



Industrial Development Report 2016

The role of technology and innovation in

Inclusive and Sustainable Industrial Development (ISID)

http://www.unido.org/fileadmin/user_media_upgrade/Resources/Publications/EBOOK_IDR2016_OVERVIEW_ENGLISH.pdf

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not necessarily reflecting the main findings or policies of UNIDO

- ✓ **Poverty eradication can only be achieved through strong, inclusive, sustainable and resilient economic and industrial growth, and the effective integration of the economic, social and environmental dimensions of sustainable development.**
- ✓ **How do countries move up the development ladder? The answer lies in the adoption and adaptation of knowledge from abroad.** (Through 'Circular Migration of skilled workers', 'Foreign Direct Investments' & 'Participation in Global Value Chains'?)
- ✓ **Global value chains offer new opportunities for industrialization and industrial policy.**
- ✓ **Even if new technologies hurt income distribution and employment creation, it is often temporary.**
- ✓ **The relationship between structural change and social inclusiveness is positive.**
- *The transition from a labour-intensive to a technology-intensive economy drives economic upgrading. Low income countries thus acquire the necessary capabilities to catch up and reduce the gap with per capita incomes in high income countries.*
- *Globalization and the fragmentation of production at international level (global value chains) have facilitated the diffusion of new technologies through the intensification of trade in sophisticated manufacturing goods.*
- *Reaching advanced levels of inclusive and sustainable industrial development requires not only increasing incomes but also conscious efforts to sustain growth, promote social inclusiveness and move towards greener structural transformation.*
- *Industrialization, crucial to the future growth of developing countries, a major force in structural change, shifts resources from labour-intensive activities to more capital and technology-intensive activities.*
- *In developing countries energy and natural resources use affects growth in medium- and low-tech industries.*
- *Diversification into manufacturing can help to achieve rapid average growth rates, longer periods of growth and less volatility in growth.*
- *Premature deindustrialization smothers economic development potential by limiting the application of technology to production and generating low productivity and informal services activities—while mature deindustrialization often leads to dynamic high-tech services.*
- *Technological capabilities are strengthened by investing in human capital, institutions, improving innovation systems and upgrading in global value chains.*
- *Technological capabilities are expanded in developing countries by acquiring and adapting technologies created elsewhere.*

The report emphasizes the critical need for international cooperation to promote technological change and achieve **Inclusive and Sustainable Industrial Development (ISID)**

For long-term structural change, manufacturing plays a key role. It creates many productive, formal jobs at an early stage of development. It also drives technological development and innovation to sustain productivity growth in manufacturing and other sectors. And it has varying effects on employment, wages, technological upgrading and sustainability.

- Even though technology and automation generally improve people's working conditions, the number of jobs may decrease as a result, with workers being replaced by machines. Technological change itself can mitigate this effect. New technologies also generate new markets, for example the waste and recycling industry, reduce the prices of consumer goods and provide opportunities for new investments with higher levels of profitability. Most importantly, the expansion of new technologically-intensive industries absorbs those workers who have lost their jobs to machines.

How can developing countries catch up with the global economic and technological frontier? What matters for countries in transition from an agrarian to a modern economy is generating many formal manufacturing jobs that pay more than agricultural and subsistence sectors. For this, the rapid growth of export-oriented labour-intensive industries is important.

- By promoting technological change through investing in human capital, improving innovation systems and upgrading global value chains (GVCs).

- Rather than build new technology themselves, developing countries can use technology transfers from abroad to grow. Global Value Chains compel countries with low productivity to upgrade their production capabilities.
- Structural change can prompt a shift to more environment-friendly sustainable sectors and activities—such as from heavy industry to light, to more recycling or to services, which tend to be less polluting than manufacturing.
- Premature deindustrialization can smother the growth potential of manufacturing when it sets in. The kind of informal service activities that emerge at this stage reduce rather than enhance growth. When mature deindustrialization sets in at higher levels of per capita income, the kind of services that emerge— logistics, business services and information technology services— are much more dynamic and can take over and complement the growth-enhancing role of manufacturing.

✓ **How do countries move up the development ladder? The answer lies in the adoption and adaptation of knowledge from abroad.** (Through 'Circular Migration for skilled workers', 'Foreign Direct Investments' & 'Participation in Global Value Chains?')

The foremost challenge for low-income countries is sustaining the process of industrialization

- The world's manufacturing production increased its participation in Global Value Chains and integration into supply chains led by North America, Western Europe and East Asia.
- Sub-Saharan Africa increased the share of value added coming from other regions in its manufacturing output (backward production linkages) and share in its total value added derived from intermediate exports to other regions (forward production linkages). But such integration did not see the region industrializing rapidly.
- The types of services activities likely to replace manufacturing at premature deindustrialization are more likely to be low-skilled, low-productivity, non-tradable activities, such as retail or personal services, which do not have strong increasing returns or the potential for cumulative productivity increases. Although those activities may be important for job creation, they are not likely to drive growth. Nor are they likely to allow countries to leapfrog to dynamic growth-pulling services activities before they have industrialized.
- A partial developing-country exception may be India, the "office of the world," which has enclaves of dynamic service activities but whose employment numbers are tiny relative to the country's population.

Linking inclusiveness and environmental sustainability

- Industrialization was not factored into the Millennium Development Goals, but inclusive and sustainable industrial development (ISID) features strongly in the 2030 Agenda for Sustainable Development. Sustainable Development Goal 9 promotes ISID with targets for sharply raising industry's share of employment and GDP by 2030, integrating small-scale industrial and other enterprises into value chains and markets, upgrading infrastructure and industries with greater resource-use efficiency, using clean and environmentally sound technologies and industrial processes, boosting scientific research, upgrading technological capabilities and encouraging innovation (UN 2015).

Technology and innovation in manufacturing propel sustained growth

- The rapid diffusion of new technologies based on broad areas of scientific research such as information technologies, biological sciences, material sciences and energy are examples of technological breakthroughs. These new technologies will likely fuel the next wave of global economic growth. A dozen new economically disrupting technologies might have a huge impact in years to come: mobile internet, cloud technology, advanced robotics, autonomous vehicles, energy storage, 3-D printing, advanced materials and renewable energy. These technologies have the potential to affect billions of consumers, hundreds of millions of workers and trillions of dollars of economic activity across different industries
- These technologies are also sometimes called "general purpose technologies." They affect the entire economy, transforming both household life and the way firms conduct business. Examples include the steam engine, electricity, internal combustion and information technologies.
- Televisions, mobile phones or even computers when first introduced, their commercial uses were restricted and the costs of production were so high that only a small portion of society could afford them. Their massive diffusion later was enabled by a series of widespread incremental innovations.

✓ **Global value chains offer new opportunities for industrialization and industrial policy**

Lessons from upgrading in clusters in advanced economies

- The emergence of clusters—the film industry (Hollywood, Bollywood and Nollywood), high-tech firms (Silicon Valley), specialist software firms and firms specializing in new materials (Seattle, near Microsoft and Boeing), metalworking and machine tools (Baden Württemberg)— was originally due to external economies and market forces.
- In an increasingly global economy, important as inter-firm cooperation and trust might be, they are generally not enough to ensure a cluster's survival in the modern world. Many of the clusters that once dominated global trade in sectors such as footwear, ceramics, clothing and furniture have failed to make the required transitions. The latest challenge— dancing to the tunes of global buyers of final and intermediate products and services since the last quarter of the 20th century— is even more daunting. Unless producers can meet these Global Value Chains' needs, they are out.

Industrial clusters in low-income countries

- Many clusters, particularly in the least developed economies or in localities of great poverty in middle-income economies, are essentially “survivalist.” They can remain static for many years, showing little signs of upgrading or firm development.
- Their markets are overwhelmingly local. The entrepreneurs essentially make the kind of products that they themselves consume, and there is little incentive for product upgrading or for the more extended division of labour owing to the small size of the market.
- The more dynamic clusters are associated with sales beyond the immediate area to national, regional and foreign markets
- *Organizational upgrading.* Many informal sector clusters offer wide scope for upgrading workflow, quality procedures, material storage, machine maintenance and business strategy. These “soft” elements of process technology can involve writing business plans and securing finance from governments and NGOs. But while important, they meet only a restricted part of the organizational technology upgrading agenda.
- *Inter-firm divisions of labour and functional upgrading.* One of the major drivers of productivity growth is specialization within firms and the division of labour between firms. This is often a natural outcome of cluster dynamics. Once enterprises begin to participate in Global Value Chains, they also need to upgrade functionally.

Upgrading technology in global value chains

- From developing countries’ perspective, Global Value Chains (GVCs) offer new opportunities for industrialization and industrial policy. Rather than having to build up capabilities over the complete range of industrial activities, countries can focus on entering given slices of GVCs.
- The more deeply embedded foreign firms are in the local economy, the more they can help upgrade their local suppliers.
- There is ongoing debate about the relative importance of horizontal policies that affect all firms in the economy versus selective (discretionary, vertical) policies that target specific sectors, Technologies or even firms. Although there is a widespread and generalized commitment to an open trading environment, in reality many countries continue to craft their trade policies to support the particular needs of their productive sectors.

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| <ul style="list-style-type: none">✓ Even if new technologies hurt income distribution and employment creation, it is often temporary✓ The relationship between structural change and social inclusiveness is positive |
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Designing and implementing inclusive and sustainable industrial development policies

- *Clusters of policies.* Policymakers thus have to weigh economic pros and environmental cons, social pros and environmental cons, and environmental pros and economic cons. The technology policies need to be complemented by macroeconomic, business-enabling, trade and investment, industry institutionalization as well as infrastructure policies to support a country’s competitiveness. These policies are prerequisites for integrating into GVCs but should be complemented with a more radical macroeconomic approach and strategic investment policies.
- *Industrial policies.* Industrial policies for innovation are a broad concept for combining technological and non-technological policies for different kinds of innovations at different stages of development. One crucial element determining the emergence, development and expansion of innovation activities is government intervention. Governments in developed and developing countries are increasingly making innovation a key issue, recognizing its potential to promote economic growth and address social and environmental challenges. The main argument for government support is that a market economy cannot generate by itself the optimal levels of investment in innovation because of market failures and information asymmetries that lead to serious funding gaps.
- Policymaking should be broadened to take into account non-technological innovation.
- *Competitiveness policies.* Global Value Chains lead firms might require their local suppliers to adopt international standards, if they are skilled and fully competent or when the product is a commodity. Lead firms can also require them to adjust to specific technical and quality standards and to take full responsibility for the process technology. As lead firms do not become directly involved in the learning process but impose pressure on their suppliers for innovating and keeping abreast of technological advancements, they can be seen rather as a crucial stimulus for inducing learning and innovation but not as participants in the process. Nor do lead firms always enrich local firms with knowledge transfer and support upgrading processes. So, it is crucial to understand the structure of the value chains, the processes of structural change and the power asymmetries between firms that determine how entry barriers are created and how gains and risks are distributed.
- *Complementary policies.* Industrial policy-makers, especially in developing countries, might gradually shift their attention from investigating and imitating international best practices to identifying and reproducing national success stories.
- *Encourage public–private dialogue.* Governments should join forces with their industrial private sector to design interventions based on their combined expert knowledge and to ensure that decisions are supported by key stakeholders. Especially in developing countries with low public sector capacity, the private sector input can contribute to successful policies. The new industrial policy needs to be based on such dialogue and not on top-down planning.