other factors, such as technological progress, are even more important determinants.

An appropriate skills supply increases gains from trade and improves their distribution

An adequate response of the supply of skills to changes in the demand can substantially improve overall labour market outcomes. For instance, skills upgrading in reaction to, or in anticipation of, increasing demand can dampen the impact of trade on wage differences and instead increase the employment shares of skilled workers. Skills mismatches, on the other hand, can amplify the impact of trade on the skill premium, lead to higher unemployment for certain skill groups and constrain expansion of successful firms through shortages of certain skills. Recent studies provide indirect evidence that the differences between the skills of workers who lose jobs and the skills required by expanding firms, and therefore skills mismatches, may be substantial.

Both education policies and incentives in the labour market shape the way people invest in their education. Addressing this area is a long-term process. Continuing education and training, both at universities and in the form of technical and vocational education and training (TVET), and on-the-job training, can help workers cope with the big changes in demand for skills which are in varying degrees triggered by globalization.

Available responses

There are common themes across countries in the constraints on matching skills supply to demand. These are usually more severe in developing countries than in their developed

counterparts, which have been focused for longer on developing information systems to identify and anticipate skills needs, on improving their education and training systems, and on strengthening workplace learning.

There is room for countries at all stages of development to adjust their responses. The need and scope for less developed countries to adjust is greater, but even for developed countries the challenges of adjusting to trade-connected shocks to employment may heighten the priority they place on skills development with a view to inclusive trade.

Important principles that may be helpful for responding effectively to skills needs related to trade include the following:[1]

- **Policy coherence:** Connecting trade and skills policies requires coherence in policy between these and related policy areas.

- **Social dialogue:**[2] This is central to making skills systems responsive to the needs of industry, including those industries producing tradable goods and services.

- **Broad access to education, skills development and lifelong learning:** Low-skilled workers, workers who lack transferable skills, workers whose learning skills are weak, and workers whose skills are at risk of obsolescence benefit less from trade and are vulnerable to technological change or to a trade-connected employment shock.

- **Targeted training for displaced workers and/or workers at risk of displacement:** Reskilling may be required to allow workers to move to a different occupation or a significantly different job, whether because their original job became unnecessary or because change offers a good opportunity.

- **Investing in training for employed workers:** Training for workers at all skill levels is a necessary part of implementing effective strategies, in order to underpin the capabilities needed in markets for tradable products and services. Addressing impediments to adequate investment in skills by and for micro-, small and medium-sized enterprises (MSMEs) is especially important in strengthening value chains, including domestic supply chains, and in ensuring inclusive access to training for the workers they employ.

- **Core work skills:** Strong core work skills, such as team working and problem-solving, are a vital underpinning for employability, and for business performance,

complementing the technical skills required for specific types of jobs. Strong core work skills across the labour force contribute to the inclusiveness of growth, and provide a good starting point for offsetting the tendency of trade to widen wage inequality.

- **Skills needs analysis and anticipation:** Tradable industries are especially subject to changing skills needs. Forward-looking skills needs analysis and skills anticipation are needed to inform policy coherence and social dialogue, and to inform decision-making by all relevant partners.

- **Labour market information (LMI) and employment services:** Effective LMI and employment services systems are required to provide and communicate the information that all actors need to inform their thinking and decision-making. Employment services also have a broader role in training displaced workers and in matching them to available jobs.

- **Quality and relevance in skills development:** In order to meet industry skills needs, education and training for skills development has to meet appropriate quality standards, and its content must be relevant to the needs of the industry that it aims to meet.

Skills development is not the only available type of response. Migration, internally within a country or between countries, can also play a role. Where there are skills shortages, measures to increase participation in the labour force, for example through promoting higher female participation can also contribute to the solution. Sometimes, better recognition of existing skills is also part of the solution. Systems for recognition of prior learning (RPL) can make the availability of existing skills more visible to employers, benefiting both employers short of skills and workers in need of work, and easing workers' access to continuing education.

Endnotes

1. Recognizing that the situation and appropriate responses can be different in each country.

2. "Social dialogue is defined by the ILO to include all types of negotiation, consultation or simply exchange of information between, or among, representatives of governments, employers and workers, on issues of common interest relating to economic and social policy. It can exist as a tripartite process, with the Government as an official party to the dialogue or it may consist of bipartite relations only between labour and management (or trade unions and employers' organizations), with or without indirect government involvement. Social dialogue processes can be informal or institutionalized, and often it is a combination of the two" (http://www.ilo.org/ifpdial/areas-of-work/social-dialogue/lang--en/index.htm).

Abbreviations

ALMP	active labour market policy/programme
AnCO	An Chomhairle Oiliúna: Training Council (Ireland)
CPTE	Council for Professional and Technical Education (Singapore)
DTIS	Diagnostic Trade Integration Strategy
EDB	Economic Development Board (Singapore)
EGF	European Globalization Adjustment Fund
FAO	Food and Agriculture Organization of the United Nations
FÁS	An Foras Áiseanna Saothair: Training and Employment Authority (Ireland)
FDI	foreign direct investment
GAP	Good Agricultural Practice (UN FAO)
GJEPC	Gem and Jewellery Export Promotion Council (India)
GJSCI	Gem and Jewellery Skill Council of India
HRD	human resource development
HRM	human resource management
IALS	International Adult Literacy Survey
ICTs	information and communications technologies
ILO	International Labour Office
ISCO	International Standard Occupational Classification
IT	information technology
LFS	labour force survey(s)
LMI	labour market information
MSMEs	micro-, small and medium-sized enterprises

MTI	Ministry of Trade and Industry (Singapore)
NFQ	National Framework of Qualifications (Ireland)
NGO	non-governmental organization
NMC	National Manpower Council (Singapore)
NSDC	National Skill Development Corporation (India)
PES	public employment services
PIAAC	Programme for the International Assessment of Adult Competencies (OECD)
PSB	Productivity and Standards Board (Singapore)
RPL	recognition of prior learning
SCORE	Sustaining Competitive and Responsible Enterprises (ILO)
SMEs	small and medium-sized enterprises
STED	Skills for Trade and Economic Diversification (ILO)
STEM	science, technology, engineering and mathematics
STEP	Systematic Tracking of Exchanges in Procurement (World Bank)
TVET	technical and vocational education and training

1 Why do skills and trade matter?

1.1 Why this study?

Over recent decades the global economy has experienced a profound transformation, mostly as a result of the joint forces of trade integration and technological progress, combined with important political changes. There is no doubt that this transformation has been accompanied by significant positive effects at the global level. Increased trade integration has helped to raise incomes in advanced and developing economies, lifting millions out of poverty. Since the global financial crisis of 2007–08, however, trade, productivity and income growth have decelerated, partly because of a slowdown in the pace of trade reforms fuelled by a change in attitudes towards globalization and trade.

At the same time, the transformation of the global economy has also translated into change at the level of firms, of individuals – as workers or consumers – and of communities. As consumers, individuals benefit from lower prices and wider product variety. As workers, individuals need to adjust to changes in the labour market. While overall better job opportunities are expanding, some workers who are forced to leave their existing jobs find it difficult to access these opportunities. These workers feel left behind and they often blame globalization.

Indeed, an important part of the benefits of trade, or for that matter of technology, only materialize if economies adjust – often at a cost – to seize the opportunities offered by further integration or new technologies; and neither the benefits nor the costs are shared equally within countries. Overall, the benefits from trade or technological progress far outweigh the costs, but this does not mean that the costs and those who bear them can be ignored. Governments can play a crucial role in reducing adjustment costs and in spreading the benefits from trade more broadly. Policies aimed at facilitating adjustment can reduce the number of those left behind by trade or technology, while at the same time raising the net gains from trade and technology, improving overall efficiency and boosting income.

Reaping the benefits from global trade and effective integration into global markets goes hand in hand with the adoption of new technologies, improved forms of work organization and productivity increases. Given the role of skills in export performance, and in a country's capacity to absorb foreign direct investment (FDI) and to move up in value chains, a strong emphasis on skills development is vital. Human capital is one of the principal enablers of trade growth and economic diversification, and is also an important "buffer" which facilitates adjustment to more open trade.

In the current fast-changing context of globalization, where technology and trading relations evolve rapidly, the responsiveness of skills supply to changes in demand plays a central role from not only an efficiency but also a distributional perspective. Adjustment to trade opening, and to trade shocks more generally, as well as to the adoption of new technologies involves significant changes in firms' demand for workers and in particular in their demand for specific skills. The skills used in import-competing firms may differ substantially, in both quantity and quality, from those needed by export-oriented firms. Similarly, new technologies may render certain skills obsolete while also requiring new ones. Appropriate skills development policies are key to helping firms expand their export activities, and are also key to helping workers who lose their jobs make a smooth and rapid transition to new jobs with equal or higher wages.

Skills development policies are only one of the many policy instruments available to governments to lower adjustment costs and to redistribute the benefits from trade and technological progress. Other ALMPs, such as job-search assistance or activation strategies, passive labour market policies such as unemployment insurance or other income replacement policies, and social protection policies, as well as complementary policies such as housing or credit market policies, can also be used to lower adjustment costs, while various instruments are available to redistribute the gains from trade or technology to those who bear the costs from those changes. Nevertheless, this report argues that skills development policies have an important role to play in enabling more firms and more workers to participate in trade and to derive benefits from trade.

In this context, the report focuses on the role of skills in explaining trade patterns and performance, as well as on their role in mediating the effects of trade on economic efficiency and distribution. The objective of the report is to consider how coherence between trade and skills development policies can be ensured by shedding light on the

linkages between trade and skills, with a view to understanding when and how skills development policies can be used by governments to maximize the gains from trade and to ensure that these gains are shared broadly.

The report combines findings from the economic literature – both theoretical and empirical work – and lessons from the ILO's STED Programme. Economic theory provides a number of interesting insights regarding the effects of skills endowments on trade patterns and performance. It also helps us to understand the various channels through which trade affects the demand for skills; and it clearly spells out how changes in the demand for skills interact with the supply of skills in determining the impact of globalization on labour market outcomes. The empirical literature provides evidence on the various channels through which trade affects the demand for skills and shows that their importance varies with countries' levels of economic development. More recent studies also focus on the role of particular skills in shaping the impact of globalization on individual workers.

The ILO has a long record of providing technical assistance to its member States, with a particular emphasis on developing countries. Since 2010, the ILO has developed the STED Programme, which provides sector-level technical assistance on identifying the skills development strategies required for future success in trade. STED initiatives work with national and sectoral stakeholders in tradable sectors to understand the strategic development challenges facing each target sector, and the contribution that skills development can make to addressing those challenges. They enhance coordination between trade, development and skills policies, and identify strategies to meet the skills needs identified. Where funding allows, STED continues beyond the analysis to assist stakeholders and other development partners in implementing these skills development strategies.

Experience from STED has given the ILO a considerable amount of case-study evidence on the practical links between skills and development of tradable sectors, drawn from countries in Africa, Asia and Europe, covering sectors such as agro-food, furniture, metals, pharmaceuticals and tourism. The sum of this evidence does not provide a representative sample of data – it is based on a limited number of sectors (19) in a limited range of developing countries (11). Still, with very similar themes emerging across countries in different regions and at different stages of development, and across different sectors, it provides a rich and practical source of insights into the skills–trade nexus.

1.2 What do we mean by skills?

A skill is the ability to do something. When we address skills in the context of trade, we focus on skills that are useful in employment. The concept of skills encompasses job-relevant knowledge and personal attributes, as well as the specific competencies required to do the job. While competency and knowledge requirements vary greatly across occupations, industry sectors and geographical locations, and between and within firms, all jobs require skills. Other terms sometimes used with meanings overlapping that of skills include ability, talent, aptitude and competence.

The ILO explains employability skills as follows:

> the skills, knowledge and competencies that enhance a worker's ability to secure and retain a job, progress at work and cope with change, secure another job if he/she so wishes or has been laid off, and enter more easily into the labour market at different periods of the life cycle. Individuals are most employable when they have broad-based education and training, basic and portable high-level skills, including teamwork, problem solving, information and communications technology (ICT) and communication and language skills … This combination of skills enables them to adapt to changes in the world of work. (ILO, 2004, p. 3)

Most of the quantitative empirical literature on trade and skills simplifies this complexity and diversity with a division into two, or occasionally three, skill categories on the basis of either occupation or level of qualification. The exact criteria vary, but the division is typically between higher-skilled and lower-skilled workers, or between non-production, "white-collar", versus production, "blue-collar" workers. This paper aims to juxtapose the findings of this quantitative empirical literature on trade and skills with qualitative empirically derived information on trade and skills that reflects the complexities of the broader picture.

1.3 Main findings

Skills matter for efficiency. Globalization and trade can be powerful drivers of economic growth. Trade facilitates technology diffusion and helps firms increase their productivity through access to new technologies. It also enhances productivity by intensifying

competition and by offering new market opportunities for the most productive firms. Reaping the benefits of globalization thus implies upgrading technology, improving productivity and reallocating resources to more productive firms. The availability of workers with appropriate skills and capabilities is crucial for such adjustment. If skills supply responds swiftly to changes in demand, or indeed if skills development successfully anticipates emerging skills needs, adjustment costs will be lower and economies will reap more benefits from globalization.

Skills also matter for the social impact of globalization. On the labour market, the adjustment necessary to benefit from globalization translates into new vacancies as well as jobseekers. If laid-off workers and new graduates of education and training courses that are still designed to meet past needs have skill sets different from those sought by firms trying to seize new export opportunities, and these skill sets remain unchanged, their relative wages may fall, with repercussions for wage distribution. If, in the same circumstances, wages fail to adjust or other labour market frictions operate, mismatches may arise in the form of skills shortages and unemployment. If, however, workers can adjust their skill sets in response to or in anticipation of changes in demand, changes in wage distribution and adjustment costs will be reduced.

Depending on the national context, any or all of three different types of motivation may be significant in shaping skills-based responses to trade. First, skills are an important factor in establishing and developing comparative advantage. Skills development can be used as part of strategies to strengthen a country's trade performance, either through a broad emphasis on ensuring that skills development systems strengthen participation in trade or through more targeted skills development aimed at developing comparative advantage in specific activities. Good practice therefore includes a universal need for skills development systems to be responsive to the existing and emerging skills needs of tradable industries and their domestic supply chains. Second, if there is a trade-connected employment shock, this can have a persistent negative impact on the labour market prospects of workers who lose their jobs. Skills strategies to alleviate this include: reskilling and upskilling for workers who lose their jobs; education and training for workers who may be vulnerable in future, to strengthen transferable skills and make them more employable; and using skills development as part of strategies to build comparative advantage in replacement activities suited to meeting the aspirations of unemployed workers. Third, trade may tend to increase wage inequality by increasing the skill premium. Increasing the supply of in-demand skills inhibits this tendency by allowing more workers to access better-paid jobs.

Whichever of these motivations is compelling for a country or indeed for an internal region or economic sector, experience so far shows that countries have resorted to some or all of the following strategies:

- policy coherence and social dialogue to connect policies on skills, trade and related domains, and to make skills systems responsive to skills needs, both at national and sectoral levels;

- broad access to education, skills development and lifelong learning to better supply the skills needs of tradable industries, to make the employability of workers more resilient in the event of a trade-connected employment shock, and to make society less vulnerable to increased wage inequality arising from trade;

- investing in training for employed workers at all skill levels to enable implementation of effective business strategies, underpinning capabilities needed in tradable product and service markets;

- addressing impediments to adequate investment in skills by and for micro-, small and medium-sized enterprises (MSMEs) and their workers;

- building strong core work skills, with a particular focus on initial compulsory education, so as to underpin employability and the ability of firms to implement modern forms of work organization;

- deploying skills needs analysis and anticipation to inform policy coherence and social dialogue, and to inform decision-making by all relevant partners in skills development;

- strengthening labour market information (LMI) and employment services systems to provide and communicate the information needed by all, from governments to individual workers and students, to inform their decision-making;

- strengthening quality assurance and relevance in skills development so as to better meet the needs of industry and workers.

2 What do we know about skills and trade?

2.1 The availability of skills affects countries' trade patterns and performance

The level and dispersion of skills in a country can affect its trade pattern

The level of skills of a country's workforce can influence its comparative advantage. One theory of comparative advantage, predicts that countries endowed with more skilled labour would be likely to specialize in the production and export of relatively more skill-intensive products. The dispersion of skill levels also affects countries' comparative advantage.

More recent research has shown a quantitative effect on trade flows resulting not only from the aggregate endowment of human capital but also from the degree of skill-level dispersion, that is, the distribution of skill levels among workers, where a low dispersion means that all workers have very similar skill levels (see Bombardini, Gallipoli and Pupato, 2012; Grossman, 2004; Grossman and Maggi, 2000). Detailed data linking workers to their employers have become available providing information on workers' education, years of experience, demographic characteristics and wage history, as well as on the firms they work for, including their longevity, investments, employment levels and composition, industries of operation, and output and export records. Using this information, researchers have explored the sources of comparative advantage and the distributional effects of trade in much more detail than was possible before. With regard to sources of comparative advantage, among the questions they have focused on are whether and how the distribution of factors, and more specifically workers distinguished by their level of skills, affects trade and specialization patterns.[1]

There is indeed evidence that countries characterized by higher skill-level dispersion tend to specialize in industries that exhibit higher substitutability of low and high skills across tasks, that is, industries such as paper-making or leather-tanning, where poor performance in some tasks can be mitigated by superior performance in others. Bombardini, Gallipoli and Pupato (2012) use the scores of common literacy tests administered to households across a large sample of countries to measure skill-level dispersion.[2] Their estimates for 19 OECD countries suggest that countries at similar stages of development can differ substantially in the degree of skill-level dispersion. The United States and the United Kingdom, for example, display a more dispersed skill-level distribution, with a larger gap between the most skilled and the least skilled, than Sweden or Germany. Furthermore, cross-country differences in the standard deviation of scores are 1.6 times larger than cross-country differences in mean scores. The authors then explore the relation between skill-level dispersion and bilateral trade flows, and find that differences in bilateral trade flows by industry are correlated not only with cross-country differences in mean scores but also with cross-country differences in standard deviation. More specifically, they find that countries with higher skill-level dispersion export the products of those industries that exhibit weaker complementarities between workers' skills levels. Skill complementarities at the industry level are considered to be low when poor performance in some tasks can be mitigated by superior performance in others, which is the case in, for example, the paper-manufacturing or leather-tanning industries. In high-complementarity industries, on the other hand, poor performance in one task cannot be mitigated by superior performance in other tasks, and efficiency improves when workers of similar skill levels are employed in every stage of production. Examples of such high-complementarity industries include aerospace or engine manufacturing.

The evidence regarding the link between skill-level dispersion and comparative advantage has prompted economists to look for mechanisms that could explain it. The kinds of mechanisms they consider involve information asymmetries that prevent optimal matches between workers and firms.[3] Such inefficient matches have implications for relative outputs across sectors, as they are particularly costly in industries where the complementarities between worker talents are highest. This effect is strongest in countries with higher skill-level dispersion. In other words, the output of industries with higher skill-level complementarity is lower in countries with higher skill-level dispersion. These countries will thus specialize in industries with lower skill-level complementarity. Another explanation assumes workers are each endowed with multiple skills and focuses on how each worker will optimally choose an industry that maximizes the total output of his or her whole skill set (Ohnsorge and Trefler, 2007). In a setting where workers are endowed with two skills, for example, quantitative and communication skills, countries with high levels of endowment inequality will export goods that intensively use either skill,

but not both skills. This could for example explain US dominance in industries such as film and information technologies, and German dominance in machinery and other goods involving long chains of production with high complementarity of tasks.[4]

A similar reasoning has been applied to explain the difference between China's and India's respective comparative advantages. It suggests that China's relatively low skill dispersion could explain its comparative advantage in industries with longer production chains, while India's relatively high skill dispersion could explain its comparative advantage in industries with shorter production chains (see Asuyama, 2011, 2012). In 2005, the shares of workers who did not have access to primary education, who had access to primary and lower secondary education, and who had access to upper secondary and post-secondary education were respectively 50 per cent, 30 per cent and 21 per cent for India and 8 per cent, 73 per cent and 19 per cent for China. The length of production chains is defined as the intensity of intermediate input use in production. According to this definition, production chains would tend to be longer in manufacturing than in agriculture, mining or services, although variations would exist within sectors.

Skill levels and skills development policies affect trade performance

Empirical evidence suggests that the accumulation of human capital may help promote export diversification, while responsive skills development systems can enhance participation in trade.

A country's development path depends on its capacity to accumulate capabilities, including workers' skills, that lead to product diversification and quality upgrading (Hausmann and Klinger, 2007; Hidalgo et al., 2007; Hidalgo and Hausmann, 2009; Fortunato, Razo and Vrolijk, 2015). Two studies (Cadot, Carrere and Strauss-Kahn, 2011; Agosin, Alvarez and Bravo-Ortega, 2012) find a negative and significant correlation between the level of human capital and a measure of export concentration, while another (Parteka and Tamberi, 2013) finds no significant correlation. The rationale behind the correlation between human capital and diversification, if it exists, could be that human capital accumulation allows countries to change their specialization patterns from commodities to manufactured goods or services with a greater input of knowledge. Given that technologies developed in advanced economies are typically tailored to the needs of a skilled workforce and therefore inappropriate for skill-scarce countries, the greater availability of specialized human capital and the lower relative cost of this input may allow firms to adapt existing goods and technologies to the national environment, which may induce export diversification.

Box 2.1: Skills measurement

Different measures for skills are used for different purposes and in different contexts. We focus on five main approaches here:

1. Most of the economics literature on trade and skills quantifies skills by categorizing workers between two categories – low-skilled and high-skilled – or three categories – low-, medium- and high-skilled. The categorization is usually made on the basis of occupation (where occupations are grouped into each level), level of qualification or years of schooling.

2. Much of the wider skills literature focuses at a lower level of aggregation when approaching skills quantitatively. Again, indicators such as occupation, level of qualification, field of study, years of schooling or years of work experience are often used as measures of skill, although they are often considered more as quantitative proxies for skill rather than as direct measures. Data on occupations and qualifications are most often used in the skills literature, especially in describing and modelling supply of and demand for skills. Labour force surveys provide accessible data on a number of these indicators at national level for most countries that can be disaggregated by sector, gender or other criteria to an extent that is constrained by sample size. Skills surveys of employers and of workers typically provide coverage of a number of these indicators, as well as collecting other data on skills.

3. Qualitative analysis of skills is typically carried out on the basis of variants of the following suite of factors, one or more of which may also be measured in some quantitative work: (a) *foundation skills*, such as literacy and numeracy; (b) *vocational or technical skills*, covering skills and knowledge required to do specific work; (c) *personal skills*, such as honesty, integrity and work ethic; and (d) *core work skills*, which include the abilities to learn and adapt; read, write and compute competently; listen and communicate effectively; think creatively; solve problems independently; manage oneself at work; interact with co-workers; work in teams or groups; handle basic technology; and lead effectively as well as follow supervision. Surveys of employers, and surveys or skills testing of workers, can provide quantitative data on these skills. For example, the OECD's Survey of Adult Skills, conducted by the Programme for the International Assessment of Adult Competencies (PIAAC), surveys 5,000 adults in each country covered, testing literacy, numeracy and "problem-solving in a technology-rich environment", and collecting information about how skills are used in the workplace under the headings of cognitive skills, interaction and social skills, physical skills and learning skills. The World Bank's Systematic Tracking of Exchanges in Procurement (STEP) programme similarly surveys households, assessing reading proficiency and related competencies; personality, behaviour, and attitudes to time and risk; job-relevant skills that respondents possess or use. Meaningful quantitative research into detailed technical/vocational skills requires a focus on specific occupations and sectors. At the most detailed level, direct measurement of skills involves detailed job analysis, occupation analysis and skills testing.

4. Some skills research and policy literature classifies skills as cognitive and non-cognitive, drawing on the work of Hanushek and Woessmann (2008). The main underlying logic is that individual labour market outcomes and overall national economic performance are significantly influenced by the quality of education, as well as its duration. A further consideration is that the quality of non-cognitive skills (including personal skills) in the labour force correlates positively with the quality of cognitive skills. Indicators for cognitive skills are typically sourced from standardized testing at secondary level, school grades at secondary level, or standardized testing of adults in skills learned mainly at school, such as literacy. This analytical framework focuses attention on the importance of the quality of schooling, and on the contribution schooling makes to overall skills quality. However, when used to the exclusion of other measures of skills it addresses directly only a subset of those skills that are important in the workplace, and directs attention away from the contribution that TVET, higher education and workplace learning make to skills development.

5. In addition to being concerned with absolute measures of skills, skills policy is also concerned with relative measures covering issues such as skills shortages; gaps and deficiencies in the skills of workers, new labour force entrants or other new recruits; and underutilization of skills. It is further concerned with measuring the process and outputs of skills development, whether in the form of workplace training or in the form of education and training through TVET, higher education or other providers. Important sources of data and other information include surveys of employers, surveys of workers, labour force and other household surveys, administrative data from public and private employment services, surveys of job advertisements, administrative and survey data from education and training providers, and consultations with industry and experts.

Skills policy is concerned not just with the current match between available skills and the self-identified needs of industry, but also with identifying the changes required to match future skills supply with the likely future needs of industry. A range of qualitative and quantitative methods can be used to address this need, using any or all of the types of skills indicator described in this box.

Countries with responsive skills development systems and the capacity for effective anticipation of skills needs are more successful in using skills in more skill-intensive tradable activities, with consequent impacts on trade. The econometric literature on trade and skills demonstrates that a country's endowment of skills has an impact on its trade patterns and export performance. However, the indicators of skills on which this literature is based are pitched at a high level of aggregation. It is also important to establish how well the skills of workers within each high-level occupational or

qualifications category meet the specific needs of industry at a more detailed level, in terms of both current needs and the skills needed to enable industry to develop in line with national and sectoral ambitions. To a great extent, this ability is a function of the responsiveness of skills development systems to current and anticipated future skills needs. Countries that are well integrated into international trade, with well-diversified, high value-added exports, almost universally have well-developed systems for initial and continuing education and training, and for workplace learning, that are responsive to the demands of exporting and export value-chain industries, in terms of both responding to current demands and taking a forward-looking approach to planning. Experience under the STED Programme shows that lack of responsiveness in skills development systems is a key barrier to meeting the current and emerging skills needs of exporting and export value-chain industries in developing countries. Underlying this lack of responsiveness are shortcomings in resourcing and capacity among skills development providers, and within the skills systems themselves, as well as weak mechanisms for system governance in terms of industry engagement, identification and anticipation of skills needs, and quality assurance.

2.2 Trade tends to increase the demand for skills

Trade, in part through its interaction with technological innovation, tends to raise the demand for high-skilled workers relative to that for low-skilled workers, which, depending on the supply of skills, raises the share of high-skill employment and/or the skill premium. On a more detailed level, it also changes the composition of the demand for skills within each skill level, as reflected especially in occupations, levels of qualification and detailed skills requirements within occupations.

This section proceeds in four parts. The first spells out the mechanisms through which trade affects the demand for skills and thus the respective shares of high-skill and low-skill employment and/or the skill premium, that is, the ratio of high-skill to low-skill wages. The second discusses evidence from the STED Programme on how trade affects the demand for skills, which moves the discussion to a more detailed and disaggregated level of skill categorization and analysis. The third considers the evidence on the effects of trade on employment by skill levels and on employment-related effects of possible mismatches between the demand and supply of skills. The fourth reviews evidence of the impact of trade on wages by skill level, including the skill premium.

Economic theory identifies several channels through which trade may affect the demand for skills

Economic theory identifies a number of important linkages between trade, skills development policies and labour market outcomes. It helps explain how trade and its interaction with technology may affect the demand for high-skilled as opposed to low-skilled workers, and how, depending on the supply of skills, employment and wages adjust.

Economists have proposed a range of models to explain how international trade can affect the demand for skills. Each model isolates a particular channel relevant to the type of trade, the level of economic development of the trading partners or the interaction with other factors such as technology.

There are four main mechanisms through which trade may affect the relative demand for skills. A reduction in trade costs tends to relocate resources towards sectors in which countries have a comparative advantage. This may increase the relative demand for skills in countries with a comparative advantage in skill-intensive sectors. Second, within each sector, a reduction in trade costs may also relocate resources towards the most productive and skill-intensive firms, potentially raising the relative demand for skilled workers in each of them. Third, as the costs of offshoring decrease, the least complex and locationally dependent stages that were still performed onshore in high-income economies may relocate to low-income economies. These newly offshored tasks would nevertheless be more complex compared to the already offshored stages, so that the average complexity of tasks performed in both countries could increase, pushing upward the relative demand for skilled workers everywhere. Finally, lower trade costs may trigger skill-biased technological change that raises the productivity of and increases the relative demand for skilled workers in both exporting and importing firms in developed and developing countries alike, thereby also contributing to increased demand for skills.

Comparative advantage may affect the demand for skills

In the short term, trade liberalization between countries with different levels of skill endowments is likely to change the relative demand for skills in each of them. This particular mechanism may work in the skill-abundant country to increase the relative demand, while in the country where skilled workers are relatively scarce it could result

Box 2.2: The skill premium and the relative demand for high-skilled workers

Figure 2.1 The skill premium and the relative employment of high-skilled workers

A simple supply and demand diagram (figure 2.1) can help clarify how the skill premium and the relative demand for high-skilled workers are related. The horizontal axis represents the relative employment of high-skilled workers, i.e. the number of employed high-skilled workers divided by the number of employed low-skilled workers. The vertical axis represents the skill premium, i.e. the wage of high-skilled workers relative to the wage of low-skilled workers. Because the axes are measuring relative quantities and relative prices, we can plot the relative demand for and the relative supply of high-skilled workers. The relative supply curve is upward-sloping, and shows that if the wage of high-skilled workers increases relative to the wage of low-skilled workers, more high-skilled individuals will be willing to work (or more workers will acquire skills). The relative demand curve is downward-sloping, and shows that as the relative wage of high-skilled workers increases, firms are going to demand relatively fewer high-skilled workers. The intersection of the two curves gives the relative wage and relative employment which prevail (in equilibrium) in the economy. If the relative demand increases at any given relative wage, the relative demand curve shifts to the right. If the relative supply does not move, the new equilibrium skill premium is higher, and so is the relative equilibrium employment. Both relative prices and relative quantities

have increased. A shift of the relative supply may compensate for the shift in the relative demand and result in a new equilibrium where relative employment increases but the skill premium does not change. There is abundant empirical evidence that in many economies in the past 30 years the skill premium has increased alongside increases in educational attainment, which suggests that the relative demand for high-skilled workers increased faster than their relative supply. Three channels can generally explain this outward shift of the relative demand curve: a change in product demand (increased demand for high-skill-intensive goods), skill-biased technological change (new technologies complement high-skilled workers), and international trade (relocation of workers towards high-skill-intensive industries and high-skill-intensive firms).

in a fall in the relative demand. However, empirical evidence does not support the latter prediction.

As noted on p. 23, countries' trade patterns tend to follow the principle of comparative advantage, and the endowment theory of comparative advantage would suggest that countries specialize according to their relative endowment of production factors. This particular theory would suggest a force at work in countries that are abundant in skilled labour that leads them to specialize in, and thus be likely to export, skill-intensive products. When trade barriers decline, this particular mechanism would suggest that the skill-intensive sector in skill-abundant (high-income) economies would expand, while it would tend to have the opposite effect in (low-income) economies where skilled labour is scarce. This element of comparative advantage might have implications for the relative demand for skills in each economy. In the high-income economy, it would tend to expand the skill-intensive exporting sector and to contract the import-competing sector, potentially leading to an increase in the relative demand for skilled workers. This is because the expanding industry needs relatively more skilled workers than the contracting industry releases. Since this model of comparative advantage assumes that the relative supply of skilled workers remains unchanged, the increased relative demand would result in an increase in the wage of high-skilled workers relative to that of low-skilled workers. Note that the situation would be the opposite in the low-income country, where the relative demand for high-skilled workers would decline, thereby reducing the skill premium. However, this prediction has been contrasted with empirical evidence that suggests that the demand for skills has increased in most countries, as discussed in more detail on p. 58. More recent theoretical literature has emphasized several other mechanisms that explain better the observed patterns.

Offshoring may increase the demand for skills in both developed and developing countries

As the costs of offshoring decrease, the least complex and locationally dependent stages that were still performed onshore in high-income economies may relocate to low-income economies. These newly offshored tasks are nevertheless more complex than those already offshored, so that the average complexity of tasks performed in both countries may increase. This mechanism would work towards pushing up the relative demand for skilled workers everywhere. Theory suggests that skilled workers benefit from offshoring but that the effect on low-skilled workers may be ambiguous.

Differences in the ability to produce complex products are one of the drivers of trade in parts and components. Since advanced economies' skill abundance gives them comparative advantage in complex products, their firms tend to offshore their least complex activities to less developed economies. As globalization proceeds and the coordination costs of offshoring production decrease, more stages become less locationally dependent and thus can be profitably offshored. The logic of comparative advantage dictates that the high-income country would offshore the least skill-intensive tasks from the range it was previously performing.[5] The remaining tasks still performed at home would then become more skill-intensive on average. In the low-income country, the newly offshored tasks would be more skill-intensive than all the tasks that were previously performed. The key mechanism here is that the least skill-intensive tasks in the high-income country become the most skill-intensive tasks in the low-income country.[6] The relative demand for skilled workers would thus increase in both countries.

Theoretical models identify three ways in which a fall in the costs of offshoring may affect low-skilled workers in high-income countries. First, as noted above, offshoring of simple tasks may reduce the relative demand for low-skilled workers, which would put a downward pressure on their wage. Second, the cost of tasks that are offshored would decline, leading to a decrease in the overall cost of production. This acts in just the same way as an improvement in the productivity of workers who perform the remaining onshore tasks, including low-skilled ones, and would push their wages upwards. Finally, there can be the so-called terms-of-trade effect. The decrease in the production cost may lead to a decrease in the price of the good when a country is large enough for its producers to influence world prices. Since this effect is stronger for goods whose production makes intensive use of simple tasks, and thus employs relatively more low-skilled workers, it would bring down the relative wage of low-skilled workers.[9] Overall, this theory predicts that while wages of high-skilled workers may increase as a result

Box 2.3: What is offshoring?

Offshoring refers to transferring abroad part of the production (or a task) that was (or could have been) done by the firm in its home country.[7] The motivation behind offshoring is rooted in the interaction between comparative advantage and coordination costs. The following example, taken from Hummels, Munch and Xiang (2016, p. 5), gives a good description of the mechanism at work: "China may have a comparative advantage in assembly of electronic components produced in Malaysia based on designs from US engineers, but to disaggregate these tasks profitably, to offshore them, requires effective coordination and inexpensive shipment." In this example, the United States has a comparative advantage in the design of the product, Malaysia has a comparative advantage in the production of the electronic components, and China has a comparative advantage in the assembly of the product. Part of this comparative advantage pattern is based on domestic production costs. However, for offshoring to be profitable, additional costs such as those of coordination and supervision must not be excessive. The firm offshoring part of its production process needs to make sure that the intermediate input it is purchasing meets its requirements.[8] This coordination process is costly and has to be taken into account by the firm in its decision to engage in offshoring. Finally, trade costs are important, since by definition offshoring implies the transport of goods across national borders. To sum up, a firm makes the decision to offshore part of its production process on the basis of (foreign and domestic) production costs, coordination and supervision costs, and international trade costs. It is apparent that as the costs of trade between countries fall (due to new and/or cheaper transport technologies, lower tariffs and/or better communication networks), offshoring becomes more profitable, while it becomes less profitable as production costs fall at home.

of offshoring, the effect on low-skilled workers may be ambiguous. They may see their wage increase if the productivity effect dominates the other two effects; they may see no change if the three effects perfectly cancel one another out; or they may see their wage fall if the positive productivity effect is not strong enough. Which effect dominates is therefore an empirical question, to which we turn to on p. 53.

Trade liberalization may lead to the expansion of high-productivity firms, which increases the relative demand for skilled workers

International trade may lead to firm selection, whereby the least productive firms may be driven out of business and the most productive firms expand. More productive firms tend to employ relatively more skilled workers and have higher returns to skills, which would translate into a higher relative demand for skills.

When globalization opens up new trading opportunities, the most productive firms try to seize them and expand their production. To do this, they need the relevant resources, including relevant skills. At the same time, however, globalization stiffens competition on the domestic market, and the less efficient firms may see their sales decline or close down, with repercussions in terms of lost jobs.[10] On the labour market, this adjustment process translates into changes in supply and demand or, in other words, jobseekers and vacancies. If firms trying to seize new export opportunities need more high-skilled workers while low-productivity firms lay off more low-skilled workers, demand would exceed supply in the high-skill segment of the labour market and supply would exceed demand on the low-skill segment.

Both technology and skilled workers are important determinants of firms' productivity. Significantly, there is strong evidence that the two factors are complementary, meaning that skilled workers can be more productive when working with better technology, and better technology requires skilled workers for its potential to be fully exploited. This means that returns to skills are higher in firms that use better technology. Consequently, high-skilled workers employed in the most productive firms can earn higher wages than workers with the same skills in less productive firms. Since trade liberalization leads to the expansion of the most productive firms, it also means that more high-skilled workers can find jobs that pay a high wage premium.

These mechanisms have two main implications. First, trade may increase the demand for skills in all countries, pushing the skill premium upwards. Second, trade may also increase the wages of high-skilled workers employed at exporting firms relative to those of high-skilled workers employed by non-exporters. Importantly, how wide this exporter wage premium becomes depends on the fixed costs that firms have to incur when they want to sell into foreign markets. In a scenario where there are no fixed costs, even the least productive firms have some chance to export. Lowering variable trade costs such as tariffs would not have any impact on the wage gap between high-skilled workers employed in exporting and non-exporting firms respectively, because it would benefit all firms and would not induce any reallocation of workers between firms. On the other hand, in a scenario where fixed costs associated with exporting, such as the costs of setting up a distribution network, of complying with regulations or of obtaining brand recognition, patents and licences, are high, lower tariffs would benefit only the few most productive firms, which can afford to pay the fixed costs, and would hurt domestic firms that face import competition. This expansion of the large, most productive firms at the expense of the small, least productive firms would then create or increase the exporter wage premium for high-skilled workers.[11]

Trade-induced technological change may lead to a higher relative demand for skills

Globalization provides increased incentives and opportunities to raise productivity and product quality. Firms may increase investment in research and development and upgrade their technology, which can lead to an increased relative demand for skilled workers.

A large body of literature argues that technological progress is the most important driver of the demand for skills (see e.g. Autor, Levy and Murnane, 2003; Michaels, Natraj and Reenen, 2014). In some cases, technological progress and trade may go hand in hand and jointly increase the relative demand for skilled workers. As speculated some time ago by Wood (1994), trade with low-wage economies can trigger technology upgrading in developed countries, which increases the need for high-skilled workers. While at the time Wood was writing such trade accounted for only a small share of developed countries' total trade, the situation changed in the mid-1990s and early 2000s, possibly accelerating the adoption of technologies that raise the demand for skilled workers. In developing countries, better access to new technologies through imports can also be an important driver of the demand for skills.

As discussed in the previous paragraphs, import competition puts pressure especially on low-productivity firms. One way in which these firms can respond is by investing in innovation that makes them fit to face the competition. This includes increasing productivity and/or product quality, or differentiating their products from those of their competitors. Thoenig and Verdier (2003) propose one such mechanism. In their model, firms engage in what the authors call defensive skill-biased innovation to avoid imitation or leapfrogging. This innovation takes the form of an increase in the tacit knowledge that firms embed in their production process. This knowledge is difficult to imitate and confers a competitive advantage on the firm. It also requires a larger share of skilled workers. The authors argue that firms engage in defensive innovation by "complexifying [their] products or work organizational methods, and by relying more on noncodified workers' know-how. This last solution, in turn, requires relatively more skilled workers" (Thoenig and Verdier, 2003, p. 710).

Bustos (2011) sets out a complementary mechanism in which exporters have more incentive to upgrade their technology when trade costs fall. This is because their sales on foreign markets become more profitable, which in turn gives them an incentive to invest in more advanced technologies to increase their productivity. Since advanced technologies

often substitute for low-skilled workers and require servicing and operation by relatively high-skilled workers, the relative demand for skills by exporters may increase.[12]

Furthermore, exporters from developing economies may have an incentive to upgrade the quality of their products when they gain better access to rich markets. This argument, proposed by Verhoogen (2008), is based on the assumption that firms can produce output of different qualities and that the export (rich) market demands higher-quality product than the domestic market. As trade costs fall, more firms are able to enter the export market, and existing exporters can sell more to foreign consumers. Because they would sell only high-quality products to the foreign consumers, the average quality they produce would rise. Since the assumption is that production of a high-quality product requires more skilled workers than that of a low-quality one, an expansion of export production for rich markets would lead to an increase in the relative demand for high-skilled workers.[13]

Finally, imported technological change may be an important driver of demand for skills in developing countries that rely on imports for most of their capital equipment (Burstein, Cravino and Vogel, 2013). The adoption of new technologies and the building of incremental new-to-firm innovations and know-how around them, rather than deep innovation, is the main driver of technical change in developing countries.[14] When imports of capital equipment become cheaper owing to lower trade costs, new technologies embedded in such equipment become more accessible and thus more profitable to adopt. The complementarity between advanced technology and skilled workers would then increase the demand for skills.

Evidence from the STED Programme sheds light on the many interlinkages between trade and the demand for skills

Trade affects not just the level of skills demanded, but also the subject matter of those skills. Reflecting this, practical strategies on skills very frequently focus on achieving a better fit between skills demand and skills supply within a level of qualification or level of occupation, rather than between levels. The ILO's STED Programme provides evidence on common patterns in skills requirements in tradable sectors in developing countries, taking account of these complexities.

While quantitative work on trade and skills (reviewed in the previous section) typically uses the level of a worker's occupation or the level of their qualification as the measure of their skill, these indicators provide only partial information on the skills possessed that

are important in the workplace. There are major differences in detailed skills content between occupations classified as being at the same level, as there are also between qualifications at the same level in different fields of study. Even for workers classified as being in the same occupation and qualified to the same level in the same field of study, there may be workplace-relevant differences in skills arising from different job requirements, different work and education histories, differences in subject content within the field of study in which the worker's main qualification is held, and differences in continuing education and training, and in workplace learning.

The ILO's STED Programme provides evidence relevant to subject matter, observing patterns in business capabilities needed that shape the skills required for firms in these sectors to underpin comparative advantage, enabling them to participate effectively in tradable markets, whether exporting or import-competing.

The STED Programme also examines how trade opening affects skills needs

The need to comply with regulations, standards and customer expectations in foreign markets is among the key factors driving changes in skills needs.

Across all sectors analysed under STED, there are consistent patterns in the impacts trade opening and other forms of market change have had – and are continuing to have – on what firms in tradable sectors and the value chains in which they participate have to do well. These patterns are among the key factors shaping current and future skills needs.

Trade opening exposes the tradable sectors analysed to competition with more sophisticated global and regional firms and value chains. Firms in these tradable sectors come under pressure to conform to international benchmarks for performance, which are more demanding than local market requirements.

For the sectors analysed through STED, the impact of trade opening has been spread out over time, and the degree of exposure to sophisticated international competition has increased progressively. While benefiting initially from some combination of cost advantages, access to domestic resources and incumbent advantages in domestic markets, the tradable sectors analysed have had to adjust to competition and opportunities over time by adopting and adapting business practices, technologies and innovations in use internationally. Most of this change has been led by large firms capable of entering

Box 2.4: Sectors and countries analysed in the STED Programme

To date, the ILO's STED Programme has analysed the current and future skills needs of 19 tradable sectors in 11 developing countries in Africa, Asia and Europe.

Eight of these analyses have been in agro-food or food processing; four in tourism and hospitality; two in pharmaceuticals manufacture; two in metals and metallurgy; and one each in ready-made garments; furniture; and a composite "light manufacturing" sector. Sectors are selected for analysis within the programme on the basis of criteria including national development priorities, the anticipated scope for skills to have a positive impact on the sector's effective participation in tradable markets, the scope for this impact on trade to have a positive and inclusive impact on employment, whether directly or indirectly, and the scope for the sector's development to contribute to economic diversification. Where sectors depend significantly on domestically produced inputs, the focus extends beyond the tradable sector itself and along the domestic parts of the value chain in which it participates. For example, participation of an agro-food sector in trade often connects large numbers of small, otherwise marginal, farms to export markets. These selection criteria have collateral implications for the profile of businesses in the sectors on which the STED Programme has focused to date. The sectors are ones in which firms, including exporting firms, are predominantly domestically owned and managed. Even if there are some significant FDI operations in the sector, the main focus in the analysis is on domestically managed operations.

In general terms, the sectors analysed through STED tend to comprise a minority of large firms that are likely already to export and to compete directly with imports in the domestic market, alongside greater numbers of medium-sized firms that mostly serve the domestic market – often with niche products – and may already export. The extent to which small and micro-enterprises feature varies, but for many of the sectors analysed these smaller businesses account (directly or indirectly) for a major share of employment and for by far the greatest number of enterprises. In agro-food, tourism and the one furniture sector analysed (in Egypt), large numbers of micro-enterprises play an important role in the sector or its domestic value chain, although often in supplying inputs to those parts of the sector that supply domestic markets rather than export markets.

In the sectors analysed, large firms are the most likely to export independently, and were usually already important players in their domestic markets prior to the accelerated integration of international trade that occurred from the early 2000s. Medium-sized firms rely more on intermediaries, on joining regional and global value chains controlled by a foreign value-chain leader, or on supplying intermediate inputs to larger firms for access to export markets, or may instead focus on their domestic market. Small firms and micro-enterprises either serve local markets, or rely on intermediaries or on supplying inputs directly to larger enterprises to aggregate their production and connect them to national and international markets.

The extent to which sectors analysed have potential to increase exports varies. In Malawi, for example, exports of oilseeds are already growing rapidly, and the analysis shows potential to reinforce this growth and to develop exports of oilseed-based products; however, the immediate priority in horticulture is to level the playing field with neighbouring countries, resulting initially in a more equal flow of trade in horticultural products with regional neighbours. Even so, for all sectors the analysis showed substantial potential to improve the sector's ability to participate effectively in tradable markets, with likely benefits in productivity and total output, and with an expectation that the net impact on employment in the sector (including its domestic value chain) would be positive. That impact might be positive in terms of numbers employed, or in terms of people hitherto under-employed or in low-productivity employment becoming more fully employed.

export markets independently, followed by firms that have learned from them, often collaborating with others, and has diffused to their domestic competitors and along their domestic value chains.

Regulations, standards and customer expectations are key factors driving these changes. Compliance with regulations and with required standards is necessary to gain access to foreign markets. Compliance with customer expectations, which may include compliance with voluntary standards, is necessary in order to establish and maintain stable trading relationships with markets. Entering demanding markets is challenging for developing-country exporters whose home markets are less demanding. It becomes more challenging as regulations, standards and customer expectations in developed-country markets become more demanding, and as requirements in developing-country markets to which they may export converge on those of developed countries.

Harmonization of regulations and standards between countries makes these challenges more manageable, and several of the countries in which sectors have been analysed under STED are helping their exporting sectors comply with market access requirements by developing their own regulatory and standards regimes in the direction of convergence with those of demanding export markets. In agro-food, for example, this can involve establishing regulations and an effective national food safety system, developing testing facilities, and establishing mechanisms to educate businesses and their workers at all stages of the value chain in good practices and compliance. In addition to placing pressure on firms to comply with standards and regulations external to their business, trade also places pressure on them to behave in a less ad hoc manner internally, so as to

deliver products and services that meet customer expectations for product consistency and quality, and so as to reduce internal waste. This induces them to establish and comply with product and process standards internal to their own business. In principle, this is different from complying with external standards. However, as it is more efficient to integrate work on establishing and complying with internal standards with other compliance work, the impact on requirements for capabilities and skills is similar.

The international norm is now for customers to demand a high degree of flexibility and responsiveness from suppliers of goods and services. Modern operations management practices emphasize minimizing the level of stock held by manufacturers, retailers and many intermediaries. International customers expect their suppliers to deliver reliably in accordance with agreements, and to be able to change what is delivered in response to changes in end customer demand. They expect a quick turnaround on changes in design or other product characteristics that are required for success in the end market. Achieving this degree of flexibility and responsiveness is difficult, and is a barrier to exporting for firms in developing countries.

The developing-country firms in sectors targeted under STED are in many cases constrained in their ability to meet end-customer requirements on products, services and flexibility, and to comply with regulations of importing countries, and such constraint may emanate from weaknesses in the supply chain that provides their inputs as much as from their own internal deficiencies. These may be weaknesses within the country, as with food-processing firms dependent on the performance of local farmers and intermediaries. Or they may be weaknesses in linking to international sources of supply, such as for example with the Egyptian furniture sector, which is almost entirely dependent on imported timber. Cost considerations make the sector's raw material supply chains dependent on sources of unreliable quality; most smaller firms do not have the capability to manage these sources effectively, which has a negative impact on their product quality. Where the supply chain is domestic, it is in effect an extended part of the exporting sector, whose performance affects the performance of firms involved directly in exporting and in import competition. Resolving these supply-chain problems depends in part on addressing skills deficiencies in the supply chain, and the evidence from STED is that this is among the key areas where skills can make a difference to trade.

International markets for products and services are also subject to emergent change in the products and services demanded and in the competitive environment, driven by political, economic, social, technological, environmental and legal factors: some of this change is predictable, as the playing out of trends that continue over time, and some of

it is discontinuous and hard to predict. Tradable sectors in developed countries that have long been exposed to this sort of change tend to have mechanisms to cope with and indeed benefit from it, with strengths in marketing, innovation, continuous improvement and change management.

Developing-country sectors analysed under STED are less well adapted to this sort of market change. To the extent that they can compete on the basis of low-cost strategies after market opening, the price advantages that they can bring to the market offer some protection initially. However, these advantages lessen as costs and incomes rise, and firms have to respond by becoming more flexible, by upgrading, and by offering products and services that are differentiated from those of competitors. To achieve this, the business capabilities of developing-country tradable sectors, and their domestic value chains, must converge in strength on those of their developed-country counterparts.

Some areas of business capability are important to competing

All of the business capability bottlenecks common across sectors analysed under STED have skills and knowledge at the centre.

Across the whole range of sectors addressed through STED in different developing countries, similar bottlenecks in business capabilities appear. The key business capability bottlenecks common across most – in some cases all – of the sectors analysed are in:

- efficiency and effectiveness of operations;
- compliance with standards and regulations;
- marketing, sales and channel management;
- innovation, product design and product development;
- supply chain management and procurement;
- value-chain development.

The sectors addressed through STED are almost universally constrained by weaknesses in the efficiency and effectiveness of operations that affect their productivity, their ability to respond effectively to customer demands, and usually the quality of their products or services.

Box 2.5: The notion of business capabilities and their relationship with skills

The ILO's STED approach places identification of the business capabilities required for future success in internationally tradable markets at the centre of its analysis of a sector's skills needs. A business capability is something significant that businesses can do that contributes to their ability to achieve their objectives. A sector's business capabilities chiefly lie in the capabilities of its own firms, but the capabilities of local suppliers, service providers, regulators, research institutions and other complementary types of organization often also contribute to business capabilities, either by themselves or in combination with the sector's firms. Business capabilities are characteristics of organizations, although worker skills form an integral part of most business capabilities. All sectors have existing business capabilities, built up from the technologies they use, the manufacturing and business processes they apply, the skills of their workers, their forms of work organization, and the infrastructure to which they have access, among other factors.

STED uses the business capability concept to connect a development-oriented vision of the future for the sector with the skills needs that follow from that vision. It assesses gaps between the business capabilities that the sector has now and those that will be required for future success in tradable markets. It then assesses what skills will be needed in order to close those gaps.

The approach straddles the management and trade literatures on capabilities. From the management literature, the capability-based view of the firm is of "resources and organizational capabilities as the principal source of sustainable competitive advantage and the foundation for strategy formulation" (Grant, 1996, p. 375). This is similar to the technological capability approach from the trade literature, which "suggests that comparative advantage depends more on the national ability to master and use technologies than on factor endowments in the usual sense" (Lall, 2000, p. 4). Technologies, and the skills, knowledge and business practices to apply them effectively, are so central to firm-level and sector-level capabilities that technological capability and business capability represent just slightly different perspectives on the same underlying concept. This is especially the case when technologies are taken to encompass soft technologies such as approaches to business organization, as well as hard technologies embodied in physical devices and software.

This is partly a matter of lower investment in technology, which is in turn a consequence of choices about the design of operations that are more labour-intensive than those of developed-country competitors, and partly a matter of constraints on investment. However, it is also substantially a consequence of deficiencies in how these enterprises

operate in terms of the skills of front-line workers, how processes are designed, how equipment is used, how work is organized and managed, and how the overall business is managed. These factors are largely determined by the skills of workers and managers at all levels, both directly and through the endowment of tacit knowledge that is embedded incrementally in operations over time.

Most of the sectors analysed through STED are constrained by weaknesses in their ability to comply with standards and regulatory requirements for full access to key markets. Developed-country markets are especially demanding, and firms in these sectors have greatest difficulty in complying with the standards that they require and with their regulations. However, with standards required by developing countries also rising, we have seen multiple cases where significant exporters in a sector have lost access to export markets when they have been unable to respond quickly to new regulations. Compliance is an especially important matter in sectors such as food and pharmaceuticals that are highly regulated. However, it is also important in other sectors, for example in furniture, where fire safety, wood finishes and documenting the sustainability of sources of timber are salient regulatory issues. The importance of compliance is not limited to export markets: firms must also be able to provide safe products of good quality to their domestic market, to protect occupational health and safety, and to meet their relevant internal standards to operate effectively. While technology has an important role to play – from safety switches and guards on machines to the information technology systems needed to manage regulatory approvals and documentation – compliance is fundamentally based on the skills and knowledge of workers and managers, on consistent application of suitable operating and business processes, and on a business culture capable of supporting these factors.

Businesses that have the ambition to participate more effectively in international trade must understand the markets in which they expect to operate, and must have the capability to promote their products in those markets, to sell to those markets, and to distribute their products and services to customers. They do not need to have all of these capabilities in-house; firms regularly make use of mechanisms such as agents, distributors, importers or group marketing schemes to help them reach export markets, or sometimes even in serving their domestic markets. In many countries, governments supplement the export marketing capabilities of firms through mechanisms including export promotion agencies and state promotion of tourism. However, while many exporting firms will always depend on partners to reach export markets, the evidence across a range of exporting sectors analysed through STED is that strengthening firms' internal marketing capabilities is a necessary part of strengthening their position in export markets. Firms in developing countries new to exporting often start by being highly dependent on partners and on

opportunistic sales. However, if they are to be successful over the longer term, they must build market knowledge and market relationships over time, and build the marketing and channel management capabilities required to underpin this. Strong capabilities in marketing, sales and channel management are based on the skills and knowledge of those working in these areas, with support from cumulative investment over time in information technology, marketing materials, business processes, physical infrastructure and relationships with partners.

Incremental innovation in processes and products is a normal feature of business globally, without which it is now difficult for a business to remain competitive in either tradable or non-tradable sectors. As businesses in tradable sectors seek to participate more effectively in international trade, the pressure for deeper innovation increases. Innovation is required to raise productivity, improve quality, appeal more to customers, move into more attractive market segments and/or to differentiate an enterprise or product more effectively from its competitors. At the most basic level, this requires introducing approaches to work organization that favour incremental innovation, such as "lean management" or "kaizen". Beyond this, it requires the development or sourcing of deeper capabilities in innovation that may come from engineering, marketing, design, science or combinations of these, informed by understanding of the domain in which the innovation is needed. When participating in analysing tradable sectors under STED, the ILO's sector partners regularly identify a need to strengthen both process and product innovation, so as to underpin their capability to participate in traded markets. Again, strong capabilities in innovation are based on the skills and knowledge of those working in these areas, with support from the accumulation of investment and experience, and often relationships with external partners.

The ability of firms to source the inputs they need, purchase them efficiently, and cope with both inbound and outbound logistics is identified as a problem area in many of the sectors analysed. As firms and sectors participate more in international markets, the stakes in supply-chain operations increase, as these activities can have a major impact on the delivered cost of goods, on their quality, and on the ability of each firm to meet its customers' delivery requirements. Across many sectors, developing-country firms in tradable sectors find they have either to move from ad hoc and transactionally focused purchasing arrangements to more stable relationships with suppliers, or to find effective ways of vetting suppliers so as to ensure that the inputs they purchase are sufficiently consistent and compliant, despite prioritizing price as a criterion when purchasing from varied suppliers. Strong capabilities in supply-chain operations are based on the skills and knowledge of those working in the area, with support from accumulated investment and experience. Relationships with external partners play a major role.

The performance of developing-country tradable sectors analysed under STED is constrained not just by their own capabilities but also by deficiencies in the value chains of which they form a part. In food processing, for example, many firms depend on the performance of local agricultural production, and of intermediaries that aggregate, transport and often pre-process agricultural commodities. Overall success in developing the capabilities they bring to serving the market depends not just on improving their own internal capabilities, but also on building a capable value chain. This may, for example, require the firm to work with its suppliers to improve their performance. It also gives governments interested in strengthening the position of their countries' tradable sectors in international markets a reason to intervene further up the value chain – for example, in the case of food, in areas such as agronomy, food safety and development of cold chains.

Technology, work organization and assuring compliance jointly affect capability needs

The ways in which business capability needs impact on skills needs are affected strongly and jointly by technology, work organization and the need to assure compliance with requirements. This seems to be universal across all sectors analysed under STED.

It is observed from work under STED that application of information and communications technologies (ICTs) has an important enabling role in addressing each of the main business capability bottlenecks that are common across most or all of the sectors studied. This is true at all stages of each value chain, and in businesses of all sizes, from small farmers tracking market and meteorological information to large exporting business deploying ICTs across all functional areas. More automated equipment and better communication and management of information contribute, when deployed appropriately, to improving the efficiency and effectiveness of operations. In many cases, also, information technology products and services encapsulate good practices, making those practices more readily accessible to firms. ICTs also have a major role in effective compliance, by providing efficient means to capture, manage and present information required for compliance with standards and regulations. Modern marketing, sales and channel management rely heavily on ICTs: for market intelligence and analysis, for routine communications with intermediaries and end customers, for communicating sales and marketing messages, for management of information on customer relationships, and for carrying out transactions. ICTs also play a key role in innovation, product design and product improvement, both because process and product innovations frequently have ICTs embedded in them, and because the innovation process is facilitated by appropriate use of technologies for gathering and organizing

information, and often also for product design. Any degree of sophistication in supply-chain management and procurement is ICT-intensive for most businesses.

One of the keys to strengthening the operation of value chains is improving communication and management of information along the value chain. ICTs can play a key enabling role in this.

Work organization also has a central role in addressing business capability bottlenecks. In developed countries, major changes in the organization of work in both manufacturing and tradable services in recent decades have been key to improvements in productivity, quality and responsiveness to market demands. The changes emphasize process-focused organization of work and enabling high performance and engagement by workers through mechanisms such as teamwork, multiskilling and problem-solving. Similar changes are visible in many of the developing-country sectors analysed under STED, but here they are at a much earlier stage, and many firms are either struggling to get started or undecided about what new forms of work organization to adopt, if any. These changes in work organization originate in a fusion of management practices that originated in Japan in the 1980s, and have since become ever more widespread across the globe, with effective application of modern ICTs. They have become embedded in modern human resource management, operations management and industrial engineering, and are at the core of how businesses in tradable sectors improve productivity and quality. Business improvement programmes with titles using key terms such as “lean manufacturing” and “kaizen” are frequently used to accelerate their deployment. Speeding up the adoption of modern work organization principles and practices offers an opportunity to tackle bottlenecks in business capabilities related to operations, logistics and process innovation.

The ways in which businesses operate are also shaped by the need to assure compliance with internal quality standards, customer requirements, voluntary standards, required standards and regulatory requirements. This requires the development and deployment of systems for compliance, both within firms and along value chains, that are supported by work organization and by technology.

Small and medium firms often lag behind large firms in the same sector in technology, work organization and compliance, in both developed and developing countries. This is partly a matter of scale limiting resources and access to expertise. It can be alleviated by initiatives that aim to serve multiple businesses. For example, the ILO provides project-based technical assistance on improving production processes and work organization to groups of SMEs (typically about 20 to 100 employees) in some developing countries, mostly in tradable sectors, under the programme Sustaining Competitive and Responsible Enterprises (SCORE).

The STED Programme identified two common trends in skills demand

The implications for skills arising from the STED analyses are that two types of skills are needed: stronger foundation and core work skills, and specific types of technical skills.

Globally, employer surveys and other research on skills needs almost universally highlight a high- priority need for stronger core work skills. This finding is confirmed by STED analysis of skills needs in tradable sectors of developing countries. To underpin core work skills, employers in tradable sectors and their domestic value chains now overwhelmingly need, or at least value, foundation skills in literacy and numeracy, even for most low-skill jobs.

Core work skills include the abilities to learn and adapt; to read, write and compute competently; to listen and communicate effectively; to think creatively; to solve problems independently; to manage oneself at work; to interact with co-workers; to work in teams or groups; to handle basic technology; and to lead effectively as well as follow supervision (Brewer, 2013). Core work skills include both cognitive and non-cognitive (mainly behavioural) elements. Both cognitive and non-cognitive elements of core skills are largely formed in compulsory education, with family (and, where relevant, other pre-school care) also having an important influence. They are further developed in post-compulsory education and training, and in the workplace.[15] Table 2.1 provides an indication of the range of skills and abilities falling under each of the four broad core work skill categories.

Table 2.1 Core skills for employability

Broad skill category	Core work skills; ability to
Learning to learn	■ think abstractly ■ use learning techniques to acquire and apply new knowledge and skills ■ organize, process and retain information ■ interpret and communicate information ■ pursue independent learning ■ conduct systematic inquiry and follow through to find answers ■ take responsibility for own learning ■ spend time effectively ■ stay on task ■ select the best approach to tasks

	■ begin, follow through and complete tasks ■ manage own learning ■ adapt ■ work safely ■ learn willingly ■ use time efficiently without sacrificing quality
Communication	■ read competently ■ write to the needs of an audience ■ write effectively in the language(s) in which the business is conducted ■ listen and communicate effectively ■ listen to understand and learn ■ read independently ■ read, comprehend and use materials, including graphs, charts and displays ■ understand and speak the language which the business is conducted ■ use numeracy effectively ■ articulate own ideas and vision
Teamwork	■ interact with co-workers ■ understand and contribute to the organization's goals ■ work within the culture of the group ■ plan and make decisions with others and support the outcomes ■ work in teams or groups ■ respect the thoughts and opinions of others in the group ■ coach, mentor and give feedback ■ lead effectively ■ lead when appropriate ■ mobilize a group for high performance ■ manage oneself at work ■ accountability for actions taken ■ build partnerships and coordinate a variety of experiences ■ work towards group consensus in decision-making ■ value others' input ■ accept feedback ■ resolve conflicts
Problem-solving	■ think creatively ■ solve problems independently ■ test assumptions

- identify problems
- take the context of data and circumstances into account
- adapt to new circumstances
- identify and suggest new ideas to get the job done (initiative)
- collect, analyse and organize information (planning and organization)
- plan and manage time, money and other resources to achieve goals

Source: Brewer, 2013.

Over time, employers have increased the emphasis that they place on core work skills. This trend is linked to changes in work organization that have created flatter work structures and greatly increased the emphasis on communication, collaboration, problem-solving, consistency in performance and personal responsibility at all occupational levels. Strong core work skills are required if firms using modern forms of work organization are to perform effectively, and stronger skills can form a basis for better performance. As firms in developing-country tradable sectors analysed under STED progressively adopt modern forms of work organization, improving the core work skills of their workforce becomes increasingly important to their business performance.

Implementing modern work organization effectively also requires changes in management and supervisory skills. Skills in human resource management (HRM) are of central importance, both within the human resources function and in line management. Both leadership skills and technical skills in quality assurance, problem-solving and business improvement are required for operations management and technical leadership occupations, including supervisory management and industrial engineering.

Modern work organization is most easily recognized in businesses that are big enough to have a formal differentiated management structure, but changing business conditions mean that the implications for skills needs are similar even in micro-enterprises within traditionally low-productivity sectors, especially where these are linked to non-local markets. Small-scale entrepreneurs linked to tradable sectors, smallholder farmers and their workers increasingly need to be literate and numerate, to solve problems and plan, to apply technologies effectively, and to contribute to compliance with standards and regulations in the value chain of which they form a part.

While core work skills are increasingly important to the success of tradable sectors, technical skills are also at least equally relevant, and there is a need for skills analysis and policies to focus on both. Cognitive skills to the level learned in compulsory education and core work skills are easier to measure and compare than technical skills because they are similar across

occupations and sectors. Technical skills vary between occupations, and can vary within an occupation across different sectors and even between firms in a sector. As with core work skills, technical skills have both cognitive and non-cognitive components. Cognitive skills refer to "the ability of an individual to perform the various mental activities most closely associated with learning and problem solving. Examples include verbal, spatial, psychomotor, and processing-speed ability."[16] Non-cognitive skills refer particularly to behavioural skills.

In analyses of tradable sectors under STED we have seen a broad, but not universal, upward trend in the levels of technical skill required. In some (but by no means all) cases, this is reflected in occupational employment statistics. The types of case where this is most clearly apparent in the statistics are where increased mechanization results in skilled machine operators (from ISCO 8 or 7) being replaced by technicians (from ISCO 3), or in low-skilled manual workers (from ISCO 9) being replaced by skilled machine operators (from ISCO 8 or 7). Increased attention to quality may also increase the numbers of quality control specialists (from ISCO 8 or 7), quality and regulatory managers (from ISCO 3 or 2), laboratory technicians (from ISCO 3) or laboratory scientists (from ISCO 2) by enough to be observable in sector statistics. Contingent on the sector and country, there may also be observable increases in professional occupations or sales and service occupations in statistics, as the significance of functions including marketing, product development, production engineering, IT, procurement and supply-chain management increases. These trends can have an impact on gender equality if workers in existing occupations with a significant female presence are replaced by graduates of courses with a predominantly male participation, even where it might be feasible to upskill existing workers (see e.g. McKay, 2006).

Skills needs are also changing within statistical occupational categories. Overall, in the sectors analysed under STED, these are in the direction of increasing skills requirements, by requiring workers to update skills and to bring a higher level of skills to their work. For example, in production operations more modern machinery, greater automation and a requirement for consistently high efficiency and quality make work more demanding cognitively within occupations from machine operator to engineer. The need for flexibility makes multiskilling across production roles and machine types necessary. Similarly, in marketing, sales and general management, a shift from selling to domestic markets to selling internationally requires a higher degree of professional expertise and changes in the profile of skills, while in tourism and hospitality, as international tourist numbers increase, the level of skill needed in customer-facing and food-service occupations rises above that required when serving domestic customers, especially for premium services. Improved customer service skills, foreign language skills, food-preparation skills and tourist-guiding skills are especially important. In farming, too, moving to supply commercial markets, and especially attractive developed-country export markets, requires

development of skills in agronomy, food handling and compliance with standards such as the Good Agricultural Practices (GAP) promoted by the UN Food and Agriculture Organization (FAO).

Despite this overall pattern of rising skills needs seen in STED analysis of developing-country tradable sectors, a pattern of reduced skills needs in front-line occupations is observable in some sectors, where tasks are simplified and kept under tight systematic control by management. This is most common in large FDI and contract manufacturing operations undertaking repetitive manual work. Even in the same sectors, smaller operations under domestic control often require a higher degree of flexibility and initiative, requiring higher and broader skills in front-line occupations.

Differences in context mean that similar business capability gaps can have different implications for technical skills in different sectors in a single country, and in the same sector in different countries. Table 2.2 shows an illustrative sample of some of the types of occupational skills found through ILO work to be linked to the common types of business capability bottleneck noted above. For small businesses in tradable sectors, entrepreneurs and managers may need to have capabilities in several of these skill areas.

The quantitative literature on skills and trade focuses mainly on broad questions about the impact of trade, for which high levels of aggregation in skills data and cross-country analysis are appropriate. However, highly aggregated data on skills enables observation of only a part of the variation in skills. Guidance on practicable ways to improve matching between skills demanded and skills supplied requires a disaggregated approach to skills analysis that brings into view a larger share of the variation. Skills demanded vary between and even within occupations. Within occupations, skills demanded vary at a detailed level between sectors, between individual firms, and often even between jobs apparently in the same occupation within the same firm. When observing skills from the education and training aspect of the supply side, field of study is a key dimension of skills variation. Again, the detailed content within a field of study can vary between subfields and courses that are ostensibly in the same field, often as a consequence of targeting different occupational niches.

In focusing on broad questions, the quantitative literature on skills and trade seeks to simplify so as to enable generalizations about common characteristics in their mutual relationship. While the questions addressed are important, the answers do not provide comprehensive guidance to governments on skills policy questions, or to employers, workers or providers of education and training. An approach is needed that allows for complexity in terms of both detail and systemic interactions.

Table 2.2 Common bottlenecks in business capability and examples of linked occupational skill areas

Common business capability bottleneck	Examples of linked occupational skill areas
Efficiency and effectiveness of operations	■ Technical skills of machine operators, assemblers, crafts, technicians etc. ■ Production management skills, including people management and engineering ■ Core and "soft" skills of workers at all levels required for modern work organization and productivity improvement
Compliance with standards and regulations	■ Quality assurance and compliance skills ■ Regulatory management skills ■ Laboratory scientist and technician skills ■ Document management skills
Marketing, sales and channel management	■ Marketing skills, channel management skills ■ Sales management skills ■ Sales skills ■ Teleservice skills
Innovation, design and product development	■ Development engineering and science skills ■ Design skills ■ Process engineering skills ■ Marketing skills
Supply-chain management and logistics	■ Logistics management and work skills ■ Sourcing and procurement skills ■ Supply-chain management skills
Value-chain development	■ Key skills outside the exporting sector that contribute to the sector's success, e.g. for food-processing: agronomy, food safety and logistics management skills

Source: ILO STED Programme, http://www.ilo.org/skills/projects/sted/lang--en/index.htm.

STED is the ILO's response to this need in respect of tradable sectors. It brings to bear qualitative approaches used in skills needs analysis, and originating partly in business studies, to the task of addressing skills needs at a disaggregated level, making it possible to provide guidance at, for example, occupational level. It is designed as an approach that prioritizes the provision of practical guidance and also the involvement of key actors in each target sector so as to validate and build ownership of the analysis and guidance. The STED process aims to enable action based on the guidance generated.

While STED is not methodologically sophisticated, by taking a broad qualitative and systems-based approach it points towards questions on skills and trade that could be addressed in a more quantitative and systematic manner. The complexity of the systems observed through STED suggests that this research might be approached not only through regression-based analysis but potentially also through complex systems modelling.

Evidence on the effects of trade on employment by skill level

Empirical evidence overwhelmingly indicates that international trade plays a significant role in increasing the relative employment of skilled workers. It confirms that offshoring, exporting and new technologies embodied in imports are drivers of changes in employment composition.

The previous sections of this chapter clearly suggest that greater openness to international trade affects the demand for skills in any country. The empirical evidence presented in this section sheds more light on the experiences of various countries and on the importance of the different channels.

The empirical evidence on the link between international trade and the relative demand for skilled workers relies on the simple mechanism described in box 2.2. When the relative demand for skilled workers increases faster than their relative supply, the skill premium increases. On the other hand, if the increase in the supply of skills just matches the increase in the demand for skills, we observe an increased share of high-skilled workers in employment but possibly no change in the skill premium. Therefore, depending on the flexibility of skills supply, an increase in the demand for skills is reflected in a higher share of skilled workers or a higher skill premium, or both.

The following paragraphs summarize the evidence relating to relative employment, while the section on p. 58 focuses on the evidence regarding relative wages.

Trade and offshoring

Evidence, most of it from developed countries, shows that while international trade and offshoring have contributed to an increase in the relative share of high-skilled workers in total employment, or to an increase in the shares of both high- and low-skilled workers relative to that of medium-skilled workers, the main factor driving all these changes has been technological progress.

International trade and offshoring contributed to the increasing demand for skills in the United States in the 1970s and 1980s, but technological change played a much more important role. The early evidence on how trade affects the demand for different groups of workers is based on US data from the 1970s and 1980s. The period was characterized by an increase in the share of non-production workers in the manufacturing labour value added which suggests that the demand for skills shifted towards more highly skilled workers. This is because the proportion of high-skilled workers tends to be larger in activities that are not directly related to the production process, such as marketing or logistics, than in routine production activities. The empirical analysis nevertheless shows that while international trade contributed to the observed trends, investment in computers and in research and development was the most important driver (Berman, Bound and Griliches, 1994).

Further analysis focused in particular on the impact of increased offshoring from the United States to Mexico. Mexico implemented a reform of its trade and investment policies in the 1980s. This reform reduced the cost of FDI by US firms, and consequently led to the expansion of offshoring activities. In accordance with the previous studies, the analysis concluded that offshoring contributed to the increasing relative demand for non-production manufacturing workers in the United States but that its impact was small relative to that of technology upgrading. The respective contributions were estimated to be around 15 per cent for trade and around 30 per cent for technology (Feenstra and Hanson, 1999).

Offshoring of production stages from the United States to Mexico in the 1980s can explain a large part of the increasing demand for skills observed in Mexico. During the late 1980s Mexico also saw an increase in the importance of non-production workers in the manufacturing labour value added. The empirical analysis found that increased employment in US-owned assembly plants in Mexico (maquiladoras) accounted for more than half of the observed trend in the border regions where maquiladoras were concentrated, and therefore had a relatively large impact on the Mexican labour market (Feenstra and Hanson, 1997). This evidence therefore supports the idea that offshoring from high-income to low-income countries can increase demand for more highly skilled workers in both economies.

Firm-level evidence from France and Belgium supports the findings that offshoring is associated with a lower relative demand for production workers, especially for the less skilled ones. There is evidence that increased offshoring to China – at the time of the research, a low-wage country – contributed (albeit only slightly) to the increasing share of non-production workers in Belgian manufacturing firms between 1996 and 2007 (Mion and Zhu, 2013).

There is also evidence that, between 1986 and 1992, French manufacturing firms which increased their imports of final goods, and therefore were likely to engage in offshoring of the assembly stage, changed their labour force composition towards non-production activities (Biscourp and Kramarz, 2007). Evidence from the same study also shows that all types of offshoring, whether foreign sourcing of final goods or of intermediate inputs, are associated with an increase in the share of skilled workers such as engineers or technicians among the remaining production workers. Interestingly, the employment changes were a result of offshoring to other OECD countries, which suggests that skills upgrading within firms from high-income countries is not necessarily linked to offshoring to low-wage countries, but rather appears to be associated with increases in sourcing from foreign markets in general.[17]

In the past two decades, the employment of medium-skilled workers in routine occupations has declined in developed economies. More recent empirical evidence on the effect of trade on labour market outcomes incorporates worker-level information, focusing on the distinction between routine and non-routine occupations.[18] Routine occupations are occupations which are repetitive and easily codifiable. Non-routine occupations require problem-solving skills and complex communication activities. While the former are susceptible to offshoring and import competition from low-wage countries, the latter are more difficult to relocate. Acemoglu and Autor (2012) have found that the employment in routine medium-skill occupations such as office administrator or operator/labourer has declined in the United States since the 2000s. Conversely, employment in low-skill occupations such as personal care or food/cleaning services has increased, as has employment in professional or managerial occupations that require numerous skills. Most empirical evidence points towards the major role of technological change, such as automation and computerization, in explaining this shift in employment composition in the United States and other OECD countries (see e.g. Autor, Levy and Murane, 2003; Goos and Manning, 2007; Reijnders and de Vries, 2017).

Import competition from low-wage countries reduces the demand for manual manufacturing workers and induces changes in the employment structure away from mid-wage occupations to high- and low-wage occupations. A recent study of the impact of import competition from a low-wage country on workers in Denmark shows that import competition has contributed to the relative loss of occupations in the middle of the wage distribution and that it can explain 16 per cent of the increase in earnings inequality in Denmark between 2000 and 2009 (Keller and Utar, 2016).[19] The authors of the study show that increased import competition, especially in the textile industry, pushed some workers from mid-wage jobs (such as machine operators) to high-wage jobs, but others to low-wage service jobs (for example in travel services or housekeeping). They find that whether workers are able to move up or only to move down depends on several

factors. First, workers in occupations that require cognitive skills[20] either stay in mid-wage jobs or move upwards, and therefore are unaffected by or benefit from import competition. Second, vocational training with a manufacturing focus makes mid-wage workers less vulnerable to wage reductions if they stay in their jobs, but does not protect them from moving into low-wage jobs. Finally, college education and vocational training with an information technology focus protects workers from moving to low-wage jobs and strongly increases their chance of moving into high-wage jobs in the face of import competition from a low-wage country.

It is worth noting that offshoring is not limited to physical goods, and that some services can also be performed remotely. Examples include accounting services, call centres, technical assistance and even research and development. These services are generally considered to be skill-intensive (at least compared to the manufactured goods that are typically offshored, most of which are low-skilled labour intensive). The number of firms that are offshoring services is small but growing: indeed, offshoring of services has been called the "third industrial revolution" by some authors (e.g. Blinder, 2006). It has given rise to some fears in developed countries that tasks performed by skilled workers could become eligible for offshoring thanks to improvements in ICTs. Industry-level analysis of several European countries shows that, taking into account offshoring of goods, imports of services are positively correlated with the relative demand for high- and medium-skilled workers, and thus negatively correlated with the relative demand for low-skilled workers (Crinó, 2012). This finding is refined using worker-level evidence from the United States that allows the effect of offshoring to be assessed across skill groups and occupations. This evidence supports the finding previously obtained that services offshoring increases the relative employment of high-skilled workers (with qualifications above a first degree) but emphasizes that the response differs markedly across occupations. Within the category of occupations that require high skill levels, the positive response relates predominantly to occupations that are considered to be "non-tradable", such as high-level managers or lawyers. These are occupations that require a lot of face-to-face contact, consist of mostly non-routine tasks and are not necessarily enabled by computers. These findings imply that services offshoring not only increases the demand for high-skilled workers but also shifts the demand for different types of study programmes and degree qualifications.[21]

Trade-induced technological change

Evidence from both developed and developing countries shows that trade-induced technological change increases the share of skilled workers.

When faced with increased competition from low-cost countries, firms in advanced economies may react by increasing investment in research and development to upgrade the quality of their products and move into other, more profitable, market segments. A study using firm-level data for 12 European countries over the period 1996–2007, during which Chinese imports grew quite fast, estimated that increased trade with China accounted for about 15 per cent of technology upgrading in Europe after the year 2000 (Bloom, Draca and Reenen, 2016). It also showed that half of this technology upgrading was due to firms investing in research and development, and half to the exit or downsizing of firms with outdated technologies. The same study showed, finally, that imports from China had had a significant impact on the relative employment of skilled workers, not so much directly as through the technology upgrading. Supporting this evidence, an analysis of Belgian firms in the same period shows that import competition from China induced skill upgrading in low-tech industries (Mion and Zhu, 2013). The findings suggest that imports from China account for 27 per cent of the increase in the share of non-production workers, and for almost half of the increase in the share of highly educated workers, in these industries.

In South America, trade liberalization has prompted firms, especially exporting firms, to upgrade their technology and to increase the skill intensity of their workforce. Examining how the drop in tariffs (to zero) between the signatory members of the MERCOSUR agreement[22] affected Argentinian firms between 1992 and 1996, Bustos (2011) found that after the liberalization exporters upgraded their technology faster than non-exporting firms. The technology upgrading was followed by skill upgrading as exporters increased the share of high-skilled workers in their workforce.[23] This evidence thus supports the theory that greater exposure to trade can increase the relative demand for skilled workers in less developed economies because it induces technology upgrading.

In less developed economies, better access to foreign technologies through imports is associated with increasing relative employment of non-production workers. Examining the factors behind the increase in inequalities in Indonesia after 2000, one study found that the adoption of foreign technologies through imports and FDI was associated with an increased share of non-production workers in the labour value added of manufacturing firms (Lee and Wie, 2015). Similar evidence is available for Mexico and shows that Mexican firms that import machinery and equipment are more likely to employ more skilled workers (Hanson and Harrison, 1999).

Evidence on the effects of trade on wages by skill level

When the relative demand for high-skilled workers increases faster than the relative supply, the skill premium increases. There is evidence that trade has raised the skill premium through the reallocation of workers towards the most skill-intensive, often exporting, firms. In developing countries, this mechanism has played a role, but the complementarity between imported technology and the use of skilled labour has also contributed to the increase in the skill premium.

While changes in the demand for skills are difficult to measure directly, they can be inferred from information about educational attainment and the wage premium of skilled workers. A simultaneous increase in both the skill premium and the supply of skills, as occurred in Argentina between 1995 and 2005 (Figure 2.2(a)), is a clear indication of an increasing demand for skills. Brazil, Chile and Colombia, on the other hand, have experienced a decrease in the skill premium which clearly corresponds to an increase in skills supply (figure 2.2(b)–(d)). This does not imply that demand for skills did not increase in these countries, but it means that at most it increased much more slowly than the supply of skills. Therefore, if we take into account the changes in supply of skills, we can infer the changes in the demand for skills from the evolution of the skill premium. The following paragraphs provide evidence on the contribution of international trade to such changes.

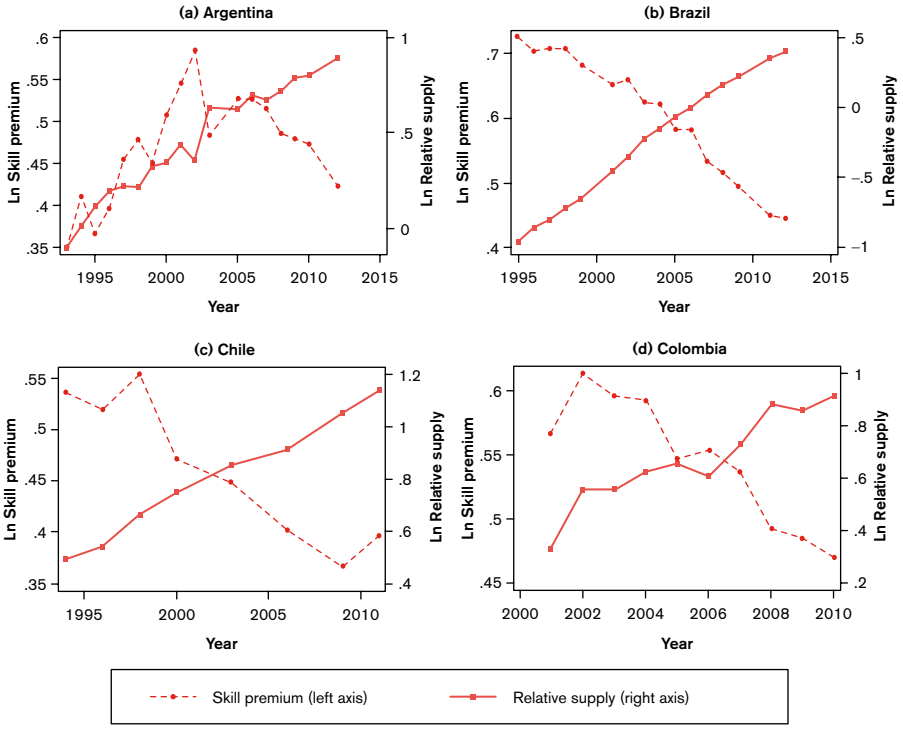
Trade and offshoring

Evidence shows that exporting firms pay higher wages but not necessarily a higher skill premium, and that offshoring tends to raise the skill premium in the offshoring country.

The increase in the skill premium in the United States in the 1980s can to a large extent be attributed to the shift of employment towards exporting firms who paid a higher skill premium. Using US data from the 1980s, Bernard and Jensen (1997) were among the first to provide evidence for the link between international trade and wage inequalities using firm-level data. They showed that most of the large increase in the college wage premium (the wage difference between a college graduate and a high-school graduate) in the United States during the 1980s could be attributed to a reallocation of workers between manufacturing firms. Importantly, this increase was almost entirely driven by the expansion of exporting firms that were found to pay a higher skill premium.

Subsequent worker-level studies from various countries have confirmed that exporters pay higher average wages and that this is to a large extent because they are more

Figure 2.2 The evolution of the skill supply and the skill premium in four South American countries



Note: The skill premium is the log of the relative wage of high-skill workers compared to low-skill workers and the relative supply is the ratio of high-skill workers to low-skill workers in the population. Wage and number of workers are measured in terms of efficiency units, and high-skill workers are individuals with at least a complete secondary education.

Source: Cruz and Milet, 2017.

productive and employ relatively more skilled workers.[24] However, these studies do not always support the finding that exporters pay a higher skill premium. For instance, evidence from Denmark shows that the export wage premium is positively related to the overall skill intensity of the exporting firm but that it is driven by the wages of the least-educated workers (Munch and Skaksen, 2008). This implies that Danish exporters in fact pay a lower skill premium than non-exporting firms. Furthermore, an

increase in exports is associated with an increase in wages that is similar for both high-skilled and low-skilled workers (Hummels et al., 2014).[25]

Offshoring tends to lower the wages of workers whose jobs are likely to be offshored. Since in developed economies these are routine jobs that are predominantly held by low-skilled workers, the impact of offshoring is stronger for this skill category. High-skilled workers in certain non-routine occupations are, on the other hand, unlikely to face competition from abroad and thus they benefit from offshoring. A study using data on the Danish labour force between 1995 and 2006 found that an increase in a firm's offshoring activity has opposite effects on high-skilled and low-skilled workers (Hummels et al., 2014). When faced with a similar increase in offshoring by their firm, the wage of high-skilled workers increased by 8.5 per cent while the wage of low-skilled workers declined by 7.3 per cent. This effect is independent of the level of economic development of the country to which the activities are offshored. More detailed analysis revealed that low-skilled workers experience a negative impact because they work in routine occupations. On the other hand, workers in non-routine occupations that require mathematical skills benefit. Furthermore, high-skilled workers benefit more from offshoring if their occupation requires a strong background in social sciences or communication. These results highlight the benefits of offshoring for high-skilled workers in occupations that are unlikely to be offshored because they consist of relatively complex tasks or require face-to-face interaction and communication. Conversely, demand declines for tasks which are easily codifiable and can be performed at a distance. In this way, offshoring and technology have a similar impact on the relative demand for skills.

Using a long sample of US worker-level data from 1984 to 2002, Ebenstein et al. (2014) constructed a measure of exposure to offshoring at the worker level. They confirmed that international trade affects wages primarily in occupations that are intensive in routine tasks. In line with expectations, their findings showed that wages are negatively related to import competition and positively related to export intensity. Furthermore, the study showed that the impact of offshoring was significant only in the later part of the period studied, from the mid-1990s. Offshoring activities in low-wage countries led to lower wages for routine workers, while offshoring activities to high-wage countries increased their wages. Importantly, the effects of international trade differ across skill categories. Wages of low-skilled workers, with only high-school education or less, react much more to trade and offshoring exposure than wages of high-skilled workers with college education or more.

Trade-induced technological change

There is evidence that trade liberalization has contributed to an increase in the skill premium by inducing skill-biased technical change, and that imports of R&D-intensive capital goods are correlated with a higher skill premium.

Rapid episodes of trade liberalization have contributed to an increase in the skill premium by inducing skill-biased technical change. One study showed that the drastic tariff reduction which took place in Colombia during the 1980s and 1990s induced both skill-biased technical change and an increase in the skill premium (Attanasio, Goldberg and Pavcnik, 2004). The authors of the study demonstrated that while returns to secondary and elementary education remained stable between 1990 and 1998, the return to college education increased by 20 per cent. Their analysis showed that this increase was not driven by increases in wages in specific industries or occupations, but was similar across the whole economy. This prompted the authors to consider whether trade liberalization had led to the economy-wide increase in the skill premium. They found that those industries that had experienced larger tariff cuts increased the share of more highly skilled workers in their workforce (workers who had completed secondary education or higher). Trade liberalization therefore induced a higher demand for relatively skilled workers in certain industries. The authors argued that their findings pointed towards skill-biased technical change as a result of increased competitive pressure brought about by a decrease in protection. Importantly, the study showed that while the share of individuals educated to higher than primary level increased in Colombia during the period, it lagged behind the human capital accumulation of South-East Asian economies. The increased demand for skills was therefore not matched by an increase in the supply, and so contributed to a higher skill premium across the whole economy.

Another study has shown that the adoption of new skill-biased technologies through imported capital goods is associated with a higher skill premium in developing countries (Raveh and Reshef, 2016). The authors used data from 21 developing countries over the period 1983–2000 and focused on imports of capital goods, in particular on R&D-intensive capital goods likely to embed advanced technologies. Use of such capital goods complements, and therefore benefits, high-skilled workers.[26] Accordingly, the authors find that imports of capital goods in general have no effect on the skill premium, while imports of R&D-intensive capital goods are correlated with an increase in the skill premium.

2.3 Trade and skills jointly affect productivity, growth and wage distribution

The previous sections of this chapter have discussed how skill supply affects trade patterns, and how trade affects skill demand and thus labour market outcomes for different skill groups. This section takes a step forward in discussing how the interaction between skills supply and trade-related skills demand determines the impact of trade on aggregate outcomes such as average productivity, growth and wage distribution. For instance, skills mismatches can constrain the expansion of successful firms, lowering the average productivity gains and making it more difficult for displaced workers to find new stable employment. Skills upgrading in reaction to, or in anticipation of, the increasing demand can, on the other hand, enable firms to exploit trading opportunities as well as dampening the impact on wage differences and spreading the gains from trade more equally.

The availability of skills affects the impact of trade on productivity and growth

In developing countries, skills gaps and skills shortages constrain the performance and expansion of firms in tradable sectors. Some of the problems related to skills gaps also persist in an attenuated form in most developed-country tradable sectors, more in SMEs than in large firms. A higher level of education facilitates worker mobility across occupations or sectors, enabling trade to generate more gains.

The positive impact of trade on productivity can be constrained by skills gaps

Skills gaps may limit a firm's ability to respond to market demand by increasing output, even if it has spare capacity. Qualitative gaps between the skills a firm has and those it requires to carry out its existing operations effectively and efficiently may be harming performance.

There is a consensus that international trade leads to a higher average productivity in the economy because it induces expansion of the most productive firms and motivates firms to increase productivity. However, when firm expansion and performance improvement are limited by skills gaps,[27] this positive impact may not be fully realized.

Problems caused by current skills gaps are direct constraints on the effectiveness with which firms and sectors can participate in tradable markets. They keep exports at lower

levels than would otherwise be possible. In developing countries, the impact on scope for exporting to developed countries is especially significant, because such problems exacerbate the difficulties firms face in performing at the quality and consistency required by developed-country customers, and may not comply consistently with regulations and required standards. Skills gaps also constrain firms in adopting and implementing the most effective business strategies.

Deficiencies in the quality and relevance of skills, and in some cases actual skills shortages, are significant constraints in most of the developing-country tradable sectors analysed through STED, both currently and for the future with a view to tackling the most urgent business capability gaps. For example: Cambodia's food-processing and light manufacturing sectors are affected by a shortage of workers with the mid-level technician skills needed to raise productivity, improve quality and move into higher value added activities; Jordan's food-processing sector reports being constrained by a shortage of suitably skilled food-processing machine operators; and Malawi's oilseed sector needs to raise technical skill levels along the value chain so as to attain product standards that will allow it to export groundnuts to a greater range of countries. A lack of sufficient higher-level technical skills in areas including, among many others, marketing, science and engineering for product development, industrial engineering and supply chain management is also constraining progress in the sectors analysed.

To the extent that a sector uses domestic sources of inputs, skills gaps that constrain its access to export markets may have negative repercussions for its supplier sectors. For example, the employment impact of a food-processing sector's exports may be concentrated in the agriculture or aquaculture sectors that supply it, and the impact of constraints on processed food exports on economic returns, incomes and employment may be greater in those sectors than in the food-processing sector itself. Thus the productivity of the sector, and of the value chains, international and domestic, of which it forms a part, is below the potential of the sector's existing assets and strategies, which harms returns both to labour and to capital.

The practical problems arising from skills gaps in developing countries are familiar from the industrial history of many developed countries. They persist in an attenuated form in most developed-country tradable sectors, more in SMEs than in large firms. In broad terms, the types of problems arising from skills gaps in developing countries are the same types that have been addressed progressively in developed-country tradable sectors since the 1980s through adoption of new forms of work organization, new HRM practices incorporating greater emphasis on skills development, and a systematic focus on

Box 2.6: Consequences of skills gaps

Survey evidence from the ILO STED Programme provides copious examples of problems attributable to skills gaps quoted by firms in one developing-country tradable sector with rising exports:

- low productivity;
- low sales;
- low profitability;
- lack of compliance with regulations or with specifications;
- pressures on senior managers, making it difficult for them to focus on developing the business;
- many errors;
- waste of materials destroyed because of incorrect processing;
- production delays;
- complaints from customers and returned goods;
- orders not delivered as required;
- products not of optimal quality, risking customer dissatisfaction, reputational damage and fines;
- problems with compliance on product safety;
- difficulties managing sales teams and meeting targets;
- difficulties penetrating export markets.

Skills gaps are not the sole cause of these problems, which also reflect issues concerning technology, work organization and strategy, but tackling these related issues is itself dependent on addressing the skills gaps. Comparable difficulties arising from current skills gaps have been seen in many other developing-country tradable sectors, although not always at similar intensity. These difficulties affect SMEs more than the large firms that have the strongest capabilities and typically also the most experience in exporting.

compliance with standards (internal and external to the firm) and regulations. Developed countries for which these problems have loomed less large historically include Japan, whose exporting firms originated the new forms of work organization from the 1950s onwards, and those European countries with long-established dual apprenticeship and technical university systems which have a history of strong skills development.

Developed-country firms have stronger capabilities, but still need to strengthen them if they are to develop, adopt and implement effective strategies that will raise productivity. Studies of tradable sector enterprises in developed countries regularly find that deficiencies in management skills and knowledge related to export markets constrain SMEs from exporting (see e.g. OECD, 2009). This is consistent with the wider findings of studies on skills mismatch in developed countries that attribute much of the current skills mismatch that they observe to deficiencies in firm management as an underlying cause (see McGowan and Andrews, 2015). Broad sector-level consequences of failing to implement effective strategies will include constraints on the rate of increase in unit productivity; on the introduction of new or improved products; on improvements in quality and compliance; and on effectiveness in connecting to attractive markets. Box 2.7 provides a more detailed account of types of skills mismatches and skills gaps.

Education and trade reinforce each other in generating higher growth

A higher level of education makes it easier for workers to move between occupations or sectors. This higher mobility facilitates the relocation of workers across firms and sectors, which in turn accelerates the adjustment to trade and its positive impact on productivity.

The vast majority of models in international trade assume that workers can move across sectors and occupations at no cost. In reality, workers are not perfectly mobile. Economic activity is geographically localized and workers have “sticky feet” (Hollweg et al., 2014) which means that they are not fully able (or willing) to change jobs (Artuç, Chaudhuri and McLaren, 2010). Kim and Kim (2000) propose a framework in which the combination of international trade and education generates economic growth. In their model, individuals have two kinds of capabilities. The first are general skills and knowledge, obtained through schooling; the second are job-specific skills, knowledge and know-how. Crucially, the latter are not transferable to other occupations or

Box 2.7: Skills mismatches and skills gaps

The term "skills mismatch" refers to certain types of imbalance between skills offered and wanted on the labour market. It applies equally to the current and the potential workforce, to those already in employment and to jobseekers. Such an imbalance between the supply of and demand for skills can appear in a number of different ways, and at various levels, including the individual, the employer, the sector and the economy. "Mismatch" refers to situations at the individual level, when the skills and job preferences of individuals do not match the requirements of the jobs available. "Shortage" (or, more rarely, "oversupply") is used to describe sustained situations at the aggregate level, in which the demand for skilled workers is not in balance with the quantity of workers who have the particular skills required and are willing to work at given wages and working conditions at a particular place and time.

Educational attainment or qualifications are often used as proxies for certain levels of skills (so that certain individuals may be described as over- or undereducated/qualified). In every country both over- and undereducation coexist, and may be combined with other forms of mismatch: skills shortage or surplus (quantitative mismatch), vertical or horizontal mismatch, skills gap (qualitative mismatch), skills obsolescence etc. Table 2.3 provides a summary of the types of skills mismatch.

Mismatches occur both in the form of real skills imbalances – where there are jobs which people cannot do – and because of unfavourable working conditions – where there are jobs which people do not want to do for reasons such as low pay, low prestige or other poor working conditions. Avoiding severe mismatches is in the interest of all labour market actors, as they can have negative effects for individuals, businesses and the overall economy. At the individual level, mismatch may result in lower wages, lower return to educational investment, decreased job satisfaction, diminished career prospects or even unemployment. Where employers cannot find the skills necessary to implement their business strategies, they often employ workers at suboptimal skill levels, and if they do not invest in skills upgrading, they may downgrade their strategies by implementing suboptimal technologies or limiting innovation or expansion. Among other negative effects, skills mismatch often results in suboptimal work organization and higher staff turnover.

Table 2.3 Types of skills mismatch

Skills shortage	Demand for a particular type of skill exceeds the supply of available people with that skill
Skills surplus	The supply of people with a particular skill exceeds the demand for it

Skills gap	When types or level of skills of the employed or job applicants are less than or different from those required to perform the job adequately
Vertical mismatch	The level of education or qualification is less or more than the job requires
Horizontal mismatch	The type/field of education or skills is inappropriate for the current job
Quantitative skills mismatch	The number of people with a certain type of skill either exceeds demand for this skill (surplus) or is insufficient to fulfil the demand (shortage)
Qualitative skills mismatch	The type/field of education or skill is inappropriate for the current job (similar to horizontal mismatch)
Overeducation	To have completed more years of education than the current job requires
Undereducation	To have completed fewer years of education than the current job requires
Overqualification	To hold a higher qualification than the current job requires
Underqualification	To hold a lower qualification than the current job requires
Overskilling	To be unable to fully use one's skills and abilities in the current job
Underskilling	To lack the skills and abilities necessary to perform the current job to an acceptable level
Skills obsolescence	Skills previously used in a job are no longer required or deteriorate over time

Source: Cedefop, 2010a.

industries, but a high level of general skills enables workers to accumulate faster the new industry-specific skills. The general skills Kim and Kim have in mind thus improve workers' mobility across sectors and, together with international trade, generate a higher growth rate for the economy as a whole.

Education and skills development policies play an important role in the impact of trade on wage distribution

Trade and offshoring, like technological progress, raise the relative demand for high-skilled workers; this translates into a higher skill premium if the response of skill supply is sluggish. Moreover, high-skilled workers are better able than low-skilled workers to switch jobs when their employers are faced with import competition. Workers' investments in education in response to trade shocks may amplify the distributional effects, suggesting that governments may have a role to play in shaping these investments.

Trade can increase the skill premium if the skills supply response is sluggish

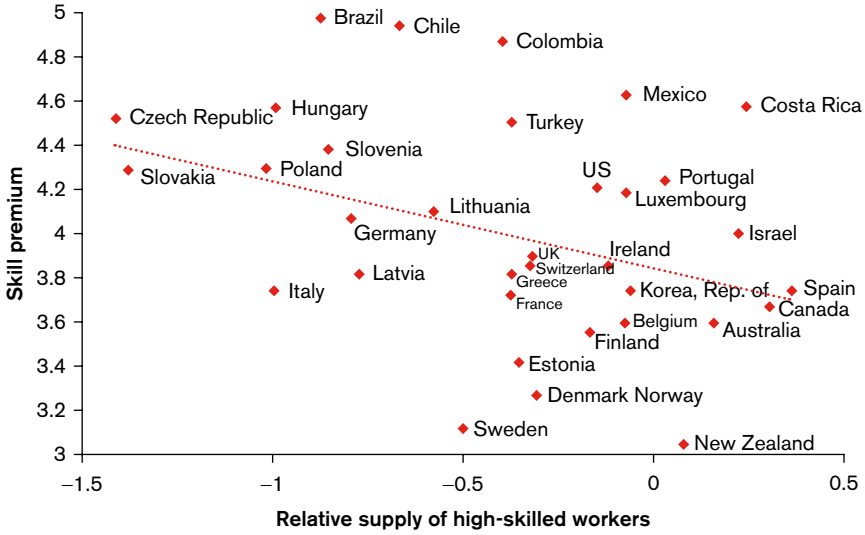
Given that the upskilling or reskilling of low-skilled workers is costly and takes time, an increase in the demand for high-skilled workers tends to translate into a higher skill premium.

The empirical evidence shows that trade tends to increase the skill premium in both developed and developing countries by increasing the demand for high-skilled workers. It is important to stress that the skill premium acts as a signal for the levels and types of skills that are demanded on the labour market, and an increase in it should motivate workers to increase their skill levels and/or acquire the appropriate type of skills. It can therefore be an important mechanism in upskilling the labour force and consequently in advancing economic development. However, the finding that the skill premium tends to be higher for several years following trade liberalization suggests that the adjustment of skills supply can be sluggish. The empirical evidence suggests that while high-skilled workers can adjust promptly to changes in skill demand, upskilling or reskilling of low-skilled workers is costly and takes time. In the meantime, the higher demand for skills results in a higher skill premium and puts upward pressure on wage inequality; this can be especially important in developing countries, where wage inequality is already high (see Figure 2.3). This has implications both for general education policies aiming at the improvement of core work skills in the population and for specific adjustment policies that target workers who find it difficult to adjust to the changes in skills demand.[28]

Trade can lead to shifts in the wage distribution

From the 1990s onwards, many advanced economies experienced a marked shift in the wage distribution. Occupations at the bottom and at the top of the distribution

Figure 2.3 The relative supply of high-skilled workers and the skill premium, selected countries, 2012



Note: The relative supply of high-skilled workers is defined here as the population with tertiary education divided by the population with upper secondary education. The skill premium is defined as the earnings of workers with tertiary education divided by the earnings of workers with upper secondary education. Both variables are in logarithms. The closest available year is used for countries where data for 2012 are unavailable. Earnings data are based on full-time full-year earners.

Source: OECD, 2012; UNESCO, educational attainment statistics, http://data.uis.unesco.org/Index.aspx?DataSetCode=EDULIT_DS&popupcustomise=true&lang=en.

experienced wage increases, while occupations that were originally in the middle lost in relative terms. Such mid-wage occupations are highly intensive in routine and manual tasks, which have been increasingly replaced by automation, or outsourced or offshored, thanks to improvement in ICTs.

During the 1980s wage inequality increased in many advanced economies owing to an increase in the share of high-wage jobs at the expense of low-wage jobs. By contrast, in the 1990s and 2000s many advanced economies saw a rapid decline in the employment share of mid-wage jobs, accompanied by an increase in both low- and high-wage jobs, leading to so-called job polarization.[29] Furthermore, workers at the bottom and at the top of the distribution experienced increases in their wages, while the mid-wage occupations lost in relative terms. Recent empirical research shows that this is due to a disappearance of routine occupations which are easy to automate or offshore and more susceptible to import competition from low-wage countries. As pointed out in pp. 53 and 58,

trade, especially offshoring, played a role in the reduced demand for routine and manual skills in advanced economies. Empirical research shows, however, that the role of technology is considerably more important than that of trade in explaining the recent trends (Goos, Manning and Salomons, 2014). This finding also emphasizes that while there is no empirical evidence for a similar evolution in developing countries, it may be expected that they will face similar trends in the future.

High-skilled workers are better positioned than low-skilled workers to take advantage of the changes brought about by increased trade

Mobility of workers across firms and sectors can be costly, hindering the efficient allocation of resources across firms and sectors. High-skilled workers appear to be more mobile than low-skilled workers and therefore switch more easily into the expanding, more competitive, industries and firms.

According to the standard trade models, reaping the benefits from trade requires the reallocation of resources, including workers, from shrinking firms and sectors to expanding ones. When changing jobs is difficult for workers, the trade adjustment process may become costly, take longer than expected or not happen at all. Lamo, Messina and Wasmer (2011) argue that the existence of firm- or sector-specific human capital makes it costly to switch jobs and hence slows down the adjustment in the labour market following large shocks. Such costs to workers include, for instance, the need for retraining and consequently a longer spell of unemployment, or lower starting wages in a new job owing to the initial lack of skills and knowledge specific to the new employer.

In practice, it is not easy to properly measure skills shortages and mismatches (see box 2.3 for a detailed classification).[30] However, recent studies that focus on the costs to workers of switching industries and occupations provide indirect evidence that the difference between the skills of workers who lose jobs and the skills required by expanding firms may be substantial. Artuç, Lederman and Porto (2015) estimate that manufacturing workers in developed countries have to forgo on average 2.76 times their annual wage when switching industries within manufacturing; in developing countries this multiple increases to 3.71. Artuç and McLaren (2015) add the costs of switching occupations to the analysis in their examination of the US labour market. They find that switching occupations and (broadly defined) sectors comes at a similar cost, but that the cost of switching depends on the level of education. For instance, while entering a white-collar occupation costs a non-college-educated worker 5.31 times the average annual wage, it costs a college-educated worker only 2.68 times that figure.

Obstacles to labour mobility caused by the mismatch between demand for and supply of skills can magnify the impact of trade on the skill premium and generate longer unemployment spells for certain skill groups. Recent literature has shown that the adjustment to import competition can have a negative impact on the earnings and employment of certain groups of workers. Autor et al. (2013) show that US workers employed in industries which faced strong import competition from China over the period 1990–2007 experienced lower cumulative earnings and were more likely to rely on government social programmes. Importantly, the authors show that these results are driven by the impact on individuals with initial low wages. High-wage workers, on the other hand, did not suffer much earning loss.[31] One reason for this is that mobility is low among low-skilled workers, and they are over-represented in the manufacturing sector.[32] In a subsequent paper, Autor et al. (2014) focused on individual employment trajectories and found that, upon losing their jobs, low-wage workers tend to remain in the manufacturing sector, where they are repeatedly affected by adverse shocks. Conversely, high-wage workers manage more easily to relocate to sectors less exposed to future shocks.

These differential effects for high- and low-wage workers are also found by Utar (2016) for Denmark. She found that all workers in import-competing firms are more likely than workers in other firms to switch to other employers or to become unemployed. However, she finds that once workers relocate to the service sector, high-skilled workers (workers with a college education) are much more likely to have stable jobs than less educated workers. Furthermore, she finds that some occupations allow workers to recover much faster than others. For instance, managers or clerks manage to find stable jobs in the service sector, and secretaries moving from the manufacturing sector to the service sector more than recover their earning losses after a decade. On the other hand, workers in occupations strongly linked to manufacturing production (for instance, machine operators) experience frequent spells of unemployment after switching to the service sector.

Trade openness affects the decision of workers to invest in education in a way that may amplify its distributional effects

Workers' decisions to invest in education in response to globalization may amplify its effect on wage distribution. Educational systems play a role in shaping workers' educational decisions and thus in shaping the distributional impact of globalization.

Blanchard and Willmann (2016) propose a framework in which individuals take into account the international context in their decision to invest in education. The authors

argue that in advanced economies globalization has brought down the prices of intermediate inputs whose production requires relatively modest skill sets and pays mid-range wages. These include manufacturing inputs such as electronic components, and also back-office tasks such as basic accounting. Consequently, wages in such occupations decline and workers decide not to acquire these mid-level skill sets. This may lead to a shift in the skill-level distribution towards the extremes, because workers who would have chosen mid-level skill sets either downgrade or upgrade their skill levels, depending on their ability and the cost structure of the educational system. The authors emphasize the role of educational systems in shaping workers' educational decisions and thus in shaping the distributional impact of globalization. They further argue that, within a given general educational system, highly targeted policies can be also successful in shaping the distribution of skill levels and income. Such policies need to help workers displaced by imports in moving to higher-wage, export-oriented sectors. In less developed economies that specialize in production of the intermediate inputs mentioned above, globalization has exactly the opposite impact. It is predicted to increase the wages of medium-skilled workers and to induce shifts in skill attainment towards the middle range.

Investment in skills can enhance the likelihood that trade will improve access to decent work

Trade provides opportunities for improvement on several of the key dimensions of decent work. However, decent work is not an automatic outcome of trade, which can benefit some aspects of decent work but does not necessarily benefit all. Appropriate skills development policies can help trade to promote decent work.

Employment creation, social protection, rights at work and social dialogue are the four pillars of the ILO Decent Work Agenda, with gender equality as a cross-cutting theme. Decent work involves opportunities for productive employment and should deliver adequate earnings, security at the workplace, social protection for families, and freedom for people to organize and engage in social dialogue, all leading to inclusive growth. For the ILO, productive employment and decent work are key elements of achieving a fair globalization and equitable and inclusive development.

The ILO Framework for the Measurement of Decent Work (ILO, 2013, p. 12) identifies the following ten substantive elements which are closely linked to the four pillars of decent work:

- employment opportunities;
- adequate earnings and productive work;
- decent working time;
- combining work, family and personal life;
- work that should be abolished;
- stability and security of work;
- equal opportunity and treatment in employment;
- safe work environment;
- social security;
- social dialogue, employers' and workers' representation.

Under each of these substantive elements, there are a number of key indicators on decent work that are used to monitor and assess progress towards decent work. Provision of training to employees itself contributes directly to decent work through the key indicators for the "adequate earnings and productive work" element.

Trade provides opportunities for improvement in several of these elements, to which skills development can contribute. However, decent work is not an automatic outcome of trade, which can benefit some aspects of decent work, but does not necessarily benefit all.

Trade tends to raise productivity both in tradable sectors and across the whole economy, presenting opportunities for workers to share in the returns through improved earnings. A country's ability to improve the population's standard of living over time depends on its ability to raise its output per worker. Rising standards of living contribute to increasing the quality of work available to workers across sectors not limited to those connected to trade.

Productivity improvements in the context of trade frequently come about in part through deployment of modern approaches to HRM and through new forms of work organization. Trade contributes to the pressure to adopt these new practices, as part of the basis for both raising productivity and improving business capabilities. Strong core work skills and

people management skills are required to implement these strategies. Where adopted, these approaches tend to favour better working conditions, greater investment in skills and more concern for employee satisfaction, as a means of better meeting market demands and improving productivity. Investment in technology, driven partly by trade, tends to increase the stake employers have in developing and retaining the skills of their workers. There is some evidence, too, that improved working conditions can lead to more productive workers (Brown et al., 2015).

Trade favours higher skills, and tends to drive more investment in skills development. There is evidence that more training leads to higher labour productivity (Dearden, Reed and Van Reenen, 2000). Also, according to the study by Robinson, Perryman and Hayday (2004), opportunity to train is a significant driver of employee engagement.

As countries become more open and more involved in international trade, compliance with international standards and regulations is becoming more significant as a factor in export success. Trade can thereby provide an impetus towards compliance with labour standards, as one of the sets of standards with which compliance may be demanded by customers in export markets, either as a matter of regulation or as a matter of customer demand for voluntary compliance. Compliance with standards itself requires significant skills and training, with specialized quality and compliance occupations in areas such as laboratory testing, quality control, quality assurance, documentation and regulatory management, and with changes to the content of skills in most operations-focused jobs needed to cover new tasks related to quality, documentation and compliance.

In addition to its impact on the quality of work in firms directly engaged in exporting and in import-competing markets, trade also has an indirect impact on employment through domestic supply chains. There is here at least the potential to improve the quality of work in supply-chain sectors by creating pressure for compliance with standards, such as the FAO's GAP or the ILO's occupational safety and health standards, and through raising the economic returns to supply-chain businesses.

Endnotes

1. Grossman (2013) reviews recent theoretical research that incorporates heterogeneous labour into models of international trade to explore, among other things, the linkages between the distribution of skills and comparative advantage.

2. Bombardini, Gallipoli and Pupato, 2012, use test scores from the 1994–98 International Adult Literacy Survey (IALS), as part of which a common test was administered to a large sample of adults between the age of 16 and 65 in 19 countries.

3. One possible explanation involves firms hampered by their inability to observe workers' contribution to output and workers hampered by their inability to observe the output or profits realized by their employers (Grossman, 2004, 2013; Asuyama, 2012). Another possible explanation involves a job-search environment where workers' skills cannot be observed in advance of employment and so workers are randomly matched with firms (Bombardini, Gallipoli and Pupato, 2012).

4. A relevant concept here is that of an "O-ring" reliable good: that is, a good whose production involves many components, and whose overall reliability is the reliability of the least reliable component.

5. Note that this is a highly stylized model. In reality, the least skilled manufacturing tasks that get offshored are often in the middle of the overall skill range. This is because the very least skilled tasks are often in non-tradable services such as cleaning or catering services. The implications for wage inequality and employment structure are discussed in more detail on p. 68.

6. For a complete exposition of the model, see Feenstra and Hanson, 1996.

7. This last point is an important feature of offshoring. In practice, however, it is quite difficult to determine whether a product could have been produced by the firm at home. Economists rely on the classification of products and industries to determine whether this is the case. For instance, if a car manufacturer is importing "car parts and components", this is likely to qualify as offshoring, as this manufacturer could probably have produced these products. If the same car manufacturer imports textile products (for the car seats, for instance), that is unlikely to be considered offshoring, as car manufacturers do not produce textile products.

8. One factor in coordination and supervision costs is the incompleteness of contracts: see e.g. Antràs, 2003.

9. For a detailed exposition of the model, see Grossman and Rossi-Hansberg, 2008.

10. For theoretical models featuring heterogeneous firms, see e.g. the seminal paper by Melitz (2003).

11. For a full exposition of the theoretical model, see Sampson, 2014.

12. It is important to remember that technological change does not have to be biased towards skilled workers. Historical evidence suggests that during the early years of the industrial revolution in England, the large-scale migration to urban areas by low-skill labour triggered innovation in skill-saving technologies. For example, the tailor's shop was replaced by a factory, in which complex tasks were broken down into simpler tasks which could be performed by low-skill labour (Mokyr, 1990).

13. Brambilla, Lederman and Porto (2012) support this theory by showing that Argentinian firms exporting to high-income countries hire more skilled workers than either exporters to middle-income countries or purely domestic firms.

14. Indeed, Caselli and Wilson (2004) report that OECD countries account for over 90 per cent of total worldwide expenditure on research and development.

15. Child labour may deprive children of the opportunity to attend school, either fully or at all. Given the importance of initial school-level education to skills development, this is a major obstacle to decent work for these children, even once they reach adulthood. Of particular importance in this regard are the following two ILO fundamental Conventions: the Minimum Age Convention, 1973 (No. 138), and the Worst Forms of Child Labour Convention, 1999 (No. 182).

16. National Council on Measurement in Education, *Glossary of important measurement and assessment terms*, https://www.ncme.org/ncme/NCME/Resource_Center/Glossary/NCME/Resource_Center/Glossary1.aspx?hkey=4bb87415-44dc-4088-9ed9-e8515326a061.

17. For a more detailed exposition of the literature that estimates the impact of offshoring on workers, see Hummels, Munch and Xiang, 2016.

18. Using the US O*NET catalogue, which provides information about the knowledge, skills, abilities and specificities of a large number of occupations, Autor, Levy and Murnane (2003) have grouped occupation characteristics into the two broad categories of routine and non-routine.

19. High-, mid- and low- wage jobs are classified according to how much they paid before the period analysed.

20. In this study, skills such as evaluating information to determine compliance with standards, mathematical reasoning, or developing objectives and strategies.

21. Further references about services offshoring can be found in Crinó, 2009.

22. The MERCOSUR Agreement was signed in 1991 by Argentina, Brazil, Paraguay and Uruguay.

23. In this study, high-skill workers are defined as college graduates plus technical education graduates (two to three years of post-secondary education).

24. The evidence comes from Brazil, Denmark, Germany, Mexico and Sweden. See e.g. Schank, Schnabel and Wagner, 2007, for a list of existing studies; or Helpman et al., 2017, for a broader overview of the literature on trade and inequality.

25. This is not the case when the authors focus on exports to high-income economies. An increase in this type of exports has a much stronger positive impact on high-skill workers and therefore implies an increasing skill premium (Hummels et al., 2014).

26. The intuition behind this is that high-tech capital goods often substitute for less-skilled workers, and at the same time the operation and servicing of such capital goods requires relatively high-skilled workers.

27. For a detailed exposition of skill gaps, see p. 97.

28. Goldin and Katz (2008) argue that in the United States the slowdown in the growth of educational attainment was a major reason for the surge in the college wage premium from 1980 to 2005.

29. See Autor, Katz and Kearney, 2006, for the United States; Goos and Manning, 2007, for the UK; Goos, Manning and Salomons, 2009, or Michaels, Natraj and Reenen, 2014, for a sample of European countries; Dustman, Ludsteck and Schönberg, 2009, for Germany; Harrigan, Reshef and Toubal, 2015, for France, and Keller and Utar, 2016, on Denmark.

30. Two main sources are available to researchers: data from surveys, where employers are directly asked whether they face skill shortages; and information about job vacancies.

31. The authors found that an increase in imports from China to the value of US$1,000 per worker reduces the employment rate for individuals with a college education by on average 0.42 of a percentage point, while the reduction is 1.11 percentage points for workers without a college education (males and females are affected equally), which is nearly three times as large.

32. For estimates of mobility costs across sectors or occupations, see Artuç, Chaudhuri and McLaren, 2010; Artuç and McLaren, 2015.

3 Responding to trade-related changes in skills demand

3.1 Skills responses to change driven by trade

In recent decades, global and regional trade policies have helped less developed countries in pursuing comparative advantages in higher-productivity activities, and in exploiting these to drive development, raise income levels and give workers a better standard of living. Skills development has had, and continues to have, an important enabling role in this process.

Globalization has changed the position of most economies in at least some activities on which they have historically relied for employment, and has led to specialization in new or expanding areas of activity that have replaced the lost activities. This has resulted in substantial aggregate gains in country productivity over time, but has also required relocation of workers between occupations, industries and regions. In many developed economies, this adjustment process has been faster since 2000, as China and other emerging economies have become more fully integrated into the international trading system, gaining comparative advantage in labour-intensive manufacturing activities, and causing developed-country manufacturing sectors to focus on high-productivity, less labour-intensive activities in which they retained or created comparative advantages. There have been comparable trends in tradable services centred on India and the Philippines. However, demand in developed countries for services that can be imported from India and the Philippines has grown fast enough, and productivity growth in developed countries has been slow enough, that the combination of imports and domestic labour productivity growth has produced few instances of persistent labour market dislocations in developed-country tradable services sectors.

In this global context, the main high-level economic motivations for action on skills for trade relate to economic efficiency and distribution. At a more detailed level, three main types of motivation in responding to trade-related changes in skills demand are

important: pursuing comparative advantage, reducing adjustment costs and limiting the tendency of trade to increase wage inequality.

Skills are an important factor in comparative advantage (see p. 23). Skills development can be used as part of a strategy to strengthen a country's trade performance, either through a broad emphasis on ensuring that skills development systems strengthen participation in trade, or through more targeted skills development aimed at developing comparative advantage in specific activities. There is a consequential universal good practice need for skills development systems to be responsive to the existing and emerging skills needs of tradable industries and their domestic supply chains, so as to avoid shortages or deficiencies in the types and quality of skills supplied relative to the skills demanded by industry. This is necessary to ensure that skills availability does not act as a drag on participation in trade, just as a more general responsiveness to skills needs across the economy is required to limit labour market friction and underpin productivity growth. The ILO *Conclusions on skills for improved productivity, employment growth and development* "underscore the principle that effective skills development policies need to be integral components of national development strategies in order to prepare the workforce and enterprises for new opportunities and adopt a forward-looking approach to dealing with change" (ILO, 2008, p. v).

A second type of motivation focuses on reducing the adjustment costs that arise when employment is lost for reasons connected to trade, for reasons of efficiency, to contain the distributional impact, and to promote social cohesion (see p. 68). The sooner the worker can make the transition to a new job and the better the fit of that new job with their skills, the lesser the extent to which they are under-employed or underutilize their skills, and the shorter the time for which they are unemployed, the fewer resources are wasted and the lower the costs to the worker.

A third type of motivation is about offsetting the tendency for trade to drive increases in wage inequality through raising the skill premium (see pp. 28, 62). There is evidence, especially from Latin America, that the skill premium can be reduced by increasing the supply of skills that are in demand. This is corroborated by work by the ILO (ILO, 2016a) which found that ALMPs in three Latin American countries reviewed could improve workers' employability and provide them with new job opportunities, and that at the national level this could translate into less poverty and lower levels of inequality. The findings highlight the importance of ensuring that policies are tailored to fit the productive needs of the country and are targeted towards individuals' characteristics.

In general, meeting the current and anticipated skills needs of tradable industries requires action in initial education and training for those not yet in the labour force, and in continuing

education and training for those who are employed in the industry and in its domestic supply chain – and sometimes also among unemployed workers and workers employed in other sectors, so as to prepare them to work in the industry or its domestic supply chain.

Where there is a shock to employment, it may not be clear to what extent the fundamental causes lie in trade or in technological change; but the need for an effective skills policy response is the same whatever the balance between the underlying causes. Three complementary types of skills strategies are available for this purpose: providing education and training for workers who lose their jobs to make them more employable; designing education and training for workers so that their skills will be more transferable if they need to change jobs in the future, while also meeting the skills needs of their current jobs; and developing skills to strengthen comparative advantage in replacement activities, especially where the dislocation results in a shortage of good-quality replacement job opportunities suited to meeting the aspirations of unemployed workers.

Skills development is not the only available type of response: migration, increased labour force participation, RPL and ALMPs (beyond training) can also contribute.

Migration, internally within a country or between countries, can contribute by supplying the skills that industry needs and/or by enabling workers who cannot find suitable employment locally to move to where their skills are in demand. Even if supply of and demand for skills are well balanced at national level, local mismatches can exist that could, with increased mobility, be resolved by migration within the country. International migration is also a major feature of skills supply for many countries and sectors. Examples include migration of IT specialists to technology hubs; migration of health-care professionals from developing countries to developed countries; and migration of high-skilled workers to manage FDI and contract manufacturing operations in developing countries where there is a shortage of suitable skills available locally.

Where there are skills shortages, measures to increase participation in the labour force, for example by promoting higher female participation, can also contribute to the solution. Measures to increase labour force participation by attracting workers back into the labour force often require support from education or training, so as to bring their skills up to date, or to prepare prospective returnees to work in an occupation or sector different from that in which they worked previously.

Sometimes, better use of existing skills is also part of the solution. One aspect of this may be RPL systems (see e.g. Aggarwal, 2015; Branka, 2016a, b), which can make the availability of existing skills more visible to employers. This benefits both employers who are

short of skills and workers in need of work. RPL systems are frequently used in conjunction with education and training, giving workers credit for their existing competencies and knowledge, and thereby reducing the commitment of time and resources required to obtain a qualification, and reducing the delay before skills become available.

Better use of skills may also be achieved through strategies such as new forms of high-performance work organization or "lean" operations.

Other ALMPs, such as job-search assistance or activation strategies, passive labour market and social policies, including complementary policies such as housing or credit market policies, can also be used to lower labour market related barriers to matching skills supply to demand.

3.2 Skills supply

Skills supply refers to the number of workers available with the set of skills required to undertake an occupation, or any of a grouping of occupations, at any given wage rate. Governments, individuals and firms have a shared interest in the supply of skills. The main types of education and training that contribute to skills supply are initial education and training, continuing education and training, workplace learning and training provided under ALMPs.

Meaning of skills supply for an occupation

Skills supply refers to the number of workers available with the set of skills required to undertake an occupation, or any of a grouping of occupations, at any given wage rate.

Quantitative empirical research often aggregates supply of, and demand for, skills into just two or three groupings, for example high skills and low skills, or high skills, medium skills and low skills. Policy research and statistics on skills demand and supply are usually based on the ISCO listing of occupational categories, which offers 436 occupations at its most detailed level, or on national classifications (which are often variants of ISCO). Research on skills demand and supply at firm or sector level is often based on even more detailed occupational classifications using terminology specific to the sector or to the firm itself.

Workers may have the required skills for more than one occupation, and may be employable in more than one sector. Not all workers apparently qualified for an occupation on the basis of easily observable characteristics will necessarily be considered employable for all jobs in that occupation by all employers; and employers will sometimes widen

or narrow their criteria for employability in an occupation in response to labour market conditions or other factors. For all these reasons, it is often necessary to adjust data on the supply of skills for an occupation in order to make it comparable with estimates of demand for skills in that occupation.

In skills research and policy, skills supply can refer either to the stock of workers with skills matching demand, or to the flow of new workers becoming available for employment, net of those previously available who become unavailable.

The terminology based on stock is associated with microeconomic analysis of skills in markets, with estimates of supply for an occupation based on the number of skilled workers currently employed or available from other sources, taking account of competing demands for those workers.

The terminology based on flow is associated with skills forecasting models, which use a macroeconomic model to forecast employment by sector, and disaggregate sector employment by occupation. Demand is calculated as the sum of expansion demand, derived from change in occupational employment, plus replacement demand, to replace workers who leave the occupation. Estimates of skills supply are constructed to be comparable with forecasts of demand, usually taking new graduate numbers as a starting point (see e.g. Cedefop, 2010b). These models are most often used in planning education and training provision, for which a flow-based definition of supply is highly suitable.

Qualitative discussion of skills supply does not necessarily have to specify whether it refers to stocks or to flows. Where there is a shortage, an increase in the net flow will increase the stock, and where there is an excess supply a decrease in net flow will reduce the stock.

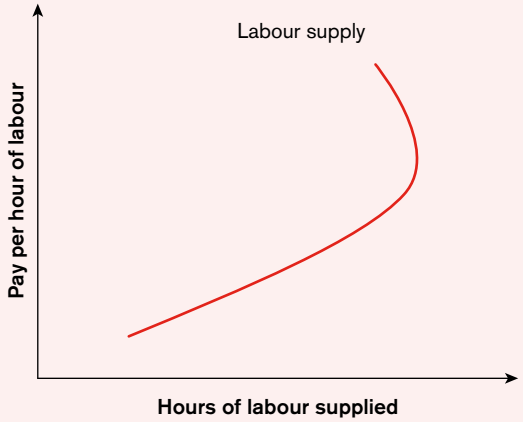
Box 3.1: Supply of skills schedule

A supply schedule can help clarify how skills supply behaves in response to a demand shock such as might arise from a change in trade. A classic view of labour supply (see figure 3.1) emphasizes the trade-off that workers may make between work and leisure. With hours of labour supplied on the horizontal axis and pay per hour on the vertical axis, the supply curve initially slopes upwards, as higher pay induces workers to work longer hours, and attracts some who are outside the labour force to (re-)enter the market. However, there are limits to how much labour will be supplied, and as pay increases the marginal utility of leisure eventually exceeds the marginal utility of greater pay, making the supply curve slope backwards.

(continued)

Box 3.1 (continued)

Figure 3.1 A classic view of labour supply

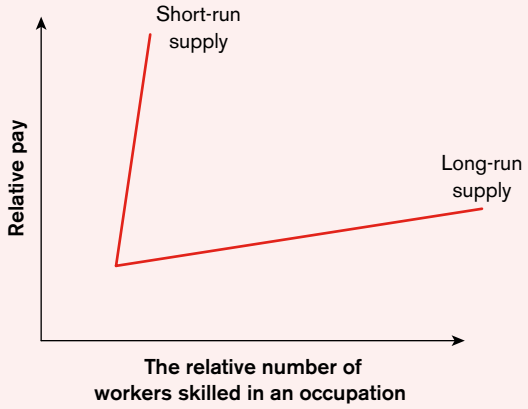


In the context of skills supply, it is necessary to distinguish between the short run and the long run. It is usual in skills analysis to focus on the number of workers available, rather than on hours of labour, as the main measure of supply. This makes the skills supply schedule upward-sloping. It implicitly treats variations in hours worked as a coping mechanism to deal with short-term fluctuations in demand, where persistent changes in labour demand usually require change in the number of workers.

For an occupation with a set of skills that distinguishes it clearly from other occupations, skills supply is typically relatively inelastic over the short run. At the margin, an increase in pay relative to the rest of the economy may increase the supply of workers by delaying retirement, by attracting skilled workers back into the labour force, by attracting workers from other occupations with appropriate individual skill sets, or by attracting migrants from another labour market. Conversely, a reduction in pay may encourage some workers in the occupation to leave the labour market or to move to other occupations. However, over periods too short for the number of individuals with the skills required for the occupation to change from its existing trajectory, the net impact on supply is small.

Over the long run, skills supply is typically more elastic. An increase in pay relative to other occupations will increase the share of new entrants to the labour market who undertake education and training relevant to the occupation, and who choose to enter career paths that can lead to the occupation. Workers whose skill sets partly meet the skills profile of the occupation are more likely to train in the additional skills they need to enter it. A decrease in

Figure 3.2 Short-run and long-run supply of skills



relative pay will divert individuals away from education and training courses associated with entry into the occupation, encourage workers to follow career paths that lead to alternative occupations, and encourage workers in the occupation to supplement their skills in ways that equip them to work in other occupations. Even if workers already in the occupation have difficulty in moving to other occupations, there may be a significant outflow through retirement, migration or other routes over a period of years. Skills obsolescence can have the effect of removing workers from the skills supply for an occupation, especially affecting those in workplaces that do not keep up to date and those who become long-term unemployed.

The supply schedule chart in figure 3.2 illustrates the difference between short-run and long-run supply of skills for an occupation. The horizontal axis represents the relative number of workers skilled in an occupation. The vertical axis represents average pay in the occupation relative to the rest of the economy.

Decisions to invest in education and training for an occupation are often complex, influenced by choices distributed across multiple labour market actors. Individuals make decisions on investing in developing skills not just on the basis of the returns they can expect and on personal development goals, but also in the context of choices by employers, governments and providers of education and training. If training in a skill is provided by the employer, at the employer's cost, during normal working hours, and is a job requirement, then the expected economic return required for a decision in favour is much lower than if it is necessary for the individual worker to find an independent supplier, pay the full economic cost of provision and

(continued)

Box 3.1 (continued)

undertake the training outside working hours with no flexibility on working hours offered by the employer. In either case, the supply of available education and training has a major impact, as it constrains what education and training an employer or individual worker (or group of workers) can source, and at what cost.

Decisions may also be influenced by the availability of subsidies (whether through individuals, employers, providers of education and training, industry organizations or other civil society organizations), by the existence of levies on employers to fund training, by regulatory or legal requirements for training, by collective promotion of training by workers' organizations, or by the availability of suitably structured credit for education and training.

At initial education and training level, the cost of education and training, the cost of living while engaged in study, the opportunity cost of being partly or wholly outside the labour force while studying, the availability of suitably structured credit, and the rationing of access to provision all influence decisions about the level and field of study, alongside expectations of economic returns, personal aptitudes, personal development goals and often issues of status.

At the level of the individual, therefore, decisions about investing in skills are influenced heavily by the characteristics of the broad skills development system within which they are embedded. For the aggregate of all decisions relating to an occupation, the level of investment in skills is contingent on the characteristics of the skills development system as much as on the expected returns to skills.

Private and public supply of skills

Governments, individuals and employers share an interest in education and training to meet skills needs. All invest in education and training. Economic returns accrue to employers, to individual workers and to society as a whole. Reflecting these shared interests, institutional arrangements for education and training in all countries show a combination of public and private involvement in resourcing, governance and ownership.

Viewed as a whole, systems for funding education and training in any individual country are usually complex, aiming to ensure universal access up to an education level that varies across countries, sufficient participation in post-universal education and training, sufficient education and training for the workforce, and reinforcement of the employability of workers who lose their jobs, while also allocating costs to those who will benefit from an economic return and redressing expected market failures.

There are significant variations between countries in how costs are split between governments, employers and individuals, but the following summary from the G20 training strategy provides a good overview.

- **Government** – Governments have the responsibility for initial training as part of universal education, and for retraining focused on the unemployed or workers at risk of unemployment during economic crises. National, regional and/or local governments may finance training directly and/or promote co-financing by creating incentives for employers and individuals to invest in training. Incentives may involve subsidizing training through budget allocations to training institutions; reliefs from general revenue; payment of tuition charges and fees; funding for in-service training; vouchers and loans provided to trainees; exemptions from employer payroll levies where training is provided; and grants made available to firms to undertake certain designated forms of training both on and off the job.

- **Employers** – Direct or indirect financing of training by employers is a clear statement of the importance of continuing education and training in maintaining and increasing productivity, competitiveness and versatility. Payroll fees or levies can be effective when combined with effective governance and communication mechanisms to maintain the relevance of training to employers. Employers may be exempted from training levies or charged at a reduced rate in proportion to the training they provide to their employees, whether internally or externally. In other arrangements, employers may provide grants to training institutions, or invite several training providers to compete for training courses financed by one or more employers. Smaller enterprises may come together to arrange training jointly to reap economies of scale within clusters or communities.

- **Individuals** – Workers invest time and money in keeping their skills and competencies up to date, taking responsibility for maintaining their employability in the face of economic change. Some schemes involve forgoing income during training in exchange for higher income after completion of training; this may be feasible for some individuals, especially where training costs qualify for tax credits/deductions or where subsidized loans are available for training. However, these schemes are not sufficient to enable workers at low income levels, those with family responsibilities or those in the informal economy to participate in lifelong learning; here employer or public provision of training is necessary. (ILO, 2011, pp. 32–33)

Incentives, payroll fees, training levies, tax credits/deductions and subsidized loans are designed to overcome expected market failures that might otherwise result in

underinvestment in education and training, or in individuals or firms bearing an excessive cost burden.

Among the types of market failure most commonly prioritized for action are: the tendency of many firms to underinvest in training because they expect too great a share of the returns to accrue to employees and competitors; the tendency of smaller firms to underinvest in training where they lack the management capacity to do so effectively and suffer from diseconomies of scale in procuring training or providing it on their own behalf; the tendency of firms of all sizes to invest least in training for their lowest-skilled workers; and barriers, including information barriers and gaps in provision, to identifying skills needs and matching them with suitable training solutions.

Examples of other common types of intervention to redress market failures include measures to improve the supply of training available to enterprises, often through education and training institutions; to make information on training supply more accessible; to develop cooperation on training between businesses with similar training needs; and to strengthen the general management capacity and human resource development capacity of SMEs.

Participation in international trade should sharpen the policy focus on getting skills development right, for governments, firms and workers.

As skills are centrally important to avoiding placing any unnecessary drag on firms' ability to participate in internationally competitive markets, governments, firms in tradable sectors and their domestic value chains, and workers employed in these areas have a shared interest in ensuring that initial education and training, continuing education and training, and workplace learning respond well to current and anticipated skills needs. Governments have a strong interest in ensuring that skills development systems serving these sectors are well designed and function properly, and that effective measures are taken to redress the risk of market failures. Firms in these sectors have a collective interest in ensuring that skills development systems meet their needs and that market failures affecting skills development are addressed. Each firm also has an individual interest in ensuring that its internal training strategies meet its own business needs. Individuals have an interest in taking advantage of the education and training opportunities offered to meet the needs of the sectors and firms in which they are employed or anticipate being employed, both to support their own employability and career progression, and because they will usually share in the economic benefits of their increased productivity.

Tradable sectors and their value chains are especially exposed to change that affects employment; even where the net employment impacts are positive, there are losers as well as winners among firms and among workers. In long-established sectors newly exposed to international trade, frequently the most capable firms succeed in export markets while less capable firms lose out from new competition in their domestic markets, as seen across multiple countries and sectors under the ILO's STED Programme. In some cases, exposure to trade results in a structural shift, forcing even the most capable firms in a sector to adjust. In sectors long exposed to international trade, new international competitors or improved competition from existing competitors can push sectors and firms out of established markets or limit them to niches requiring less labour, as has been particularly noticeable in manufacturing in many developed countries with the full entry of more emerging economies into traded markets since around 2000. Some types of activity, notably garment manufacturing and electronics assembly, have a history of mobility, moving between centres of activity as the relative advantages in costs, labour availability, business environment, infrastructure and market access offered by different locations change over time. A succession of developed and emerging economies have had to adjust to the resulting job losses, while also seeking to preserve what they can by specializing in higher value-added activities within these sectors. Even in firms that succeed in international trade, rapid change in technologies and working practices drives changing, and on average rising, skills requirements. Lower-skilled workers, and workers whose skills have not stayed up to date, are often vulnerable to losing their jobs even if employment is increasing overall. Low-skilled workers who lose their jobs are especially vulnerable to difficulty in finding good new jobs.

For these reasons, governments and tradable sector workers have a joint interest in continuing learning to underpin employability beyond the direct business needs of employers for specific technical skills, focusing more broadly on strengthening core work skills and technical skills that would be transferable between jobs, occupations and sectors. Mechanisms based on public funding, on levies or on public mandates to employers may be used to support workers' access to continuing education and training, so as to underpin future employability in this way. Workers' organizations also have an important role to play, both in dialogue about provision and mechanisms for access, and in communicating to their members the relevance of investing their own time and resources in learning. Lack of interest among workers is sometimes a barrier even to participation in training provided by employers during working hours, and, alongside competing priorities, can be a correspondingly greater barrier to participation in continuing education and training outside working hours.

Investment in continuing education and training beyond the direct business needs identified by employers can still benefit employers. Many individual employers in internationally tradable sectors facilitate employees in studying part time towards qualifications that are not directly relevant to their jobs, often on the basis that doing so will enhance their core work skills and can boost worker motivation.

Types of education and training provision

Two main types of education and training contribute to the supply of skills: initial education and training; and continuing education and training. Workplace learning and training under ALMPs are subsets of continuing education and training, but are addressed as distinct categories here, both to emphasize the important role of the workplace in continuing learning and because of the significant role ALMPs have in trade adjustment. Gaps between supply of and demand for skills often occur where the existing mechanisms for supply of a skill cannot cope adequately with current or anticipated demand, or where the nature of skills demand changes and existing mechanisms have difficulty changing in response.

A country's system for supplying skills will normally include all of these types of education and training. If more than one channel is capable of supplying skills, then whether one is better than another in meeting a particular skills requirement is contingent on the particular skills needed, on the institutional arrangements and on the context. If one channel for skills supply is not capable of providing sufficient skills, or skills of sufficient quality, this raises the question whether additional or alternative channels of supply should be used.

Approaches to education that combine classroom- and work-based learning can be better for skills development than either classroom-based or work-based education and training alone (see ILO, 2011). Work placements and internships can provide a work-based component to TVET and vocationally oriented university courses. Work-based learning approaches to initial training, including apprenticeships, function better in combination with a classroom-based component.

In many countries, there are gender differences in access to education and training in terms of both choices and access. These apply at all stages, with women often not receiving the same degree of access or preference as similarly qualified men, whether in initial or continuing education or in workplace learning. Gendered roles in the workplace, and provision organized with insufficient allowance for family responsibilities, often act as barriers to women's full participation.

Initial education and training

Graduates from each country's formal education and training systems account for the main flow of skilled workers into its labour market.

Primary education and general secondary education develop cognitive[1] and non-cognitive[2] skills that form the basis for the foundation[3] and core work skills required in the workplace, and the starting point for developing broader *transferable* skills – that is, skills that are transferable across jobs, occupations and sectors. They provide a pipeline of new entrants into TVET and university education, and into jobs that require limited technical skills at entry level.

TVET providers and universities educate and train students in the technical skills required to supply many medium-skill and high-skill occupations, as well as building upon the cognitive and non-cognitive behavioural skills learned in primary and secondary education. They play an important role in developing transferable skills – skills that are applicable across different employers, sectors and occupations, and which are key to career flexibility. Graduates do not necessarily take up occupations directly connected to their qualifications when they enter the labour force. Often, in practice, they form part of the skills supply for other occupations in which they can apply the skills they have learned.

Formal work-based learning systems, such as apprenticeships, under which new entrants into an occupation train on the job, are a major channel of skills supply for specific occupations, but the range of occupations for which they are important varies between countries. In some countries, they are focused mainly at medium skill levels; in others, they also function alongside universities in supplying skills for highly skilled occupations at skill levels equivalent to those of university learning. The meaning of "apprenticeship" as a term varies between countries, from informal work-based learning lasting a few months to formally structured programmes combining workplace and institution-based learning of up to about four years' duration. Experience across many countries shows that the best results from work-based learning are achieved where the learning programme is well structured, and includes both on-the-job and off-the-job learning (see also ETC, 2013). Examples most often quoted as embodying best practice are from European "dual system" apprenticeships, which include both formal on-the-job learning and classroom-based learning at technical training institutes or training centres.

A range of other types of civil society and commercial organizations may also provide initial education and training. Training by professional associations, industry organizations (including

employers' and workers' organizations) and providers of private qualifications also supplies skills for some occupations, which vary depending on the country. In some cases, especially in developing countries in receipt of development aid, non-governmental organizations (NGOs) and development partners also provide initial training. Initial training by these other types of organizations is frequently integrated with work-based training provision: an example would be training provided by some professional accountancy bodies for trainee accountants.

Continuing education and training

Continuing education and training for those already in the labour force is also important to the supply of skills, both because skills needs change and because many people move between jobs and occupations as their careers progress.

Skills requirements within occupations and within specific jobs change over time, often requiring skills to be updated, upgraded or broadened. Reskilling may be required when a worker moves to a different occupation or a significantly different job, whether because their original job became unnecessary or because change offers a good opportunity.

The skills for many types of job are regularly supplied through career progression from other jobs rather than directly from initial education and training. To supply these skills, in addition to informal learning, formal training in, for example, supervisory skills or additional technical skills may be needed.

Continuing education and training occurs on a spectrum from short interventions in the workplace to substantial external programmes of learning leading to major qualifications such as diplomas or university degrees obtained through part-time study, distance learning or blended learning methods. As well as learning targeted directly on employers' skills needs, return to study by employed workers pursuing their own career goals is an important part of the skills supply landscape. Continuing education and training, especially more formal programmes, plays an important role in maintaining and continuing to develop transferable skills.

Workplace learning

Continuing workplace learning is one of the main channels for upgrading, updating, broadening and adding to the technical and core work skills of workers throughout their careers; for providing the skills required to deploy new technologies, new processes and new types of work organization; and for developing the skills needed to promote workers to more senior roles.

Workplace learning overlaps with institution-based continuing education and training in responding to changing skills needs and in underpinning career progression. It covers a spectrum of learning activities including classroom training, practical training on equipment, ICT-enabled training and blended learning (incorporating both ICT training and other forms of learning), as well as training and mentoring integrated with, or interspersed with, normal work. It is a central part of every skills development system. The extent to which workplace learning is provided varies greatly. Larger firms and exporting firms, which tend to have stronger management, provide more formal training than smaller and domestically focused firms, where weaker management and diseconomies of scale tend to limit the amount of training undertaken on average.[4]

Depending on the country and the specific occupation, initial skills training for many low-skilled and medium-skilled occupations is provided by the employer in the workplace to workers with only school-level qualifications. In many cases, there are problems with skills development at this level, with employers focused narrowly on developing the specific technical skills required on the job, and on workplace-specific procedures and work organization. There is scope to improve this approach by combining such workplace training with classroom-based learning at an education or training institution in an overall programme of learning leading to a recognized qualification.

Training under ALMPs

ALMPs are policies designed to give unemployed workers and new labour market entrants active assistance in moving into employment. They contribute to skills supply by improving the matching of available skills to jobs, and by reducing the barriers to taking up employment. Training provided under ALMPs aims to develop skills that are marketable skills, whether technical skills, core work skills or both. ALMPs may provide training directly or enable access to any of the other types of provision described above.

Alongside other labour market institutions, ALMPs play a central role in enabling workers who become unemployed to move into new jobs. Even during periods of strong demand for labour there is often significant job churn, not all of it voluntary; ALMPs play an important role in matching workers to the most suitable available jobs, minimizing periods of unemployment, and developing skills that unemployed workers need to get back into employment.

In times of weak labour market demand, and especially where there are job losses on a large scale, ALMPs become especially important in ensuring that unemployed workers remain connected to the job market, and regain employment quickly in jobs appropriate to their skill levels. In cases where significant numbers of jobs are lost at once, through

closure or downsizing of a major employing operation, it is common for governments to establish ALMPs targeted at workers who face unemployment or who have become unemployed and aiming to facilitate their transition back into employment.

One framework for such initiatives is the European Commission's European Globalization Adjustment Fund (EGF), which aims to support workers who lose their jobs due to the effects of globalization. It funds 60 per cent of the cost of projects providing a package of personalized assistance measures that include tailored job search, outplacement[5] or (re) qualification. The projects are managed and run by national or regional authorities. The EGF is targeted on cases where 500 or more workers at a single employer (including suppliers and downstream producers) or in a particular sector lose their jobs, and on areas with sharply increasing numbers of young jobseekers (European Commission, 2014).

Experience suggests that ALMPs should be based on an accurate analysis of the labour market and social needs of the specific country. The lessons of ILO impact evaluations of ALMPs highlight the importance of: (i) ensuring that policies are tailored to fit the productive needs of the country and are targeted towards individuals' characteristics; and (ii) leveraging complementarities among labour market policies and reinforcing the incentives to participate in ALMPs in order to increase their efficiency and reach (ILO, 2016b).

Table 3.1 summarizes the main types of skills development provision and their main contributions to skills supply.

Table 3.1 Main types of skills development provision and their contributions to skills supply

Type of provision	Initial or continuing	Main contribution to skills supply
Primary and academic secondary education	Initial education	Development of cognitive and non-cognitive behavioural skills that form the basis for foundation and core work skills required in the workplace. Pipeline of graduates for entry into other education and training, or for entry into jobs that require limited technical skills at entry level. Improving cognitive and non-cognitive behavioural skills that form the basis for foundation and core work skills required in the workplace.
	"Second-chance" education	Pipeline of graduates for entry into other education and training, or for re-entry or late entry into the workforce, usually into jobs requiring limited technical skills at entry level.

Table 3.1 (continued)

TVET	Initial TVET	Development of technical skills for relevant occupations. Increasingly, also focuses on developing cognitive and non-cognitive behavioural skills, and directly on developing core work skills.
	Apprenticeship and other forms of work-based learning	Development of technical skills for relevant occupations. Also focuses directly on developing core work skills, and increasingly on developing cognitive and non-cognitive behavioural skills. Formal apprenticeships involve structured workplace training. High-quality apprenticeships also involve classroom training, often at a school, college or training centre away from the workplace.
	Continuing TVET	Upskilling, updating skills, broadening skills or reskilling for members of the existing labour force. Developing skills needed for workers to move to more senior roles. Long courses improve skills substantially. Short courses improve skills incrementally.
University	Initial education	Vocationally oriented courses develop technical skills for occupations in which those skills are relevant. Whether or not a course is vocationally oriented should be understood on a case-by-case basis, as many subjects not explicitly linked to major occupations may be taught based on curricula with substantial vocationally relevant content. All university courses aim to develop more advanced cognitive and non-cognitive skills that form the basis for higher-level core work skills.
	Continuing university education	Upskilling, updating skills, broadening skills or reskilling for members of the existing labour force. Developing skills needed for workers to move to more senior roles. Long courses improve skills substantially. Short courses, such as executive education courses, improve skills incrementally.
Professional associations, industry associations, NGOs, development partners and providers of private industry qualifications	Initial training	For some occupations in some countries, qualifications offered by professional associations or private organizations are important routes to entry after completing education. Training may be offered by the provider of the qualification or by other organizations, sometimes prior to entry into the occupation and sometimes during a training period or apprenticeship at an employer. Attaining the qualification usually depends on acquisition of technical skills.

(continued)

Table 3.1 (continued)

	Continuing training	Professional associations, industry associations (including employers' and workers' organizations) and providers of private qualifications are important sources of continuing training tailored to upskilling, updating skills, broadening skills or reskilling members of the existing labour force to meet the needs of specific sectors and occupations, and to developing skills needed for workers to move to more senior roles. They are key providers of short courses to improve or update skills incrementally in response to developments in occupational skills needs and changing sector skills priorities.
Workplace learning	Initial and continuing training	Workplace learning covers a wide spectrum of learning activities, including classroom training at the workplace or provided by the employer away from the workplace, practical training on equipment, IT-enabled training, and both structured and unstructured training and mentoring within the worker's usual working context. Depending on the specific country and occupation, initial skills training for many low-skill and medium-skill occupations is provided by the employer in the workplace. Continuing workplace learning is one of the main channels for upgrading, updating, broadening and adding to the technical and core work skills of workers throughout their careers, for providing the skills required to deploy new technologies, new processes and new types of work organization, and for developing skills needed to promote workers to more senior roles. The extent to which it is provided varies greatly.
ALMPs	Continuing and initial training	ALMPs are programmes to actively assist unemployed workers and new labour market entrants into employment. They contribute to skills supply by improving matching of available skills to jobs, and by reducing the barriers to taking up employment. Training provided under ALMPs aims to develop marketable skills, whether technical skills, core work skills or both. ALMPs may provide training directly or enable access to other types of provision.

Lifelong learning and qualifications systems

Lifelong learning is the pursuit of knowledge throughout life for personal or professional reasons. It is recognized internationally as a policy priority, both for its contribution to employability and because of the inherent value of self-development.

In some countries, lifelong learning is well established; in others there is considerable scope to improve continuing access to education and training, both formal and informal, with a view not only to its contribution to employability but also in support of wider social objectives. A well-developed approach to lifelong learning improves access to learning opportunities for workers in sectors exposed to trade.

Competency-based qualifications systems that facilitate recognition of skills through whatever path of learning they have been obtained are playing an important role in supporting lifelong learning.

These RPL systems allow skills to be recognized within a framework that is common across each country, and help providers of education and training in providing paths for workers to progress to higher levels of qualification and skill.

Current versus prospective skills gaps

Gaps between supply of and demand for skills as perceived by firms or workers (skills gaps) can be current or prospective.

Current skills gaps arise when firms cannot recruit enough workers for some types of job, or when the workers who are available do not have the skills required to do the work that is currently required effectively, and firms and workers cannot easily develop these skills. They can also arise where workers have skills that are not currently in demand on the labour market.

Prospective skills gaps can be identified on the basis of anticipated future skills needs, and also on the skills that are needed now, not for current productivity but to create the basis for future productivity improvement and competitiveness. Or, alternatively, analysis may show that skills currently in demand will be less in demand in future, or even become obsolete, leading to future skills oversupply or skills obsolescence.

At any time, there is usually an approximate match between the skills in a firm, the business and operating processes that it currently implements, and the technologies

it currently deploys. Firms seldom recruit or train skills far in advance of what they can deploy productively, but they cannot compete if their skills are insufficient to deliver products or services consistent with the expectations of their target market at a level of productivity consistent with their technologies and costs. However, the pace at which they can change so as to become more productive, to innovate and to compete more effectively is limited by the skills that they can recruit or develop in their workforce. Even where there is a good match between a firm's skills, the processes it currently implements and the technologies that it deploys, the strategies that it can implement for the future are constrained by its access to skills. Enterprise surveys carried out under the ILO's STED Programme typically reflect this analysis by showing mixed views among firms as to whether their existing endowment of skills meets current needs, but a consensus among export-oriented firms that they will need stronger capabilities in the future, along with the stronger and broader skills required to underpin these.

Firm-level gaps in capability and in skills are inseparable. The ability of firms to improve business capabilities is constrained by the skills available, but the scope to apply skills is also constrained by the firm-level context in which they are deployed.

Both current and prospective gaps in skills supply are partly a matter of timing. No matter how effective and responsive skills development systems are, skills needs change constantly, and they cannot always be anticipated far enough in advance to ensure that all the skills needed are available when they are required. However, where there are deficiencies in skills development systems, this generates greater skills gaps. If skills systems do not have the capacity to deliver the skills needed, or if they are unresponsive to changes in the skills needs of employers and workers, then their capacity to close skills gaps, or even to understand that they exist, is compromised.

A responsive skills supply system can improve trade performance and inclusiveness

A skills supply system that is responsive to current and anticipated skills needs can address skills mismatches connected to trade.

The challenges of skills supply are about improving the match between supply of and demand for skills. As summarized in box 2.7 above, key dimensions of mismatches include supply of skills that is insufficient to meet demand, whether in terms of shortages or qualitative mismatch through underskilling, undereducation or underqualification, or a combination of these; supply of skills that cannot be used effectively, whether because of oversupply, overskilling, overeducation or overqualification; and skills obsolescence,

where skills that once met demand are no longer needed. All of these forms of mismatch can, and often do, coexist.

All of these forms of mismatch are relevant to trade. Where the supply of skills is insufficient to meet skills needs, whether in terms of the quantity or quality of skills, this constrains firms in tradable sectors and their domestic supply chains in the strategies they can implement effectively. Where there is quantitative oversupply, investment in skills may be wasted. For firms, where there is overskilling, overeducation or overqualification, this sometimes boosts productivity, but sometimes harms morale among workers who feel they are working at too low a level, and so may hinder worker retention. For individual workers, it raises the questions whether they have overinvested time and resources in education and training, and whether they might be rewarded better in a different job. For governments, it raises questions about the efficiency of their investment in education and training, and about whether the skills developed could be deployed more productively in other sectors.

Overeducation and overqualification may be partly a consequence of education and training serving societal purposes beyond skills supply, with some individuals, enabled by government and education and training providers, choosing fields of study and qualifications based on criteria other than employability. It is in any case not possible in an advanced economy to micro-manage choices about fields of study, and many education courses that are not formally vocationally oriented have good long-term employment outcomes because they build strong core and transferable skills and offer meaningful access to career paths. Even so, if skills supply systems, taken as a whole, are not responsive to skills needs, this puts the economy and its exporting firms at a disadvantage in international trade.

Rapid change in skills needs in tradable sectors means that skills obsolescence is always a threat. This can arise if curricula for initial education and training courses fail to change adequately in response to changing skills needs; if workplace training is insufficient to allow workers to keep up with changing needs; if changes in technology and working practices make jobs obsolete, and the workers in these jobs are not trained for emerging new roles; and if some combination of trade and technology change causes employment dislocation, leaving workers without access to work that fits their skills.

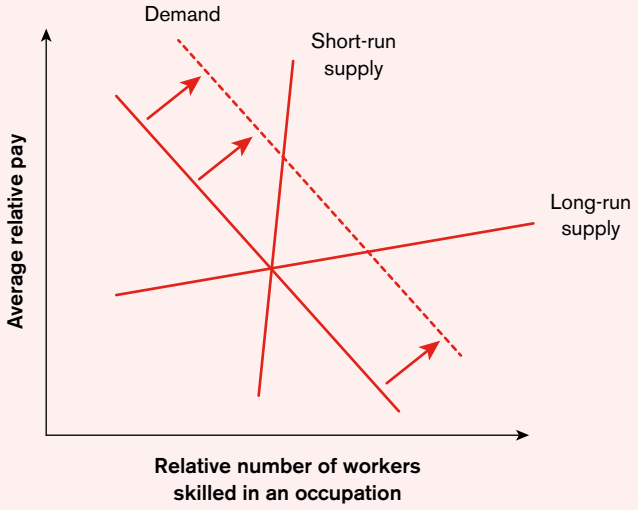
The consequences of changing skills needs can be biased significantly by gender. This may arise because occupations are gendered in many country and sector contexts, and the skills associated with those occupations may be more or less transferable. For example, skills in administrative work tend to be more transferable between sectors than those in front-line production work, and the associated occupations are often gendered. Also, in many country contexts men get better access than similarly qualified women to upskilling and reskilling opportunities, potentially making it easier for them to move to other work.

Box 3.2 illustrates how a positive shock to skills demand can lead to skills shortages. Box 3.3 illustrates skills supply responses to a negative shock to skills demand.

Given the wide range of types of skills development provision, there is no single correct means of responding to a skills shortage. Employers, governments, providers of education and training, and indeed individual workers and students have meaningful choices to make about how best to respond, so that collaboration in analysing skills needs and devising responses is a necessary part of responding to any shortage.[6]

Box 3.2: Skills shortage arising from a positive shock to skills demand

Figure 3.3 Skills supply in the case of a positive shock to skills demand



A supply and demand diagram (figure 3.3) can help clarify how skills shortages occur in the case of a positive shock to skills demand such as may arise through a change in

trade. The horizontal axis represents the number of workers in an occupation available for employment at a level of pay relative to other occupations. The vertical axis represents average pay in the occupation relative to other occupations in the economy. The supply curve is upward sloping, but the slope varies markedly with the time horizon.

Over the long run, supply is highly elastic, responding to market signals. In the event of a positive shock to skills demand, as illustrated, skills supply does not greatly constrain employment growth in the occupation, and the increase in demand for skills in the occupation has only a small impact on relative pay for the occupation.

Over the short run, supply is inelastic. Education and training systems take time to adjust in such a way as to increase their output. Where a new supply of skills in an occupation comes mainly from initial education and training, even once they make the adjustment it may be years before an increase in intake of students or trainees increases the output of graduates, thereby increasing the supply above its existing trajectory. In the meantime, the number employed in the occupation undergoes a small increase, perhaps accommodated by relaxing recruitment criteria or by delaying retirements, and relative pay for the occupation rises significantly. The inelastic short-run response shown in the diagram assumes that the sector is the main employer of workers with the skills required for the occupation, and that there is no reserve of under-employed workers in the occupation. If workers with these skills are also employed in other sectors, or if there is a reserve, then the supply elasticity seen by the tradable sector may be greater.

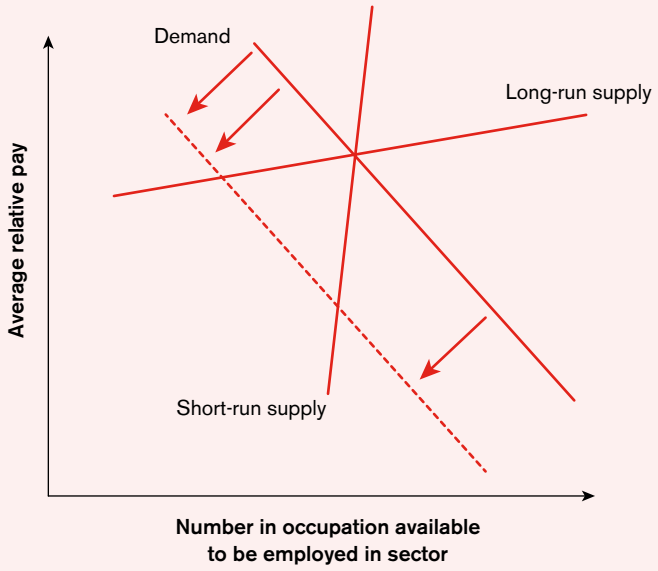
The difference between the skills supply in the occupation in the short run and in the long run can be interpreted as one indicator of shortage. Another perspective is that sticky wages result in a mismatch between skills supply and what industry perceives to be demand.

The responsiveness of the education and training system largely determines how quickly the supply curve moves between short-run inelasticity and long-run elasticity. If the increase in skills demand is anticipated far enough in advance, it may be possible to guide skills supply in advance sufficiently to avoid a shortage. If the increase in demand is unanticipated, then a fast response by education and training systems will minimize the delay, and accelerated approaches to skills development may reduce the duration of the shortage.

Skills shortages can also be viewed through a macroeconomic and structural framework, where demand for skills in an occupation is a function of sector-level employment and the composition of employment in each sector, and supply of skills in the occupation is again the supply of skills matching the occupation available for employment.

Box 3.3: Skills supply responses to a negative shock to skills demand

Figure 3.4 Skills supply in the case of a negative shock to skills demand



Here again, a supply and demand diagram (figure 3.4) can help clarify what occurs during and following a negative shock to demand for skills in an occupation, such as might arise through a change in trade. The horizontal axis represents the number of workers in an occupation available to be employed in a tradable sector. The vertical axis represents average pay in the occupation relative to the rest of the economy. Again, the supply curve is upward sloping, and again the slope varies with the time horizon. Over the long run, supply is highly elastic, responding to market signals. Over the short run, supply is inelastic. Workers displaced have difficulty in finding other jobs that match their set of skills, and average relative pay falls. As wages tend to be sticky downwards, the adjustment in pay does not take place only through pay within the sector, but also through unemployment; under-employment; and employment in jobs that have a poor match with the skills of displaced workers, and so are less productive and do not pay as well.

Adjustment in the market for skills in the occupation may take a long time – perhaps decades – before the supply curve reaches its long-run position, as workers face significant persistent penalties for skills mismatch in the labour market, and in many cases are slow to move to where their skills would be more in demand.

Interventions to facilitate the adjustment accelerate the shift, reducing but not eliminating costs to efficiency. Where the focus is only on getting workers back into employment quickly, this has an impact only to the extent that it is successful in returning workers to employment; this impact is limited where skills mismatches limit the productivity of displaced workers to a level below that which they delivered in their previous employment.

Box 3.4: Evidence from STED on the need for a responsive skills supply system to enable participation in trade

In all of the developing-country tradable sectors in which work has been undertaken through the STED Programme, deficiencies and shortages in skills have been observed that have negative impacts on the ability to participate effectively in internationally traded markets. Information on other sectors gleaned from STED sector selection processes indicates that this is a general issue in exporting sectors in the countries where STED-based work has been done, with the possible exception of those sectors made up mainly of multinational operations and contract manufacturers that rely mainly on low-skilled labour to undertake simple routine tasks without much variation. However, smaller firms in these sectors often have more demanding skills requirements, and are less well equipped to develop their existing workers' skills, and so they too are affected negatively by skills shortages and deficiencies.

In almost all cases studied, a lack of sufficient responsiveness in the skills supply system is prominent among the root causes of the deficiencies observed, as identified through a combination of mapping of systems and dialogue with national and sector partners. This is apparent both in mainstream TVET and university systems, and in workplace training, with provision of education and training to meet some key skills needs being absent or insufficient, and where it does exist frequently subject to problems relating to quality and work relevance. Among the numerous examples observed are: out-of-date and therefore irrelevant TVET curricula for garment manufacture in Kyrgyzstan, leading to most production workers being recruited without prior training; a skills shortage in Cambodia, where the TVET system was not equipped to meet a rapid increase in demand for mid-level technical manufacturing skills in light manufacturing and food processing; and a qualitative skills deficiency in Egypt, where a need for training in international marketing skills for managers of medium-sized furniture firms was not being met.

The main types of systemic issue underlying these deficiencies in responsiveness are examined on p. 107.

It is not always right to choose a single solution. Sometimes, expanding existing education and training provision will meet the need adequately. Sometimes, especially where there is an immediate acute shortage, it is necessary to supplement existing provision with an accelerated channel for skills development or a channel for the acquisition of skills from non-traditional sources, such as migration or a different form of training. Sometimes, the existence of a skills shortage provides an opportunity to innovate, for example by creating an apprenticeship mechanism, or by retraining workers who are unemployed or whose skills are underutilized. The main options are summarized in boxes 3.5 and 3.6.

Box 3.5: Meeting the need for mid-level technical skills: Balancing upskilling and recruitment

Repeatedly, STED work observes firms in transition from activities focused on low-skill technical work towards more mechanized and automated operations. There is a consequential shift in the technical skills needed from low-level manual skills to more advanced machine operator, craft and technician skills. There are two broad strategies available to meet these changing skills needs: upskilling existing workers or recruiting workers who already have these skills. Where a sector is upgrading as a whole, the latter means increasing the number of workers new to the labour force trained in mid-level skills through initial TVET.

Both of these strategies are viable. However, an exclusive focus on initial education and training can leave existing workers stranded without jobs matching their skills, and can result in their accumulated skills and knowledge being lost to the sector. For these reasons, it is desirable that strategies to develop the new skills needed should preferably include upskilling of existing workers. At the same time, it is important that initial education and training should adjust to meet the skills demands of the sector.

In some cases, there can be a gender bias in this shift. In certain sectors and countries, some low-level occupations in tradable sectors that were originally established to take advantage of low-cost labour are highly feminized, while new entrants into the mid-level jobs replacing them are mainly male. Ensuring that existing workers with the potential to work in the mid-level jobs have access to skills development opportunities can help offset this risk of gender bias, while also enabling firms to make best use of the skills they have available.*

* For a deeper exploration of this topic, see McKay, 2006; Silvander, 2013.

Where there is a sufficient supply of skills at aggregate level within a country, there may be scope to address a skills shortage by facilitating mobility among skilled workers, or by locating operations close to where they live. As the availability of housing is often a constraint on mobility, policies to ensure an adequate supply of well-serviced residential accommodation can form part of strategies to promote mobility.

Box 3.6: Strategies to adjust the supply of skills in cases of current or anticipated shortage

Increase numbers of new TVET or university graduates with suitable qualifications: Where there is sufficient demand from prospective students, and where there is available capacity at suitable providers, this can be achieved essentially by making the decision to increase numbers and providing the funding required. However, the situation is often more complex than this, with multi-stakeholder decision-making processes that are hard to coordinate, sometimes lack of sufficient demand for places among well-qualified potential students/trainees, and difficulties in creating sufficient capacity in terms of staffing, classrooms and well-equipped space for practical learning. There will always be a time lag – several years in the case of substantial TVET and university courses – between the decision to create more places for students and the increase in graduate output. If the additional places on new and expanded courses are filled by less qualified applicants, non-completion rates may rise, and employers may eventually be less satisfied with the skills of graduates, partly offsetting the increase in skills supply arising from the increase in student/trainee intake.

Increase apprenticeships and other work-based initial learning: Apprenticeships and other forms of work-based initial learning provide an alternative to institution-based learning that is important – even dominant, especially at TVET level – in many countries. In many contexts, for example in the "dual" systems of European countries such as Germany, apprenticeships combine work-based learning with institution-based learning. There is an increasing policy interest globally in developing high-quality work-based learning systems as complements to college-based TVET and university provision capable of providing high-quality relevant skills. These forms of education and training can contribute to tackling skills shortages. Where there is a long-term problem with skills supply from TVET institutions and universities, developing apprenticeship and work-based initial training systems can provide an additional channel of supply, although it takes time and commitment to build up apprenticeship systems from scratch. Where they are already in place, existing apprenticeship and work-based training systems can respond to shortages more quickly

(continued)

Box 3.6 (continued)

than institution-based courses of similar duration; employers can recruit more apprentices, and can use the growing skills of apprentices as they learn, rather than having to wait for graduation from an institution. Also, where the shortage is a severe constraint, and where education systems are capable of being flexible and responsive, it may be possible to adapt mainstream courses quickly for delivery in the workplace or through a combination of workplace and institution-based learning.

Provide conversion courses or specialization courses to provide skilled people who possess other qualifications with the skills needed to do the work: Where people with other qualifications at approximately the level required are available, it may be possible to provide courses to convert their skills so as to supply the shortage. Alternatively, it may be possible to provide courses to enable people to upgrade their level of qualification while changing their skills specialization to the area of shortage. These approaches provide a much more rapid response to shortages than is possible just by increasing student/trainee numbers. It benefits participants by giving them skills that are in heavy demand, at a time when they may be entering the labour market for the first time, unemployed, under-employed or employed in jobs for which they are overqualified.

Strengthen recruitment and retention of workers: In some cases, skills shortages arise because firms are unsuccessful in recruiting workers in competition with firms in other sectors, or in retaining them after recruitment. Where there is a skills shortage, competition for employees often raises labour turnover rates at firm level, but this only affects the skills supply at sector level if workers leave the sector rather than moving to other similar firms. Where a skills shortage arises mainly from problems with recruitment and retention, resolving the shortage requires jobs to be made more attractive, whether in terms of working conditions, HRM practices or pay.

Train workers already employed in the sector experiencing the shortage, or among whom there is a qualitative gaps in skills, to do the work required: In some cases, there is scope to upskill or reskill workers already working in the sector to provide the skills that are in shortage. This often works by individual selection of workers who have demonstrated potential to do the work required after upskilling or reskilling. Sometimes, it involves targeting groups for upskilling: for example, it is relatively common for firms that decide they need more highly skilled production workers to train significant numbers in, for example, higher-level machine operator skills or technician skills; and many firms requiring significant numbers of quality assurance specialists supply the need by selecting and training general production staff rather than recruiting from specialist courses.

Facilitate workers with the required skills, or related skills, in moving from other sectors: The usual pattern is that workers who have built up experience in a sector

tend to stay employed in that sector, and on average suffer significant costs if they switch, especially if they switch both sector and occupation. However, especially where there are job losses in one sector but a skills shortage in another sector, or where the shortage is in an exporting sector that pays well, there is often scope for the shortage in one economic sector to be supplied by skills from another. In most cases, some retraining is required. An example that has occurred in a number of country contexts is retraining apparel workers to work in electronics assembly. Another is that of programmes to train workers rapidly in a range of technical skills to fill technician roles in large new manufacturing operations. Internationally, "Just Transition" policies that provide alternative marketable skills and job opportunities to workers losing employment as a consequence of measures taken in the transition to the low-carbon economy are a high priority.

Attract suitably skilled workers not currently in the available workforce: Examples of how this may be done include activation measures to attract skilled individuals currently working in the home or otherwise outside the labour force back into the workforce; ALMPs to provide unemployed workers with training in the skills they need to do the work; or facilitating migration to where the skills are needed, whether within the country or internationally.

Relax qualifications requirements and other recruitment criteria: For many types of skill, employers have some scope to relax their requirements for qualifications and other criteria when recruiting, and this is a common first response to a shortage of skills. The implications include accepting a wider range of qualifications, or lower grades; providing more training for new recruits; providing more continuing training; changing work organization or technology to compensate for some workers being less skilled; and accepting reduced productivity for a period.

3.3 Common systemic constraints on matching skills supply to demand

There are common themes across developing and developed countries in the systemic issues that affect their ability to match skills supply with demand. Nevertheless, these constraints tend to be more significant in developing countries. Developed countries have generally been focused for longer on improving their education and training systems, and on strengthening workplace learning, and as a consequence have made more progress in tackling such constraints. As developing countries have become more exposed to global markets, they have been under increasing pressure to catch up on skills development, and on the good practices required to overcome the common constraints.

Many of these constraints are of recurring policy concern even in developed countries, with systems being adjusted repeatedly to improve outcomes or to address changing conditions. All of those listed below are still of policy concern in at least some developed countries. The list presented here is supported by the broader literature on skills systems, is consistent with the ILO experience of promoting skills for employability, and is corroborated by experience under the STED Programme with analysis of skills systems in developing countries as they interact with trade. Box 3.7 below provides some illustrative examples from STED.

Implementing skills supply strategies is not straightforward. Skills needs and skills development systems are complex. A systemic approach to identifying constraints on implementation, and to developing measures to address the constraints, can help.

Key areas where constraints arise include the following:

- **Cognitive, and behavioural non-cognitive, skills among school leavers that are weaker than required to underpin core work skills in employment**: The basis for the core skills required for high performance in a modern workplace is formed primarily at school. Employers globally indicate that they need stronger core work skills among their workers (see e.g. Kautz et al., 2014).

- **Information weaknesses affecting individuals, firms and governments**: Gaps in creation, analysis and communication of information on skills have a negative impact on the decisions of individuals (students and workers), firms and governments.[7]

- **Weaknesses in institutional mechanisms to identify and anticipate skills needs, and then to guide and coordinate education and training systems to provide the skills needed**:[8] These weaknesses take institutional and technical form, the former usually being more significant. At government level, skills development systems benefit from collaboration between ministries of labour, education, trade, industry and planning, and other line ministries with responsibilities for development of specific sectors, and between their agencies. Mechanisms to enable this collaboration are frequently weak. Collaboration between the main partners in skills development – government, employers, workers' organizations, providers of education and training, and other interested types of institution – is necessary at both national and sector level and in direct connections between education and training providers and industry, to enable skills development systems to effectively identify and anticipate skills needs, and to guide education and training systems. It is especially important that employers have a strong voice in shaping education and training at the level of sectors and the fields of

study to which they are closely related. Again, mechanisms to enable this collaboration are frequently weak. Institutional mechanisms for identification and anticipation of skills needs require technical analytical inputs, and the extent to which the capacity to provide these inputs is in place varies between countries. Especially in developing countries where national statistical offices and public employment services are not yet well developed, there may be underlying gaps in LMI that are hard to bridge.

- **Lack of inclusiveness in access to education and training, with low-skilled workers poorly equipped to respond to skills needs**: In many countries, access to post-compulsory education and training is very unequal, both in terms of initial and continuing access to TVET and university education, and in terms of access to workplace learning (see e.g. UNESCO, 2015). Higher-skilled workers typically undertake more workplace learning activities than their lower-skilled counterparts, and in some contexts access to continuing education and training and to workplace learning is different for women and for men. As a consequence, low-skilled workers are at the greatest risk of being left behind in the context of industrial and technological change, and again the degree of vulnerability to change can vary by gender. As noted above, low-skilled workers are especially vulnerable to persistent negative labour market impacts in the event of a negative trade shock.

- **Underdeveloped systems for lifelong learning**: Lifelong learning depends on access for all adults to learning opportunities at all levels, from basic literacy and numeracy upwards, both for professional and career purposes and for purposes of personal development. It also depends on effective mechanisms to recognize learning and to enable progress between qualifications of different types (see e.g. Ryan, 2003; Walters, Yang and Roslander, 2014).

- **Undeveloped systems for apprenticeship and other forms of initial work-based learning**: Where systems for formal apprenticeships and other forms of initial work-based learning are not already well established in a country, it usually takes considerable time, coordination, resources and commitment to establish them. The main exception is where firms that already operate initial work-based learning systems replicate them when offshoring production to develop their local supply of skills.[9] A successful example is that of automobile industry apprenticeships, initially established by German firms in Mexico, collaborating with local TVET institutions (see e.g. Cáceres-Reebs and Schneider, 2013).

- **Student preferences that do not match skills demand**: The supply of graduates from TVET and universities is shaped by student demand to an extent that

varies across countries, levels of study and fields of study. This constrains the ability of education and training systems to respond to demand for skills; if a type of course cannot attract enough suitable applicants, this limits the number of graduates it can produce. Patterns of student preference that have an important impact on skills supply internationally include the following:

- Most developed countries identify an undersupply of university graduates in science, technology, engineering and mathematics (STEM). Most identify shortages of skills in ICT as being especially acute. Most also highlight a gender imbalance, with relatively small numbers of women entering university in ICT disciplines.
- There is a strong preference for university education over TVET in many countries (see e.g. Winch, 2013), to the extent that places on university courses in fields of study that offer poor employment opportunities are often in greater demand than places on TVET courses in fields for which there is strong demand. This affects both developed and developing countries, reducing the numbers entering TVET, and in developing countries often producing a large oversupply of graduates from liberal arts courses that can be provided at relatively low cost.

- The main policy implications are that education and training systems are constrained by student preferences in the extent to which they can respond to skills needs, and that there is an important place in skills policies for providing students with information on skills needs that might enable them to make better decisions.

- **Weaknesses in education and training management**: Especially in developing countries, management of TVET institutions is often weak, making it difficult to plan effectively, to make best use of resources and to collaborate effectively with industry partners. Often, deficiencies in management extend into agencies and ministries responsible for the governance and direction of the system.

- **Problems with quality of education and training provision and quality of qualifications**:[10] Serious problems with the quality of education and training provision at both TVET and university levels exist in many countries, assessed in terms of both academic learning and developing the skills required in the workplace. There is a major emphasis internationally on developing quality assurance systems and qualifications systems to contribute to addressing this problem, and these systems are usually more advanced in developed than in developing countries. Quality assurance systems are usually designed to assure both the academic quality of the provision and the quality and

workplace relevance of the competencies developed. Qualifications systems contribute to standardizing the minimum quality associated with a qualification, and (especially at TVET level) to standardizing the competencies associated with a qualification in a specific field. However, quality of provision is not just about quality systems; it is often constrained by the resources available for updating courses, for developing and updating the skills of the teaching workforce, and for providing specialized equipment and materials for practical learning.

- **Unsuitable funding models for TVET and university provision**: TVET and university education are often constrained in what they can do to provide relevant education and training by the funding systems within which they operate. Funding models reliant on public funds that do not provide incentives to respond to skills needs may make it difficult for institutions to keep their courses relevant and up to date, and may make it difficult for them to provide courses for which costs are above average even if industry needs the skills they will produce. In some cases, the design of funding models makes it difficult for institutions to make investments in staff development, premises and equipment that are required to keep courses up to date.

- **Uncertainties among employers about the business benefits of training for employees**: For many employers, it is difficult to decide to increase investment in training beyond the minimum needed to induct new employees, to comply with regulations and mandatory standards in areas such as health and safety and food handling, to introduce new equipment and processes, and to train workers in the skills needed to take on new responsibilities. Firms that are larger, are involved in exporting, have higher margins, have better management skills, or have adopted modern HRM practices and approaches to work organization, train more. Firms with weaker management, smaller firms, and firms that have not adopted modern management practices are less certain that they need to train, that training will be effective in achieving important business objectives, and that they can justify investing economically and financially in terms of the return that will accrue to the firm. Firms operating on tight margins may have difficulty in funding training. The quality of management skills has a major impact on employer perceptions of the costs, benefits and risks of investing in training.[11]

- **Weaknesses in HRM and strategies in businesses, especially in MSMEs**:[12] The ability to use training effectively for business purposes depends to a great extent on human resources strategies and on the quality of HRM. Modern HRM generally favours organizational strategies that entail significant investment in skills

development for workers. On average, MSMEs are less likely to be able to afford to invest in strong HRM capabilities than their larger counterparts, affecting their capacity to benefit from learning as well as their capacity to recruit effectively.

- **Lack of supply of suitable training**:[13] Employers interested in sourcing training for their workers often have difficulty in identifying a suitable source of supply at a sustainable cost. The extent to which this is a problem varies. In countries where there is a well-established pattern of supply of training services by TVET providers, universities, civil society organizations or private providers, firms are likely to be able to source a range of supply of training (and counselling on training) that will meet a substantial share of their needs. Where the system of supply is less developed, it is likely to be more difficult to source suitable training, and it is likely to cost more and be of less assured quality and relevance. Even where potential providers of suitable training exist, the time and effort required to develop suitable new course material may be prohibitive for the provider to develop at its own cost with only one identifiable client, and too costly to be paid by the firm that requires training. Lack of supply is more severe for MSMEs than for large firms; even where there is a source, an SME may require training only for a small number of employees, where a course requires a larger number to be provided economically.

- **Barriers to skills development provision reaching MSMEs in the domestic supply chain**:[14] Exporting firms in some tradable sectors depend on domestic supply chains that may themselves depend heavily on MSMEs, in manufacturing, agriculture or services. The firms' performance depends heavily on the performance of their supply chain, and while they can take responsibility for their own skills development, it is difficult to improve skills at supplier firms, and further back up the supply chain. Supply-chain MSMEs often have very limited capacity to improve themselves.

- **Barriers to migration, both internal and external**:[15] Migration by skilled workers can provide part of the solution to skills shortages. It can also sometimes provide opportunities that match their skills better than those available locally to workers who have been displaced through loss of employment connected to trade.

These constraints provide a partial explanation for why workers who lose their jobs as a result of import competition or technological progress may remain unemployed for many years.

Where cognitive and behavioural non-cognitive skills are weak at school-leaving age, this has a persistent impact on core work skills, limiting the employability of workers who

need to find new jobs, and limiting their ability to acquire the new skills that would be required to enter a different occupation. Lack of inclusiveness in education and training, and underdeveloped systems for lifelong learning, can limit the scope especially for lower-skilled workers either to improve their employability while in work or to upskill at their own initiative after losing employment. A combination of different constraints that affect workplace learning mean that many workers receive less ongoing training than they would if HRM were stronger, if employers were more certain of their own ability to benefit from employee training, and if there were a better supply of training available. As a consequence, their learning skills and habits are weaker, and they have more limited technical skills potentially transferable to another employer or another occupation.

However, these common system constraints that limit the adaptability of workers are not the full story. There are also geographical factors at work. When there is substantial dislocation linked to trade, its effects are often localized geographically to regions within a country.

Tradable industries in which employment dislocation occurs are often concentrated geographically. As workers who lose their jobs have a limited propensity to migrate away from their existing homes, the immediate unemployment effects are often confined to a regional labour market within the country, rather than being spread across the national labour market. Under these circumstances, where job losses occur on a large scale, workers are likely to take longer on average to find new employment, in part because it takes longer for the regional labour market to adjust to absorb the stock of unemployed workers, and in part because the shock itself is likely to depress economic activity within the region. A greater duration of unemployment has a negative impact both on the likelihood of re-employment and on wages received after re-employment (see e.g. Abraham et al., 2016).

In some cases, substantial job losses connected with trade reflect a region-level structural change under which a concentration of tradable industries that have historically provided relatively high-productivity, relatively well-paid employment to the region loses its capacity to do so, whether through loss of comparative advantage or through shrinking markets. Productivity increasing faster than output in products and services in which the industry retains both comparative advantage and markets seems to also play a role. Where this occurs, the region may no longer have the capacity to provide jobs approximately matched to the skills of displaced workers. Employment in locally traded sectors may be squeezed as closed and downsized businesses purchase less locally and as local consumer spending is hit, making it more difficult for displaced workers to find jobs locally in other sectors even below their skill levels.

Economic regeneration may provide a remedy for the region over the long term, but even where it succeeds recovery periods can be measured in decades. For example, manufacturing employment in the US state of Michigan almost halved between 1999 and 2009 as changes took place in automobile production value chains, and over the same period the state's unemployment rate rose from 3.7 per cent to 13.7 per cent. By 2016 manufacturing employment in Michigan was still a third down on the 1999 level, despite its being one of the fastest growth locations for manufacturing employment in the United States, with the unemployment rate having fallen to 4.9 per cent.[16]

Box 3.7: Sample evidence from STED on common systemic constraints in matching skills supply to demand

Cognitive, and behavioural non-cognitive, skills among school leavers that are weaker than required to underpin core work skills in employment: In the Jordanian food-processing sector, for example, sector partners pointed out that many production workers do not consistently take responsibility for carrying out their tasks accurately and efficiently, leading to production delays and wasted materials, and complicating the process of ensuring compliance with customer requirements. This was attributed especially to cultural factors, including attitudes formed at school, as well as to dated management approaches.

Information weaknesses affecting individuals, firms and government: In the Vietnamese tourism sector, for example, limited analysis and public communication of information on skills needs was seen to have a negative impact on the career choices of school leavers, contributing to constraining the supply of skills to the fast-growing sector.

Weakness in institutional mechanisms to identify and anticipate skills needs and to guide and coordinate skills development: As this is the issue addressed most directly by STED, the countries where STED is applied have significant weaknesses in this area. For example, in Malawi the main thrust of the STED project, agreed with national partners, has been to address a lack of coherence between the national export strategy and the skills, education and training systems; a lack of systems for anticipating skills needs; and weak collaboration between industry and providers of education and training, and between different ministries and their agencies.

Lack of inclusiveness in access to education and training, with low-skilled workers poorly equipped to respond to skills needs: The highest-profile issues in this area are in developed countries and in some developing-country cases where changes in comparative advantage or introduction of new technologies have caused a shock to employment or to the composition of skills needed. Examples of industries where this has

occurred in multiple countries, developing and developed, include garment manufacturing and routine manual assembly, in which a succession of countries have lost earlier comparative advantages to lower-cost locations, reducing sector employment and often leaving workers poorly equipped to find alternative work at an equivalent level of productivity. STED has not worked in sectors undergoing a shock of this scale, but repeatedly works in sectors where low-skill jobs are being eliminated and replaced by medium-skill jobs, such as in pharmaceuticals in Bangladesh or in areas of food processing suited to mechanization and automation. Where workers have the capability and opportunity to upskill so that they can do the new jobs, this gives them a clear career path. Where they do not have sufficient underlying education and also lack access to the opportunity to upskill, they may lose their jobs without being well equipped to find equivalently productive work.

Underdeveloped systems for lifelong learning: In many cases, STED work is done in countries undergoing rapid change, where the basic level of skill required for productive employment is rising. As skill levels and productivity rise, literacy, numeracy and a range of related core work skills are becoming more necessary for employment at a level of productivity consistent with that of the economy generally. These are needed in enterprises of all types, including but not limited to those in tradable sectors and their domestic supply chains. For example, in food processing, which has been studied under STED in a number of countries, compliance with international standards on food safety is greatly facilitated by literacy among workers all along the value chain from farm to fork. It is especially important that workers have access to opportunities to improve their literacy and numeracy, and to raise their level of education.

Undeveloped systems for apprenticeship and other forms of initial work-based learning: Initial work-based learning is an important route through which workers acquire the skills needed for employment in many occupations in tradable sectors studied under STED in developing countries, whether or not there is a formal or even informal apprenticeship system in place. For example, in the Jordanian food-processing sector, machine operators require significant technical skills which are mostly learned on the job. The level of skills required – both technical and core work skills – was seen to be rising; but without a structured system for work-based learning, there was an insufficient flow of good-quality new machine operator skills into the sector to fuel growth and raise productivity. Another example is provided by the Egyptian furniture sector, which is mostly made up of small family-operated workshops which operate an informal apprenticeship system; here the quality of learning was seen to be variable in terms of both technical and business skills, with a negative impact on the sector's ability to supply international value chains.

Student preferences that do not match skills demand: In the course of STED analysis of tradable sectors, a recurring theme raised by national and sector partners across most

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Box 3.7 (continued)

countries studied is a strong preference for university education among students (and their parents) that results in young people missing good employment opportunities. A concrete example comes from STED work in Jordan, where analysis of unemployment by level of education showed that TVET graduates were significantly less likely to be unemployed than university graduates.

Weaknesses in education and training management: STED has not directly generated substantial evidence on education and training management. However, in most cases STED work has taken place in the context of national efforts to improve TVET that have included a focus on raising the quality of TVET management, and national partners involved in the STED process have argued that this is important in making the TVET system more effective and more responsive to industry, student and worker needs. For example, in Viet Nam STED work was coordinated with ILO support for developing and introducing a new TVET law, and with ILO support for the TVET agency in providing training to TVET managers.

Problems with quality of education and training provision and quality of qualifications: STED-based initiatives regularly find deficiencies in the quality and relevance of education and training provision, and indeed improving the quality and relevance of TVET provision is a major theme of technical assistance for developing countries provided by the ILO and some other development partners. In Malawi, for example, 53 per cent of responses to a STED survey of oilseed enterprises said that recruited university graduates did not have the knowledge and skills they needed, while 69 per cent said that technical school graduates did not have the required knowledge and skills.

Unsuitable funding models for TVET and university courses: Evidence from STED work supports the hypothesis that funding models frequently have negative impacts on skills development, with funding frequently appearing as a barrier to improving skills development. For example, STED work in tourism in Viet Nam found that public funding criteria were seen by many providers as supporting delivery of out-of-date curricula, while colleges had no regular source of funding for the training of their existing teachers that would be required to make courses more current and relevant.

Uncertainties among employers about the business benefits of training for employees: Discussions in the context of STED stakeholder meetings of what hinders employers from providing training for their workers in the skills they need usually generates a diversity of views. However, the reasons mentioned by employers almost invariably include concerns about whether their businesses can afford the investment, whether they will get a fair share of the return on an investment that may drive demand for higher pay and may benefit competing employers who may hire the workers, and indeed whether training will

produce a sufficient improvement in performance to be justified. These are issues widely highlighted in the literature on the economics of training.

Weaknesses in HRM and strategies in businesses, especially in MSMEs: STED-based work regularly explores approaches to work organization and technology in the target sectors, and how these interact with training and skills. Firms consulted very frequently indicate that they understand in principle that modern approaches could make them more productive and competitive, but that the practical barriers to adopting these approaches put this sort of change out of their reach. This is less an issue for the largest firms in the sectors studied, which are better resourced and have managers educated and trained to international standards, but for second-tier firms – and even more so for MSMEs – it is a common and substantial constraint. Modern skills in HRM and a practical understanding of modern HRM practices are important to enabling this sort of change, but are frequently weak among all but the larger firms in the sectors targeted under STED. For example, a leading firm in the food-processing sector in Jordan introduced a modern approach to HRM, cutting employee turnover sharply, raising productivity and improving quality and compliance. As the STED process progressed, other firms became interested in adopting these new practices themselves, but were uncertain about their ability to do so.

Lack of supply of suitable training: STED-based initiatives regularly find that gaps in the supply of suitable training prevent firms in tradable sectors from developing skills that they need to perform effectively. Examples include work in Tunisia that identified a need for a greater supply of certified skills in welding in the metals sector to satisfy customer quality requirements; and a broad lack of formal training provision targeted on small business owner-managers in the Egyptian furniture sector, which is mostly made up of MSMEs.

Barriers to skills development provision reaching MSMEs in the domestic supply chain: One of the major types of gap in business capability identified in tradable sectors targeted under STED is in the development of domestic supply chains. Even where firms can meet their own development needs, where they rely on a domestic supply chain their ability to participate in an internationally tradable market is often constrained by the capabilities of the supply chain. Efficiency, business strategies and compliance with standards and regulations on the part of types of enterprise such as farms, component suppliers, primary processors of raw materials, aggregating intermediaries and logistics providers in many cases have a major impact on which international markets a sector is permitted to serve, on how effectively it can serve them, and on how cost competitive it can be. For example, STED work in the Egyptian food-processing sector reinforced an existing understanding that deficiencies in food safety compliance in agro-food supply chains contributed to limiting the access of food-processing firms to developed-country markets.

3.4 Mechanisms for responding to trade-related changes in skills needs

Just as there are common themes internationally in constraints on matching skills supply to demand, there are also common themes in the mechanisms needed to tackle those constraints, whether the primary motivation is to develop comparative advantage, to respond to a trade-connected employment shock, or to offset the tendency for trade to increase the skill premium. In all cases the central challenge is improving how skills supply matches skills demand, whether this is about responding to new skills needs or coping with a decrease in demand for certain skills. The common themes cover areas including governance, policy coherence, access to skills development, training as a response where workers are displaced, effective systems for training employed workers (including those employed in MSMEs), strengthening core work skills, and strengthening systems in skills anticipation, and in quality and relevance of education and training provision.

Good governance in skills development systems

Key elements of good governance in skills development are investment in skills by industry, and responsiveness to skills and employability needs on the part of education and training providers.

The capability of skills development systems to respond effectively to skills needs depends on the existence of good systems for governance. To the extent that decision-making responsibility for education and training providers rests with government, it is important that it is responsive to skills needs, at each level of government concerned. This is partly about complementarity of systemic elements, given that governments will also be targeting broader interests such as equity and social inclusion. Governments may adopt policies that favour investment by industry in skills development, targeting both demand and supply.

To the extent that decision-making responsibility for education and training rests with providers themselves, it is important that the governance framework, funding framework and incentives under which they operate favour responsiveness to skills and employability needs.[17] This imperative is addressed by the ILO's Human Resources Convention, 1975 (No. 142), and by the Human Resources Development Recommendation, 2004 (No. 195).

For firms in tradable sectors and their domestic supply chains, it is important that they have the capacity to analyse and address their skills needs; that they adopt effective strategies for high productivity, innovation and compliance, which are likely to focus on

good HRM practices including skills development; and that the framework within which they operate is favourable to investment in skills.

For individuals, and for organizations aiming to meet the needs of individuals, it is important that governance systems emphasize employability, with a focus on core work skills, relevant technical skills, and skills transferable between jobs and occupations that prepare workers not just for the immediate job but for a durable career offering sustainable decent work. Individuals should be able to see a system of incentives that favours investment in skills, both in initial education and in lifelong learning. The system of governance should ensure that individuals have access to meaningful information on careers and on the labour market relevance of different types of skills investment.

Developed countries typically have well-developed skills governance systems, and mostly need to make incremental changes in line with evolving international good practice and national strategies. Most developing countries, on the other hand, are in the process of building their institutions and mechanisms for governance. For many, technical assistance from international development partners makes an important contribution. The STED Programme aims to contribute to building skills governance mechanisms and institutions by involving national and sector partners in sector-focused skills anticipation activities linked to sector-focused implementation processes that can be mainstreamed into the countries' and sectors' skills governance systems.

A major challenge for public policy is to foster institutional arrangements at national and subnational levels through which government departments, employers, workers and training institutions can respond effectively to changing skills, education and training needs, and through which skills issues can feed back into other policy areas. This is relevant wherever skills demands are changing, whether the policy interest is in comparative advantage, in adjusting to negative shocks related to trade or technology, or in limiting the extent to which trade tends to increase the skill premium.

Skills and trade policies should be viewed together, and also viewed in the context of employment policies. As discussed in Chapter 2, skills are an important enabler and determinant of trade. Trade has impacts on skills needs, while trade and skills have a joint impact on productivity and labour market outcomes, including the skill premium, which is a key determinant of wage inequality. Trade and skills also interact with other policy domains including economic and development planning, industry policy (especially in less developed countries), infrastructure, research and innovation, environmental protection and regional integration.

Institutional arrangements for identifying and anticipating skills needs, including needs related to trade, and for shaping education and training provision to meet these needs are central to addressing this challenge. The policy interest in trade and skills exists at a number of levels. In government, it is important that it is recognized at the very highest level, as well as at the level of policy integration. Activities supporting implementation of policies on trade and skills will extend across a range of relevant ministries which is likely to include the ministries of trade, labour and education, and potentially also other ministries such as those of planning, industry, agriculture, tourism and transport or infrastructure. For employers, concerns about skills and trade should exist at the top level of employer organizations, in sectoral and regional organizations, and at the level of individual employers engaged in international trade. For workers' organizations, the policy interest should similarly exist both at the highest level, for individual organizations at sector or regional level, and even at the level of the individual workplace.

ILO research and experience indicate that social dialogue and collective bargaining at the enterprise, sector and/or national levels are highly effective in creating incentives for investment in skills and knowledge.

Social dialogue plays a key role in processes to reform TVET systems and in shaping national skills development strategies. Dialogue is conducive to successful reform, as a process bringing all actors into alignment with a shared commitment to working towards a common goal.

At national level, mechanisms to integrate trade and skills policy include:

- National-level skills policy advisory bodies, with participation from trade and industry ministries and their agencies, national employers' organizations and national trade union federations. An example is Ireland's Expert Group on Future Skills Needs, which includes representation from the Department of Jobs, Enterprise and Innovation and its main development agencies, the Irish Business and Employers' Confederation and the Irish Congress of Trade Unions.

- National strategies for development, with a joint focus on trade and skills; in addition, national trade strategies consider skills issues, and national skills strategies address trade issues. For example, STED-based activities in Cambodia are being undertaken in the framework of implementation based on the most recent Diagnostic Trade Integration Strategy (DTIS).

Sector-level mechanisms to integrate trade and skills policy include:

- Sector-level skills advisory bodies and councils, with participation from sector-level trade organizations or other official bodies concerned with strengthening the sector's position in trade, sector-level employers' organizations and sector-level workers' representatives. For example, the Gem and Jewellery Skill Council of India includes the Gem and Jewellery Export Promotion Council among its founder organizations, along with a number of sectoral employers' organizations including the All India Gems and Jewellery Trade Federation.

- Sector development strategies, with a joint focus on trade and skills, along with sector trade strategies that consider skills issues, and sector skills strategies that address trade issues. For example, in Malawi, STED-based activities are being undertaken in the horticulture and oilseeds sector in support of implementing the national export strategy.

TVET institutions and universities collaborate with industry organizations and individual employers on planning training provision, on course content, on providing continuing education and training for workers, and on provision of student work placements.

This collaboration is centrally important to achieving a good fit between education and training provision in both initial and continuing stages. For example, in Denmark or under Brazil's *Sistema S*, continuing training concerns all partners at the enterprise level with extensive participation by both companies and workers.

The need for collaboration is especially strong for tradable sectors because of their high propensity to change, and because responsive skills systems are important to achieve effective adjustment. Again, the STED Programme aims to build sector-level collaboration between industry and the providers of education and training that develop skills for the sector, whether pre-entry in initial education and training or for existing workers through continuing education and training.

It is not necessary for policy coherence to be equally strong at national, sectoral and local levels. Successful systems differ in the extent to which they emphasize each level, although they almost invariably feature all three.

Sector-based approaches to skills governance, planning and delivery are a common good practice, and within a large country these may work best at regional level. At a minimum, most education and training systems take a sectoral approach to consulting with industry at the level of the specific field of study on matters including skills standards, curricula, quality assurance and planning (see Wilson, Tarjáni and Říhová, 2014).

Sectoral approaches to skills analysis and skills development recognize that firms in a sector usually have similar skills needs, employ workers for jobs in similar occupations, and use the same or similar education and training providers as sources of graduates and as suppliers of workforce training. Sectors usually have a range of established institutions such as employers' organizations, workers' organizations, other industry organizations, often professional bodies for occupations important to the sector, education and training providers that serve the sector, regulatory bodies, development organizations such as sector export promotion councils, and other organizations that provide services to the sector. Firms in a sector frequently have overlapping supplier and customer bases, and participate in the same or similar value chains. To a great extent, they use similar technologies, and often deploy, or aim to deploy, similar forms of work organization. The strategic challenges they face, including those of exporting and of competing with imports in the domestic market, and the barriers they face to meeting them are also often similar. For these reasons, the sector is an effective level for analysing and anticipating skills needs, and for taking practical action on skills.

Sector skills councils are an increasingly common approach to governance and provision of skills development at sector level, both in developed countries such as the United Kingdom and New Zealand, and in developing countries such as India and South Africa.

These are industry-led sector bodies that are usually established under an apex national body under government charter, and with funding arrangements established by the Government, often with co-funding from private industry sources such as a training levy. An example is the Gem and Jewellery Skill Council of India, which is typical in having a number of functions, including skills analysis and foresight for the sector; establishing national skills and occupational standards, along with curricula for at least the sector's main TVET-level occupations; providing or facilitating the establishment of centres of excellence in skills for the sector; facilitating the provision of skills development for the sector's main occupations, through both initial education and training and continuing education and training; and contributing to assuring the quality and relevance of courses and qualifications.

Other types of sectoral approaches are also common. For example, in the Netherlands, vocational education, including apprenticeships, is structured around 17 national expert centres for TVET that are financed by the Government and bipartite sectoral funds and organized by sector. The boards of these centres are made up of educators, employers and trade unionists. The centres' tasks typically include advising the Government on the qualification structure and competency profiles for the sector, training company trainers and monitoring changes in skills demand. Lifelong learning is supported

Box 3.8: STED and skills system governance

The STED Programme aims to foster the development of institutional arrangements that identify and anticipate skills needs, including needs related to trade, and to shape education and training provision to meet these needs. In a number of cases, including in Cambodia, Jordan, Malawi and Viet Nam, current technical assistance work following initial STED analyses includes support for mobilizing the development of sector skills councils, including complementary work on capacity development for relevant national and sector partners. STED-based activities provide a working illustration of sectoral approaches to skills governance, and establish a process of working at sector level, enabling national and sector partners to test and pilot some of the basic functions of skills councils before committing to establishing them them formally.

Country-level work under the STED Programme involves both government and the social partners, and institution-building under the programme aims to contribute to the development of institutions in which industry has a strong voice coming from both employers' and workers' representatives. It is observed that in practice involving the social partners and government leads to analysis and findings that are more robust, and more capable of useful implementation, than would have been the case with a narrower range of partners.

Work under STED also aims to strengthen links between industry and relevant providers of education and training, both by involving providers of education and training in the analytical process, and by fostering collaboration in initiatives to deliver the education and training required to meet current and anticipated skills needs.

through some 100 bipartite sectoral funds for training and development. In Ireland, there is a system of industry training networks (SkillNets) funded jointly by industry and the Government, and governed under tripartite arrangements, that provide training for firms and workers in the member firms of each network. Each major exporting sector has its own SkillNet.

Broad access to skills development for displaced workers

Broad access to skills development can offset trade-related excessive increases in the skill premium.

One of the key themes in the literature on the interaction between trade and labour markets is that increasing exposure to trade usually leads to an increase in the skill

premium, tending to widen the distribution of wages. As argued in Chapter 2, this distributional impact seems to be a consequence of increased trade increasing relative demand for more skilled workers, with a supply response that is not sufficient to offset the resulting increase in the skill premium. Broadly directed investment in increasing access to skills development can therefore offset possible unintended consequences of trade on wage distribution.

Broad access to skills development is needed to make workers in tradable sectors more resilient to trade-related employment shocks.

Another key theme in the literature on the interaction between trade and labour markets is that, while models of the interaction between trade and labour markets have traditionally assumed low levels of labour market friction, allowing workers to move easily between sectors and occupations, recent evidence suggests that displaced industrial workers may experience longer spells of unemployment and precariousness, and a persistent negative impact on their income.

Both of these themes point to a trade-related need for mechanisms to ensure broad access to skills development, both through initial education and training and throughout the working-age population.

People caught up in large-scale redundancies, often from the closure or downsizing of industrial operations, are frequently targeted by interventions to redress skills gaps. However, the evidence on the long-term impact on workers of a need to change sector of employment or occupation points to a need for a more holistic initial education and lifelong learning strategy to ensure that industrial workers develop not only skills transferable to other sectors, but also a strong capacity to learn and adapt that they can either apply within their current career path or use to retrain and reorient their careers if necessary. These skills and capabilities are increasingly necessary in industrial workplaces in any case. This need has especially strong implications for TVET and university-level institutions, which can provide industrial workers with learning opportunities that are not strictly job related, and for workers' organizations, which that can inform and motivate their members, coordinate the provision of training, and both collaborate and negotiate with employers to broaden the focus of workplace training and facilitate access to continuing education. There is a complementary need to sensitize employers to the benefits of ensuring their workers have a broad range of skills not only to meet their own business objectives, but also including more transferable skills.

When jobs are lost in significant numbers, and when substantial job losses are imminent, governments and workers have a shared interest in bridging the gap between current skills and the skills that workers will need for productive employment in the future by, respectively, providing and engaging in targeted training.

When designing interventions in such circumstances, governments and other partners should consider which among the following are appropriate, taking account of the skills of the displaced workers and of labour market demand conditions:

- employment services, such as job matching, that do not involve skills development;

- short courses, designed to supplement the skills of displaced workers quickly, with a view to their returning to employment with a minimum of delay, thereby limiting the direct cost of the intervention, the cost of social protection while each worker is unemployed, and the cost to each worker in lost pay before they return to work;

- substantial skills development interventions targeted on developing in-demand skills for a different occupation, whether aimed at raising the workers' skill level or moving horizontally to a different occupational skill set at around the existing level of skill;

- developing skills targeted on strengthening or broadening the comparative advantage of industries in the region, with a longer-term focus on rebuilding the capacity of employers in the targeted region of the country to provide productive, well-paid employment;

- reinforcing the provision of training to employees in vulnerable tradable sectors, especially those with lower skills, both with a view to strengthening the firms that employ them, and with an emphasis on building transferable skills that will enable them to more easily find alternative employment at a different employer or in a different occupation.

Where short interventions are likely to be effective at matching skills to employment opportunities, thereby getting workers back quickly into productive employment in jobs matching their skill level, then this is likely to be the most efficient response, minimizing costs both to government and to displaced workers.

However, if demand for the skills of displaced workers, and for skills that can feasibly be developed through a short training intervention, is weak, then the prospects for re-employment after a short intervention may be poor. Employment rates after training interventions are not always good; for example, an evaluation of the EGF found that the re-employment rate at the end of assistance varied from 4 per cent to 86 per cent across

different initiatives, with an average of 49 per cent (Weber et al., 2015). This was not found to be better than similar interventions funded under other programmes. However, in general well-designed training-focused ALMP interventions are effective, with small (or in some cases even negative) short-term impacts, coupled with larger impacts in the medium or longer term (two to three years after completion of the programme) (Kluve, 2016).

More substantial education and training interventions may be justified for workers for whom the re-employment rate is likely to be low. More highly skilled displaced workers are more likely to return to employment, and are more likely to choose to migrate to take advantage of opportunities in other regions if they cannot find suitable work locally: this may by itself be enough to justify more substantial interventions, such as supporting unemployed workers to return to education so as to raise their level of qualification. Where there is identifiable demand for more workers, and where displaced workers already have some of the skills required, the case in favour of more substantial education and training interventions targeted on these occupations is more clear-cut, especially where this has the potential to contribute to strengthening or broadening the comparative advantage of industries still operating in the region. One example of a mechanism to support this kind of intervention is the creation of skills development accounts for unemployed workers to enable them to choose education and training courses (see the Republic of Korea case study on p. 143). Another is the creation of a large and varied number of substantial courses for unemployed workers, targeted on areas of skills demand (see the Ireland case study on p. 148).

Education and training institutions, including TVET colleges and universities, have a key role to play in delivering these interventions. Where the interventions can integrate a verifiably relevant and effective work-based learning component, this can improve the quality of the intervention, connect participants with employers and strengthen core work skills. It is important that both employers' and workers' representatives should be involved in designing and guiding these interventions to ensure quality and relevance of learning, and as a safeguard against participants engaged in work placements displacing other workers.

Where there is a need for a longer-term adjustment, building on local strengths so as to broaden and deepen comparative advantages can provide a basis for widening access to productive employment. Skills development has a central role to play in economic development at this level (see OECD, 2014).

Local and regional partnerships, involving government, employers and a range of civil society organizations, as well as providers of education and training, can play a key role in forming and delivering development strategies at this level. Firms that trade outside the

Box 3.9: STED and broad access to education and training

The STED Programme aims to identify current and future skills needs, and to stimulate practical responses. This work, by broadening access to relevant skills development, has the potential to make the outcomes of trade more equal. Interventions following STED analysis, for example, modernizing TVET curricula for courses connected to key occupations, improve access to relevant education and training.

A goal of some interventions that form part of STED-based projects is to strengthen skills required to implement modern forms of work organization. An example of such an intervention is a course for food-processing machine operatives, developed and piloted in Jordan. While it was targeted on better matching workers' skills to the needs of the industry, many of the skills developed through this and other such interventions are expected to be transferable to other sectors and employers, making the employability of the workers involved more resilient.

STED-based interventions aim to build on sectoral strengths. The theory of change of STED-based work at sector level is that better meeting the strategic skills needs of the sector will strengthen firms in the sector, raising productivity and improving their ability to participate effectively in tradable markets, ultimately resulting in more decent employment.

region have an especially important role through providing employment to workers who will spend locally, helping to create employment in locally trading businesses.

Training for employed workers as an important component of continuing learning

Firms and their employees need convenient access to the range of types of training and education necessary to meet skills needs.

This includes:

- access for employers to a supply of training courses that meet their direct skills development needs, across technical, management and core work skill areas, including both short and long courses, and ranging from courses relevant across a range of sectors, through courses relevant to their sector, to courses addressing the specific skills that they require for specific technologies or work practices;

- access for workers to courses equivalent to those provided in initial education and training, to modules within these, and to other courses leading to qualifications at education and training institutions, through mechanisms such as part-time education, distance learning or e-learning, combined classroom and work-based learning, or other mixed modes of learning;

- access for employers and workers to classroom-based courses and other services to support work-based training leading to recognized qualifications;

- access to workplace improvement programmes focused on improving productivity, quality, responsiveness and working conditions, including the training for workers and managers at all levels required to support these programmes;

- access to training that takes account of family responsibilities and other non-work demands and is otherwise sensitive to different needs of men and women;

- development by employers of their own capabilities in training provision, and of their capacity to source and support training from external sources, including collaboration with partners such as workers' organizations, other employers, and other industry and professional organizations in providing training that it is difficult to provide efficiently and effectively at firm level.

In many cases, the central challenge at firm level is to move from an equilibrium where investment in skills development is at a low level and work is organized on the assumption of relatively weak skills and low levels of personal responsibility among workers, to a new equilibrium based on modern work organization, modern HRM practices and technology that is more demanding of worker skills (see e.g. Wilson and Hogarth, 2003). Mechanisms to mobilize supply and demand by providing funding for development, piloting, capacity building and in some cases continued provision of training can play a key role in raising the level of training undertaken by employees to that appropriate to this higher equilibrium.

Breaking out of a low-skill equilibrium is only partly about skills. From a business perspective, it is about repositioning firms into higher value-added product markets and market segments, with skills supporting this transition.

It is difficult to build demand among firms, especially MSMEs, for education and training in advance of the creation of a supply, and it is also difficult to build supply in advance of demand. Mechanisms to jointly mobilize supply and demand can be funded

Box 3.10: STED and training for the employed

STED-based analysis considers skills development at both initial and continuing stages of education and training, and can generate recommendations at both levels. Indeed, some types of recommendations, such as those on developing and piloting occupational skills standards and new curricula based on these standards, may have impacts at both levels. STED-based initiatives frequently recommend and implement initiatives targeted specifically at employed workers: examples include development of new modules for a continuing training course for pharmaceutical technical workers in Jordan; a course in welding leading to international certification in Tunisia; and a mentored self-study training course for small hospitality businesses in a province of Viet Nam.

by government, by industry itself –through a mechanism such as a training levy or through coordination by an industry body – or through a development partner (in the case of less developed countries). To the extent that education and training provision is funded or managed publicly, governments can directly encourage education and training systems to include employed workers among the targets of provision.

Skills development is more challenging for MSMEs

Mechanisms to improve access by MSMEs to skills development are best focused on improving management capacity or access to training for employees, or on both together. Well-skilled MSME managers who have undergone management development training themselves are more likely to value training for the workers they manage, more likely to understand how they can use it to raise productivity and improve business performance, and more likely to decide to make use of training for workers when suitable opportunities arise.

The recurrent pattern of MSMEs carrying out much less training than larger enterprises is significant at the nexus between trade and skills in three main respects. First, it limits the ability of smaller enterprises to participate in tradable markets, including export markets and those parts of their respective sectors' domestic market most exposed to trade, beyond the extent to which they are inherently constrained by the economies of scale. Second, in tradable sectors that depend on domestic supply chains composed to a significant extent of MSMEs, such as small commercial farming or aquaculture enterprises, small workshops, or even medium-sized manufacturing or services suppliers, it limits the business capabilities that tradable sector firms can apply

Box 3.11: STED and skills development for MSMEs

STED-based work takes account of the needs of both large firms and MSMEs. While large firms are more likely to export regularly, there are in almost all contexts other tiers of smaller firms with export potential, or that act as suppliers to exporters, or that are directly competing with imports in the sectors in which STED is applied. Responses to the skills needs identified are usually relevant to both large firms and MSMEs, especially where they target improvements at TVET and university level that have impacts on the supply of skills available to firms of all sizes, or improve the ability of education and training providers to meet the training needs of firms and their employees. MSMEs rely on external sources of skills development to a greater extent than large firms, but improvements to the skills supply system benefit even large exporting firms that can focus more resources and attention on other skills and other priorities.

Examples of STED-related work on improving skills supply in ways that benefit businesses of all sizes include work currently under way on supporting the development and piloting of skills standards in new curricula for tourism guides in Myanmar, and for welders, machinists, bakers and fruit and vegetable processing workers in Cambodia.

In some cases, STED-related work specifically targets smaller businesses. For example, STED work in the horticulture sector in Malawi has inspired an intervention targeted on small horticultural producers (principally women), focusing on improving their productivity, controlling crop diseases and connecting them to commercial markets through larger aggregator enterprises.

to markets, constraining their ability to participate effectively. Third, as exporting firms are much bigger on average than their non-exporting counterparts, the impact of trade in raising the skill premium is likely also to reflect a widening of skills and productivity gaps between large firms and MSMEs (a mechanism explained on p. 62). Strategies to offset the increase in the skill premium could logically include mechanisms to improve access by MSMEs in all economic sectors to training, focusing on both formal and informal enterprises.

Scale constraints on MSMEs providing training themselves mean that mechanisms to promote training are best focused on externally coordinated provision, developing courses that will eventually be provided to managers and workers from large numbers of enterprises, and usually aiming to train people from several enterprises on each course. This is often done most efficiently at TVET institutions or universities, or by industry associations (including employers' or workers' organizations) or professional bodies. In the context of less developed countries, development

partners are sometimes also involved in provision. For small commercial farms, and for other types of small enterprise whose output is aggregated with that of similar enterprises, other strategies for delivering training may be appropriate. Farm extension services bring advice and training to farmers, individually or in groups. Cooperatives, and other types of organization that aggregate outputs, also often provide training and advice aimed at improving productivity, quality, compliance and timing of production.

Funding mechanisms are important to stimulating supply of, and demand for, training at this level. While some of the mechanisms listed above can operate on a market basis, public subsidies or funding based on levies are often required to overcome barriers to adequate provision.

Core work skills are important to productivity and participation in trade[18]

Core work skills in areas such as teamwork, communication skills, problem-solving and personal responsibility are precisely those required to implement new forms of work organization, to comply consistently with regulations and with internal and external standards, and to use equipment in ways that maximize productivity and minimize downtime and waste. They do not replace the technical skills required for a job, but they are an important complement to them.

This makes core work skills central to attaining strong business capabilities in areas important to effective participation in trade, including efficiency and effectiveness of operations and compliance with standards and regulations.

A need for stronger core work skills is regularly identified by industry skills studies and skills needs surveys of employers, across developed, emerging and less developed economies. With variations in terminology, and some differences in emphasis as to which skills are core, the need for strong core work skills is promoted as a policy priority worldwide. Policies to strengthen the development of cognitive and behavioural non-cognitive skills that underpin core work skills at the level of compulsory education are a key foundation for this. There is also scope to integrate development of core work skills into post-compulsory initial and continuing education and training. Lifelong learning strategies that incorporate education in literacy, numeracy and employability skills, and that support the personal development of adults, also make an important contribution.

Box 3.12: STED and core work skills

Practical STED-based work does not focus on the level of compulsory initial education, but it aims to integrate improvement of core work skills into curricula, especially for TVET and for training of workers in employment.

Skills needs analysis and anticipation form an important part of a responsive skills development system

Trade is a major driver of skills needs. The supply of available skills, both explicitly defined and tacit,[19] is an important factor shaping trade. Understanding current gaps between supply and demand for skills, both in terms of shortages and in terms of gaps in quality and relevance, is central to analysing the constraints that skills currently place on trade, and what the immediate priorities are to release those constraints. Envisioning possible futures for trade, and anticipating future skills needs based on those envisioned futures, provides information that is necessary if education and training programmes are to respond to future market needs.

Skills needs analysis and skills anticipation are well established in most developed countries, but are at a formative stage in most developing countries. Experience provides important lessons about the limits of skills forecasting: crucially, that it is important to focus on providing adaptable core skills useful across all occupations, and to develop technical skills and knowledge that will be applicable across multiple occupations even when the detailed technical skills content of jobs changes. Endeavours to train for precise technical skills needs face both the risk that the needs may change before curricula can adjust, and the certainty that the skills content of jobs will change over time. Interventions through shorter training courses undertaken as continuing education and training after entering the labour force can minimize time lags between the emergence of skills needs and the provision of appropriate training. Quantitative analysis based on LMI is an important component of well-developed skills anticipation systems, but is reliable only when complemented by qualitative information from employers and workers.

Alongside the process of anticipating what skills will be needed, it is important to take into account individuals' own educational and career aspirations, as these may constrain the availability of students and trainees interested in taking up education and training opportunities to develop the skills anticipated to be in demand. School leavers and

workers often have preferences that are influenced by issues of social status, and are not well informed about where the labour market opportunities currently lie and will lie in the future. Maintaining good remuneration and societal appreciation for skilled jobs in tradable industries, and for the education and training paths that lead to them, is key to maintaining or developing a reliable supply of skilled workers.

To be of value, skills needs analysis and skills anticipation systems should be technically credible, but they should also be well connected to institutional mechanisms for planning the provision of education, training and workplace learning. They should emphasize policy coherence, not only analysing and anticipating skills needs in the abstract, but fitting this analysis into enabling the delivery of priorities across wider policy domains.

Box 3.13: Strategies and approaches for identifying and anticipating skills needs/shortages

Identification and anticipation of skills needs and shortages takes place in a variety of institutional contexts, and using a variety of tools. There is no single "right way" to do it, and successful systems usually use a mix of complementary tools. Skills analysis must take account both of numbers of workers and new graduates with the skills needed, and of the quality and relevance of the skills they possess as judged against current and emerging job requirements.

Almost all developed countries have systems to identify and anticipate skills needs and shortages. These systems overlap with systems established for other purposes. They differ in content and institutional arrangements, and in the extent to which the different components are considered to be part of a single system or are distributed throughout other systems. The systems and the institutional arrangements in which they are embedded tend to evolve over time.

Developing countries with which the ILO cooperates technically on skills are at varying stages along the path of developing and institutionalizing systems for identification and anticipation of skills needs. Several development partners provide technical assistance in this area, and STED is one of a number of ILO methodologies for skills anticipation available to partners, gathered in a compendium:[20] see Říhová, 2014; Sudakov et al., 2016; Wilson, Tarjáni and Říhová, 2014; Andersen and Feiler, 2015; Corbella and Mane, 2014; Schonburg, 2014; Kriechel et al., 2014; Říhová and Strietska-Ilina, 2015.

The following is an overview of key types of tool used in identification and anticipation of skills needs, and in identifying shortages and qualitative gaps in skills.

(continued)

Box 3.13 (continued)

Labour market information: LMI systems provide data that can be used in identifying and anticipating skills needs and gaps.

Data from labour force surveys (LFS) conducted by national statistical offices are directly useful in quantifying trends in employment at the level of occupation, sector, qualification and region within a country. They can also be used to analyse unemployment and under-employment. This is a key source of data for quantitative work on skills.

Examples of other surveys often conducted by national statistical offices that are directly useful in skills anticipation are official vacancies surveys and some official enterprise surveys.

Public employment services (PES) produce statistics on labour market demand and vacancies. They work to match available workers to vacancies, and some provide their employer and worker clients with very sophisticated analysis of skills needs.

Skills forecasting models: Most developed countries and many developing countries have skills forecasting models designed to forecast employment by occupation, sector and often qualification level. These models are built on sectorally based macroeconomic models of the economy, ranging in complexity from relatively simple input–output models to complex computerized general equilibrium models. They disaggregate sectoral employment forecasts by occupation, based on projections of the occupational composition of employment that take LFS occupational data as their starting point. They are at their most reliable when projecting skills needs at high levels of sectoral and occupational aggregation. Detailed sectoral and occupational employment outcomes are sensitive to new trends not visible in historical data, so they are less likely than more aggregated forecasts to be reliable. In some cases, models are adjusted to reflect intelligence from sector experts, or from separate sector- or occupation-level analyses, in an endeavour to compensate. Forecasts of demand for new entrants to an occupation take account of both the change in numbers forecast and estimates of the number who will need to be replaced because they have left the labour force or switched to different occupations. This topic is addressed in more detail in Kriechel et al., 2014.

Qualitative skills policy research: A large part of the information on skills that is relevant to policy is not encapsulated in the historical data on which skills forecasting models are built. Occupations and qualifications are only partial proxies for skill, and there are often trends, uncertainties and priorities known to sector actors that are not distinguishable in historical data.

Qualitative skills anticipation is most frequently undertaken at sector level through skills sector studies, or through more limited sector surveys. Sector-level analysis is well suited to analysis of skills needs, first, because most sectors have relatively small numbers of important

occupations and these are common across most firms; second, because businesses in a sector are usually affected by similar trends and drivers of change; and third, because there is usually an existing community of business and employer organizations, workers' organizations, interested government ministries and agencies, providers of education and training, and professional organizations interested in ensuring the sector's development. Skills planning at sector level is often partly about endeavouring to shape the future by providing the skills required to support strategic development choices, and not only to supply skills demand as forecast from the current state of the sector. Qualitative policy research is needed for detailed assessment of current and future skills needs, and for detailed assessment of gaps and labour market conditions at the level of sector or occupation. Qualitative analysis is also needed to progress from identifying current and future shortages and gaps to devising effective and practicable responses. STED is the ILO's mainly qualitative approach to skills anticipation for tradable sectors. This topic is addressed in more detail in Wilson, Tarjáni and Říhová, 2014. See also Sudakov et al., 2016, on a foresight approach to forming a shared vision of future skills needs.

Data on education and training: Most governments collect data on the number of students currently attending at least publicly provided education and training courses, and on the number of graduates they produce, often classified by level, subject area and type of provider. The extent to which they include privately provided courses varies, as does the extent to which they use data from different parts of the system to regularly produce aggregated statistics. With adjustments to estimate how many graduates enter the job market (for example, some may go on to further study or emigrate), statistics on graduate numbers provide an important indicator on the new supply of skills to the labour market. Modellers have had mixed success in making estimates of the supply of newly available graduates comparable with forecasts of demand for new entrants at detailed occupational level. Tracer study surveys are an important tool in tracking labour market outcomes of graduates.

Locally responsive education and training provision: To a degree that varies between countries, and between sectors, mainstream education and training institutions commonly have ongoing collaborative contact with industry, both at the level of the institution and at the level of individual subject areas. The contacts may involve formal industry involvement in processes such as curriculum development, quality assurance and organizing work placements for students. They may involve the institution providing education and training services to industry. They may be informal. These contacts may provide education and training institutions with much of the information and incentive they need to respond effectively to industry needs.

Work studies and competency frameworks: Analysis of the detailed skill content of jobs and occupations is undertaken through work studies that observe the skills used in

(continued)

Box 3.13 (continued)

jobs directly or make use of expert knowledge on jobs and the occupations of which they form a part. Research into occupational skills at this level of detail is often undertaken as part of the process of developing competency frameworks to define the skills required for an occupation, and to form the basis for developing curricula. This is done more for occupations where common skills standards across the occupation are important, and less where there is a need for flexibility, so it is applied more at TVET level than at university level.

Other surveys: Other survey information may be available that provides data and insights on current skills demand, supply, shortages and gaps. Enterprise surveys on skills needs and gaps may include useful data. Skills and training surveys of enterprises are undertaken both publicly and often privately by industry organizations. Skills-focused surveys of individuals or households provide an alternative view. The PIAAC Survey of Adult Skills provides publicly available data sets, currently for 31 OECD and other high- and middle-income countries. The World Bank's STEP survey provides data for 12 developing countries. See also Corbella and Mane, 2014, on conducting establishment skills surveys.[21]

Across many countries, elements of skills analysis and skills anticipation are often spread across multiple institutions, and there is a need for, as a minimum, effective communication across those institutions. National skills forecasting models are often located in a central technical unit, where sector-level skills analysis and anticipation may be spread across multiple sectoral bodies that may also have complementary functions in setting skills standards, undertaking curriculum development and coordinating training delivery.

LMI and employment services

LMI systems generate, update and disseminate the information on current and future skills needs that is needed for analysis and decision-making on skills supply.[22] This is especially important in the context of trade, where skills demanded can change relatively quickly, and where skills mismatches can have a large impact on economic and employment outcomes.

LMI systems also disseminate information to education and training institutions, private market trainers, employers, trade unions, young people and their families, as well as to unemployed workers, enabling them to make informed decisions.

PES (ILO, 2010) also play a key role in communicating information needed for effective decision-making, in the form of career guidance, vocational counselling, and material on access to training and job-matching services, in addition to providing training under ALMPs.

PES help workers and employers to make transitions in the labour market through job-matching services, information and access to labour market programmes (on, for example, skills training or retraining, self-employment and starting a business); and they help jobseekers to choose the best options to improve their individual employability, through dissemination of reliable LMI, career guidance and counselling, and tools and techniques to assist in searching for jobs. Many PES also administer public unemployment insurance programmes. Private employment agencies have an increasing role to play in improving labour market functions through job matching and provision of advice.

These functions are all important in matching the supply of skills to the demand in the context of trade. Where demand moves ahead of supply, they help connect workers who already possess relevant skills but who might not otherwise consider employment in shortage areas to see the opportunities, and help tradable sector firms to gain access to them. Where a shock to employment associated with technology or trade threatens jobs or results in job losses, employment services have a key role in preparing workers for alternative employment and in matching them with and introducing them to alternative employment opportunities that best match their skills. More generally, employment services, especially private employment agencies, contribute to reducing frictions in the market for skills even when supply and demand are approximately in balance, facilitating the sort of movement between firms that can be good both for career development and for strengthening a sector by promoting diffusion of learning.

Together, LMI and employment services are central to enabling mobility between jobs and between sectors.

Models of the interaction between trade and the labour market demonstrate that low levels of friction affecting workers' mobility are required to maximize the overall benefits of trade and to minimize its negative impact on labour market outcomes of workers in import-competing industries. Effective LMI and employment services systems play a central role in limiting friction, and therefore in achieving positive labour market outcomes from trade.

Quality and relevance in skills development

Quality and relevance in education and training are centrally important to meeting the skills needs of tradable sectors and of their domestic supply chains. In skills development,

they are closely linked: fitness for purpose is a key dimension of quality, and in skills development systems, relevance is central to fitness for purpose.

While technical skills are important to relevance, strong cognitive and behavioural skills, and a good grounding in currently relevant technical skills and knowledge that can be applied on the job and in continuing learning, are more important to the relevance of initial education and training than precisely matching the skill set currently required to be fully productive from the first day of work.

Key mechanisms to underpin quality and relevance in skills development include the following.

- Developing strong management skills in education and training systems,[23] including at TVET colleges and at universities, and in higher-tier management systems such as TVET agencies. Flexibility and agility in these systems will ensure that institutions remain able to respond to the evolving challenges posed by dynamic labour markets.

- Significant investment in the skills of teaching and training staff, in order to ensure both that they are capable when appointed, and that they stay up to date in the context of changing curricula, changing skills requirements in the workplace, changing technologies and changing workplace practices.

- Establishing effective means to ensure that students and trainees have access to sufficiently up-to-date equipment for learning, whether this is at a workplace or at an education or training institution, with enough funding to keep the equipment at institutions sufficiently up to date for relevance, and to provide enough materials for learning purposes.

- Developing effective mechanisms to bring curricula up to date, and keep them current. At TVET level, a key mechanism is the establishment of occupational skills standards benchmarked against international comparators, and of curricula common across institutions based on these standards. Skills standards should be set and tested by involving stakeholders in the process. ASEAN is establishing common competency-based occupational standards for a range of occupations in order to facilitate regional integration through trade and through mobility within and across its member states (ILO, 2015).

At TVET level, programmes of learning that incorporate both classroom-based and work-based training, including apprenticeships, tend to produce the best results. Exposure to the workplace in university courses also tends to improve skills development results, especially in vocationally oriented fields of learning (Gault, Leach and Duey, 2010).

Structured work-based learning at levels equivalent to university can also provide an important route to skills development, especially when combined with classroom-based components. Workplace training allows students not only to learn the technical skills related to a particular job, but also to build on the foundation of cognitive and behavioural skills learned at school by adding core work skills such as communication, ICT, teamwork, problem-solving and the ability to learn. These are directly important to employability in each worker's existing job, and to the ability to move between jobs with career progression, or as demand for skills changes.

Flexible workplace training and learning arrangements are conducive to development of a broad range of skills.

Qualifications systems have a central role in quality assurance, especially where there are mechanisms in place to assure the quality and comparability of qualifications within the system, and mechanisms to assure quality and comparability between national systems.

Mechanisms to assure the quality and relevance of qualifications within national qualifications frameworks can play a key role in this, especially at TVET level. Competency-based qualification systems can accommodate multiple pathways through education, and between education and work. They facilitate students, trainees and workers in adapting to changing skills requirements, and are likely to go some way towards helping workers switch career track where this is required because of changes in skills demand arising from trade. Lifelong learning critically depends on a strong integration between education, training and work (OECD, 2007).

Well-staffed and adequately funded training institutions are essential to skills development strategies and policies. Periodic reviews may be necessary to assess their effectiveness in meeting their goals and their efficiency in using scarce resources.

Box 3.14: Addressing the quality and relevance of skills developed by providers of education and training under STED

Quality and relevance of education and training are centrally important to meeting the skills needs of firms and their domestic supply chains, and to their ability to perform effectively in tradable markets. Deficiencies in quality and relevance can constrain productivity and the ability to meet customer demands competitively. Problems with skills quality may be mainly

(continued)

Box 3.14 (continued)

about the quality and relevance of skills development in the education and training system, or about the quality of skills of the existing workforce, and are very often a combination of both. Tackling problems with the quality and content of skills in exporting firms, and in firms connected to export markets through other exporters, most often requires action both in the formal education and training system and in training provision within industry.

Where the main problem is a gap in the quality and relevance of skills development in TVET and universities, the principal components of action at a practical level undertaken under STED are as follows:

- identifying the current gap and anticipating the future gap;
- bringing together all the main stakeholders concerned with bridging the gap to validate the analysis, devise and approve practical solutions, and coordinate implementation;
- where the proposed solution involves training, and existing training courses available are not suitable, undertaking some or all of the following for each occupation:
    - developing competency standards;
    - developing curricula;
    - developing course materials;
    - establishing a qualification;
    - piloting the new education or training course;
    - evaluating the pilot and making improvements;
    - mainstreaming the new course.

An approach that uses all these elements systematically is most directly applicable in TVET systems, but the steps are relevant to skills development at all levels.

Strategies to recruit and retain students and trainees should promote access by under-represented groups, which might include women, minorities, disabled or disadvantaged youth, or low-paid workers, both to benefit industry by maximizing access to a diverse pool of talent, and to serve social inclusion objectives.

Education and training systems are complex, and made up of parts that are not necessarily coordinated. A gap in quality and relevance of skills in one area may be representative of wider problems in the system that affect a wide range of courses. Where this is the case, a

holistic approach is required to improve aspects of the system including some or all of the following: governance and coordination; policy, strategy and planning; skills needs anticipation; financing; management of the system and of institutions; the skills of the teaching workforce; qualifications and certification system; curriculum and assessment; links to workplace learning; monitoring and evaluation of the system; and research and innovation on the system.

Box 3.15: Tools to address the quality and relevance of skills within firms under STED

Where shortcomings in the quality and relevance of skills lie principally in the skills of the existing workforce, the major components of action at firm level include some or all of the following:

- creating HRM and HRD strategies and plans at firm level, based on overall business strategies; and budgeting for training, often through both HRD budgets and budgets for initiatives to implement changes such as deployment of technologies, changes to work organization or adoption of new business practices;
- strengthening the skills and knowledge of general managers, operations managers and human resource managers in HRM, HRD and modern operations management practices, so that they can identify strategic skills development needs and devise and implement skills development plans based on these needs;
- consulting with workers' representatives on HRD strategies and plans, and with individual workers on training;
- developing each firm's culture and management model so as to value and prioritize skills development and consistent high performance by each worker, and to improve working conditions, based on modern operations management practices;
- sourcing suitable training that is consistent with skills development needs, ongoing operational constraints and economic constraints (especially for MSMEs, this often means sharing with other firms that have similar skills development needs, either by using classes at education and training providers also attended by employees of other firms, or by collaborating with other MSMEs in sourcing training directly or through a business organization);
- developing each firm's own capacity to train its employees, including HRD management, skills assessment, training of trainers, training in mentoring

(continued)

Box 3.15 (continued)

for supervisors and team leaders, developing training plans, and establishing infrastructure such as learning management systems and access to online training or training rooms;

- establishing relationships and mechanisms for cooperation with external partners in areas such as apprenticeships, sector training networks, TVET institutions, universities and private training providers; also, collaborating with other firms and partners on sector-level skills strategies.

Responses to gaps in the quality and relevance of skills of the existing workforce are also often implemented at the level of a sector, industry or other grouping of firms. These may be coordinated by industry organizations (including among others employers' organizations and/or workers' organizations), professional bodies, government agencies or ministries or development partners. It is also common for universities, TVET providers and private providers of training to develop and provide training for workers in employment. Education and training for employed workers is frequently provided on the joint initiative of more than one of these types of organization.

3.5 Lessons from experience: Case studies of successful skills development policies

The first case study, on the Republic of Korea, focuses on how skills development policies were used to respond to the consequences of the 1997 Asian financial crisis.

The second case study focuses on Singapore, which has used skills policies as a core part of its FDI-focused development model. The focus of skills policies has evolved over time as development strategies have evolved towards enabling the development of high-skill tradable sectors.

The third case study, on Ireland, illustrates how the country has used skills policies in adjusting to successive trade shocks, starting with entry to the European Economic Community in 1972, later with the establishment of the European single market, and more recently with the trade shock associated with the 2008 global crisis.

The fourth case study, on skills councils in India, illustrates sectoral approaches to skills governance and development for a tradable sector. It takes the case of the Gem and

Jewellery Skill Council of India (GJSCI), an industry-led body formed under the umbrella of the National Skill Development Corporation (NSDC), which is responsible to the Ministry of Skill Development and Entrepreneurship.

Skills policies to support the Republic of Korea's economic development through international trade[24]

The Republic of Korea is an example of a country that has radically transformed its production structure and participation in international trade, shifting from being one of the poorest nations in Asia to one of the most dynamic industrial economies over a few decades. Its success in structural transformation and industrial upgrading through a government-led export-oriented strategy has been described in many studies.[25] Skills development has been a central component in rapid, strong and equitable economic growth. Education and training have been both cause and consequence of high growth rates.

The Republic of Korea has integrated its skills development policy with its development strategies. The skills development system has complemented economic and development goals by supplying skilled workers for export-oriented light industries in the 1960s and early 1970s, heavy and chemical industries in the 1970s and 1980s, and more sophisticated, advanced and knowledge-based industries in the 1990s and 2000s. The skills development system drove industrialization by directly supplying, or requiring enterprises to supply, a skilled workforce. The incentive-based system within the framework established by the Employment Insurance Act 1993 (later amended) was strengthened in 2004 into an incentive system to support lifelong employment under the Workers' Skills Development Act.

The 1997 Asian financial crisis triggered a capital flows shock in the Republic of Korea, creating a problem of mass unemployment, with the number of unemployed more than doubling from 561,000 in the fourth quarter of 1997 to 1,235,000 in 1998. The number of the unemployed who had lost jobs as a result of company restructuring increased from 320,000 in 1997 to 1,079,000 in 1998. In response to this, the Government initiated comprehensive measures in 1998. These included a shift in the balance of its skills development policy from supporting economic growth towards reduction in poverty and inequality and creation of employment opportunities. The Government focused on ensuring training opportunities for disadvantaged groups, such as unemployed people, non-regular workers,[26] older workers, females and SME workers. Some of the key measures taken at that time and more recently are described in the following paragraphs.

Large-scale vocational training programmes: These were introduced after the 1997 crisis, with a particular focus on IT, to help counter unemployment among well-educated and young workers. IT training courses not only contributed greatly to bringing down unemployment in the short term, but also laid the foundation for the country to re-emerge as an economy strong in IT. The number of unemployed vocational trainees reached 330,000 by 1999, of whom 76,000 participated in IT training courses. The IT sector was targeted because of its ability to absorb the unemployed, especially well-educated unemployed youth. Most government support for training in IT was provided through non-formal education. In addition, there were two types of government training programme: specialized training support programmes operated by the Ministry of Information and Communication, and a vocational training programme for the unemployed managed by the Ministry of Labour.

Skills development accounts for the unemployed: The skills development account is a voucher system that allows an unemployed worker to select a suitable training course. The system is designed to address problems in the traditional training system for the unemployed, including training courses that are supplier-oriented and inflexible, and courses offered without cooperative participation of employers, workers' unions and employment services. The system has enabled unemployed workers to be proactive in choosing training courses, and in obtaining information and assistance from counsellors. Satisfaction surveys have reported that the pilot project (carried out in 2008) had the positive results intended. The number of training courses undertaken increased, the length of training courses shortened, and satisfaction rates among participants rose.

Support for SME workers: SME training consortia were established to redress an imbalance between large enterprises and SMEs in taking up rebates on the national training levy. The scheme assisted SMEs by helping them to organize themselves as training consortia, and provided the consortia with training management specialists financed by public funds. Private and public training providers received public subsidies if they formed consortia with SMEs. These subsidies covered the costs of facilities, equipment and salaries for training personnel.

Training programmes for non-regular workers: Non-regular workers received special support for taking external training courses, and support under the skills development system. This category of workers received full reimbursement of the training fees under the Employment Insurance Act.

Training programmes for older workers: Two types of training programmes were introduced for older workers. Short-term training courses were provided by the Ministry of Labour through the national Human Resources Development Service (HRDS), which

selected providers through competition. The number of selected training institutions reached 197 in 2007, offering 47 different courses for 2,900 workers. They covered minimum skills for employment, industrial safety and hygiene, sound work ethics and safety. The second type of training programme was provided by local governments through training and employment centres for older workers, focusing on skills to earn supplemental income and to continue to participate socially, and on broadening employment opportunities (Choi, 2016).

Training programmes for poor self-employed workers: Accounting for an increasing share in the labour force (35 per cent in 2005), self-employed and non-paid family workers faced problems including declining average income and increasingly limited access to social security. In addition, they tended to be older and to have a low level of education. Skills development training was mobilized as a means of assisting these vulnerable groups. In 2009, special training services were provided to 2,500 self-employed entrepreneurs.

Training programmes for unemployed female heads of household: The number of female household heads trained reached 1,985 in 2005, of whom 772 were employed after the training.

Regional unemployment training programmes: These programmes were provided for those who were not covered by the Employment Insurance Act, including poor and young fishermen and others. The programmes were operated by local governments and funded by their own resources. A total of 4,400 people benefited from these programmes in 2007.

Development of a responsive skills development system in Singapore[27]

Key institutions in the Singaporean system of skills development include the Ministry of Trade and Industry (MTI), the Ministry of Education and the Council for Professional and Technical Education (CPTE). The MTI is responsible for broad economic development policies and is supported by a range of semi-autonomous agencies. One of those is the Economic Development Board (EDB), an agency that has the primary function of attracting FDI and ensuring that foreign investors' demands for skilled workers are met. The EDB also works with other agencies, such as the Productivity and Standards Board (PSB) and the Institute of Technical Education, and with industry-specific bodies such as the Precision Engineering Institute, to meet the skills needed by investors. The Ministry of Education has jurisdiction over schools, polytechnics, universities and the Institute of

Technical Education. The CPTE is an independent body with overall responsibility for matching demand for and supply for skills in the economy. Studies of skills development in Singapore suggest five key features that have contributed to its success in trade and characterize the system.

The first is the successful integration of skills development and economic development. The Government has successfully linked its skills development strategies with its economic development strategies to provide the skills necessary for each phase of economic development. During the early import-substitution industrialization period (up to the mid-1960s), the focus was on improving basic education and developing secondary vocational institutions and polytechnics that not only provided the science, mathematical and technical education required for economic development, but also met short-term needs for trained technicians. During the following period of export-oriented industrialization (up to the mid-1970s), the Government's main goal was to attract foreign investment. Because foreign investors needed technically trained manpower, the Government increased the number of technical education institutions and articulated the "skills and technology transfer model" (see below), in which foreign investors were given incentives to participate in technical education. From the mid-1970s to the mid-1980s, a higher value-added, export-oriented strategy required improvements in both general skills (vocational and technical training for occupations such as fitters, electricians and welders) and specialized skills needed by the industries that were growing through foreign investment. The policy response was threefold: (1) the Government established a large "general skills" supplier, the Vocational and Industrial Training Board; (2) the EDB intensified its model of technology transfer for meeting specific skills by offering subsidies and grants to foreign companies to induce them take the initiative in training; and (3) policy-makers reformed the education system, creating a dual system on the German model to funnel high-school students into vocational institutions or colleges. The Government reformed curricula at the National University of Singapore, and also created the Nanyang Technological University and two new polytechnics.

From the mid-1990s, economic development policies sought to enhance creativity among the young and develop entrepreneurial risk-taking behaviour. This new focus of economic development contributed to making Singapore a major investment force in the region and responded to industry feedback that although Singapore graduates were analytically sound and could execute well-defined tasks, they were often stymied when problems and instructions were not clear or when they faced situations that demanded innovation and creativity. To address these shortcomings, the emphasis of the basic education system was rebalanced away from exams and towards projects that stimulate creativity.

A second key feature is the "skills and technology transfer model" of the Singapore system. This provides significant incentives for foreign investors to establish training centres in collaboration with the state, while guaranteeing them the right to hire the centres' graduates. The model initially started on a small scale when the EDB targeted two firms (Rollei of Germany and Tata of India), and has since been applied more widely. Incentives offered have varied between firms. Another significant feature was that the EDB participated in the management of these centres through the existing vocational training apparatus in Singapore. The model of cost sharing with foreign investors and the Singaporean Government was successful, not only generating the skills required for foreign investors in the short run, but also creating centres for developing skills transferable to other employers by harnessing the unique expertise of a range of foreign firms.

A third key feature of the Singapore system is the creation of the **Skills Development Fund** in 1984. Employers are required to contribute 1 per cent of the gross salary of all employees earning less than US$1,500 per month to the fund and may recoup 80 per cent of their contributions through training grants for skills development. The training grants are structured to provide training for skills in demand. Firms with training plans covering over 50 per cent of the workforce are eligible for larger grants, while companies continuing to use low-skilled workers in low-cost operations are penalized. By 1996, roughly 33 per cent of the Singaporean workforce was receiving training under this system, and corporations were spending 3.6 per cent of their payroll on training.

A fourth key feature of the system is its ability to pay attention to **long-term skills development through reform of education policy**. While the EDB has been focusing on ensuring that skills are available for economic development, the CPTE has established specific targets and policies for different components of the education and training system. In 1979 it introduced the New Education System to improve the quality of Singapore's primary schools, and in 1990 it revised education policy again to foster creativity in schoolchildren by changing the structure of examinations and adding project-based methods of evaluation, more research and term papers, and other methods to encourage students to "think outside the box".

A fifth key feature of the Singapore system is **the lines of communication, and the structure of interaction, that enable the system to work efficiently**. The EDB, under the MTI, became the architect of the technology transfer model. The National Manpower Council (NMC) facilitates interaction among the MTI, the Ministry of Education and the Ministry of Manpower – the three government ministries that are involved in upskilling – enabling them to coordinate their work, while the NMC retains overall responsibility for matching demand for and supply of skills

in the economy. The PSB focuses on productivity improvements in industries and firms, and refers those firms to appropriate skills training institutions. The PSB thus focuses on workers who are already employed, while other institutions (both training and educational) focus on those about to enter or re-enter the workforce. Interaction takes place among these ministries through committees. Frequent job rotation among leaders of these institutions has succeeded in creating a unity of purpose for the system. Furthermore, Singapore's tripartite system, with management, labour and government representatives sitting on the boards of most public institutions, also provides a channel through which training and skills development programmes can be kept focused and relevant.

Skills development policies for tradable sectors in Ireland

Ireland has a history of implementing skills development policies, both to support the functioning of tradable sectors and to respond to and support adjustment to trade opening and trade shocks. In the years immediately preceding Ireland's accession to the EEC in 1973, the Irish Government introduced major reforms in education and training, partly with a view to meeting the skills needs of tradable sectors that would need to adjust to increased integration into international markets. Free secondary education was introduced. A national network of training centres was established under a government agency, the Training Council (AnCO), to provide industry-relevant training. From the early 1970s, regional technology colleges were established to provide higher education at technician level to provide skills expected to be needed by industry, and also to provide access to higher education away from the main cities. All of these grew rapidly, responding both to industry demand for skills and to social demand for opportunity. The universities also grew rapidly. These developments eased the adjustment of indigenous industry to market opening, and provided a base of English-speaking skills accessible to FDI firms seeking to access EU markets. For Irish workers, growing employment opportunities at both indigenous and FDI employers replaced those lost at firms previously protected from import competition. While much of the benefit went to new labour force entrants, training provided to unemployed workers by AnCO provided displaced workers with opportunities to retrain for new jobs.

From 1990, there was a renewed interest in skills planning. The Economic and Social Research Institute developed a skills forecasting model in collaboration with FÁS, the national training authority and successor to AnCO (Hughes, 1991). FÁS

undertook a series of sectoral skills studies, overseen by tripartite industry training committees, with the aim of developing a skills response to the adjustments consequent on the establishment of the European single market. These focused on tradable sectors (clothing, textiles, chemical and allied products, food processing, mechanical engineering, electrical engineering and electronics) and on one supply-chain sector (print and paper) (FÁS, 1992, 1993a–d, 1994). Implementation plans were put in place for each sector.

A wide range of training interventions were developed and implemented following on these studies, mostly targeted on raising the skills of employed workers so as to support firms in adjusting to more competitive market conditions.

During the 1990s, FDI employment in electronics manufacturing and software in Ireland grew rapidly, and in pharmaceuticals and medical devices at a steadier pace. Employment in indigenous exporting sectors also grew, especially in software and also in areas such as food processing, mechanical engineering and construction products. This expansion coincided with, and was supported by, rapid change in Irish higher education, with the university system growing rapidly, and with institutes of technology (formerly regional technology colleges), mainly to train technicians, increasingly producing graduates at higher technician level and at undergraduate degree level in engineering and sciences, as well as in business studies and the humanities.

From the mid-1990s, reports from industry to government showed a rapidly worsening shortage of software professionals. Neither software professionals nor the software sector were clearly distinguishable in the official statistics available at the time, but surveys of software sector enterprises showed that employment had more than doubled between 1993 and 1997, and was expected to continue on an upward trend. At about the same time, large new FDI investments created a sudden large increase in demand for technicians in electronics manufacturing that could not be met from the existing flow of graduates from education. It was understood from the evidence that skills shortages threatened the Irish economy's export-driven growth.

The Expert Group on Future Skills Needs – a multi-stakeholder group incorporating the social partners – was established jointly by the Minister for Enterprise, Trade and Employment and the Minister for Education to advise the Irish Government on its response to this skills crisis. It has continued to operate since, advising the Government on skills policy.

The response to the ICT skills shortages, implemented by the Government on the basis of advice from the Expert Group, had a number of components:

(1) through collaboration between the Government and the universities and institutes of technology, the number of places made available on relevant undergraduate courses was increased substantially;

(2) an Accelerated Technician Programme, developed in collaboration between the Government, electronics FDI companies and institutes of technology, created a new parallel stream of technician training, compressing technician training into an 18-month period that included a substantial work placement;

(3) postgraduate courses were established to give graduates from other fields skills in computing, especially to undertake less technically demanding work;

(4) inward migration by workers with relevant skills was promoted.

These measures allowed major FDI investments to proceed, and reduced the impact of the skills shortages on the indigenous exporting technology sector. The FDI investments facilitated were high skill and high value added, and mostly stayed in Ireland when many lower-skill electronics manufacturing operations established earlier left for countries with lower labour costs in the 2000s.

During the 2000s, Irish growth shifted from being export driven to being domestically focused. Skills shortages in exporting sectors ceased to be the main priority, and the focus of targeted skills policies shifted to non-exporting sectors, including construction and health care. Interventions to boost skills supply for the software and electronics sectors were wound down. While lower value-added parts of the electronics manufacturing value chain moved away from Ireland over the decade, in many cases they left higher value-added activities such as R&D, supply-chain management and customer care in place. Graduate quality became a problem for technology industries as courses in computing and electronic engineering became less popular among school leavers, and firms relied increasingly on inward migration for high-level technology skills.

Ireland was severely affected by the global crash of 2008, both in the domestic economy and in loss of manufacturing and tradable services employment. The unemployment rate reached 15.1 per cent in 2011. However, there has been a substantial recovery in employment since, with the unemployment rate falling to 6.7 per cent late in 2016. The recovery in employment is in both tradable and non-tradable sectors. One indicator of tradable sector employment shows an increase from 254,000 in 2009 to 299,000 in 2015 (DoJEI, 2016).[28]

One of the main policy instruments used by the Irish Government to promote recovery has been an annual Action Plan for Jobs,[29] first introduced in 2012. Each year's plan includes

strategies to address bottlenecks in the supply of skills identified as constraining jobs growth. The number of places made available on mainstream courses at universities and institutes of technology has increased, with an emphasis on skills in demand from tradable sector firms in areas including ICTs, life sciences and financial services. There has been a major new emphasis on retraining and upskilling unemployed higher education and TVET graduates, and on upskilling unemployed workers with only secondary education qualifications. Under the Springboard programme, co-funded by the Irish Government and the EU, higher education providers, public and private, offer free full-time and part-time conversion courses in skills that are in demand on the labour market from technician to postgraduate level. The courses offered respond to skills priorities identified by the Expert Group on Future Skills Needs, and focus particularly on skills relevant to exporting sectors, including ICT, manufacturing and international financial services, as well as on key skills for enterprises trading internationally. Some qualifications under Springboard focus on cross-enterprise skills such as innovation, enterprise/entrepreneurship, digital marketing and project management. Early in 2017 it was announced that eligibility for Springboard courses would be extended to homemakers and to workers in employment interested in retraining for high-priority shortage occupations.

The responsiveness of the Irish skills development system has been enhanced by the adoption of a National Framework of Qualifications (NFQ) that covers all levels of competence from basic literacy and numeracy (Level 1) to doctoral (Level 10). The NFQ has been used to create pathways for learners to progress through education and training that cross different types of qualification and different types of provider. It has made it easier for providers to recognize and respond to learner needs, and has created a common framework within which both traditional public providers of education and training and private providers can operate. By making provision from different providers comparable, and by providing elements of a common quality assurance mechanism, it has facilitated the Government in using private providers of education and training, as well as public providers, in responding effectively to skills needs.

In Ireland, the main responsibility for funding continuing education and training, outside targeted labour market interventions, rests with employers and with individual workers. However, the Government funds a tripartite body, SkillNets, which part-funds the operation of industry-led training networks, funding a network manager and a share of the cost of training provided under each plan agreed with the central SkillNets organization. Each major tradable sector has a SkillNet, and there are SkillNets organized around a range of other themes. The Irish Government's response to the crash of 2008 included changes to the operation of networks that made places on their courses available to unemployed workers, on the basis that the skills targeted were known to be in demand.

Other changes currently under way include the establishment of a new apprenticeship model designed to bring work-based approaches to training and qualifications to sectors and levels of competence where these approaches have not traditionally been present, and regionally focused mechanisms through which employers can influence skills development in institutions in their regions.

Skills councils in India: The case of the Gem and Jewellery Skill Council of India[30]

NSDC is a public–private partnership in India, under the aegis of the Ministry of Skill Development and Entrepreneurship. It aims to promote skills development by catalysing and providing funding for the creation of large, quality, for-profit vocational institutions. Its mandate includes enabling support mechanisms such as quality assurance, information systems and academies for training trainers, either directly or through partnerships. It also aims to support and coordinate private-sector initiatives. It has 40 affiliated sector skills councils, one of which is the GJSCI, founded in 2012. The GJSCI was established in collaboration with the main gem and jewellery industry organizations, including the Gem and Jewellery Export Promotion Council (GJEPC) which represents almost 6,000 exporters.

Gems and jewellery form one of India's key export sectors. It accounted for US$40.7 billion in exports in 2014, of which US$22.5 billion was in unmounted, unset worked diamonds and US$13.1 billion in articles of jewellery and parts thereof.[31] An analysis of the sector undertaken for the NSDC indicates that India accounts for more than four-fifths of diamond processing in the world by value. In 2013, manufacturing subsectors employed over 3 million people, with another 1.3 million employed in jewellery retailing within India. The sector has problems attracting enough workers because jobs are considered unattractive owing to poor and stressful working conditions and problems with health and safety. There is scope to improve productivity and reduce material losses through improved skills and better working processes. There is also considerable scope to improve the quality of jobs. The sector has a programme, called Dakshagraam, to improve productivity, reduce waste and improve working conditions at firm level in gem and jewellery firms.

Recommendations from the NSDC analysis on meeting human resource requirements covered training in health and safety; improving working conditions and the working environment; setting up training centres to serve current sources of workers and to gain access to additional sources; sensitizing employers to the need for training; and development and piloting of skill development models involving both industry and training institutes (KPMG, 2014).

The GJSCI's main objectives are to identify skill development needs; to determine skills/competency standards and develop curricula by creating national occupational standards; to develop recognition of prior learning (RPL) so as to recognize the existing skills of artisans and provide them with further opportunities; to promote Dakshagraam in gem and jewellery manufacturing firms; to work with affiliate institutes to provide training; and to establish academies of excellence in the sector.

The initial round of work on identifying skills development needs generated three reports from studies undertaken in 2014 on behalf of the NSDC and GJSCI.

National occupational standards are a means to define skills needs on the basis of best international practices for the sector, and to level up and increase the uniformity of training by using these standards as the basis for training at a large number of institutions under the affiliate institutes programme. So far, 117 standards are reported to have been developed and more than 200 affiliates are providing training under the standards.[32]

RPL provides a means to measure and certify the existing skills of workers against national occupational standards, and to develop routes through which they can raise their skills and level of qualification without having to go back to the start of initial training. So far, over 22,640 artisans are reported to have been certified across India.

Academies of excellence provide a mechanism to develop greater expertise, and to disseminate it through the sector. Three are reported to have been developed so far.

Programmes to improve productivity and working conditions play an important role in linking skills development to both improved firm competitiveness and improved job quality. Dakshagraam is representative of a range of programmes based on process improvement, modern technologies and new forms of work organization deployed in many sectors under titles such as "lean" manufacturing, kaizen or the ILO's SCORE programme.

An NSDC evaluation (NSDC, 2015, executive summary) has found a range of positive impacts from skills council activity in India at individual, industry and societal levels. For example, the majority of employers in three regions surveyed (85 per cent, 85 per cent and 76 per cent) "agreed" or "strongly agreed" that the skills of candidates trained by the NSDC were better aligned than those of others with the job requirements of their companies/industries. A majority (81 per cent, 81 per cent and 77 per cent) either "agreed" or "strongly agreed" that the alumni of NSDC training programs displayed better performance than other workers.

Endnotes

1. Cognitive skills are thinking-based skills in areas including perception, attention, memory, motor skills, language, visual and spatial processing, and executive functions. In empirical skills research, indicators such as examination results and the results of standardized tests are often used as proxy indicators for cognitive skills.

2. Important non-cognitive skills learned partly in formal education include "critical thinking skills, problem solving skills, emotional health, social skills, work ethic, and community responsibility. Also important are factors affecting personal relationships between students and teachers (closeness, affection, and open communication), self-control, self-regulation, persistence, academic confidence, teamwork, organizational skills, creativity, and communication skills" (García, 2014, p. 3).

3. "Foundation skills include the literacy and numeracy skills necessary for getting work that can pay enough to meet daily needs. These skills are also a prerequisite for continuing in education and training, and for acquiring transferable and technical and vocational skills that enhance the prospect of getting good jobs" (Brewer, 2013, p. 6).

4. For example, in 2010, the percentage of employees participating in any type of work-based continuing vocational training in the EU-28 countries was 25 per cent for employees of firms with 10–49 employees, 34 per cent for those at firms with 50–249 employees and 46 per cent for those at firms with 250 or more employees (Eurostat, data downloaded 21 March 2017 from http://ec.europa.eu/eurostat/web/education-and-training/data/database.) Brunello and De Paola (2004) reviewed evidence that lower provision of training in smaller firms represents underprovision, and found evidence that it does. Case-study evidence from the ILO's STED Programme observes smaller firms in developing-country tradable sectors providing training for their workers at a lower level than their larger same-sector counterparts, and facing substantial scale-related barriers to providing training.

5. Outplacement refers to providing employed workers whose jobs are under threat with assistance in finding alternative employment.

6. Responses to employment loss connected to a trade shock are discussed on p. 123.

7. On the importance of LMI for decision-making, see Říhová, 2014.

8. Skills anticipation is identified as a priority in the G20 training strategy (ILO, 2011). The STED Programme forms part of the ILO's response to weaknesses in skills anticipation in developing countries.

9. For examples of good practices, see ILO, forthcoming.

10. On the impact of quality deficiencies in education, see e.g. Hanushek, 2005.

11. The discussion here draws on e.g. Almeida et al., 2012, and is also heavily informed by discussion with employers and other stakeholders in multiple countries under the STED Programme.

12. See e.g. Sheehan (2013, p. 564), who finds in research based on longitudinal data from SMEs, based on relationships between HRM practices and performance indicators that "the

medium to longer-term gains associated with … investment (in the selected human resource practices) are demonstrated to have significant positive effects for sustained competitive advantage".

13. For example, Stone (2012) highlights training supply as a constraint on small businesses internationally in upgrading skills, as part of a useful broader review of constraints on skills development in small businesses. Problems with quality and availability of training supply are regularly found to be a constraint on skills development in STED-based projects.

14. Barriers to improving domestic supply-chain performance rooted partly in skills are a recurring theme of STED sector studies, for example in the Egyptian food-processing and furniture sectors (Abdallah et al., 2015, 2016).

15. See e.g. Molloy, Smith and Wozniak, 2011, on the decline of internal migration within the United States.

16. Bureau of Labor Statistics data, downloaded 1 Apr. 2017 from https://www.bls.gov/lau/.

17. For an up-to-date treatment of financing, see OECD, 2017.

18. On core skills, see Brewer, 2013; Brewer and Comyn, 2015.

19. "Tacit skills" refers to skills that are uncodified and hard to communicate specifically, but still necessary. Their existence is indicated by the fact that quantitative research on skills often finds substantial variations in performance that are not explained by observed variables, and it is inferred that they are explained by unobserved variables.

20. For the compendium, see http://www.ilo.org/employment/Whatwedo/Projects/WCMS_534345/lang--en/index.htm.

21. The following ILO skills anticipation guides provide more detailed advice on different types of tool: Říhová, 2014; Kriechel et al., 2014; Wilson, Tarjáni and Říhová, 2014; Andersen and Feiler, 2015; Corbella and Mane, 2014; Schonburg, 2014; Sudakov et al., 2016.

22. On how LMI is used to inform or influence the development of skills policies, see Sparreboom and Powell, 2009.

23. For good practices in TVET management, see Gasskov, 2000, 2006.

24. This case study is based on Young-Sun and Kyung Woo, 2009.

25. See e.g. the paper on which this case study is based, Young-Sun and Kyung Woo, 2009; also McKay, 2005;Moon, 2016.

26. The term "non-regular workers" refers to non-typical workers including temporary or fixed-term workers, casual workers, dispatched workers, commissioned workers and call-based workers.

27. This case study is based on Kuruvilla and Chua, 2000, and Kuruvilla, Erickson and Hwang, 2001.

28. The data set behind the publication is available at https://www.djei.ie/en/Publications/ABSEI-2015.html.

29. https://www.djei.ie/en/Publications/#lt=Action Plan for Jobs#ly=#ls=#lty=#lk=.

30. Information on skills councils in India and the GJSCI is drawn from the NSDC and GJSCI websites: http://www.nsdcindia.org/ and http://www.gjsci.org/ (accessed 13 May 2017).

31. http://www.trademap.org/Index.aspx, selecting India, annual data and HS71, downloaded Feb. 2017.

32. http://www.gjsci.org/nos.html, downloaded 22 May 2017.

4 Conclusions

4.1 The relationship between skills and trade

In the context of globalization, where technologies, market demands and trading relations change rapidly, the responsiveness of skills supply to current and prospective changes in demand is of crucial importance. It enables exporting firms and businesses in their domestic supply chains to participate effectively in international trade in goods and services. It also has an important role to play in facilitating adjustment to trade shocks by ensuring the smooth transition of workers from low-skill jobs in import-competing sectors to higher-skill and higher-productivity jobs in exporting firms and industries.

Given the role of skills in export performance, and in a country's capacity to absorb FDI and to move up in value chains, a strong emphasis on skills development is vital. Skills are one of the principal enablers of trade growth and economic diversification, and in this regard an important complement to infrastructure.

Trade opening changes the competitive environment on product markets, providing incentives in the economy to shift more resources towards its most productive activities. Education and in particular core work skills play an important role in facilitating this adjustment, with workers who are more skilled being better able to adjust to changes in the content of their jobs, or to taking new jobs at a different employer, or in a different occupation or sector.

There is clear evidence that trade, often through its interaction with productivity and technology upgrading, increases the demand for certain skills in both developed and developing economies. As the relative demand for high-skilled workers increases, their wages tend to increase relative to those of less skilled workers. A responsive skills supply that balances out the increased demand mitigates the upward pressure on wage inequality and promotes a more inclusive distribution of the gains from trade.

Trade provides opportunities to promote decent work. Decent work is not an automatic outcome of trade, and while it benefits some dimensions of decent work it does not necessarily benefit all. Trade tends to raise average productivity both in traded industries and across the whole economy, presenting opportunities for workers to share in the returns. Where adopted, modern HRM techniques and new forms of work organization tend to favour better working conditions, greater investment in skills and more concern for employee satisfaction, as a route towards more closely meeting market demands and improving productivity. With increasing investment in technology being driven by trade, the stake employers have in developing and retaining the skills of their workers tends to increase. Investment in skills complements these opportunities to promote decent work, enabling increases in productivity, providing the skills needed for modern forms of HRM and work organization to be effective, and as itself being a component of decent work.

Depending on the national context, any or all of three different types of motivation may be significant in shaping skills-based responses to trade:

- First, skills are an important factor in comparative advantage. Skills development can be used as part of strategies to strengthen a country's trade performance, either through a broad emphasis on ensuring that skills development systems strengthen participation in trade, or through more targeted skills development aimed at developing comparative advantage in specific activities. There is a consequential universal good practice need for skills development systems to be responsive to the existing and emerging skills needs of tradable industries and their domestic supply chains.

- Second, if there is a trade-connected employment shock, this can have a persistent negative impact on the labour market prospects of workers who lose their jobs. Skills strategies to alleviate this include reskilling and upskilling for workers who lose their jobs; education and training for workers who may be vulnerable in future, to strengthen their transferable skills and make them more employable; and using skills development to build comparative advantage in replacement activities suited to meeting the aspirations of unemployed workers.

- Third, trade may put upward pressure on wage inequality by increasing the skill premium. Increasing the supply of in-demand skills dampens this pressure by allowing more workers to access better-paid jobs.

Whichever of these motivations is most compelling for a country, or indeed for an internal region or economic sector, effective strategies will be built on some or all of the following

types of response, of which skills development is just one, albeit a highly important one. Migration, internally within a country or between countries, can also play a role, whether to supply the skills that industry needs, or for workers who cannot find suitable employment locally and are willing to move to where their skills are in demand. Where there are skills shortages, measures to increase participation in the labour force, such as through promoting higher female participation or promoting later retirement, can contribute to the solution. Measures to increase labour force participation by attracting workers back into the labour force often require support from education or training, so as to bring their skills up to date or to prepare prospective returnees to work in occupations or sectors different from that in which they worked previously. Sometimes, better recognition of existing skills is also part of the solution. RPL systems can make the availability of existing skills more visible to employers, and also provide workers with paths into continuing education and training.

We still have little rigorous evidence on how services trade and services offshoring affect labour markets and the demand for skills in developed countries, and even less on how they affect destination locations such as India[1] and the Philippines. There is an emerging literature on how trade and offshoring affect individual decisions to invest in human capital, but the empirical evidence is still scant. More evidence is also needed on the effectiveness of adjustment policies that target upskilling and reskilling.

4.2 Constraints on matching skills supply to trade-related demand

There are common constraints across countries in matching skills supply to demand. These are usually more severe in developing countries than in their developed counterparts, which have been focused for longer on improving their education and training systems, and on strengthening workplace learning.

Key areas where constraints often arise can be summarized as follows:

- cognitive, and non-cognitive behavioural, skills among school leavers that are weaker than required to underpin core work skills in employment;

- information weaknesses, affecting individuals, firms and governments;

- weaknesses in institutional mechanisms to identify and anticipate skills needs, and then to guide and coordinate education and training systems to provide the skills needed;

- lack of inclusiveness in access to education and training, with low-skilled workers poorly equipped to respond when skills needs change for trade-related reasons;
- underdeveloped systems for lifelong learning;
- underdeveloped systems for apprenticeship and other forms of initial work-based learning;
- student preferences that do not match skills demand, especially with many developed countries identifying an undersupply of graduates in STEM subjects, and strong preferences for university education over TVET in many countries;
- weaknesses in education and training management;
- problems with quality of education and training provision and quality of qualifications, in terms of both quality of teaching and facilities and curriculum;
- unsuitable funding models for TVET and university provision;
- uncertainties among some employers about the business benefits of training for employees;
- weaknesses in human resource management and strategies in businesses, especially in MSMEs;
- lack of supply of suitable training, especially for MSMEs;
- barriers to skills development provision reaching MSMEs in the domestic supply chains of exporting sectors;
- barriers to migration, both internal and external.

4.3 Available responses and persisting challenges

The responses available to address constraints on matching skills supply to trade-related demand are within the scope of the kinds of policies for education, training and skills development already implemented in many countries to varying degrees. To date, they are implemented more in developed countries than in their less developed

counterparts. However, policy priorities differ between developed countries and many developing countries are making good progress, often with support from international development partners. There is room for countries at all stages of development to adjust their responses. The need and scope for less developed countries to adjust is greater, but even for developed countries the challenges of adjusting to trade-connected shocks to employment may heighten the priority that they place on skills development related to trade and inclusive growth.

Important principles in responding effectively to skills needs related to trade include the following.

- **Policy coherence**: Connecting trade and skills policies requires convergence in policy between these and related policy areas, at both national and sectoral levels.

- **Social dialogue**: This is central to making skills systems responsive to the needs of industries, including those producing tradable goods and services.

- **Broad access to education, skills development and lifelong learning**: Low-skilled workers, workers who lack transferable skills, workers whose learning skills are weak and workers whose skills are at risk of obsolescence benefit less from trade and are especially vulnerable to technological change or to a trade-connected employment shock. Societies without inclusive access to education and training are more vulnerable to increased wage inequality from trade.

- **Targeted training for displaced workers and/or workers under risk of displacement**: Reskilling may be required to allow workers to move to different occupations or significantly different jobs, whether because their original jobs become unnecessary or because change offers a good opportunity.

- **Investing in training for employed workers**: Training for workers at all skill levels is a necessary part of implementing effective strategies, underpinning capabilities needed in tradable product and service markets, including efficiency and effectiveness of operations; compliance with standards and regulations; marketing, sales and channel management; innovation, product design and product development; and supply-chain management and procurement. Skills development is important in strengthening value chains, including domestic supply chains.

- **Skills development for MSMEs**: Addressing impediments to adequate investment in skills by and for MSMEs is necessary to enable more to participate in

markets for tradable goods and services, to strengthen domestic, regional and global value chains in which they participate, and to underpin inclusive access to training for the workers they employ.

- **Core work skills**: Strong core work skills are a vital underpinning for employability and for business performance, and are complementary to the technical skills required for a job. Rooted especially in initial compulsory education, they are key to implementing modern forms of business organization that are important for effective participation in tradable product and services markets and to raising productivity economy-wide. Strong core work skills across the labour force contribute to the inclusiveness of growth, and provide a good starting point for offsetting the tendency of trade to widen wage inequality.

- **Skills needs analysis and anticipation**: Tradable industries are especially subject to changing skills needs. Forward-looking analysis and anticipation of skills needs are needed to inform policy coherence and social dialogue, and to inform decision-making by all relevant partners.

- **LMI and employment services**: Effective LMI and employment services systems are required to gather and communicate the information that governments, workers, employers, students, trainees and providers of education and training need to inform their thinking and decision-making. Employment services also have a broader role in training displaced workers and in matching them to available jobs.

- **Quality and relevance in skills development**: In order to meet industry skills needs, education and training for skills development must meet appropriate quality standards, and the content must be relevant to the needs of the industry that it aims to meet.

More specific areas where attention is required in many countries include the following:

- **Development of core work skills in initial education**: Almost universally, employers identify a need for stronger core work skills among their workforce, including among new graduates entering the workforce. Underlying this issue in many countries is an insufficient focus in initial compulsory education on developing the cognitive and behavioural non-cognitive skills required to underpin the core work skills required in the workplace. In some contexts, while parts of the system develop core skills well, other parts of the system underperform. While the need to place greater emphasis on core work skills such as communication, problem-solving and team working is widely accepted, there is still a widespread need for further reform.

- **Quality, relevance and consistency of formal education and training provision**: TVET systems internationally increasingly share a good practice competency-focused approach to TVET provision and assessment that provides a framework for assuring quality and relevance. Universities internationally increasingly focus on assuring the academic quality of their provision, although the extent to which they focus on relevance varies. Many developing countries are less advanced than their developed-country counterparts in these processes. Key elements of the TVET-level competency-based approach include occupational skills standards (or competency standards) developed in collaboration with industry experts; curricula based on these standards; training for teachers in delivering education, training and assessment against the standards; investment in (or access to) the facilities and equipment required to deliver training based on the standards; quality assurance processes; and awarding of standard qualifications. Relevance is assured by periodic review to update standards and curricula, which may include benchmarking against comparable qualifications in other countries. Investment in management development for TVET and university managers, and for system managers to support this, is also important.

- **Strategies for lifelong learning, with a particular focus on low-skilled workers, industrial workers and workers in sectors under adjustment**: Governments and social partners can build effective strategies for lifelong learning accessible to the whole labour force, but with a particular emphasis on workers exposed, or potentially exposed, to trade-connected employment shocks. Successful strategies seem to be those which aim to ensure that workers have meaningful access to continuing education and training that raise skill levels, build transferable skills and lead to recognized qualifications, in order to build employability resilient to employment shocks, while also developing skills relevant to the existing employer. Governments and partners working together can ensure that the employed status of workers is not a barrier to uptake, and that funding models reflect the benefits to workers and to society of learning that is not employer-specific.

- **Acknowledgement of the importance of skills within the response to trade-connected employment dislocation**: Emphasizing skills development, taking account of potential employment opportunities available to unemployed workers, is important in designing and implementing ALMPs responding to significant employment dislocation. Where difficulties are expected in matching workers with jobs suited to their level of skill, longer-term ALMP strategies may be considered in areas such as substantial reskilling in different occupations that may be in demand, educating to a higher level of qualification that might foster greater labour market mobility, and developing skills that could be used to strengthen local comparative advantage in activities capable of sustaining higher levels of employment.

- **Work-based learning**: For many occupations in tradable sectors in many countries, especially those in the low to medium skill range (such as machine operator occupations), skills are developed mainly through work-based learning, but this often does not follow a curriculum or lead to a qualification recognized outside the individual firm. Some of this activity is recognized as apprenticeship, but the meaning of the term varies across country and sector contexts. Strengthening the quality, relevance and transferability of technical and core business skills requires a more structured approach that may include skills standards and a core curriculum for each occupation, classroom-based modules off the job, recognized qualifications, RPL mechanisms and pathways for qualified workers to upskill and raise their level of qualification at TVET and university levels. Quality apprenticeships provide a good model for this. Werquin (2010) provides a useful review of country practices on recognition of non-formal and informal learning.

- **Skills development at and for MSMEs**: Successful strategies to overcome scale barriers to effective training for MSMEs producing tradable products and services typically include collaborative training networks and councils; provision of training by industry organizations; targeting of MSMEs by public providers of education and training; development of training supply for MSMEs with support from development agencies and development partners; and interventions by national, regional and local government to tilt incentives in favour of skills development for MSMEs. There needs to be a particular focus on skills for business management; human resource management; implementing modern forms of work organization; efficiency and effectiveness of operations; compliance with standards and regulations; marketing, sales and channel management; innovation, product design and product development; and supply-chain management and procurement.

- **Collection and dissemination of LMI**: Especially in less developed countries, there are frequently major gaps in systems for collecting and disseminating LMI. Good systems for LMI collection and dissemination include frequent labour force and household surveys, with sample sizes large enough to provide resolution at sector level and occupation level; consolidated statistics on graduate numbers by level and field of study; graduate tracer surveys; vacancy surveys; information on labour market demand from PES and from surveys of private employment services; broader labour market policy research; evidence-based careers information and advice services for students and trainees; and evidence-based advice services for unemployed workers and other jobseekers. Collaborations with employers' and workers' organizations can play an important role in this, as documented, for example, for Greece and Spain in ILO, 2014a, b.

- **Planning and acting at sector level, among other levels**: Sectoral approaches can be used to build solid bridges between the world of work and training providers, in order to match skills provision to the needs of enterprises. Direct participation of employers and workers, together with government and training providers, can ensure the relevance of training.

- **Imbalances of career opportunity and career risk between women and men**: Skills development should be for both women and men. In contexts where skills needs are rising, it is important to ensure that both women and men with the ability to upskill to do higher-level jobs get the opportunity to do so.

- **Institutional mechanisms to identify and anticipate skills needs as part of education and training governance**: Again, especially in less developed countries there are frequently major gaps in systems for identifying and anticipating skills demands, for assessing these in relation to likely skills supply, for developing strategies to address significant quantitative and qualitative gaps, and for implementing these strategies. Good systems for skills anticipation involve multiple government ministries, including ministries of trade, as well as the social partners and other relevant partners at national and sector levels. They use multiple complementary methods, including quantitative skills forecasting, qualitative analysis, analysis at sector and occupation level, and analysis of the match between supply and demand when reviewing curricula or individual courses. They are integrated into systems for governance of education and training. They include mechanisms to communicate to a wide audience.

- **Reputation of TVET**: Work can be done to improve the reputation of TVET among students and workers by producing and disseminating accurate information on labour market outcomes of TVET graduates; building effective careers guidance systems; and building connections to lifelong learning, including pathways to university (or university-equivalent) education.

- **Skills development in the domestic supply chains of exporting firms and firms exposed to international trade**: Relevant ministries, regulatory agencies, research centres, industry organizations, professional organizations, supply-chain integrators, major purchasers and specialist providers of training and advice such as farm extension services may collaborate on developing and implementing strategies to raise skills and performance in supply-chain MSMEs, including small agricultural enterprises where appropriate. The purpose is both to improve the effectiveness with which they connect to international markets and to make access to skills development more inclusive.

Endnote

1. The National Association of Software and Services Companies (NASSCOM), the Indian IT and business process outsourcing industry organization, estimates exports of US$110 billion and domestic sales of US$35 billion in fiscal year 2016, and employment of 3.7 million (data from www.nasscom.in, downloaded 29 Mar. 2017).

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Annex

Overview of the STED Programme[1]

STED – Skills for Trade and Economic Diversification – is an ILO programme that provides sector-level technical assistance on identifying the skills development strategies required for future success in international trade. It is designed to support growth and decent employment creation in sectors that have the potential to increase exports and to contribute to economic diversification.

The programme works with national and sector partners in tradable sectors to understand the strategic development challenges facing each target sector, and the contribution that skills development can make to addressing those challenges. It enhances coordination between trade, development and skills policies. STED projects identify strategies to meet the skills needs identified. Where funding allows, they continue beyond the analysis to assist stakeholders and other development partners in implementing these strategies for skills development. For example, in a number of countries STED analysis has been followed by support for developing competency standards for high-priority occupations, and piloting curricula based on these standards.

The programme aims to develop and strengthen the capacity of national partners to institutionalize this analytical and implementation process within their respective countries. This is done through provision of capacity-building training and through working closely with national and sector partners on programme implementation.

STED takes a forward-looking perspective, analysing a sector's development and growth opportunities, and anticipating the skills implications of participating more effectively in international trade. Together with an analysis of current skills supply and demand, this generates an overview of existing and future skills gaps. Thus, STED supports the formation of skills for which there is demand in the labour market and helps to avoid skills mismatches that contribute to unemployment, in particular among the young.

STED commenced work on a pilot basis in 2010, focused initially on developing sector reports on skills needs in consultation with national and sector partners. The first STED initiatives aiming to progress to enabling implementation commenced in 2013. STED

has been applied in 19 sectors in 11 countries; work in additional countries is in the early stages. Examples of sectors in which STED has been applied include agro-food and food processing, tourism and hospitality, and pharmaceuticals.

The countries in which STED was piloted were Bangladesh, Kyrgyzstan, the Former Yugoslav Republic of Macedonia and Ukraine. The countries in which STED work has been implemented subsequently include, in addition, Cambodia, Egypt, Jordan, Malawi, Myanmar, Tunisia and Viet Nam.

At the governance level, the STED approach aims to work jointly with partners from multiple ministries and their agencies, with the social partners, and with other partners such as education and training providers and sector organizations, through mechanisms such as project advisory committees, sector steering groups, workshops with partners, and capacity-building training courses. It aims to use these mechanisms to foster coordination and dialogue on skills for trade, building bridges between the worlds of skills development, industry skills needs and development policies. It also aims to establish patterns of collaboration that can later be institutionalized to produce a sustained positive impact on institutional skills governance.

The choice of sectors in STED work takes account of the potential for skills to have a meaningful development impact, and takes close account of national export and other relevant strategies. For example, STED work in Malawi prioritized the oilseed and horticulture sectors, taking account of the already identified importance of skills for those sectors, and of the national export strategy, in consultation with national partners. STED work in Cambodia focused on food processing and light manufacturing, both highlighted under the latest DTIS study, and was guided by a focus on export diversification.

Often, this process creates the first sustained collaboration at sector level between, on the one hand, ministries of trade and industry, export councils and other trade-oriented institutions and, on the other, ministries of labour and of education, education and training providers, and other skills-oriented institutions. It also aims to develop capacity to undertake this sort of work in-country, through involving local institutions such as national statistical offices and TVET agencies in technical work as well as in guiding the process.

Across the STED work done in 11 countries to date, there are consistent patterns in the challenges and constraints faced in attempting to meet the skills needs associated with trade. These observations inform the discussion of constraints presented on p. 107, principally in respect of developing countries. Because the sectors studied are particularly exposed to international markets that feature rapid change in competitive conditions and technologies, there is an especial need to tackle these constraints in

order to provide the skills needed to allow firms in the sectors to participate effectively in these markets. As would be expected, there is a significant degree of overlap with the list that follows here and the wider discussion of constraints presented in p. 107.

Key constraints that are common to varying degrees across countries and sectors where STED has worked include:

- lack of institutional mechanisms, or underdeveloped institutional mechanisms, to identify and anticipate skills needs, and then to guide and coordinate education and training systems to provide the skills needed (contributing to addressing this lack is STED's main entry point);

- weaknesses in the cognitive and behavioural skills of many school leavers that limit the core work skills that they can bring to employment;

- gaps in the collection of LMI required to inform choices by individuals, firms and government, and weak mechanisms to communicate it, for example through careers guidance or through informing providers of education and training about skills needs;

- undeveloped systems for apprenticeship and other forms of initial work-based learning, with apprenticeships often being informal or not having a well-defined classroom component;

- weaknesses in education and training management, especially at TVET level;

- problems with quality of education and training provision, and quality of qualifications, in terms of:
    - the quality of teaching, with skills of teachers often being out of date and lacking current practical experience, and with a lack of resources for continuing professional development for teachers;
    - curricula that do not meet current skills needs;
    - gaps in resourcing, for example in providing access to suitable equipment;
    - qualifications that do not incorporate adequate quality assurance on the skills and competencies of graduates;

- governance and funding models for TVET and university provision that do not provide adequate incentives for institutions to make their provision relevant to industry;

- employers, especially MSMEs, that do not apply modern HRM strategies, do not use modern forms of work organization, and are in a low-training equilibrium;

- lack of supply of suitable training and continuing education to allow firms to meet their skills needs efficiently, or to allow workers and managers to upskill through participation in education;

- weak interest in TVET courses among school leavers, even where there is demonstrable demand for graduates from those courses; and

- lack of clear development strategies for domestic supply chains, for example at farm level or in small furniture workshops, including weak skills development strategies at these stages of value chains.

Recognizing the complexities in meaningfully attributing trade and employment outcomes to a process that focuses on analysis, stimulating dialogue among key actors, developing institutional capacity and making a limited direct contribution to implementing recommendations on skills, the STED Programme has developed a framework for results-based management and for monitoring and evaluation, based on the Donor Committee for Enterprise Development framework. This is being piloted in three countries (ILO, 2016b).

Endnote

1. Adapted from Gregg, Jansen and von Uexkull, 2012. For information on STED, see www.ilo.org/STED.

In recent decades, the global economy has experienced a profound transformation due to trade integration and technological progress as well as important political changes. This transformation has been accompanied by significant positive effects at the global level, as increased trade integration has helped to raise incomes in advanced and developing economies, lifting millions out of poverty. At the same time, it has translated into change at the levels of firms, individuals and communities. While overall, better job opportunities are on the rise, some workers who are forced to leave their existing jobs find it difficult to access them.

Some important benefits of trade, and of technology, materialize only if economies adjust – often at a cost – to seize the opportunities offered by further integration or new technologies. While neither the benefits nor the costs are shared equally within countries, the benefits from trade or technological progress far outweigh the costs. This does not mean that the costs and those who bear them can be ignored, however. Policies aimed at facilitating adjustment can reduce the number of those left behind by trade or technology, while at the same time raising the net gains from trade and technology, improving overall efficiency and boosting income.

Given the role of skills in productivity and in trade performance as well as in access to employment and in wage distribution, a strong emphasis on skills development is vital for both firms and workers. This publication argues that in the current fast-changing context of globalization, where technology and trade relations evolve rapidly, the responsiveness of skills supply to demand plays a central role not only from an efficiency but also from a distributional perspective. Featuring results from the ILO's Skills for Trade and Economic Diversification (STED) programme, this report shows that appropriate skills development policies are key to helping firms participate in trade, and also to helping workers find good jobs.

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