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Promoting Structural Transformation through Industrialization

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Introduction

Structural transformation¹ is the change in the long-term composition and distribution of economic activities. The growth of a country's economy is at the core of the matter as it corresponds to a transition from lower to higher productivity sectors.² In UNIDO's Industrial Development Report 2013³, analyzing trends of structural change over a 50-year period, observed the transition by looking at the shifts from one sector to another (mainly from agriculture to industry and services).

Trends of industrialization in the long run show that it had positive association with wealth, economic development, technological leadership, political power and international dominance. The literature shows that countries that failed to industrialized were perceived to be on an unsustainable development path. Greater opportunities for technological transfer provided by industrialization enabled countries to enter into "the catch-up phase" through robust growth of the manufacturing sector.

Structural Transformation Approaches

There are two approaches to structural transformation. The first approach is through the changing importance of a country's economic sectors at different income levels. In this approach we exclusively look at the changing contribution of the major sectors (i.e. agriculture, non-manufacturing industries⁴, manufacturing industries and services) in the economy to gross domestic product (GDP) or income. This approach sees the agriculture sector accounting for a relatively higher share of GDP at low income levels, and as income rises, manufacturing gains ground. In the analysis using this approach, the findings show that economic development being associated with a near tripling of the share of manufacturing in the economy at the expense of the agriculture sector, whose share significantly shrinks.

In resource-rich countries, although the shift from agriculture towards industry remained, the results of the analysis over the 50-year period showed that the importance of the non-manufacturing industries was larger. This finding is linked to the phenomenon, "natural resource curse" or "Dutch disease" which is when an economy's incentives might be biased towards non-manufacturing industries, to manufacturing's detriment

In the second approach, manufacturing is the main engine of economic growth, and the main driver of productivity growth. In this approach, industrialization through manufacturing is seen to offer greater opportunities than other sectors to accumulate capital, exploit economies of scale, acquire new technologies and foster embodied and disembodied technological change. Focus is also given to the spillover effect of manufacturing on the other sectors arising from productive linkages, stimulating, for example, demand for more and better primary goods and the generation of externalities in technology development, skill creation and learning, elements crucial for competitiveness.

¹ Or structural change.

² United Nations Industrial Development Organisation, 2013. *Industrial Development Report 2013. Sustaining Employment Growth: The Role of Manufacturing and Structural Change*. Vienna.

³ This report details both the theoretical and practical reasoning, summarized in this paper.

⁴ Defined in the UNIDO report as comprising of mining and quarrying, construction and public utilities (electricity, gas and water)

Structural Transformation and its Impact Pathway towards Poverty Eradication

Haraguchi and Kitaoka (2015)⁵ notes that there is increasing recognition that structural transformation of industries is a key driver for the creation of growth rates, jobs and economic structures needed to fully eradicate poverty and to provide sustainable livelihoods for all, particularly in developing countries.

Manufacturing and Economic Growth: Empirical studies have shown close positive links between economic growth and structural transformation. The effect of a positive relationship between the share of manufacturing and economic growth is significant in poorer countries. The opposite effect is seen when there is a period of deindustrialization.⁶ Economic growth supports the increase of individual incomes which expands consumption and thus enhances human well-being⁷, thence poverty.

Manufacturing and Employment: Manufacturing is fundamental to the labour market. Jobs in manufacturing tend to be more productive than others, and tender to be better paid, offering better labour conditions. Through its spillover and indirect effects, manufacturing's productive linkages with other sectors lead to employment creation. Economists have argued and showed how employment creation and improvement in job quality via learning-based industrialization is the pathway to inclusive and sustainable development.⁸ The quantity and quality of employment generation is linked to the formation of specialized technical skills. The accelerating pace of technological change is making these skills more important.

The formal and informal employment dynamics of manufacturing are important forces during structural transformation, in addition to the skill composition, and a country's capabilities development (through education and training). Gender dynamics also play an important role recognizing that the economic empowerment of women is a powerful mechanism, particularly for poverty eradication.⁹

As one examines the impact pathway of structural transformation on poverty eradication, it is necessary to know that the role of manufacturing changes as structural change evolves. At lower incomes the application of low capital-intensive technologies allows for improvements in both productivity and employment. As the capital intensity of technology increases, productivity gains dominate and employment shifts towards manufacturing-related and other services.

The drivers of structural change in manufacturing are:

- Costs, as well as technology and demand – these being the critical drivers;

⁵ Haraguchi, H and Kitaoka, K (2015). *Industrialisation in the 2030 Agenda for Sustainable Development*, Development, 58(4), 452-462

⁶ As shown in Latin America countries, during a period of deindustrialization, modest rates of GDP per capita growth was achieved.

⁷ Andreoni, A and Chang, H-J (2016). *Bringing Production and Employment Back into Development: Alice Amsden's legacy for a New Developmentalist Agenda*, Cambridge Journal of Regions, Economy and Society.

⁸ Ibid.

⁹ See The EQUIP project - <http://www.equip-project.org/toolbox/> (accessed 5 April 2018)

- Skills matching, where types of skills are matched to the structure of industry as income grows;
- Product innovation, which has the potential to support further employment generation through the creation of new business opportunities; and
- Resource efficiency.

Technology and Structural Transformation

For innovation and technology to drive economic development and growth will depend on a country's¹⁰:

- Ability to use existing technology and to innovate;
- Performance in the global market, taking advantage of opportunities for catch-up through knowledge diffusion; and
- Ability to move into new export markets.

The effect of technological change on structural transformation is usually measured through its effect on (i) productivity; (ii) innovation, and technological capabilities; and (iii) global trade and global value chains. Findings from UNIDO (2015)¹¹ indicate that technological capabilities can be:

- Strengthened by investing in human capital, institutions, improving innovation systems and upgrading in industrial clusters and global value chains;
- Expanded in developed countries through tinkering with the frontiers of science and technology, and in developing countries by acquiring and adapting technologies created elsewhere.

In order to promote social inclusiveness, the choice of technology must be matched to a country's resource and skills endowment.

Over time, industrialization has undergone four phases of change (Figure 1), with the current phase being informed by a vision where the physical world of industrial production is merged with the digital world of information technology¹².

The current industrial revolution is currently being debated under different names, in different regions: in Germany, where it first emerged, it is commonly referred to as "Industrie 4.0", whilst in the USA, it is known as the Industrial Internet (of Things), Advanced Manufacturing or Digital Manufacturing. Encompassing aspects such as big data, cloud computing, artificial intelligence, robotics, 3D printing, new materials, augmented reality, nanotechnology and biotechnology, the current industrial revolution phase has the potential to improve productivity, increase resource efficiency and effectiveness.

¹⁰ United Nations Industrial Development Organization, 2015. *Industrial Development Report 2016. The Role of Technology and Innovation in Inclusive and Sustainable Industrial Development*. Vienna.

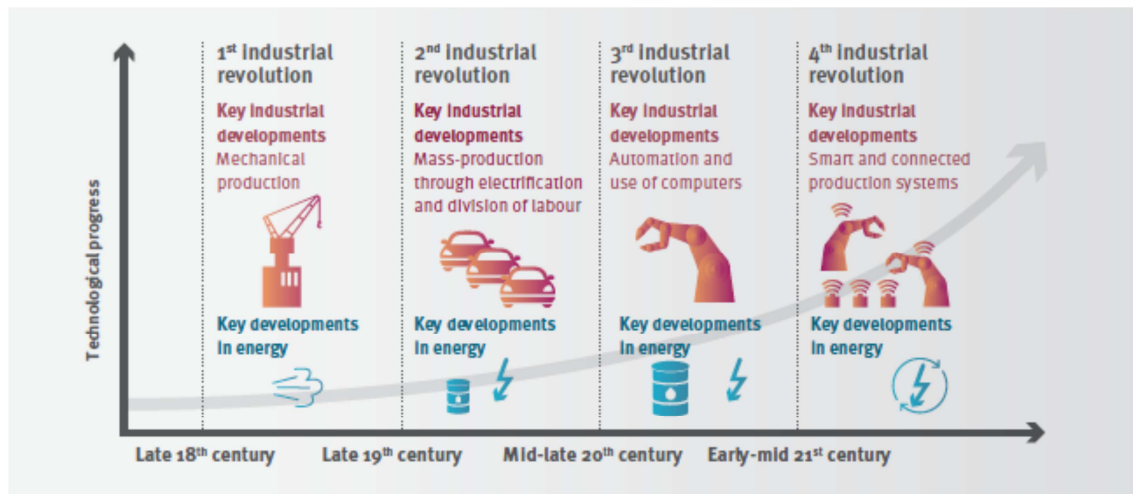
¹¹ Ibid

¹² UNIDO (2017). *Accelerating clean energy through Industry 4.0: manufacturing the next revolution*. Nagasawa, T., Pillay, C., Beier, G., Fritzsche, K., Pougel, F., Takama, T., The, K., Bobashev, I. A report of the United Nations Industrial Development Organization, Vienna, Austria.

The current debate on this phase has focused on the question of how it may affect the “future of work”. The effects on employment are not fully conclusive. In addition to effects on employment, it is anticipated that digitization, and the fourth industrial revolution will place challenges on the demand for resources, data security, the development of suitable policy frameworks, increased pressure in the race to innovate, and the deepening of global inequalities. These effects are likely to pose greater challenges to developing countries, and in particular the least developing countries.

Towards this end, there is a need to better understand the impact of the Fourth Industrial Revolution and its impact on inclusive and sustainable industrial development.

Figure 1: The Four Industrial Revolutions



Source: Nagasawa, T, et.al (2017)

Inclusive and Sustainable Industrial Development (ISID)

The adoption of the 2030 Agenda for Sustainable Development by the international community allows for the achievement of a more holistic approach to sustainable development. UNIDO pursues its mandate to promote and support inclusive and sustainable industrial development (ISID) with the aim of ensuring that countries are able to harness industry’s full potential to contribute to prosperity for all. ISID means that:

- Every country achieves a higher level of industrialization in their economies and benefits from the globalization of markets for industrial goods and services.
- No one is left behind in benefiting from industrial growth, and prosperity is shared among women and men in all countries.
- Broader economic and social growth is supported within an environmentally sustainable framework.
- The unique knowledge and resources of all relevant development actors are combined to maximize the development impact of ISID.

Through SDG 9 (*build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation*), ISID serves as a primary engine not only for

economic growth but to support the creation of jobs, technology transfer, investment flows and skills development, within an environmentally sound environment.

Haraguchi and Kitaoka (2015) show that manufacturing development is strongly associated with poverty alleviation, and reduction in income inequality.¹³ The impact that industry has on poverty eradication and income inequality is dependent on the pattern of industrialization a country chooses to follow. Analyzing structural transformation in countries by their incomes level, Haraguchi and Kitaoka (2015) coined the need for “smart industrialization” linked to structural understanding of the evolution of manufacturing productive capacities which will impact on the creation of decent work, food security and equitable growth – requirements to sustainably eradicate poverty.

In order for countries to tap into this potential, a long-term industrialization strategy would be required to help put in place a framework of stable economic, legal, and political conditions that will help create the necessary policy incentives.

To help chart a course for strong and sustained growth from ISID, UNIDO works its member states to undertake a country diagnostic to establish a strategic direction to ensure optimization of its industrialization pathway. In order to ensure that the country’s industrial development path is associated with stronger growth, better living and environmental standards, UNIDO’s diagnostic methodology features:

- An inclusive and participatory exercise involving government and stakeholders¹⁴ whose lives are directly or indirectly affected by industrial development.
- The integration of analysis at the macro, meso and micro levels.
- An appropriate set of analysis using methodologies that is best suited to examine the different dimensions of industrial development issues. Data collection is made at the quantitative and qualitative level utilizing primary and secondary sources.

Figure 1 illustrates the conceptual framework of the diagnostic tool. The framework attempts to systematically link poverty and sustainability, to economic development, via an assessment of a country’s industrial development.

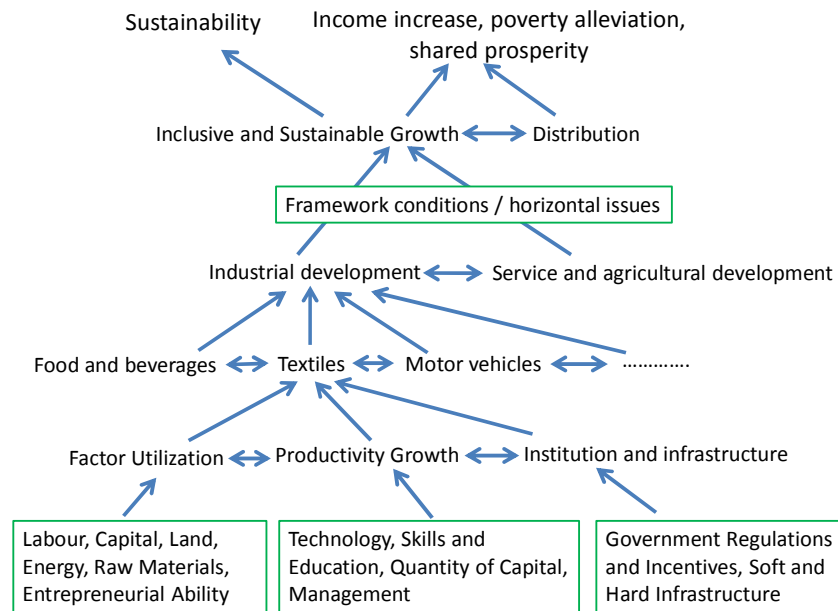
It aims to be as comprehensive as possible recognizing that contributions to growth can be sourced from different economic activities and horizontal conditions, such as education, skills, infrastructure, access to finance, investment climate and business regulations. Macroeconomic conditions are also taken into consideration to support the identification of the opportunities and challenges that a country faces and potentially face with industrial development. These conditions include the examination of changes in the economic structure of a country, its current share of industrial value added in GDP, and employment, disaggregated by gender, and youth. The framework also allows for the examination of

¹³ The authors examined the relationship between the levels of manufacturing development, measured by share of manufacturing in GDP and poverty rates (under USD 1.90) and income inequality (using the Gini coefficient). The relationship was statistically negative with the level of manufacturing development.

¹⁴ Stakeholders include the private sector, industry associations, development partners including multilateral development bodies and civil society.

factors to support further growth of the industrial sector through, for example, better use of production factors, skills and technology development, and the external environment.

Figure 2: Analytical Framework for ISID



This analytical approach is being applied to UNIDO’s innovative model to accelerate ISID in its member states, the Programme for Country Partnership (PCP).

Closing

In recent years, arguments that the importance of manufacturing has diminished, resulting in premature deindustrialization or non-industrialization have arisen. However, studies such as Haraguchi and Cheng (2016)¹⁵ show that the decline in manufacturing in many developing countries have not been caused by changes in the development potential of manufacturing but has resulted from a shift of manufacturing activities to relatively small number of populous countries. Opportunities remain for developing countries, as long as governments take appropriate actions.¹⁶ The adoption of the 2030 Agenda for Sustainable Development is a development agenda that values the role of structural transformation, and employment generation in sustainable development.

¹⁵ Haraguchi, N and Cheng, Charles Fang Chin (2016). *The Importance of Manufacturing in Economic Development: Has this Changed?* Department of Policy Research and Statistics Working Paper 1/2016, UNIDO, Vienna (subsequently published in *World Development* (2017), Vol 93, 293-315)

¹⁶ Hallward-Driemeier, Mary, and Gaurav Nayyar. 2018. *Trouble in the Making? The Future of Manufacturing-Led Development*. Washington, DC: World Bank.