

1 Boosting innovation-led growth in regions in industrial transition

The chapter provides insights into past, current and future challenges of industrial transition and outlines how regions in industrial transition are affected by long-term megatrends, such as globalisation and digitalisation. The chapter introduces five policy themes that contribute to industrial transformation and highlights the need for a strong regional and place-based approach. It further summarises crosscutting lessons on how to address multi-level governance challenges across policy themes.

Introduction

Over the past two centuries, European and OECD regions have undergone extensive periods of industrial change caused by technological progress and automation. The labour-replacing element of technological progress has historically led to fears of prolonged unemployment. Despite these fears, technological innovations have always given rise to new jobs that provided employment, while the productivity growth from automation has been the most important driver of rising living standards.

Yet, it would be incorrect to argue that technological progress comes without challenges. Even though the past two centuries of automation and technological progress have not made human labour obsolete, changes in technology alter the types and remuneration of jobs available. This can be particularly problematic where such changes are concentrated among certain groups or in certain localities. In recent years, one noticeable change has been the “polarisation” of regional labour markets, wherein middle-skilled jobs are hollowed-out while the top and bottom of the income and skills distribution grow.

Globalisation, ongoing technological progress and the demands of fighting climate change compound these adjustment costs, while also presenting an opportunity for industrial transformation. Some regions experiencing industrial transition were once motors of growth and prosperity. Since the outsourcing of industrial production to emerging economies, these regions have been struggling to adapt. In other regions, industrial transition has left pockets of disadvantage in close proximity with areas of relative prosperity. In some regions, the challenge of industrial transition is compounded by shrinking employment in the primary sector or demographic change.

Furthermore, technological advances, and in particular digitalisation and automation, are further transforming the industrial base of different types of regions. The transition to a climate-neutral and circular economy will radically alter economies and societies. Reaping the benefits of such changes will lead to strengthened competitiveness and resilience. At the same time, a lack of capacity and opportunity to keep pace with technological and industrial innovation can lead to declining investment, growth and income. If no action is taken, stronger economic disparities and territorial and social fragmentation within the European Union (EU) and other developed economies can result.

Declining industries in once-prosperous places are at the heart of current debates on territorial disparities and increased income inequality within countries. In principle, industrial decline is not always a cause for concern: it can enable an economy to progress and innovation to advance. However, for economies that are unable to manage the process of adjustments, it can cause structural unemployment and stagnation. Tackling these challenges calls for urgent deployment of new solutions and requires profound, systemic transformations.

Addressing current industrial transformation requires moving beyond traditional development policies towards those that maximise the potential of every region through a place-based approach. Doing so permits policymakers to consider the existing capabilities and legacies of regions in industrial transition, taking account of their specific characteristics. For these regions, substantial investment is needed in advanced manufacturing, skills and research and innovation in order to reap the benefits of industrial change.

To avoid focusing strictly on narrow supply-side innovation policies, policy measures in regions in industrial transition need to pay more attention to actions that can address demand-side characteristics, such as consumption patterns, firm strategies, new business models and regulatory aspects. Improved governance, including effective co-ordination mechanisms among levels of government and between innovation-led regional development policies and related policy domains, is also needed.

This report outlines the specific challenges confronting regions in industrial transition and offers guidance on how innovation-led regional development policies can facilitate a forward-looking approach to industrial transformation through policy design, implementation and monitoring. The report is directed towards all policymakers seeking to improve the “what” and “how” of policies that accompany industrial change.

This report focuses on those regions most exposed to industrial change. But almost all regions face the legacy of industrial transition in certain sectors and share a common set of challenges linked to globalisation, the Fourth Industrial Revolution and the transition to a low-carbon, circular economy. The practices and policy recommendations contained in this report will, therefore, be of significant relevance to most regions in the European Union in the context of developing their smart specialisation strategies (see Box 1.1).

Box 1.1. The growing importance of policies to address industrial transition in the EU

While the benefits of globalisation are widely spread, the costs are often localised. In addition, the transformation to a climate-neutral economy can have an overall positive impact on the EU economy but could also increase social and regional disparities. This is why this deep modernisation process needs to be well managed. The European Union is committed to helping all regions prepare themselves for the challenges of globalisation and the transition to a climate-neutral economy by 2050, ensuring a fair and socially acceptable transition for all.

The EU's Cohesion Policy has, for many years, supported the sustainable industrial transition of Europe's regions and cities and is the main EU policy instrument to address structural changes linked to energy and industrial transition. In the current 2014-20 programming period, EUR 120 billion is targeted at helping regions become more innovative and competitive. Smart specialisation strategies, that is to say strategies building on a region's competitive strengths, are at the centre of this approach. Putting in place such a strategy is a requirement for regions to receive support from the European Regional Development Fund (ERDF). These regional strategies play a key role in helping regions diversify their economies, create jobs and move up the value chain. The European Commission has proposed that, in the future, member states will be required to identify actions to facilitate industrial transition based on a thorough analysis of transition challenges and needs, including in coal and carbon-intensive regions.

Sources: European Commission (2017a), *Reflection Paper on Harnessing Globalisation*, https://ec.europa.eu/commission/sites/beta-political/files/reflection-paper-globalisation_en.pdf; European Commission (2017b), *Reflection Paper on Towards a more sustainable Europe by 2030*, https://ec.europa.eu/commission/sites/beta-political/files/rp_sustainable_europe_30-01_en_web.pdf.

This first chapter highlights contextual elements and summarises crosscutting lessons and key considerations for boosting innovation-led growth in regions in industrial transition. The subsequent chapters summarise insights and policy conclusions on five policy themes to help regional policymakers to manage industrial transition successfully, including the future of work, innovation diffusion, entrepreneurship and private sector engagement, the transition to a climate-neutral economy, and inclusive growth. Each chapter includes highlights of practices shared by the regions and countries that participated in the industrial transition peer-learning exercise (see Annex A) and concludes with a set of potential policy recommendations emanating from the related workshops (see Annex 1.A. for an overview of all policy recommendations).

Setting the scene: Current and future challenges for regions in industrial transition

Regions undergoing industrial transition share a range of very specific, yet highly interconnected opportunities and challenges resulting from their legacy of manufacturing activity. These regions often possess strong capabilities and knowledge in important industries of today but need to re-orient these towards new and emerging activities for the industries of tomorrow. A key challenge for successful industrial transition is boosting the ability of regions and their industries to break out of locked-in paths of development by pursuing innovation, new technological pathways and industrial renewal.

Regions in industrial transition have an important range of assets to build on, but face dangers of lock-in

Regions in industrial transition often have a strong legacy in manufacturing and sophisticated innovation activities in local core industries. They tend to have a pool of well-trained workers in well-established technological and industrial fields and are often home to regional innovation centres in existing industries.

However, a key risk of this legacy is lock-in: being potentially overspecialised in mature technologies and industries in decline. Innovation activities in these regions are often very sophisticated but tend to follow mature technological trajectories of a mainly incremental nature. Even though these regions may have a highly developed and specialised knowledge-generation and diffusion system, it is usually oriented towards traditional industries and technology fields. Where regions in industrial transition have been able to develop future-oriented innovation activity, it has rarely spread beyond local innovation hubs.

Moreover, small firm innovation and entrepreneurial activity tend to be low given the dominance of larger firms, incumbent to the established and mature industrial and technological specialisation. Examples of this type of path dependency is frequently found in regions specialised in heavy industries such as the Ruhr area in Germany or North East England. These regions are also well-known for being sites that may face difficulties in dealing with environmental waste and pollution (e.g. carbon emissions) as well as dependence on energy-intensive industries (Box 1.2) provides an overview of some defining characteristics of regions in industrial transition.

Box 1.2. What are the key characteristics of regions in industrial transition?

Regions in industrial transition are regions that have undergone or are currently undergoing a major restructuring of their economies and industrial profiles. These regions have experienced or are experiencing substantial changes of growth and contraction at the sectoral and business levels, with consequences for jobs and workers.

Regions in industrial transition are often characterised by:

- a long heritage of traditional (carbon-intensive) manufacturing
- a strong skills base in traditional occupations (but a lack of future-oriented skills)
- highly developed knowledge-generation and diffusion systems in established industries
- an existing high-quality knowledge infrastructure (e.g. universities, science parks) in a range of technology fields
- productivity and investment opportunities largely derived from traditional industry fields.

Regions in industrial transition have a strong potential to turn opportunities offered by current megatrends (e.g. digitalisation and automation) into regional growth paths. At the same time, these regions underperform on a range of socio-economic indicators, such as level and growth of productivity and gross domestic product (GDP), or shares of tertiary education. Addressing the challenge of industrial transitions means making better use of existing capabilities in order to successfully modernise and upgrade local economies.

Industrial decline can lead to growing inequalities

The decline in manufacturing jobs experienced by regions in industrial transition is often met with anxiety. People are concerned that a smaller manufacturing sector implies slower economic growth and a scarcity of well-paying jobs for workers in low- and middle-skilled jobs, contributing to a growth in inequality. A declining industry has a very visible impact on local communities and this is what people see. It is much harder to see the new firms and new jobs that are created as these take time to generate.

The consequences of industrial decline can be severe. Inequalities are rising and transfers alone will not be able to substitute endogenous growth opportunities. Across the OECD, a “geography of discontent” has emerged, expressed as growing disenchantment with globalisation, open economies and established policies. The divide goes between economically dynamic metropolitan places – home to high-skilled and highly educated workers – and those urban, peri-urban and rural areas where such skills may be lacking and which are left on the fringes of prosperity.

Regions in industrial transition are usually characterised by a long heritage of traditional industries and low levels of productivity in at least some parts of the local economy. It is, therefore, critical for these regions to increase productivity in order to catch up to more productive places within the same country and beyond. Policymakers addressing industrial transition have the responsibility to manage decline. This includes limiting the scale of problems arising from transition, such as prolonged periods of unemployment, while also tapping into the opportunities provided by new growth sectors, matching those with local resources and ensuring that the benefits of new activities are shared with local residents.

Industrial transition is not a new phenomenon

Industrial transition as such is not a new phenomenon. Since the first industrial revolution and the onset of modern industrial production, regional economies have undergone major changes. Today, they are experiencing yet another industrial revolution. The catalyst for each transition has been different, ranging from steam in the first industrial transition, to transport and electricity in the second, computers, semiconductors and the Internet in the third, and finally to artificial intelligence and machine learning in today's fourth industrial transition (Box 1.3).

Continued advancements in the development of artificial intelligence (AI) are likely to further accelerate changes in the world of work, transforming more tasks previously performed by humans. If managed well, these new technologies can be transformative, supporting higher productivity growth and improved well-being by complementing human capabilities rather than substituting them. For instance, they can promote the emergence of new business models and innovative ways of working, providing more flexibility for both workers and employers.

Box 1.3. Past and current industrial transition

The industrial revolution currently unfolding blurs the boundaries between the physical, digital and biological worlds. It combines technological advancements in artificial intelligence (AI), robotics, the Internet of Things (IoT), 3D printing, genetic engineering, quantum computing and other technologies. These enabling technologies are changing how people live and how business is conducted in nearly every sector, disrupting existing industries across OECD countries and providing important opportunities to advance the transition to a climate-neutral and circular economy.

While the Fourth Industrial Revolution, sometimes called Industry 4.0, is radically changing economies and societies, it rests on foundations created by the first three industrial revolutions. The advent of the steam engine in the 18th century led to the first industrial revolution, allowing for mechanisation of production for the first time and driving social change as people became increasingly urbanised. During the second industrial revolution at the beginning of the 19th century, electricity and other scientific advancements led to mass production. The third industrial revolution, beginning in the 1970s, saw the emergence of computers and digital technology. Like its two predecessors, the third industrial transition had a large impact on virtually all aspects of society. It led to a massive shift in the occupational structure of the labour force, resulting in individual winners and losers based on occupations, and had a significant impact on the prosperity of cities and regions.

The Fourth Industrial Revolution will strongly affect the nature of future jobs and future skills requirements. As with previous industrial revolutions, changing technologies and, in particular, artificial intelligence and increased automation, will see many types of jobs disappear. At the same time, entirely new categories of jobs are emerging, such as big data processing and analytics. These effects are not only relevant to large-scale companies but also provide new opportunities for small- and medium-sized enterprises (SMEs) and entrepreneurs. These technological advances will also have the potential to significantly reduce carbon emissions and resource usage across industrial and agricultural production cycles – from manufacturing to shipment, packaging and reuse.

Source: OECD (2018b), *OECD Science, Technology and Innovation Outlook 2018: Adapting to Technological and Societal Disruption*, https://doi.org/10.1787/sti_in_outlook-2018-en.

The past impact of industrial transition was not spread evenly across space

In order to sustain long-term regional development, regions must constantly transform and renew their economic base. Historically, industrial transition has led to changes in economic structures at the national and regional levels. For example, the core industrial areas of Belgium, Germany and the United Kingdom lost their economic dominance and were replaced by a set of new growth regions in the southeast of England, Flanders and the south of Germany respectively (Boschma, 2009).

Industrial change can be experienced as a temporary loss of competitiveness in a certain region. However, it is often far more substantial than that. The decline of Akron, Ohio's tire manufacturing or Pittsburgh, Pennsylvania's steel industry in the United States illustrates this. Industrial decline in these places led to substantial changes in how industries and production processes are structured. These examples also show that the actual process of industrial change comes with many faces and characteristics. Box 1.4 seeks to provide a few central elements of industrial transition.

Box 1.4. What characterises the process of industrial transition?

Industrial transition has many facets. Industrial transition is a broad term, which is often not clearly defined. Industrial transition brings with it a change in the economic structure, i.e. in relative weights of individual sectors during development processes. It can also result in shifts in the knowledge infrastructure (research organisations, intermediaries) and possibilities for the use of knowledge. From an economic geography perspective, industrial transition includes changes within a region to the spatial configuration of economic activities, the supply and demand for labour, as well as changes to the regional infrastructure, natural capital and land and housing values.

Industrial transition is closely linked to innovation. Industrial transition often involves a process by which traditional structures are replaced by modern industries. Positive industrial transition is the outcome of processes reflecting the ability of a firm, an industry, a region or a national economy to respond to new market pressures and create new opportunities for workers. On the other hand, failure to respond to a constantly changing market environment can result in economic decline, unemployment and rising inequalities, environmental externalities and falling land values. The objective of transition management is to help structurally weaker regions onto a dynamic growth path by means of innovation-promoting measures.

Industrial transition brings long-term benefits but comes with short- and medium-term costs. Industrial transition is neither automatic nor instantaneous. The most significant costs related to the adjustment process are associated with structural unemployment and environmental degradation, which in turn can generate significant adverse consequences for social welfare, especially where lasting over many decades.

Industrial transition can help some regions grow and cause others to fall behind. Industrial transition depends on many factors. Transition can be continuous or disruptive and can affect strong and weak regions and touches rural areas as much as urban areas. Industrial transition can result in different growth rates and structural adjustment pathways. Given the important role of maintaining institutional and social capital, local actors, stakeholder groups, civil society initiatives and promoters with a high level of personal commitment can play an essential role in industrial transition. In addition to firms (particularly SMEs), universities and intermediary organisations, civil society organisations that are involved in regional development projects as well as policymakers are important drivers of positive transition outcomes.

Industrial transition is place-based and time-specific. Industrial transition, ultimately, is defined on a case-by-case basis. This is due to the variations in the type and intensity of change regions experience, as well as the structures and the diverse profiles of those affected. Regionally specific approaches are important for the success of support measures, and framework conditions can differ markedly between places. Policy needs to be place-based and oriented to specific target groups since problems vary across firms, research institutions and intermediaries.

Industrial transition has unfolded differently across European and other OECD regions. Previous waves of technological breakthroughs show that technologies such as automation do not spread evenly across European and OECD regions. Rather, they affect different regions in heterogeneous ways, with a common lesson being that investment in human capital has always been a key element for regional resilience. Equipping workers with the flexibility to exit from industries where labour has been displaced by technology and capital, and enter into industries where new skills are needed at the foundation of making regions more resilient to industrial transition (OECD, 2018a).

When looking at industrial employment in Europe between 1990-2014 (Figure 1.1), it becomes evident that industrial transition did not spread evenly. While some regions, notably in Eastern Europe, experienced growing shares in manufacturing, employment in manufacturing declined for the majority of Western European regions. The heavy reliance of these regions on traditional manufacturing is being replaced by a demand for higher quality, service-oriented industrial production. In both East and West, investments in intangibles (e.g. human capital, software, etc.), a factor typically associated with the fourth industrial transition, is increasingly a source of growth.

Current long-term megatrends are transforming the industrial base of different types of regions

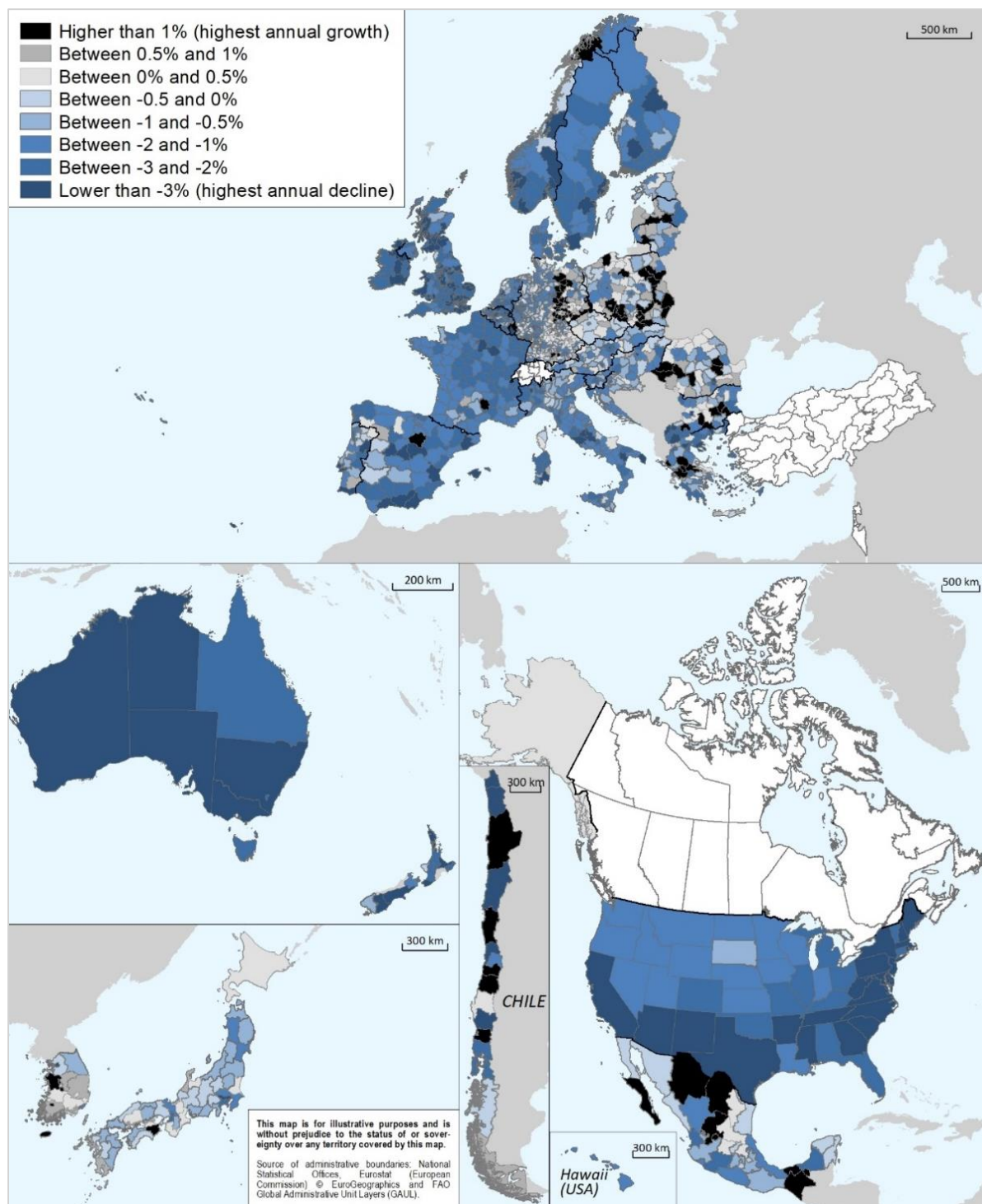
Across the EU and the OECD, new technological advancements coupled with increasing production outsourcing to lower-cost countries have led to a shift from traditional manufacturing to high-end, service-oriented industrial production. In addition, the distinction between industry and services is becoming less distinct and new production technologies determine the availability and nature of work in different types of regions (OECD, 2019a).

The fourth industrial transition has the potential to boost labour productivity and enhance well-being in all regions, but concerns remain regarding the potential impact of automation on unemployment and inequality. A common characteristic of all industrial transitions is the simplification (or even complete automation) of a broad range of originally labour-intensive activities. Historically, technological progress is a key determinant of long-term economic and sustainable wage growth. In the short term, however, automation displaces jobs, and the new jobs enabled by the technological transition can take longer to be created and/or be located in a different region.

The diffusion of industrial robots may best illustrate both technological penetration and the fear of job automation in the workplace. Although robots have existed for decades, their diffusion and capabilities have accelerated within and beyond the manufacturing sector (Brynjolfsson and McAfee, 2014). Data from the International Federation of Robotics indicate that orders of industrial robots increased about fivefold between 2003 and 2017, and this trend is expected to accelerate, including in OECD countries where the number of industrial robots per employee doubled over the last 15 years (Figure 1.2).

Figure 1.1. Changes in manufacturing employment, 2000-16

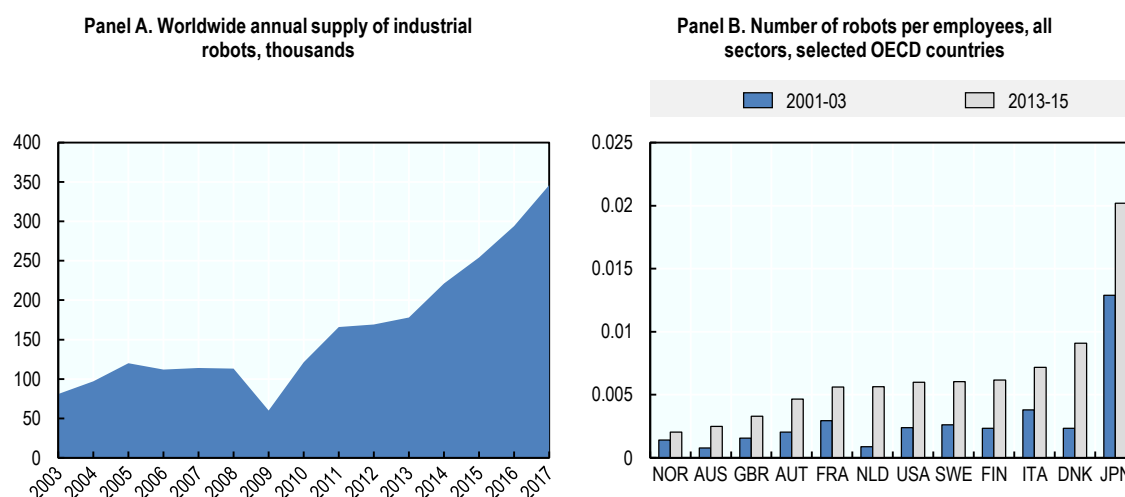
Average annual growth of the share of employment in manufacturing as a share of total employment, TL3 level



Note: First available year: 2003 for Belgium, 2006 for Poland, 2008 for Norway, 2009 for Japan. Last available year: 2015 for Australia, Finland, France, Germany, Hungary, Lithuania, the Netherlands, Poland and the United States; 2017 for Belgium, Bulgaria, Denmark, Estonia, Mexico, Slovenia and the United Kingdom. Annual average growth in the share of employment in manufacturing, except Japan (share of industry). All data are TL3 regions except for Australia, Chile, Mexico, and the United States (TL2).

Source: OECD Regional Statistics [Database].

Figure 1.2. The march of the robots



Note: In Panel A, 2017 figures are estimates. In Panel B, the initial period (in blue) refers to an average of the indicator between 2001 and 2003; the last period (in grey) refers to an average of the indicator between 2013 and 2015.

Source: OECD (2018) based on IFR World Robotics 2017 and Calvino et al. (2018), "A taxonomy of digital intensive sectors", OECD Science, Technology and Industry Working Papers, No. 2018/14, <https://doi.org/10.1787/f404736a-en>.

The rapid development and integration of new technologies in society and industry affect skills, tasks and jobs in regional labour markets. On the one hand, this leads to new growth opportunities, and on the other, it contributes to growing concerns of job displacement and talent shortages. The impact of the megatrends will differ by type of region and may be felt most strongly by those regions that are still shifting from traditional and resource-heavy industries to modern high-end manufacturing or services. In many cases, such regions need to manage past industrial decline and simultaneously remain focused on the opportunities that industrial transformation can bring.

Regions undergoing an industrial transition are confronted with a range of very specific (policy) challenges

Successful transition is a difficult task. For displaced workers, finding new jobs, especially those with equivalent income, is not evident. As the nature of jobs changes, the knowledge and skills specific to the job become obsolete. Jobs that are easily accessible, such as taxi driver or bartender, might not yield the same income as previously well-paid manufacturing jobs and may require moving to an area where demand for such services is higher. A manufacturing worker accustomed to operating heavy equipment or assembling materials might have difficulties transitioning into a position as a manager in retail, for example. Technological progress is typically associated with at least temporary job losses. Temporary does not always mean short-lived, however, nor are the disruptions evenly distributed across workers or regions in a country.

Regions in industrial transition, therefore, face challenges in modernising their industrial base, upgrading the skills of the workforce, compensating for job losses in key sectors and low productivity that limits income growth. These regions may find it difficult to re-orient local innovation capacities towards new and emerging activities, to raise or attract sufficient investment to encourage innovation and to spur small firm innovation and entrepreneurial activity.

Successful industrial transition requires technological, industrial and institutional change to occur simultaneously. The infusion of new technology is necessary for industrial change, but hardly sufficient. The big challenge for policymakers in regions in industrial transition lies in strengthening appropriate

competencies and resources for innovation at the firm level, to encourage local actors to engage with innovation processes and to ensure broad networks, strong interaction and knowledge exchange between actors across different policy domains. Box 1.5 summarises the key policy challenges for regions in industrial transition.

Box 1.5. What are key policy challenges for regions in industrial transition?

Ensure the benefits outweigh the costs: The costs of industrial transition pose a significant risk that regions fall further behind. Policy development has a pivotal role in steering transition towards the right development path.

The need to address technological change: The significance of technological change as an integral part of the transition process has to be recognised in terms of identifying and addressing major technological lock-in and by seeking to engage and frame the investment choices around new and future-oriented activities.

The need to manage the risk of structural unemployment: Transitions results in periods of structural unemployment. Early anticipation of these risks and the development of a range of (innovative) responses to restructuring in key sectors and the regional economy more broadly is important to alleviate the worst outcomes.

The capacity to steer transition towards positive structural change and economic growth: Depending on the right policy mix and associated scale of investment, dynamic economic changes in regions in industrial transition can increase long-term productivity and economic growth, contributing to rising living standards and well-being.

The ability to balance different trade-offs and ensure a just transition. Industrial transition means to balance economic, social and environmental and climate challenges to industrial transition. Considering the social aspect of the transition towards a climate-neutral economy is crucial for gaining social approval for the changes taking place.

The synergies with other policies: Adjustment policies likely coincide with changes in broader economic models, such as the provision of support for recycling of factor resources, avoidance of market rigidities and restrictions, and the creation of the right framework conditions.

Strategies for managing industrial transition

Regions in industrial transition are facing challenges in today's fast-moving environment of technological disruption, digitisation, automation and decarbonisation. Effectively managing industrial transition will help regions better understand current and future challenges and identify gaps in their approaches to managing such transition. Key considerations include how to increase the resilience of current employment and create opportunities for new job creation in a period of great change; how to broaden innovation strategies to improve diffusion of new technologies and ideas; how to promote entrepreneurship to diversify and strengthen the regional economy; how to ensure the low-carbon energy transition and harness its opportunities; and how to strengthen inclusive growth.

Preparing for the future of work

Rapidly evolving technologies mean that labour markets in European and OECD regions will inevitably undergo major transformations in the coming years and decades. Firms and regions that do not keep up

with the pace of innovation risk falling behind. While seizing the opportunities of new technologies and business models will lead to new growth paths, how to achieve this may not be self-evident. For policy design, an additional challenge is increased technological unpredictability. Support for skill development or large-scale investment might rapidly become obsolete as new technologies become available.

Regions that have experienced industrial decline or still base their current economic activity on traditional manufacturing or extractive industries are in a vulnerable position. Based on their capacities and accumulated knowledge in existing industries, companies in these regions have a strong potential to capture the benefits of the future of work. At the same time, the adoption and successful integration of new technologies and the development of new business models is constrained by significant and specific barriers that this type of region is facing. Regions in industrial transition often face a drastic decline in established job profiles due to the phasing out of traditional industries. In parallel, these regions are confronted with skills gaps in local labour markets when it comes to job profiles related to future technologies, such as professions in web- and app-enabled markets, machine learning skills and software developers.

Preparing for the future of work in regions in industrial transition requires a policy strategy that combines skills and employment policies with those that stimulate investment in new sources of employment and productivity growth. Tapping into new and emerging sources of growth and employment can help regions in industrial transition avoid being locked-in to old industries and help create job opportunities that increase productivity, wages and ultimately prosperity.

Broadening and diffusing innovation

Evidence shows that firms and industries adopting advanced technologies and innovative behaviour have above-average productivity and employment growth (OECD, 2018b). The introduction of new technologies leads to more efficient production processes and lower costs as well as the development of new products and the creation of new demand. Diffusing innovation through to low-performing firms requires enhancing the ability of firms to identify, absorb and build on technologies over the long term.

Regions in industrial transition often face large challenges in improving productivity, and even more so when they have insufficient institutional capacity, fragile industrial links or a low-skilled workforce. These regions may be unable to attract sufficient investment to encourage innovation, or commercial research structures and firms that could contribute to industrial modernisation. In many cases, although they may contain firms at the European or national technology frontier, there are significant problems in innovation diffusion and take-up in firms further away from the technological frontier. These latter firms may account for a large part of employment and output and are less resilient to shocks from international competition and technological change.

For successful industrial modernisation, it is essential that innovation-led regional development policies focus not only on cutting-edge frontier innovation but also on adopting processes or technologies that already exist elsewhere. Such a broader innovation policy should not be limited to the supply of research and development (R&D) or direct innovation support, but also strive to support education and capital investment that match the need of local industries, increasing their absorptive capacity and innovative capability. Public policy can stimulate the effective transfer of knowledge through labour mobility and collaborative networks, fostering knowledge circulation and interactive learning. Policies in this context can be platforms for knowledge diffusion and support better linkages between universities and industry.

Innovative entrepreneurship for new industrial path development

Innovative entrepreneurship is a critical factor for regional industrial modernisation and a key tool for job creation, economic growth and innovation. As such, governments are eager to promote it. The prevalence of start-ups is systematically and strongly related to local employment growth across and within regions

(OECD, 2019b). Established firms may have less incentive to innovate than young firms, as innovation will consume part of an established firm's current revenue stream by introducing new products and services that disrupt their existing products and services.

In the context of a knowledge-based economy and in the face of technological uncertainty, the role of entrepreneurship will be greater than ever. However, in order for innovative entrepreneurship to successfully diversify local economies, a range of barriers needs to be overcome in regions in industrial transition. Barriers include a weak entrepreneurship culture based on a long tradition of contract work in manufacturing, a lack of existing risk capital for innovative companies to scale up and underutilised knowledge networks.

Scaling-up innovative entrepreneurship in regions in industrial transition requires a functioning regional innovation ecosystem that drives industrial modernisation through a combination of policies in the area of entrepreneurship, SME, innovation, education and science at the regional level. Local and regional authorities have therefore an important role in connecting, developing and supporting the regional innovation and entrepreneurship ecosystem through organising the mapping of available capacities and involving different stakeholder groups in a demand-driven and collaborative approach towards successful industrial transition.

Transition towards a climate-neutral economy

Regions and cities play an important role in order to reach the objective set in the 2015 Paris Agreement of holding the global average temperature increase to well below 2 degrees Celsius and pursue efforts to limit it to 1.5 degrees Celsius above pre-industrial levels. Addressing climate change will require profound changes to currently dominant structures, practices, technologies and policies.

The transition to a climate-neutral economy will not affect every region in the same way. The progressive phasing out of carbon-intensive and extractive industries will present particular challenges for many traditional industrial regions because they are frequently characterised by weak economic diversification and firms operating in carbon-intensive sectors often count for a large share of employment. In such situations, ensuring a just transition requires achieving deep emission reductions while minimising the impact on workers and poorer households.

Promoting a just transition means combining climate action with public support in managing structural change in local economies and the impact on the local workforce. Policymakers need to pursue a dual strategy of supporting low-carbon investments while helping displaced workers at the same time. New opportunities for workers can be stimulated through investments in green technologies and green business opportunities. This helps firms in two ways. First, better environmental performance can improve the local competitiveness of existing firms. Second, promoting new technologies and business models can help upgrade and diversify the local economy, thereby re-orienting the regional knowledge base towards new activities. This is particularly important for regions in industrial transition that face the danger of being locked into existing industrial pathways due to the dominance of incumbent firms in old industries.

Promoting inclusive growth during industrial transition

Successful industrial transition not only depends on reviving economic growth but also on ensuring that growth is fairly distributed and creates opportunities for all. Globalisation and technological change affect different social groups and places differently, not least visible through widening income disparities over the last three decades in most OECD regions.

Regions in industrial transition face very specific impediments to generating greater inclusiveness. The sluggish growth experienced in the context of manufacturing decline results in prolonged periods of unemployment and relatively low prosperity compared to previous moments in time. Low incomes and high unemployment rates result in economic and mental hardship for affected segments of society. Persistent

unemployment among certain social groups, such as women, youth and immigrants, and in certain places, as well as rising relative poverty since the global financial crisis, highlight the multitude of policy challenges that need to be addressed. In the context of industrial transition, it is important that policies promoting new job creation, innovation diffusion, entrepreneurship and environmental and energy transitions are as inclusive as possible.

Inclusive growth in industrial transition also requires closing spatial gaps between frontier and lagging places within one region. Often, changes in regional structures also come with shifts in prospering and distressed local communities. Making sure that once-prosperous and now declining communities are not forgotten over the success of new economic centres and vibrant research hubs within the same region strengthens social cohesion and protects declining places. Addressing inequalities of opportunities within one region requires better access to high-quality education, investment opportunities and infrastructure across social groups and across local communities within and across a region. Not addressing these inequalities would be particularly damaging for regions in industrial transition because they “lock in” privilege and exclusion, thereby undermining the potential that regions in industrial transition have to leverage the growth opportunities arising from transition.

What makes industrial transition successful? Crosscutting lessons and key considerations

A strong regional and place-based dimension is key to support economic growth and well-being

Regions in industrial transition need to match arising opportunities with local resources. Cutting-edge innovation activities leading to higher growth might be difficult to achieve for these regions, given their local capabilities and resources. Often, using existing potential can be an important step towards an incrementally managed industrial transition. Local and regional authorities have an important role in connecting, developing and supporting a regional innovation ecosystem that brings together different stakeholders to unlock existing potential and that actively stimulates new knowledge and capacities in the region.

There are several pathways to industrial transition

Industrial transition comes in many shapes, rendering a “one-policy-fits-all” approach to developing new industrial pathways difficult. According to Grillitsch and Asheim (2018), three broad forms of industry transition can be distinguished: i) upgrading; ii) diversification; and iii) the emergence of new regional industrial paths (Table 1.1).

Table 1.1. Types of new regional path development

Types	Mechanisms
Upgrading	Major change of a regional industrial growth path based on new technologies or organisational innovations, or new business models
Diversification	Diversification into a new industry based on related or unrelated knowledge combinations
Emergence	Setting up of an established industry that is new to the region (e.g. through non-local firms or through radical new technologies and scientific discoveries) and unrelated to existing industries

Source: Grillitsch, M. and B. Asheim (2018), “Place-based innovation policy for industrial diversification in regions”, *European Planning Studies*, Vol. 26/8, pp. 1638-1662.

Upgrading existing industrial paths makes a qualitative change to existing industries and, in some regional settings, is the easiest way to spur economic growth and enhance competitiveness. An example of upgrading can be local firms moving up the value chain in global production networks through transitioning towards higher value-added activities.

Industrial diversification refers to firm-level processes where knowledge and resources from existing industries are used in new industries. The literature differentiates between two concepts, related and unrelated variety (Content and Frenken, 2016). Related variety refers to different industries that build on similar types of knowledge. Diversification based on related variety is a process where firms mainly diversify into technologically related products (Boschma, 2009). For instance, the maritime industry may apply competencies originally used to install oil platforms to the installation of offshore wind parks, thereby moving into the renewable energy sector (Grillitsch and Asheim, 2018). By contrast, unrelated variety refers to industries that do not share similar knowledge.

Finally, emergence means that new industries may emerge in regions that have no link to existing industries. The most radical form of new industry emergence is the creation of completely new industries. Sources for path creation are new technologies, scientific breakthroughs or radical innovations based on new business models, user-driven or social innovations.

Although useful to grasp industrial modernisation, these categories represent industrial modernisation typologies. Regions undergoing industrial transition might experience a combination of some or all of these pathways. Which industrial pathway to choose depends, among other things, on the sophistication of the regional innovation and entrepreneurship support system.

Regional preconditions determine the scope for industrial modernisation

The regional context shapes opportunities for successfully managing industrial transition. This context is constructed from the capabilities of regional actors, including their ability to use cutting-edge knowledge and adopt new technologies, their resource endowment and financial capabilities. Many regions experiencing industrial transition are home to high-capability actors – i.e. local universities, a developed business sector, public administration and civil society – that can contribute to and provide resources for successful industrial transition.

Regions with a heritage of manufacturing activity often have strong and established interactions between industry, research, public services and civil society in core areas of expertise. Yet, these interactions are not always used to mobilise novel combinations of knowledge and resources. This suggests that more systemic network building between sectors and better knowledge circulation at the local level and on a global scale is needed. Sourcing knowledge from outside the region can be an effective channel of industrial modernisation because an over-reliance on local sources may create lock-in and reduce innovativeness as incumbent local players may have fewer incentives to change current production outcomes and processes (Fitjar and Rodriguez-Pose, 2011).

Finally, the quality of governance influences regional innovativeness as well as the quality of policy instruments. Governance of existing policy mixes can be a major factor for diverging economic performance in regions with initially similar preconditions (Morgan, 2016). This underscores the need to adapt support systems to region-specific needs and opportunities using a place-based approach to industrial transition.

Choosing the right strategy also depends on legacies and industrial profiles

The preconditions for successful regional industrial modernisation depend on local institutional and organisational abilities and on the region's existing industrial profile. Regions in industrial transition, even those heavily reliant on traditional manufacturing, may have varying degrees of industrial diversification. Local bottlenecks to successfully manage industrial transition might differ depending on the type of region.

For example, regions with a strong specialisation in a small number of industries could be exposed to a very homogeneous knowledge base, while highly diversified regions might be either successfully diversifying their economies or facing the danger of being stuck in low-value low skills activities across a range of sectors.

Addressing the challenges arising from industrial transition needs a strong place-based dimension to regional development and a tailored approach to local conditions. Promoting development models for successful industrial transition will require building on each region's past legacy and using policy experimentation to identify policy tools that best fit the local context and legacy.

Regions in industrial transition face very specific governance challenges that need to be addressed across policy themes

Industrial transition provides many opportunities in terms of jobs and competitiveness by creating pathways towards innovation and investment, bringing in new business models and setting targets towards a resource-efficient economy. Realising these opportunities requires actively managing, or guiding, the transition process towards positive outcomes. Effective transition governance includes the co-ordination of internal (government) and external stakeholders, ensuring an enabling environment for innovation and experimentation (e.g. supportive regulatory and administrative frameworks), well-designed performance measurement systems and effective stakeholder engagement.

Because regional governments are embedded in national and supranational structures, policies and regulatory frameworks, successful transition management also requires a realistic assessment of what regional governments can influence and what they cannot. Moreover, each region in industrial transition also needs to carefully assess its starting-point in the light of changing policy thinking and how the reorientation from old to new and emerging industries can be done in the context of an already existing – and evolving – policy landscape.

Understanding the evolution of current policy mixes as a precondition to make useful predictions

Capabilities, endowments, policies and governance structures in regions in industrial transition are not static but evolve over time. Before introducing new policies to support industrial transition, policymakers need to understand the evolution of the current policy mix, how and to what extent it constrains the range of options available now, and how existing policies interact with each other. Regions in industrial transition have often introduced a range of policies in various policy fields, such as innovation policies, education and skills policies, and SME and entrepreneurship policies. These policies were in some cases effective drivers of existing industrial specialisations and knowledge and may need to be adapted to accommodate current structural change.

Getting the current policy mix right

Policy instruments do not work in isolation. Public policy unfolds over time and new policy instruments do not emerge in a vacuum but represent an intervention in a continuous stream of unfolding events. Policy mixes can be thought of in a way similar to the prescription of medication. Different medications interact with each other and the underlying medical problem in a highly complex manner. As a result, the overall medication mix may be far from optimal, as some drugs might counteract the effect of other drugs. Such interactions might also accumulate over time when new medications are introduced into the treatment regime. Based on this analogy, the same can hold true for policies. Few policy instruments are highly standardised interventions and how they react with each other is not always easy to understand.

At the same time, successful industrial transition depends on “system innovations”, i.e. a need for simultaneous changes in technology, business models, competency bases, resource use and supporting infrastructure. Achieving this requires integrated policy mixes that combine different policy instruments and create effective processes through which these instruments interact towards a shared vision of industrial modernisation.

Reflecting on goals and rationales

Policy dynamics co-evolve with other dynamics, such as budgetary, political and economic cycles. The changing economic context in regions in industrial transition calls upon policymakers to critically reflect on goals, rationales and instruments used to pursue regional development. Yet, past decisions will constrain the range of options available for current decision-makers. New policies are adopted into a context of pre-existing policy and actor mixes and institutional frameworks that have emerged over time. For instance, in the Basque country, implementing a new regional development strategy involved building on a series of existing policies and institutional actors, including a landscape of supporting actors and structures built-up over decades under earlier and very different rationales (Valdaliso et al., 2014).

Within this context, the challenge of industrial transition is particular and requires strong leadership and openness to policy experimentation and learning. Old models of development that have made regions experiencing industrial transition become leading innovation hubs in the past may no longer work. At the same time, past decisions will tend to constrain the range of options available to current decision-makers.

Allowing for policy experimentation and learning

Dealing with policy complexity requires active policy learning and adaptation. This includes learning from failure, active experimentation, and trial and error. Allowing some freedom of action for local experimentation thus becomes important for industrial transition to be successful.

The idea of experimentation takes into account the need for a flexible approach. For regions in industrial transition, this means that interventions may need to be piloted, or combined, or adapted within a given initiative. For example, there could be variations in the criteria for innovation partnerships or various options for cost-sharing in R&D funding. Once a project has been rolled out, flexibility and openness to changing plans in order to adapt to shifting conditions arising from transition is fundamental.

Balancing short-term actions and political interests with long-term strategic objectives

Reconciling long-term transition ambition with short-term priorities can be challenging because it might not be easy to garner public approval for policy measures that have a limited immediate effect. This puts regions in industrial transition in a difficult situation. On the one hand, they need to cope with the immediate needs for action resulting from a decline in traditional industries, such as higher unemployment, income losses and degrading living conditions for parts of the population. On the other hand, they need to take action to seize opportunities associated with industrial modernisation, such as attracting higher value-added industry, creating and/or attracting new companies and business models and making better use of enabling technologies. Carefully designing policies that can harness the benefits and limit the downsides of a fair transition becomes imperative.

Providing regional leadership

Regional leadership contributes to industrial modernisation by formulating and implementing both a vision and a strategy. In addition, leadership can help transform the identity of a region to the rest of the world as well as the region's own self-image, which is important in order to attract and retain talent and to foster human interactions among local agents.

The role of regional policymakers is to construct a shared vision for and with local actors with the objective of jointly designing a pathway towards industrial modernisation. Creating a shared vision requires identifying, engaging and gathering leaders from different regional stakeholder groups such as local industries, academia, public authorities and non-profits, and pursuing participative governance processes defining regional innovation strategies.

Industrial modernisation processes are likely to fail if local agents do not support the broad strategic vision for regional economic modernisation. In addition to a well-defined vision, it is important for regions in industrial transition to support exchange between local leaders and to allow new players to enter existing markets and industries. Appropriate tools to accomplish this include the promotion of internal events (for local networking) or external events (as representing the region/regional entrepreneurs at trade fairs), and incentives for collaborative R&D.

Managing financial considerations

To prepare for industrial modernisation, regional governments and other stakeholders need to ensure adequate and appropriate financing mechanisms to realise policy and programming objectives. Both the direction and the type of finance provided and leveraged are important. Stimulating investment in new sources of employment and productivity growth requires providing support to firms and workers to become more innovative and adjust from traditional sectors to new technologies. Financial support also helps encourage knowledge exchange and co-operation between local actors, such as small and large firms and universities. Such support in local collaboration and networking helps to create an attractive innovation ecosystem.

Financial incentives can be provided in various forms, including through grants (e.g. vouchers), loans or loan guarantees. However, care needs to be taken not to crowd out the private sector and to take into account competition policy concerns. To this end, regional governments can also promote alternative sources of financing. Public financing offers should be reviewed on a regular basis in order to ensure that local firms and workers have access to appropriate financing. While regions in industrial transition might have a good range of financial tools in place, these might not always correspond to the needs of businesses with models that rely on intangible assets or display high-risk profiles.

Strengthening (multi-level) governance processes

Industrial transition takes place in a complex governance environment, spanning multiple levels (local, regional, national and supranational) and involving a wide variety of actors. To successfully manage industrial transition within a region, improving co-ordination among public and private sector actors and civil society as well as ensuring a cross-sectoral and multi-stakeholder approach is vital.

Because regional governments must be responsive to national and supranational policy and regulatory frameworks, successful transition management also requires a realistic assessment of what regional governments can influence and how. In addition, “active relationship management” is necessary among the various levels of government involved in order to ensure that priorities are clear and aligned, that policies are coherent and that the objectives of all levels of government can be attained. Promoting co-ordination and capacity building at the national and subnational levels is a large and critical step toward accomplishing this.

Monitoring and evaluation of the policy mix

Because innovation and innovation policy operate in a complex, dynamic and uncertain environment, a commitment to performance measurement systems, including monitoring and evaluation, is fundamental. Not only do they paint a picture of whether or not innovation policies are meeting their objectives, they offer insight into what needs to be adjusted and build evidence bases for future policy and programming design.

Yet, performance measurement in innovation policy is a challenge, as regions often face financial and staff resources and skills limitations, as well as gaps in technical knowledge with regard to defining performance indicators and setting quantitative objectives.

In addition, with a broader understanding of what innovation can be and what it encompasses, there is a need to improve the indicators traditionally used. Available measurements largely reflect the industrial era and less so the knowledge-based and digitalised economy, leaving policymakers struggling to capture the impact of the digital transformation, for example. For regions in industrial transition, where broadening innovation policy is fundamental for a successful transition, the lack of effective monitoring and evaluation mechanisms is particularly difficult. Improving monitoring and evaluation capacities includes more consultation with stakeholders to develop goals and design programmes, more stringent collection of programme data, better monitoring of progress, adjusting programmes towards industrial modernisation, and overcoming of societal and disruptive challenges related to transition.

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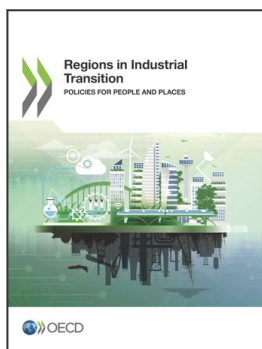
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Annex 1.A. Toolkit to assess policy responses to industrial transition

Annex Table 1.A.1. Overview of policy issues and policy responses for regions in industrial transition

Policy issue	Policy responses
Preparing for the future of work	
Lack of skilled workers to move into new and emerging activities	<ul style="list-style-type: none"> • Better anticipate skills needs for industrial transition • Strengthen capacity of firms to address their human resource needs internally • Involve local stakeholders in the planning and design of regional skills initiatives
Spatially concentrated lack of job opportunities for low- and middle-skilled workers	<ul style="list-style-type: none"> • Support vulnerable workers during the period of industrial transition • Provide workforce and management development for start-ups and scale-ups through training and upskilling programmes • Foster the integration of youth, women and older people in the labour market
Limited investment in new sources of employment and productivity growth	<ul style="list-style-type: none"> • Provide support for firms to become more innovative and adjust from “traditional sectors” to new technologies • Assist firms in better using skills at the workplace • Encourage knowledge exchange and co-operation between larger and/or newer firms with smaller and/or older firms
Lack of co-ordination and financing mechanisms	<ul style="list-style-type: none"> • Implement effective multi-level partnerships • Ensure sufficient and well-targeted financing and investment
Broadening and diffusing innovation	
Creating and sustaining comprehensive innovation ecosystems	<ul style="list-style-type: none"> • Broaden the notion of innovation and build private and public sector capabilities for innovation • Strengthen innovation financing and reduce barriers to investment • Improve monitoring and evaluation of innovation policies
Lack of (small) business capabilities for innovation	<ul style="list-style-type: none"> • Accelerate the digital transformation • Scale business innovation networks and support clusters • Support effective university-industry co-operation
Territorial disparities in innovation diffusion	<ul style="list-style-type: none"> • Leverage the potential of cities and tradable sectors • Capitalise on unique regional strengths for innovation • Strengthen skills development and skills utilisation
Promoting entrepreneurship and private sector engagement	
Limited access to finance for start-ups and scale-ups	<ul style="list-style-type: none"> • Facilitate access to finance and broaden the range of financial instruments • Strengthen financial literacy
Limited access to entrepreneurship skills and networks for start-ups and scale-ups	<ul style="list-style-type: none"> • Support entrepreneurs with information, training, coaching and mentoring • Strengthen entrepreneurial networks • Enhance start-up and SME participation in collaborative research
Improving the entrepreneurial enabling environment	<ul style="list-style-type: none"> • Ensure a friendly regulatory environment through simplified regulations and registration procedures • Foster an entrepreneurship culture through the development of entrepreneurial mindsets • Monitor and evaluate SME and entrepreneurship policies

Policy issue	Policy responses
Transitioning towards a climate-neutral economy	
Creating job opportunities for the transition to the climate-neutral economy	<ul style="list-style-type: none"> • Support green skills and jobs through training and upskilling • Support workers in transition through dedicated job-search training and Flexicurity in labour markets • Support measures to a just transition
Lack of business opportunities for green innovations	<ul style="list-style-type: none"> • Stimulate green behaviour in firms • Encourage innovation in environment-friendly technologies
Reconciling the long-term strategic dimensions of a climate-neutral transition with short-term action	<ul style="list-style-type: none"> • Foster local energy transitions through financial and strategic support schemes • Integrate the transition to a climate-neutral economy into larger regional development strategies • Ensure an enabling environment for transition
Promoting inclusive growth	
Strengthening regional well-being	<ul style="list-style-type: none"> • Integrate vulnerable populations into the labour market • Develop and implement a regional-level well-being framework
Spatial discrepancies and territorial linkages	<ul style="list-style-type: none"> • Encourage territorial co-operation through rural-urban partnerships • Ensure digital connectivity and digital services in remote regions
Improving inclusive growth governance	<ul style="list-style-type: none"> • Building strategic partnerships and stakeholder engagement • Make inclusive growth an explicit goal across levels of government



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